Texas Commission on Environmental Quality

Public Involvement Plan Form for Permit and Registration Applications

The Public Involvement Plan is intended to provide applicants and the agency with information about how public outreach will be accomplished for certain types of applications in certain geographical areas of the state. It is intended to apply to new activities; major changes at existing plants, facilities, and processes; and to activities which are likely to have significant interest from the public. This preliminary screening is designed to identify applications that will benefit from an initial assessment of the need for enhanced public outreach.

All applicable sections of this form should be completed and submitted with the permit or registration application. For instructions on how to complete this form, see TCEQ-20960-inst.

Section 1. Preliminary Screening

☐ New Permit or Registration Application

☒ New Activity – modification, registration, amendment, facility, etc. (see instructions)

If neither of the above boxes are checked, completion of the form is not required and does not need to be submitted.

Section 2. Secondary Screening

☒ Requires public notice,

☐ Considered to have significant public interest, **and**

☒ Located within any of the following geographical locations:

- Austin
- Dallas
- Fort Worth
- Houston
- San Antonio
- West Texas
- Texas Panhandle
- Along the Texas/Mexico Border
- Other geographical locations should be decided on a case-by-case basis

If all the above boxes are not checked, a Public Involvement Plan is not necessary. Stop after Section 2 and submit the form.

☒ Public Involvement Plan not applicable to this application. Provide **brief** explanation.

A public involvement plan is not required as this is a renewal application with minor amendments. Public notice will be conducted as required.

Section 3. Application Information

Type of Application (check all that apply):

Air ☐ Initial ☐ Federal ☐ Amendment ☐ Standard Permit ☐ Title V

Waste ☐ Municipal Solid Waste ☐ Industrial and Hazardous Waste ☐ Scrap Tire
☐ Radioactive Material Licensing ☐ Underground Injection Control

Water Quality

☐ Texas Pollutant Discharge Elimination System (TPDES)

- ☐ Texas Land Application Permit (TLAP)
- ☐ State Only Concentrated Animal Feeding Operation (CAFO)
- ☐ Water Treatment Plant Residuals Disposal Permit

☐ Class B Biosolids Land Application Permit

☐ Domestic Septage Land Application Registration

Water Rights New Permit

☐ New Appropriation of Water

☐ New or existing reservoir

Amendment to an Existing Water Right

☐ Add a New Appropriation of Water

☐ Add a New or Existing Reservoir

☐ Major Amendment that could affect other water rights or the environment

Section 4. Plain Language Summary

Provide a brief description of planned activities.

Section 5. Community and Demographic Information

Community information can be found using EPA's EJ Screen, U.S. Census Bureau information, or generally available demographic tools.

Information gathered in this section can assist with the determination of whether alternative language notice is necessary. Please provide the following information.

(City)

(County)

(Census Tract)
Please indicate which of these three is the level used for gathering the following information.

☐ City ☐ County ☐ Census Tract

(a) Percent of people over 25 years of age who at least graduated from high school

(b) Per capita income for population near the specified location

(c) Percent of minority population and percent of population by race within the specified location

(d) Percent of Linguistically Isolated Households by language within the specified location

(e) Languages commonly spoken in area by percentage

(f) Community and/or Stakeholder Groups

(g) Historic public interest or involvement

Section 6. Planned Public Outreach Activities

(a) Is this application subject to the public participation requirements of Title 30 Texas Administrative Code (30 TAC) Chapter 39?

☐ Yes ☐ No

(b) If yes, do you intend at this time to provide public outreach other than what is required by rule?

☐ Yes ☐ No

If Yes, please describe.

If you answered "yes" that this application is subject to 30 TAC Chapter 39, answering the remaining questions in Section 6 is not required.

(c) Will you provide notice of this application in alternative languages?

☐ Yes ☐ No

Please refer to Section 5. If more than 5% of the population potentially affected by your application is Limited English Proficient, then you are required to provide notice in the alternative language.

If yes, how will you provide notice in alternative languages?

☐ Publish in alternative language newspaper

☐ Posted on Commissioner's Integrated Database Website

☐ Mailed by TCEQ's Office of the Chief Clerk

☐ Other (specify)

(d) Is there an opportunity for some type of public meeting, including after notice?

☐ Yes ☐ No

(e) If a public meeting is held, will a translator be provided if requested?

☐ Yes ☐ No

(f) Hard copies of the application will be available at the following (check all that apply):

☐ TCEQ Regional Office ☐ TCEQ Central Office

☐ Public Place (specify)

Section 7. Voluntary Submittal

For applicants voluntarily providing this Public Involvement Plan, who are not subject to formal public participation requirements.

Will you provide notice of this application, including notice in alternative languages?

☐ Yes ☐ No

What types of notice will be provided?

☐ Publish in alternative language newspaper

☐ Posted on Commissioner's Integrated Database Website

☐ Mailed by TCEQ's Office of the Chief Clerk

☐ Other (specify)

Texas Commission on Environmental Quality

Plain Language Summary

Industrial and Hazardous Waste Permit Applications

Instructions: Complete this form and submit with any industrial hazardous waste, or industrial solid waste, permit application that is subject to 30 Texas Administrative Code §39.405(k) [applications for a Class 3 permit modification, permit amendment, permit renewals, and for a new permit]. Please be concise.

Application Information

Purpose of application: ☐New ☒Renewal ☒Modification/Amendment	
Date Submitted to TCEQ: February 20, 2026	
Customer Name: Equistar Chemicals, LP	
Facility Name: Equistar Chemicals Channelview Complex	
CN: 600124705	**RN:** 100542281
Permit Number: 50117	**Solid Waste Registration Number:** 30030
Facility Street Address: 8280 Sheldon Road	
Weblink to Street Address: https://maps.app.goo.gl/k6p27V5ihTWS61Av9	

Facility Information *(check all that apply)*

What is the primary type of business?	☒Chemical manufacturing ☐ Oil refinery ☐ Treatment, storage or disposal facility plant ☐Other **If other, enter description:**
What does the facility produce?	☒Chemicals ☐Fuels / lubricants ☐No products ☐Other **If other, enter description:**

Waste Management Information *(check all that apply)*

What types of wastes are managed?	☒Nonhazardous industrial ☒Hazardous ☐Other **If other, enter description:**
Where does the waste come from?	☒Off-site source ☒On-site source
How is the waste managed?	☒Storage ☒Process / Treatment ☒Disposal ☐Other **If other, enter description:**
What type of units manage the waste?	☒Active ☐Post-Closure **Type and count:** One container storage area and five permitted waste tanks
What happens to waste managed at the facility?	☒Transported off-site ☐Disposed on-site ☐Other **If other, enter description:**

Pollution Control Methods *(check all that apply)*	
How will the facility prevent spills, leaks, and releases?	☒Routine inspections ☐Engineered liner systems ☒Spill containment ☒Proper waste handling ☐Operations in enclosed buildings ☒Groundwater monitoring ☐Other **If other, enter description:**
How will the facility clean up spills, leaks, and releases?	☒Spill clean-up supplies ☒Decontamination equipment ☐Other **If other, enter description:**
How will the facility prevent / minimize air emissions?	☒Air monitoring / control systems ☐Filters / scrubbers ☒Routine inspections ☒Proper waste handling ☐Operations in enclosed buildings ☐Other **If other, enter description:**

Description of Update *(for Class 3 Modifications and Amendments only)*

List and explain any changes this modification or amendment would make to the two sections above—**Waste Management Information** and **Pollution Control Methods**.

The facility proposes to change the designation of Tank D-4383 from a permitted hazardous waste tank to a <90-day tank. This requires no process change. The facility is closing tanks 1101-A and 1101-B. They will not be replaced. The wastes generated on site were reviewed to determine if the lists were complete. Some wastes were removed because the facility no longer generates them.

Clear Form

Comisión de Calidad Ambiental de Texas

Resumen en Lenguaje Sencillo

Solicitudes de Permisos de Desechos Industriales y Peligrosos

Instrucciones

Complete este formulario y envíe con cualquier solicitud de permiso de desechos industriales peligrosos, o desechos sólidos industriales, que esté sujeta al Código Administrativo de Texas 30 §39.405 (k) [es decir, solicitudes para una modificación de permiso de Clase 3, enmienda de permiso, renovaciones de permisos y para un nuevo permiso].

Sea conciso: toda la información debe caber en dos páginas.

Información de la Solicitud

Propósito de la solicitud:	☐Nuevo	☒Renovación	☒Modificación/Enmienda

Sometido a TCEQ: 20 de Febrero de 2026

Nombre del Cliente: Equistar Chemicals, LP

Nombre de la Instalación: Equistar Chemicals Channelview Complex

CN: 600124705	**RN:**100542281
Número de Permiso:50117	**Número de Registro de Desechos Sólidos:** 30030

Dirección de la Instalación: 8280 Sheldon Road

Enlace Web a la Dirección Postal: https://maps.app.goo.gl/k6p27V5ihTWS61Av9

Información de la Instalación *(marque todas lo que correspondan)*

¿Cuál es el tipo principal de negocio?	☒Planta de manufactura química ☐Refinería de aceite ☐ Instalación de tratamiento, almacenamiento o eliminación ☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción
¿Qué produce la instalación?	☒Químicos ☐Combustibles / lubricantes ☐Sin productos ☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción

Información sobre la Gestión de Desechos *(marque todas las que correspondan)*

¿Qué tipos de desechos se gestionan?	☒Industrial no peligroso ☒Peligroso ☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción
¿De dónde provienen los desechos?	☒Fuente externa ☒Fuente interna
¿Cómo se gestionan los desechos?	☒Almacenar ☒Procesar / Tratar ☒Eliminación ☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción

¿Qué tipo de unidades gestionan los desechos?	☒ Activo ☐ Postcierre **Teclee y cuente:** Area de Almacenamiento de contenedores (1) y tanques (5)
¿Qué sucede con los desechos gestionados en la instalación?	☒Transportados fuera del sitio ☒Eliminado en el sitio ☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción

Métodos de Control de la Contaminación *(marque todos los que correspondan)*			
¿Cómo evitará la instalación derrames, fugas y liberaciones?	☒Inspecciones de Rutina	☐Sistemas de revestimiento de ingeniería	☒Contención de derrames
	☒Manejo adecuado de desechos	☐Operaciones en edificios cerrados	☒Monitoreo de aguas subterráneas
	☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción		
¿Cómo limpiará la instalación los derrames, fugas y liberaciones?	☒Suministros de limpieza de derrames	☒Equipos de descontaminación	
	☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción		
¿Cómo evitará / minimizará la instalación las emisiones atmosféricas?	☒Sistemas de monitoreo / control de aire	☐Filtros / depuradores	☒Inspecciones de rutina
	☒Manejo adecuado de desechos	☐Operaciones en edificios cerrados	
	☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción		

Descripción de la Actualización (*solo para Modificaciones y Enmiendas de Clase 3)*

Liste y explique cualquier cambio que esta modificación o enmienda haría a las dos secciones anteriores: **Información de Gestión de Desechos** y **Métodos de Control de la Contaminación**.

La instalación propone cambiar la designación del tanque D-4383 de un tanque de residuos peligrosos bajo permiso a un tanque de acumulación de menos de 90 días (<90-dia tanque). Esto no requiere cambios en el proceso. La instalación está cerrando los tanques 1101-A y 1101-B, los cuales no serán reemplazados. Se revisaron los residuos generados en sitio para determinar si las listas estaban completas. Se eliminaron algunos residuos debido a que la instalación ya no los genera

Part A: Application

TCEQ Use Only

TCEQ Core Data Form

For detailed instructions on completing this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission *(If other is checked please describe in space provided.)*

☐ New Permit, Registration or Authorization *(Core Data Form should be submitted with the program application.)*

☒ Renewal *(Core Data Form should be submitted with the renewal form)* ☐ Other

2. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number *(if issued)*
CN 600124705		RN 100542281

SECTION II: Customer Information

4. General Customer Information	5. Effective Date for Customer Information Updates (mm/dd/yyyy)	3/4/2026

☐ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership
☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name *(If an individual, print last name first: eg: Doe, John)*	*If new Customer, enter previous Customer below:*
Equistar Chemicals, LP	

7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number *(if applicable)*
10258111	17605504814	760550481	969557263

11. Type of Customer: ☐ Corporation ☐ Individual Partnership: ☐ General ☒ Limited
Government: ☐ City ☐ County ☐ Federal ☐ Local ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees
☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☒ 501 and higher

13. Independently Owned and Operated?
☐ Yes ☒ No

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following*

☐ Owner ☐ Operator ☒ Owner & Operator ☐ Other:
☐ Occupational Licensee ☐ Responsible Party ☐ VCP/BSA Applicant

15. Mailing Address:								
	Equistar Chemicals, LP							
	P.O. Box 777							
	City	Channelview	**State**	TX	**ZIP**	77530	**ZIP + 4**	

16. Country Mailing Information *(if outside USA)*	17. E-Mail Address *(if applicable)*

18. Telephone Number	19. Extension or Code	20. Fax Number *(if applicable)*
(281) 862-4000		( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information *(If 'New Regulated Entity" is selected, a new permit application is also required.)*

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☒ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated, in order to meet TCEQ Core Data Standards (removal of organizational endings such as Inc, LP, or LLC).

22. Regulated Entity Name *(Enter name of the site where the regulated action is taking place.)*

Equistar Chemicals Channelview Complex

23. Street Address of the Regulated Entity: *(No PO Boxes)*	8280 Sheldon Road							
	City	Channelview	**State**	TX	**ZIP**	77530	**ZIP + 4**	30
24. County	Harris							

If no Street Address is provided, fields 25-28 are required.

25. Description to Physical Location:			
26. Nearest City		**State**	**Nearest ZIP Code**

Latitude/Longitude are required and may be added/updated to meet TCEQ Core Data Standards. (Geocoding of the Physical Address may be used to supply coordinates where none have been provided or to gain accuracy).

27. Latitude (N) In Decimal:			**28. Longitude (W) In Decimal:**		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
29	49	50	95	6	38

29. Primary SIC Code (4 digits)	**30. Secondary SIC Code** (4 digits)	**31. Primary NAICS Code** (5 or 6 digits)	**32. Secondary NAICS Code** (5 or 6 digits)
2869		325199	

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

Chemical manufacturing facility

34. Mailing Address:	**Equistar Chemicals, LP**							
	P.O. Box 777							
	City	**Channelview**	**State**	**TX**	**ZIP**	**77530**	**ZIP + 4**	

35. E-Mail Address:	

36. Telephone Number	**37. Extension or Code**	**38. Fax Number** *(if applicable)*
(281) 862-4000		( ) -

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☒ Industrial Hazardous Waste
				50117
☐ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☐ Wastewater	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Jean Youngerman	**41. Title:**	Project Manager

42. Telephone Number	**43. Ext./Code**	**44. Fax Number**	**45. E-Mail Address**
(713) 646-1134		( ) -	jyoungerman@brwncald.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	Equistar Chemicals, LP	**Job Title:**	Sr. Environmental Engineer
Name *(In Print):*	Susie Geraci	**Phone:**	(281) 452- **8866**
Signature:	Susie Geraci	**Date:**	3/19/2026

Texas Commission on Environmental Quality
Instructions and Procedural Information for Filing a Permit Application for a Hazardous Waste Storage, Processing, or Disposal Facility

Part A

Bilingual Notice Application Form:

Bilingual notice confirmation for this application:

1. Is the school district of the elementary or middle school nearest to the facility required by the Texas Education Code to have a bilingual program?

   ☒YES ☐ NO

   (**If NO**, alternative language notice publication not required)

2. **If YES** to question 1, are students enrolled in a bilingual education program at either the elementary school or the middle school nearest to the facility?

   ☒ YES ☐ NO

   (**If YES** to questions 1 and 2, alternative language publication is required; **If NO** to question 2, then consider the next question)

3. **If YES** to question 1, are there students enrolled at either the elementary school or the middle school nearest to the facility who attend a bilingual education program at another location?

   ☒ YES ☐ NO

   (**If Yes** to questions 1 and 3, alternative language publication is required; **If NO** to question 3, then consider the next question)

4. **If YES** to question 1, would either the elementary school or the middle school nearest to the facility be required to provide a bilingual education program but for the fact that it secured a waiver from this requirement, as available under 19 TAC 89.1205(g)?

   ☒ YES ☐ NO

   (**If Yes** to questions 1 and 4, alternative language publication is required; **If NO** to question 4, alternative language notice publication not required)

If a bilingual education program(s) is provided by either the elementary school or the middle school nearest to the facility, which language(s) is required by the bilingual program? Spanish

Consideration of the Permit Application by the Commission:

The applicant will be notified by the Commission when the application is set for final consideration. If the Commission issues the permit, the applicant will be mailed a copy of the permit by the TCEQ Office of the Chief Clerk within one (1) month following Commission approval. (NOTE: Only one copy is mailed to the applicant and that copy will be sent to the official mailing address of the applicant as shown on the permit application form.)

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Texas Commission on Environmental Quality
Permit Application for a Hazardous Waste Storage/Processing/Disposal Facility
Part A - Facility Background Information

I. General Information

A. Facility Name: Equistar Chemicals Channelview Complex

(Individual, Corporation, or Other Legal Entity Name)

TCEQ Solid Waste Registration No: 30030 EPA I.D. No.: TXD058275769

Street Address (If Available): 8280 Sheldon Road

City: Channelview State: TX Zip Code: 77530

County: Harris

Telephone Number: 281.862.4000 Charter Number: 10258111

If the application is submitted on behalf of a corporation, please identify the Charter Number as recorded with the Office of the Secretary of State for Texas.

B. Facility Contact

1. List those persons or firms who will act as primary contact for the applicant during the processing of the permit application. Also indicate the capacity in which each person may represent the applicant (engineering, legal, etc.). The person listed first will be the primary recipient of correspondence regarding this application. Include the complete mailing addresses and phone numbers.

Equistar Chemicals Channelview Complex
P.O. Box 777
Channelview, TX 77530
281-862-4000

Thomas Warnement, Environmental Manager, 281-860-1272
Susie Geraci, Sr. Environmental Engineer, 281-452-8866

2. If the application is submitted by a corporation or by a person residing out of state, the applicant must register an Agent in Service or Agent of Service with the Texas Secretary of State's office and provide a complete mailing address for the agent. The agent must be a Texas resident.

C/O CT Corporation
1999 Bryan Street
Suite 900
Dallas, TX 75201-000
1-800-925-7562

C. Operator[1]: Identify the entity who will conduct facility operations.

Operator Name: Same as applicant

Address: _____

City: _____, State: _____ Zip Code: _____

Telephone Number: _____ Charter Number: _____

[1] The operator has the duty to submit an application if the facility is owned by one person and operated by another [30 TAC 305.43(b)]. The permit will specify the operator and the owner who is listed on this application [Section 361.087 Texas Health and Safety Code].

D. Owner

1. Indicate the ownership status of the facility:

   a. Private ___X_____

      (1) _____Corporation
      (2) ___X_____ Partnership
      (3) _____Proprietorship
      (4) _____Non-profit organization

   b. Public _____

      (1) _____Federal
      (2) _____Military
      (3) _____State
      (4) _____Regional
      (5) _____County
      (6) _____Municipal
      (7) _____Other (specify)

2. Does the operator own the facility units and facility property?

   ☒ Yes ☐ No

   If you checked "no",

   a. Submit as "Attachment A" a copy of the lease for use of or the option to buy said facility units and/or facility property, as appropriate; and

   b. Identify the facility units' owner(s) and/or facility property owner(s). Please note that the owner(s) is/are required to sign the application on page 5.

Owner Name: _____

Address: _____

City: _____, State: _____ Zip Code: _____

Telephone Number: _____

Owner Name: _____

Address: _____

City: _____, State: _____ Zip Code: _____

Telephone Number: _____

E. Type of Application Submittal:

Initial _X (RENEWAL)_____ or Revision _____

F. Registration and Permit Information

Indicate (by listing the permit number(s) in the right-hand column below) all existing or pending State and/or Federal permits or construction approvals which pertain to pollution control or industrial solid waste management activities conducted by your plant or at your location. Complete each blank by entering the *permit number*, or the *date of application*, or *"none"*.

Relevant Program and/or Law	Permit No.	Agency*
1. Texas Solid Waste Disposal Act	None	
2. Wastewater disposal under the Texas Water Code	WQ0000391000	TCEQ
3. Underground injection under the Texas Water Code	None	
4. Texas Clean Air Act	See *** below	
5. Texas Uranium Surface Mining & Reclamation Act	None	
6. Texas Surface Coal Mining & Reclamation Act	None	
7. Hazardous Waste Management program under the Resource Conservation and Recovery Act	HW-50117	TCEQ
8. UIC program under the Safe Drinking Water Act	None	
9. TPDES program under the Clean Water Act	WQ0000391000	TCEQ
10. PSD program under the Clean Air Act	See *** below	
11. Nonattainment program under the Clean Air Act	See *** below	
12. National Emission Standards for Hazardous Pollutants (NESHAP) Pre-construction approval under the Clean Air Act	None	
13. Ocean dumping permits under the Marine Protection Research and Sanctuaries Act	None	
14. Dredge or fill permits under section 404 of the Clean Water Act	None	
15. Other relevant environmental	Harris-Galveston Subsidence Dist. Well Nos. 1350, 1351, 1354, 2274	

*** List of Active and Pending Air Permits

EPA / TCEQ Permits - Active	TCEQ Permits
NSR/PSD	Air Operating permits
GHGPSDTX150,	1768, 2128, 22779, 24887
N140, N140M1, N142, N142M1	2933, 2936, 3130A
N144, N146, N280, N236,	3294, 49120, 49130
PSDTX1270, PSDTX1272, PSDTX1280, PSD1280M1	6245, 6387, 8125, 83799
PSDTX1484	AMOC157, AMOC85,
	O1426

*Use the following acronyms for each agency as shown below:

TCEQ = Texas Commission on Environmental Quality
TRC = Texas Railroad Commission
TDH = Texas Department of Health
TDA = Texas Department of Agriculture
EPA = U.S. Environmental Protection Agency
CORPS = U.S. Army Corps of Engineers

G. Give a brief description of the nature of your business.

Manufacturer of synthetic organic chemicals

H. TCEQ Core Data Form

The TCEQ requires that a Core Data Form (Form 10400) be submitted on all incoming applications. For more information regarding the Core Data Form, call (512) 239-1575 or go to the TCEQ website at http://www.tceq.texas.gov/permitting/central_registry/guidance.html.

Signature Page

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature _____ Date: 03/04/26

Name and Official Title (type or print): Anthony Wood, Plant Manager

Operator Signature: _____ Date: _____

Name and Official Title (type or print): _____

Operator Signature: _____ Date: _____

Name and Official Title (type or print): _____

Owner Signature: _____ Date: _____

Name and Official Title (type or print): _____

To be completed by the operator if the application is signed by an authorized representative for the operator

I, _____ hereby designate _____
(operator) (authorized representative)
as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

_____
Printed or Typed Name of Operator or Principal Executive Officer

_____
Signature

(Note: Application Must Bear Signature & Seal of Notary Public)

Subscribed and sworn to before me by the said Anthony Wood on this

4th day of March, 2026.

My commission expires of the 8th day of October, 2029

Cathey Kelley
Notary Public in and for Harris County, Texas

CATHEY SUE KELLEY
My Notary ID # 3531440
Expires October 8, 2029

II. Facility Background Information

A. Location of Facility for which the application is submitted

1. Give a description of the location of the facility site with respect to known or easily identifiable landmarks.

Approximately one (1) mile south of Interstate Highway 90 on Sheldon Road, five (5) miles north of Interstate Highway 10 on Sheldon Road, west of the San Jacinto River.

2. Detail the access routes from the nearest U.S. or State Highway to the facility.

Proceed approximately one (1) mile south of Interstate Highway 90 on Sheldon Road and turn left (west) into plant entrance.

Proceed five (5) miles north of Interstate Highway 10 on Sheldon Road and turn right (east) into plant entrance.

3. Enter the geographical coordinates of the facility:

Latitude: 29 deg 49 min 50 sec

Longitude: 95 deg 06 min 38 sec

4. Is the facility located on Indian lands?

☐ Yes ☒ No

B. Legal Description of Facility

Submit as "Attachment B" a legal description(s) of the tract or tracts of land upon which the waste management operations referred to in this permit application occur or will occur. Although a legal description is required, a metes and bounds description is not necessary for urban sites with appropriate "lot" description(s). A survey plat or facility plan drawing which shows the specific points referenced in the survey should also be included in Attachment B.

C. SIC Codes

List, in descending order of significance, the four digit standard industrial classification (SIC) codes which best describe your facility in terms of the principal products or services you produce or provide. Also, specify each classification in words. These classifications may differ from the SIC codes describing the operation generating the hazardous wastes.

The principal products produced are:

Benzene	Butadiene	Ethylene
Methanol	Methyl Tertiary-Butyl Ether	Propylene
Hydrogen	Poly Butadiene	

4-digit SIC Code	Description
2813	Industrial Gases
2821	Plastics Materials
2822	Synthetic Rubber (Vulcanizable Elastomers)
2869	Industrial Organic Chemicals

SIC code numbers are descriptions which may be found in the Standard Industrial Classification Manual prepared by the Executive Officer of the President, Office of Management and Budget, which is available from the Government Printing Office, Washington, D.C. Use the current edition of the manual.

III. Wastes and Waste Management

A. Waste Generation and Management Activities

Is any hazardous waste [see Title 40, Code of Federal Regulations (CFR), Part 261] presently or proposed to be generated or received at your facility?

☒ Yes ☐ No

If no, skip to question Number 2 below.

If yes, answer the following question.

1. Are you presently registered with TCEQ as a solid waste generator?

   ☒ Yes ☐ No ☐ Pending

   If no, contact the Industrial and Hazardous Waste Division of TCEQ in Austin, Texas to obtain registration information. Also, continue with the application form (go to Number 2 below).

   If yes, go to Section I of your TCEQ Notice of Registration, determine which of your wastes are hazardous, and list these wastes (and mixtures) in Table III-1 (see Number 2 below).

2. Complete Table III-1, Hazardous Wastes and Management Activities, below, listing all hazardous wastes, all mixtures containing any hazardous wastes, and hazardous debris which were, are presently, or are proposed to be handled at your facility in interim status or permitted units. See 40 CFR 261 and 268.2, attaching additional copies, as necessary.

   Guidelines for the Classification & Coding of Industrial Wastes and Hazardous Wastes, TCEQ publication RG-22, contains guidance on how to properly classify and code industrial waste and hazardous waste in accordance with 30 TAC 335.501-335.515 (Subchapter R).

   If you are not registered with TCEQ, enter "NA" for TCEQ Waste Code Number.

   For the EPA Hazardous Waste Numbers, see 40 CFR 261.20-33. For annual quantity, provide the amount in units of pounds (as generated and/or received) for each waste and/or waste mixture.

B. Waste Management Units Summary

1. For each waste and waste mixture listed in Table III-1 that is stored, processed, and/or disposed on-site (except where such storage and/or processing is excluded from permit requirements in accordance with Texas Administrative Code (TAC) Section 335), complete Table III-2, Hazardous Waste Management Unit Checklist, and enter the name of each hazardous waste management unit (Note: Please make copies of Table III-2 if necessary).

Give the design capacity of each hazardous waste management unit in any of the units of measure shown. In the case of inactive or closed units for which design details are unavailable, an estimate of the design capacity is sufficient.

Please provide a description for each waste management unit described in your own words on the line provided for "Waste Management Unit."

2. Has the applicant at any time conducted the on-site disposal of industrial solid waste now identified or listed as hazardous waste?

   ☒ Yes ☐ No

   If yes, complete Table III-2 indicating the hazardous waste management units which were once utilized at your plant site but are no longer in service (i.e., inactive or closed facility units).

   If no, and if no hazardous waste is presently or proposed to be stored [for longer than 90 days (see 30 TAC Section 335.53)], processed, or disposed of at your facility, then you need not file this permit application. Otherwise proceed with the application form.

3. Provide an estimate of the total weight (lbs) of hazardous waste material that has been disposed of and/or stored within your site boundaries and not removed to another site.

   The injection well was plugged and abandoned on February 8, 2016.

C. Location of Waste Management Units

1. Submit as "Attachment C" a drawn-to-scale topographic map (or other map if a topographic map is unavailable) extending one mile beyond the facility boundaries, depicting the following:

   See Figure C-1.A

   a. The approximate boundaries of the facility (described in Section II.B) and within these boundaries, the location and boundaries of the areas occupied by each active, inactive, and proposed hazardous waste management unit (see Table III-2). Each depicted area should be labeled to identify the unit(s), unit status (i.e., active, inactive, or proposed), and areal size in acres.

      See Figure C-1.B

   b. The overall facility and all surface intake and discharge structures;

      See Figure C-1.A

   c. All on-site injection wells where liquids are injected underground;

      See Figure C-1.C

   d. All known monitor wells and boreholes within the property boundaries of the facility; and

      See Figure C-1.D

e. All wells, springs, other surface water bodies, and drinking water wells listed in public records or otherwise known to the applicant within the map area and the purpose for which each water well is used (e.g., domestic, livestock, agricultural, industrial, etc.).

See Figure C-1.E

2. Submit as "Attachment D" photographs which clearly delineate all hazardous waste management storage, processing, and disposal units, as well as sites of future storage, processing and disposal units.

D. Flow Diagram/Description

Show as "Attachment E" process flow diagrams and step-by-step word descriptions of the process flow, depicting the handling, collection, storage, processing, and/or disposal of each of the hazardous wastes previously listed in this application.

The flow diagrams or descriptions should include the following information:

1. Originating point of each waste and waste classification code;

2. Means of conveyance utilized in every step of the process flow;

3. Name and function of each facility component through which the waste passes;

4. The ultimate disposition of all wastes (if off-site, specify "off-site") and waste residues.

IV. Index Of Attachments

List and index below all attachments to this application and indicate if included or not included:

Item	Attachments	Attachment	Included	Not Included
I.D.2.a	Lease/Option to buy	A		X
II.B	Site legal description	B	X	
III.C.1	Facility boundaries and adjacent waters map	C	X	
III.C.2	Photographs	D	X	
III.C.3	Topography map	C	X	
III.D	Process flow diagram/description	E	X	

Table III-1 – Hazardous Wastes and Management Activities

Verbal Description of Waste	TCEQ Waste for Code and Classification Code	EPA Hazardous Waste Number	Storage[1] of Wastes Received from Off-Site	Processing[2] of Wastes Received from Off-Site	Disposal of Wastes Received from Off-Site	Storage[1] of Wastes Generated On-Site	Processing[2] of Wastes Generated On-Site	Disposal of Wastes Generated On-Site	Annual Quantity Generated and/or Received
Spent Solid Filters	310H	D001, D002, D003, D004, D010, D018				X			69,000 lb
Organic containing Manufacturing Process Waste (Olefins)	109H	D001, D002, D003, D018				X			150,000,000 lbs
Spill Cleanup Material (soil)	301H	D001, D002, D003, D005, D008, D018, F002, F003, F005, U002, U003, U019, U022, U055, U147, U154, U159, U220, U239				X			90,000
Acetonitrile (ACN) contaminated wastestreams	205H	D001, D018, D035, D038				X			8,000,000 lbs
Hydrocarbons, Mixed and Miscellaneous	206H	D001, D002, D003, D018, D035, F003, F005				X			Variable
Spent Cleaning & Degreasing	203H	D001, D006, D008, D018, D027, D035, D039, D040				X			Variable
Spent Activated Carbon	404H	D001, D018				X			Variable
Resin – Solids/ Liquids	606H	D001, D002, D018				X			Variable
Paint Waste related Materials	209H	D001, D035, F003, F005				X			Variable

Verbal Description of Waste	TCEQ Waste for Code and Classification Code	EPA Hazardous Waste Number	Storage[1] of Wastes Received from Off-Site	Processing[2] of Wastes Received from Off-Site	Disposal of Wastes Received from Off-Site	Storage[1] of Wastes Generated On-Site	Processing[2] of Wastes Generated On-Site	Disposal of Wastes Generated On-Site	Annual Quantity Generated and/or Received
PolyBD Polymer, ACN, and water	606H	D001, D018				X			10,142
Spill Cleanup Material and Absorbents	310H	D001, D002, D003, D008, D009, D018, D019, D022, D038, D040, F002, F003, F005, U019,				X			153,406
Wastewater, Industrial: ECU Hazardous	219H	D001, D002, D018, D035				X	X		Variable
Acid cleaning Solution	105H	D001, D002, D007, D008, D018				X			Variable
Caustic Cleaning Solution	110H	D001, D002, D007, D008, D018				X	X		Variable
Wastewater, Industrial: Non-ECU	219H	D001, D002, D018, D028, D035	X	X	X	X	X		Variable
Mixed Alcohol	219H	D001, D018, D035, D038				X			Variable
Fuel Purge Gas Condensate and Fuel Oil	207H	D001				X			Variable
Miscellaneous Mercury Contaminated Material	319H	D001, D002, D006, D007, D009, D011, F003				X			Variable
Hazardous Polymer	403H	D001, D003, D018				X			10,304 lbs
Spent Catalyst	219H	D001, D002, D003, D018,				X			Variable
Heat Exchanger Solids	304H	D018				X			86,150 lbs
API Skimmings	205H	D001, D018, D038				X			3,020,000 lbs

Verbal Description of Waste	TCEQ Waste for Code and Classification Code	EPA Hazardous Waste Number	Storage[3] of Wastes Received from Off-Site	Processing[4] of Wastes Received from Off-Site	Disposal of Wastes Received from Off-Site	Storage[1] of Wastes Generated On-Site	Processing[2] of Wastes Generated On-Site	Disposal of Wastes Generated On-Site	Annual Quantity Generated and/or Received
Lab Packs	003H	D001, D002, D003, D005, D007, D008, D009, D011, D018, D021, D022, D035, D036, F001, F002, F003, F004, F005, P003, P022, U001, U002, U003, U004, U117, U123, U154, U213, U239				X			Variable
Hydrocarbon Contaminated Sludges	603H	D001, D002, D003, D009, D018, D035				X			700,000 lbs
Dimer Solution	203H	D001, D018				X			Variable
Lab Liquid Waste	219H	D001, D002, D009, D018, D019, D022, D035, D038, F002, F003, F005				X			20,000 lbs
Contaminated Sandblasting Media	490H	D006, D007, D008, D018				X			Variable
Off-Spec/Unused Organic Liquid Products/ Chemicals	219H	D001, D002, D003, U002, U055, U056, U133, U154, U220, U239				X			24,000 lbs
Off-Spec/Unused Organic Solid Products/ Chemicals	409H	D001, D002, D003, U019, U055, U147				X			Variable
Used Batteries (lead-acid, NiMH, Li ion, NiCad, etc)	309H	D001, D002, D006, D007, D008				X			Variable

Verbal Description of Waste	TCEQ Waste for Code and Classification Code	EPA Hazardous Waste Number	Storage5 of Wastes Received from Off-Site	Processing6 of Wastes Received from Off-Site	Disposal of Wastes Received from Off-Site	Storage1 of Wastes Generated On-Site	Processing2 of Wastes Generated On-Site	Disposal of Wastes Generated On-Site	Annual Quantity Generated and/or Received
Hazardous Waste Tank Cleanout	219H	D001, D018, D019, D022, D035, D038, F002, F003, F005				X			Variable
Spent Catalyst	493H	D003, D005, D007, D018				X			Variable
Spent Catalyst	393H	D001, D002, D003, D005, D007, D018, U019				X			Variable
Alcohol / Organics	207H	D001, D035, F003				X			80,000 lbs
Spent Catalyst	404H	D001, D002, D003, D018				X			Variable
Alky Propane Caustic Wash	109H	D002				X			Variable
Spent Aerosol Cans	308H	D001, D003, U226				X			Variable
Organic Mixture – Poly BD	219H	D001				X	X		Variable
Hazardous Debris	319H	D008, D018				X			Variable
Concentrated Inorganic Acidic Solution	105H	D002				X	X		Variable
Concentrated Caustic Solution	110H	D002				X	X		Variable

Verbal Description of Waste	TCEQ Waste for Code and Classification Code	EPA Hazardous Waste Number	Storage5 of Wastes Received from Off-Site	Processing6 of Wastes Received from Off-Site	Disposal of Wastes Received from Off-Site	Storage1 of Wastes Generated On-Site	Processing2 of Wastes Generated On-Site	Disposal of Wastes Generated On-Site	Annual Quantity Generated and/or Received
Sulfolane Material	203H	D001				X			Variable
IPOH Material	203H	D001				X			Variable
MeOH Material	203H	D001				X			Variable
Sulfuric Acid	104H	D002				X	X		Variable
Olefins Wastewater	102H	D007				X			Variable
Compressed Gas Organic	801H	D001, D003				X			Variable

[1]"Storage" means the holding of solid waste for a temporary period, at the end of which the waste is processed, disposed of, or stored elsewhere.

[2]"Processing" means the extraction of materials, transfer, volume reduction, conversion to energy, or other separation and preparation of solid waste for reuse or disposal, including the treatment or neutralization of hazardous waste, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste, or so as to recover energy or material from the waste or so as to render such waste non-hazardous or less hazardous; safer for transport, store or dispose of; or amenable for recovery, amenable for storage, or reduced in volume. The "transfer" of solid waste for reuse or disposal as used above, does not include the actions of a transporter in conveying or transporting solid waste by truck, ship, pipeline, or other means. Unless the Executive Director determines that regulation of such activity is necessary to protect human health or the environment, the definition of "processing" does not include activities relating to those materials exempted by the Resource Conservation and Recovery Act, 42 U.S.C. 6901 **et seq.**, as amended.

Table III-2 – Hazardous Waste Management Unit Checklist

Waste Management Unit	TCEQ N.O.R. Unit #	Status[1]	Design Capacity[2]	Number of Years Utilized	Date in Service
Container Storage Area	022	Active	62,180 gallons	46	1980
Tank 4455	031	Active	284,000 gallons	50	1976
Tank 3455	032	Active	284,000 gallons	51	1975
Tank D-4383	047	Active pending status change	12,000 gallons	41	1985
Tank 1101-A	114	Active pending change in status	195 gallons	36	1990
Tank 1101-B	115	Active pending change in status	195 gallons	36	1990

[1] Indicate only one of the following: Active, Inactive, Closed, or Proposed
[2] Cubic yards, gallons, pounds, gallons/minute, pounds/hour, BTUs/hour, etc.

Attachment B: Site Legal Description

June 11, 1980

METES AND BOUNDS DESCRIPTION
OF A 1246.30 ACRE TRACT IN THE
A. WHITE SURVEY, ABSTRACT NO. 81, THE
M. STROIN SURVEY, ABSTRACT NO. 1559,
THE A. PETERSON SURVEY, ABSTRACT NO. 1530,
HARRIS COUNTY, TEXAS

Being a 1246.30 acre tract of land in the Amy White Survey, Abstract No. 81, the Michael Stroin Survey, Abstract No. 1559, and the August Peterson Survey, Abstract No. 1530 all in Harris County, Texas, and being a tract of land sold to Atlantic Richfield Company as described in Deed recorded under Harris County Clerk's File No. E 237928 and also a portion of that land described in deed recorded in Volume 3012, Page 167 of the Harris County Deed Records and a portion of those lands described in deed recorded under the following Harris County Clerk's File Numbers: D 962902, D 962903, D 962905, D 962906, E 140826, E 237982; and being more particularly described by metes and bounds as follows utilizing the ARCO Plant Coordinate System as a basis for bearings, said bearing system being rotated 2° 48' clockwise form the Texas State Plane Coordinate System, South Central Zone:

BEGINNING at a 5/8 inch iron rod found marking the intersection of the east right-of-way line of Sheldon Road (100 foot wide) as described in deed recorded under Harris County Clerk's File No. E 655120 and the north right-of-way line of Wallisville Road (60 foot wide); said **POINT OF BEGINNING** being in a curve concave to the east;

THENCE along the east right-of-way line of said Sheldon Road as follows:

Northerly 196.56 feet along said curve concave to the east having a central angle of 04 degrees 00 minutes 03 seconds, a radius of 2814.94 feet and whose chord bears North 02 degrees 20 minutes 09 seconds West, 196.52 feet to a 5/8 inch iron rod found marking the point of tangency of said curve concave to the east;

North 00 degrees 20 minutes 09 seconds West, at 5462.06 feet to a 5/8 inch iron rod in concrete found marking the point of curvature of a curve concave to the east;

Northerly 191.19 feet along said curve concave to the east having a central angle of 03 degrees 53 minutes 30 seconds a radius of 2814.79 feet, and whose chord bears North 01 degrees 44 minutes 43 seconds East, 191.17 feet to a 5/8 inch iron rod found marking the point of tangency of said curve;

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North 03 degrees 24 minutes 43 seconds East, 100.17 feet to a 5/8 inch iron rod in concrete found marking the point of curvature of a curve concave to the west;

Northerly 197.98 feet along said curve concave to the west having a central angle of 03 degrees 53 minutes 30 seconds, a radius of 2914.79 and whose chord bears North 01 degrees 35 minutes 43 seconds, 197. 94 feet to a 5/8 inch iron rod in concrete found marking the point of tangency of said curve;

North 00 degrees 20 minutes 09 seconds West, 423.06 feet to a 5/8 inch iron rod found marking the northwest corner of the herein described tract, the northwest corner of the Hugh Club tract as described in Deed recorded under Harris County Clerk's File No. F 211524 and the southwest corner of a South Pacific Railroad Company tract described in deed recorded under Harris County Clerk's File No. F 431956;

THENCE along the south line of the said Southern Pacific Railroad Company tract and along the north line of the said Hugh Club tract and along a fence as follows:

South 88 degrees 54 minutes 39 seconds East, 1588.92 feet to a 5/8 inch iron rod in concrete,

South 87 degrees 50 minutes 34 seconds East, 367. 84feet to a 5/8 inch iron rod in concrete,

South 89 degrees 33 minutes 31 seconds East, 516.55 feet to a 5/8 inch iron rod in concrete,

South 89 degrees 50 minutes 37 seconds East, 795.25 feet to a 5/8 inch iron rod in concrete,

North 89 degrees 26 minutes 16 seconds East, 487.40 feet to a 5/8 inch iron rod in concrete,

North 89 degrees 58 minutes 27 seconds East, 541.24 feet to a 5/8 inch iron rod in concrete,

North 89 degrees 44 minutes 54 seconds East, 1708.01 feet to a 5/8 inch iron rod in concrete marking an "ell" corner,

North 00 degrees 14 minutes 42 seconds East, 297.82 feet to a 1 ¼ inch iron pipe marking an "ell" corner,

North 89 degrees 58 minutes 38 seconds East, at 990.10 feet pass a reference concrete monument and continue in all a total distance of 1319.68 feet to a 5/8 inch iron rod in concrete set for reference on the west bank of the San Jacinto River, approximately 150.00 feet from the centerline of the said river;

THENCE along the meanders of the San Jacinto River as follows:

South 37 degrees 52 minutes 20 seconds East 113.02 feet to an angle point,

South 26 degrees 37 minutes 52 seconds East, 232.13 feet to an angle point,

South 42 degrees 08 minutes 37 seconds East, 93.65 feet to an angle point,

South 30 degrees 17 minutes 09 seconds East, 209.63 feet to a 5/8 inch iron rod set for reference,

South 49 degrees 12 minutes 07 seconds East, 2855.01 feet to a 5/8 inch iron rod set for reference on the west bank of said river,

South 48 degrees 52 minutes 12 seconds East, 87.70 feet to a 5/8 inch iron rod on the west bank of said San Jacinto River,

South 59 degrees 35 minutes 08 seconds East, 261.04 feet to an angle point;

South 54 degrees 44 minutes 15 seconds East, 408.41 feet to an angle point;

South 56 degrees 53 minutes 48 seconds East, 249.89 feet to an angle point,

South 62 degrees 42 minutes 38 seconds East, 142.31 feet to a 5/8 inch iron rod in concrete found marking a reference point in the east line of the herein described tract, the centerline of said San Jacinto River bears North 27 degrees 17 minutes 22 seconds East, approximately 150.00 feet;

THENCE leaving said river, South 00 degrees 05 minutes 58 seconds West, at 165.35 feet pass a ½ inch iron pipe in concrete and continue in all, along the north line of an American Plant Food Corporation Tract, and along the east line of ARCO Section XI, 2533.36 feet to a one inch iron pipe in concrete found marking the southeast corner of the herein described tract, the southeast corner of ARCO Section XI the southwest corner of said American Plant Food Corporation tract, and a point in the north right-of-way line of said Wallisville Road;

THENCE along the north right-of-way line of said Wallisville Road as follows:

South 89 degrees 23 minutes 25 seconds West, 610.15 feet to a fence corner;

South 89 degrees 51 minutes 43 seconds West, 2649.68 feet to 5/8 inch iron rod in concrete,

South 89 degrees 41 minutes 24 seconds West, 3620.72 feet to a ¾ inch iron pipe in concrete at the southeast corner of a Missouri Pacific Railroad Company FEE STRIP as described in deed recorded in Volume 4187, Page 220 of the Harris County Deed Records;

THENCE along the east line of said Missouri Pacific Railroad Company FEE STRIP and the west line of ARCO Section XI, North 00 degrees 41 minutes 04 seconds, 2371.18 feet to the northeast corner of said Missouri Pacific Railroad Company FEE STRIP;

THENCE along the north line of said Missouri Pacific Railroad Company FEE STRIP South 89 degrees 59 minutes 58 seconds West, 150.01 feet to the northwest corner of the Missouri Pacific Railroad Company FEE STRIP as described in deed recorded in Volume 3135, Page 633 of the Harris County Deed Records;

THENCE along the west line of said Missouri Pacific Railroad Company FEE STRIP South 00 degrees 41 minutes 04 seconds East, 300.00 feet to the northeast corner of a Houston Lighting & Power FEE STRIP as described in deed recorded in Volume 3049, Page 533 of the Harris County Deed Records;

THENCE around the perimeter of a Houston Lighting & Power Company property as per deeds recorded in Volume 3049, Page 533, Volume 6008, Page 13, Volume 5880, Page 363, as follows:

South 89 degrees 59 minutes 58 seconds West, 400.00 feet to an "ell" corner;

South 00 degrees 41 minutes 04 seconds East, 11.71 feet to an "ell" corner;

North 89 degrees 42 minutes 14 seconds West, 298.96 feet to an "ell" corner;

South 00 degrees 17 minutes 46 seconds West, 100.00 feet to an "ell" corner;

South 89 degrees 42 minutes 14 seconds East, 551.55 feet to an "ell" corner;

South 00 degrees 41 minutes 04 seconds East, 20.00 feet to an "ell" corner marking the northwest corner of a 50.00 foot strip sold to Atlantic Richfield

Company by Houston Lighting & Power Company as described in deed recorded under Harris County Clerk's File No. E 515898;

THENCE along the common line of said ARCO FEE STRIP and Houston Lighting & Power Company line as follows:

North 89 degrees 18 minutes 10 seconds East, 50.01 feet to an "ell" corner,

South 00 degrees 41 minutes 50 seconds East, 714.24 feet to an angle point,

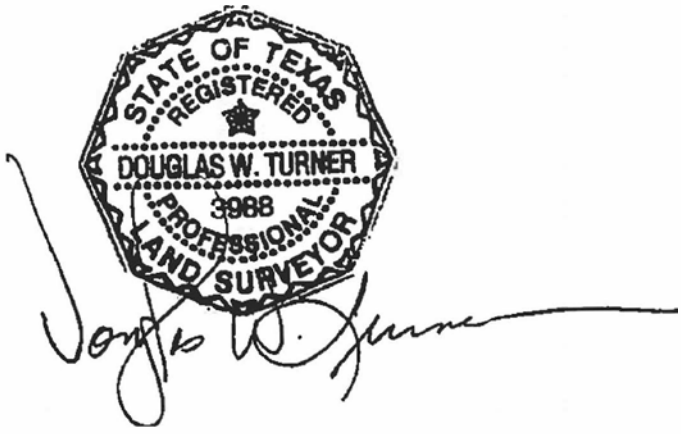
South 00 degrees 39 minutes 48 seconds East, 1229.80 feet to a point in the north right-of-way line of said Wallisville Road;

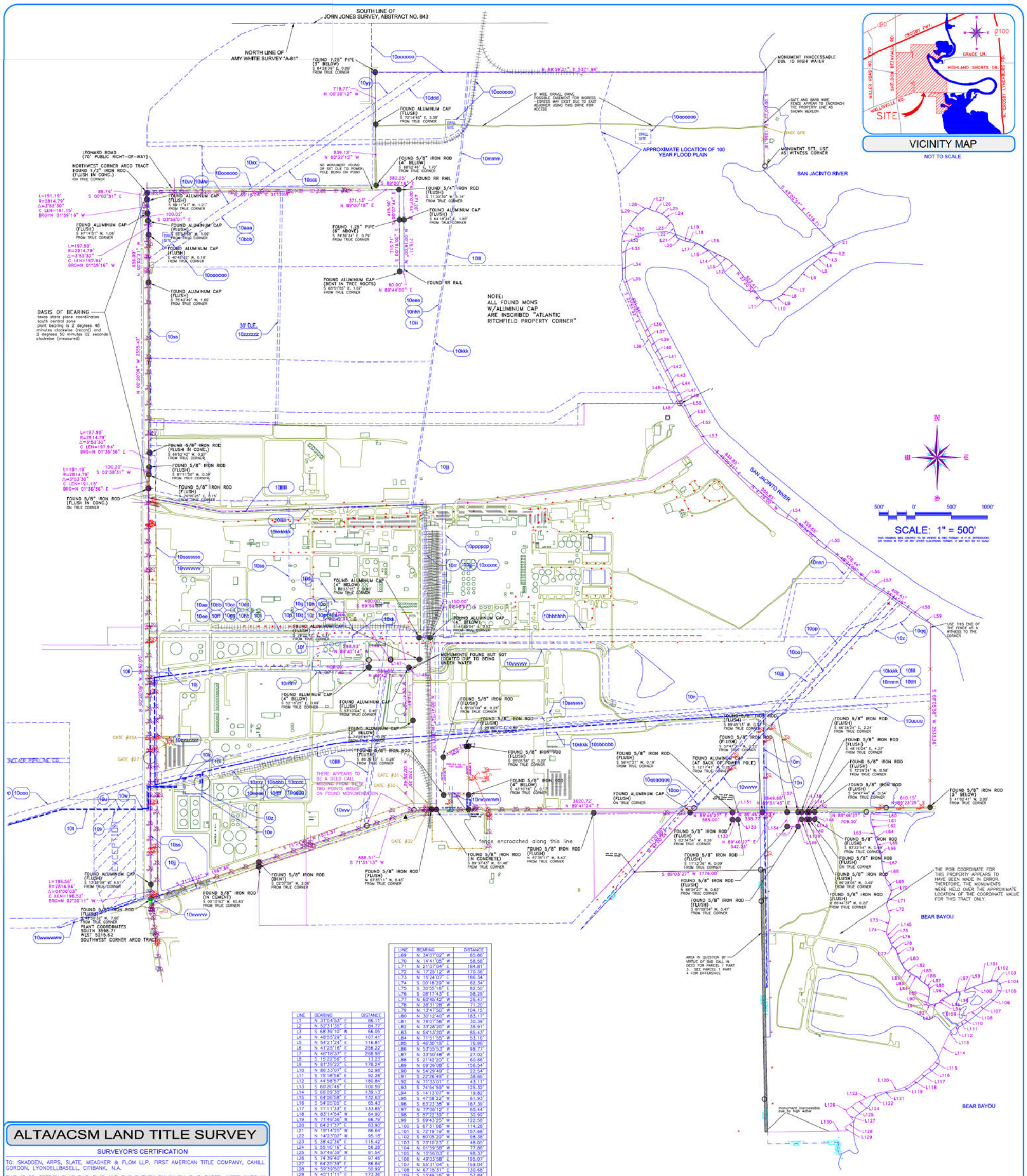
THENCE along the north right-of-way line of said Wallisville Road as follows:

South 71 degrees 24 minutes 45 seconds West, 1572.59 feet to a 5/8 inch iron rod in concrete marking an angle point,

South 71 degrees 32 minutes 01 seconds West, 689.08 feet to a 5/8 inch iron rod in concrete marking an angle point;

South 71 degrees 23 minutes 12 seconds West, 1567.70 feet to the **POINT OF BEGINNING** and containing 1246.30 acres of land.





LINE	BEARING	DISTANCE
L1	N 31°04'53" E	86.11'
L2	N 52°31'35" E	84.77'
L3	S 68°39'10" W	66.05'
L4	N 48°55'29" E	107.41'
L5	N 54°21'24" E	116.81'
L6	N 41°25'16" E	256.22'
L7	N 46°18'37" E	268.98'
L8	S 15°22'56" E	13.23'
L9	N 81°39'22" E	178.24'
L10	N 86°33'07" E	52.98'
L11	S 75°18'56" E	92.28'
L12	S 44°56'57" E	180.84'
L13	S 60°20'46" E	100.59'
L14	S 66°09'30" E	139.13'
L15	S 64°06'58" E	132.63'
L16	S 54°05'05" E	65.43'
L17	S 71°11'33" E	133.85'
L18	N 83°14'54" W	64.90'
L19	N 71°49'36" W	66.79'
L20	S 64°21'37" E	83.90'
L21	N 19°14'25" W	86.64'
L22	N 14°23'02" W	95.18'
L23	S 38°42'38" E	115.42'
L24	S 55°10'16" E	56.28'
L25	N 57°46'39" W	91.54'
L26	S 74°39'40" E	97.46'
L27	S 64°25'39" E	86.64'
L28	N 59°39'50" E	50.99'
L29	N 45°11'11" E	173.36'
L30	N 36°55'41" E	218.76'
L31	N 24°14'47" E	79.32'
L32	N 05°18'56" E	141.00'
L33	N 03°23'48" W	181.92'
L34	N 01°21'06" W	261.46'
L35	N 21°33'26" W	123.48'
L36	S 24°28'08" E	126.60'
L37	N 15°06'22" W	51.47'
L38	S 60°15'42" E	23.20'
L39	N 22°41'18" W	155.49'
L40	N 35°52'44" W	78.53'
L41	N 26°06'39" W	152.25'
L42	N 26°36'29" W	208.44'
L43	N 30°17'43" W	122.09'
L44	N 08°57'01" W	63.31'
L45	S 42°23'29" E	39.86'
L46	S 35°09'03" W	19.15'
L47	N 24°03'36" W	82.99'
L48	S 67°20'11" E	17.98'
L49	N 20°02'06" W	53.39'
L50	N 37°59'30" W	113.02'
L51	N 26°37'52" W	232.13'
L52	N 42°08'37" W	93.65'
L53	N 30°17'09" W	209.63'
L54	N 60°33'00" W	291.95'
L55	N 55°37'00" W	340.25'
L56	S 48°52'12" E	87.70'
L57	S 59°35'08" E	261.04'
L58	N 56°53'48" W	249.89'
L59	N 62°40'38" W	142.31'
L60	S 42°37'29" W	62.56'
L61	N 04°28'03" W	123.81'
L62	N 25°23'28" W	87.75'
L63	N 05°02'11" W	98.62'
L64	S 32°33'09" E	39.46'
L65	N 15°30'45" W	164.41'
L66	N 19°42'46" W	84.87'
L67	S 03°50'20" E	131.56'
L68	N 16°04'22" W	249.81'

LINE	BEARING	DISTANCE
L69	N 34°07'02" W	85.86'
L70	N 14°41'05" W	58.58'
L71	N 21°07'04" E	184.81'
L72	N 17°25'12" W	170.36'
L73	N 15°24'07" E	186.34'
L74	S 00°18'29" W	62.34'
L75	S 30°55'16" E	82.50'
L76	S 08°17'43" E	58.29'
L77	N 60°45'42" W	26.47'
L78	N 38°31'28" W	71.20'
L79	N 13°47'50" W	104.15'
L80	N 30°12'40" W	183.19'
L81	N 76°07'56" W	30.39'
L82	N 33°28'20" W	36.91'
L83	N 54°13'20" W	85.43'
L84	N 71°51'55" W	53.16'
L85	S 46°30'18" E	76.98'
L86	N 53°55'53" W	98.77'
L87	N 33°50'48" W	27.02'
L88	S 21°42'20" E	60.66'
L89	N 09°36'08" E	156.54'
L90	N 54°29'49" E	22.54'
L91	S 22°26'49" E	38.66'
L92	N 71°33'01" E	43.11'
L93	S 74°54'59" W	125.32'
L94	S 14°13'07" W	19.82'
L95	S 47°58'22" W	61.93'
L96	S 63°23'38" W	167.39'
L97	N 77°06'12" E	60.44'
L98	S 87°22'39" E	30.99'
L99	S 69°43'25" W	122.58'
L100	S 67°31'06" W	114.28'
L101	S 72°19'19" W	157.68'
L102	S 80°05'29" W	98.38'
L103	S 73°10'23" E	48.05'
L104	N 01°59'58" W	77.88'
L105	N 15°56'03" E	98.37'
L106	N 49°03'58" E	195.07'
L107	N 55°31'04" E	159.04'
L108	N 67°15'31" E	130.68'
L109	S 13°49'16" W	57.84'
L110	N 44°29'54" E	59.55'
L111	N 66°04'31" E	50.45'
L112	N 44°15'58" E	157.60'
L113	N 35°33'21" E	68.27'
L114	N 25°20'06" E	385.05'
L115	N 36°17'57" E	92.49'
L116	N 53°23'49" E	138.93'
L117	N 44°55'29" E	129.56'
L118	N 50°59'38" E	157.30'
L119	N 68°02'20" E	141.81'
L120	N 79°25'57" E	100.81'
L121	N 79°05'37" E	202.17'
L122	N 67°38'05" E	130.71'
L123	N 63°49'19" E	104.24'
L124	N 63°51'54" E	106.68'
L125	N 56°29'22" E	146.33'
L126	N 21°12'40" E	36.29'
L127	N 38°10'55" W	172.26'
L128	N 59°32'03" E	145.41'
L129	N 18°03'26" W	60.75'
L130	N 89°09'04" E	200.00'
L131	N 00°13'33" W	100.00'
L132	S 89°46'27" W	75.00'
L133	N 00°13'33" W	100.00'
L134	S 00°13'33" E	200.00'
L135	S 89°46'27" W	150.00'
L136	N 00°13'33" W	200.00'
L137	S 89°46'27" W	50.00'
L138	N 00°13'33" W	100.00'
L139	N 89°46'27" E	75.00'
L140	N 00°13'33" W	100.00'
L141	S 89°46'26" W	30.00'
L142	N 00°13'33" W	100.00'
L143	N 89°46'27" E	75.00'
L144	N 00°13'33" W	100.00'
L145	S 31°10'59" E	37.80'
L146	S 00°40'37" E	11.72'
L147	S 89°33'50" E	50.01'
L148	S 00°41'50" E	20.00'

ALTA/ACSM LAND TITLE SURVEY

SURVEYOR'S CERTIFICATION

TO: SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP, FIRST AMERICAN TITLE COMPANY, CAHILL GORDON, LYONDELLBASELL, CITIBANK, N.A.

THIS IS TO CERTIFY THAT THIS PLAT AND THE SURVEY ON WHICH IT IS BASED, WERE MADE IN ACCORDANCE WITH THE "MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS," JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS IN 2005, AND INCLUDES ITEMS 2, 3, 4, 6, 8, 9, 10, 11(a), 13 & 16 OF TABLE A THEREOF. PURSUANT TO THE ACCURACY STANDARDS AS ADOPTED BY ALTA AND NSPS AND IN EFFECT ON THE DATE OF THIS CERTIFICATION, UNDERSIGNED FURTHER CERTIFIES THAT IN MY PROFESSIONAL OPINION, AS A LAND SURVEYOR REGISTERED IN THE STATE OF TEXAS, THE RELATIVE POSITIONAL ACCURACY OF THIS SURVEY DOES NOT EXCEED THAT WHICH IS SPECIFIED THEREIN.

FIELD WORK DATE: 03/11/08
FIELD SURVEY: Michael S. Ward, PLS

For inquiries, questions or concerns about this survey contact Inquiries@ussurveyor or call 1-800-867-8783 ext. 209
U.S. SURVEYOR®
4929 Riverwind Pointe Drive
Evansville, Indiana 47715
"America's Land Surveyor"
1-800- TO SURVEY

PREPARED FOR: TX4
Skadden
SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP & Affiliates

PROJECT LOCATION:
HARRIS COUNTY, STATE OF TEXAS

PROJECT ADDRESS:
8280 SHELDON ROAD
CHANNELVIEW, TX 77049

PROJECT TYPE:
ALTA/ACSM LAND TITLE SURVEY

STATE OF TEXAS REGISTERED MICHAEL FELDBUSCH 5213 PROFESSIONAL LAND SURVEYOR

MICHAEL F. FELDBUSCH
REGISTERED PROFESSIONAL LAND SURVEYOR NO.5213
DATE OF CERTIFICATION 3/12/08

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SHEET 1 OF 3

JOB NUMBER:
SS43421.DWG_MB

FLOOD DATA This property is in Zone XXXX of the Flood Insurance Rate Map, Community Panel No. XXXX which has an effective date of XXXX and IS/IS NOT in a Special Flood Hazard Area. Field surveying was not performed to determine this zone. An elevation certificate may be needed to verify this determination or apply for an amendment from the Federal Emergency Management Agency.

STANDARD LEGEND

MONUMENT FOUND
MONUMENT SET 5/8" IRON ROD CAPPED M. FELDBUSCH TX LS 5213
P.K. NAIL FOUND
P.K. NAIL SET
FOUND X MARK
SET X MARK
R.R. SPIKE FOUND
R.R. SPIKE SET
BENCH-MARK
CONC. R/W MARKER
(R) RECORD DATA
(M) MEASURED DATA
(C) CALCULATED DATA
R/W RIGHT OF WAY
BSL BACK SET LINE
RCP REINFORCED CONC PIPE
CMP CORRUGATED METAL PIPE
PVC PLASTIC PIPE
MTL METAL
AGL ABOVE GROUND LEVEL
F.P. FOOTPRINT
L/S LANDSCAPING
TREE
SQUARE METAL LID
FUEL TANK LID
FLAG POLE
UNKNOWN MANHOLE
FROZEN MANHOLE
POWERPOLE
GUY WIRE
LIGHT POLE
STREET LIGHT POLE
ELEC. TRANSFORMER
AIR CONDITIONER
BURIED ELECTRIC
OVERHEAD ELECTRIC
ELECTRIC MANHOLE
ELECTRIC METER
ELECTRIC BOX
WATER LINE
WATER MANHOLE
WATER VALVE
WATER METER
HYDRANT
BACK FLOW PREVENTOR
FIRE DEPARTMENT CONNECTION
FIRE PROTECTION
GAS VALVE
GAS METER
UNDERGROUND GAS MARKER
GAS MANHOLE
GAS LINE
BOLLARD
BORE HOLE
MONITORING WELL
MAIL BOX
GUARD RAIL
SAN.SEWER LINE
SEWER MANHOLE
CLEAN OUT
STORM DRAIN LINE
STORM DRAIN MANHOLE
STORM INLET
CURB INLET
PAY PHONE
TELEPHONE BOX
TELEPHONE MANHOLE
TELEPHONE POLE
TELEPHONE LINE
O/HT OVERHEAD TELEPHONE
UNDERGROUND TELEPHONE MARKER
CABLE TELEVISION
O/HC OVERHEAD CABLE
CABLE BOX
UNDERGROUND CABLE MARKER
TELECOMMUNICATIONS MANHOLE
TELECOMMUNICATIONS PEDESTAL
TRAFFIC POLE
TRAFFIC SIGNAL
TRAFFIC MANHOLE
TRAFFIC SIGNAL BOX
STOP SIGN
SIGN

RY PE,PLS
DATE REVIEWED:

INT. XX
RECORD CLOSURE 1:XXXX

INT. MW
DATE: 3/12/08
SURVEY REVIEWED

LEGAL DESCRIPTION REVIEWED BY:
INT. CG
INT. SR

CERTIFICATION IS ONLY TO THE PARTIES HEREIN NAMED. THIS SURVEY IS NOT VALID FOR ANY FUTURE TRANSACTIONS OF THIS PROPERTY.

DATE OF ORIGINAL: MARCH 12, 2008
REVISION: 1 REVISIONS PER CLIENT COMMENTS DATE: MARCH 31, 2008
REVISION: DATE: , 2008
REVISION: DATE: , 2008
REVISION: DATE: , 2008

ss43421plot.dwg

NOTES CORRESPONDING TO SCHEDULE B

AS PER COMMITMENT NO. X DATED X

(10) The following matters and all terms of the documents creating or offering evidence of the matters.

(10a) a. Any covenants, conditions or restrictions indicating a preference, limitation or discrimination based on race, color, religion, sex, handicap, familial status, or national origin are hereby deleted to the extent such covenants, conditions or restrictions violate 42 USC 3604 (c). Restrictive Covenants recorded under County Clerk's File No. S792908 of the Harris County Real Property Records.

LEASES:

(10b) b. Atlantic Richfield Company to Pony Industries, Inc. dated December 23, 1986 filed for record under County Clerk's File No. K892013 of the Harris County Real Property Records.

(10c) c. Atlantic Richfield Company to Sartumer, Division of Pony Industries, Inc. dated December 23, 1986 under County Clerk's File No. K892011 of the Harris County Real Property Records.

(10d) d. Atlantic Richfield Co. to Pony Industries, Inc., 12-19-86, filed K892014 clerk's file number Harris County, TX.

Pipe Line Easements

(10e) e. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720628 of the Harris County Real Property Records.

(10f) f. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720629 of the Harris County Real Property Records.

(10g) g. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated July 7, 1980 under County Clerk's File No. G592410 of the Harris County Real Property Records.

(10h) h. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated July 7, 1980 under County Clerk's File No. G592409 of the Harris County Real Property Records.

(10i) i. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400060 of the Harris County Real Property Records.

(10j) j. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400059 of the Harris County Real Property Records.

(10k) k. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400058 of the Harris County Real Property Records.

(10l) l. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400057 of the Harris County Real Property Records.

(10m) m. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400056 of the Harris County Real Property Records.

(10n) n. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400055 of the Harris County Real Property Records.

(10o) o. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400054 of the Harris County Real Property Records.

(10p) p. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400053 of the Harris County Real Property Records.

(10q) q. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400052 of the Harris County Real Property Records.

(10r) r. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400051 of the Harris County Real Property Records.

(10s) s. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400050 of the Harris County Real Property Records.

(10t) t. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400049 of the Harris County Real Property Records.

(10u) u. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400048 of the Harris County Real Property Records.

(10v) v. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400047 of the Harris County Real Property Records.

(10w) w. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400046 of the Harris County Real Property Records.

(10x) x. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400045 of the Harris County Real Property Records.

(10y) y. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400044 of the Harris County Real Property Records.

(10z) z. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated January 21, 1980 under County Clerk's File No. G400043 of the Harris County Real Property Records.

(10aa) aa. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720630 of the Harris County Real Property Records.

(10bb) bb. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720632 of the Harris County Real Property Records.

(10cc) cc. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720633 of the Harris County Real Property Records.

(10dd) dd. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720634 of the Harris County Real Property Records.

(10ee) ee. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720635 of the Harris County Real Property Records.

(10ff) ff. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720636 of the Harris County Real Property Records.

(10gg) gg. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720637 of the Harris County Real Property Records.

(10hh) hh. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720638 of the Harris County Real Property Records.

(10ii) ii. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720639 of the Harris County Real Property Records.

(10jj) jj. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720640 of the Harris County Real Property Records.

(10kk) kk. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720641 of the Harris County Real Property Records.

(10ll) ll. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated March 20, 1979 under County Clerk's File No. G010430 of the Harris County Real Property Records.

(10mm) mm. Easement: Atlantic Richfield Company et al to Atlantic Richfield Company dated April 3, 1978 under County Clerk's File No. F539196 of the Harris County Real Property Records.

(10nn) nn. Easement: Atlantic Richfield Company to Gulf Refining dated March 27, 1978 under County Clerk's File No. F529419 of the Harris County Real Property Records.

(10oo) oo. Easement: Atlantic Richfield Company to Phillips Pipe Line Company dated March 16, 1978 under County Clerk's File No. F518560 of the Harris County Real Property Records.

(10pp) pp. Easement: Atlantic Richfield Company to Enterprise Pipeline Company dated February 6, 1982 under County Clerk's File No. H317553 of the Harris County Real Property Records.

(10qq) qq. Easement: Atlantic Richfield Company to American Distribution Company dated April 7, 1987 under County Clerk's File No. L059242 of the Harris County Real Property Records.

(10rr) rr. Easement: Atlantic Richfield Company to Exxon Gas System, Inc. dated April 7, 1987 under County Clerk's File No. L052209 of the Harris County Real Property Records.

(10ss) ss. Easement: Atlantic Richfield Company to United Texas Transmissions dated November 21, 1986 under County Clerk's File No. K845821 of the Harris County Real Property Records.

(10tt) tt. Easement: Atlantic Richfield Company to Entex, Inc. dated October 1, 1986 under County Clerk's File No. K761709 of the Harris County Real Property Records.

(10uu) uu. Easement: L. F. Lockhardt to Cities Services Pipe Line filed under Volume 3106, Page 452 in the Deed Records of the Harris County Real Property Records.

(10vv) vv. Easement: A. J. Wilson to Cities Services Pipe Line filed under Volume 2782, Page 259 in the Deed Records of the Harris County Real Property Records.

(10ww) ww. Easement: L. B. Hardin to Cities Services Pipe Line filed under Volume 2782, Page 255 in the Deed Records of the Harris County Real Property Records.

(10xx) xx. Easement: T. D. Dunman to Cities Services Pipe Line filed under Volume 2754, Page 366 in the Deed Records of the Harris County Real Property Records.

(10yy) yy. Easement: G. D. Humphries to Cities Services Pipe Line filed under Volume 2772, Page 570 in the Deed Records of the Harris County Real Property Records.

(10zz) zz. Easement: F. Lockhardt to Industrial Gas Supply Corporation filed under Volume 3478, Page 537 in the Deed Records of the Harris County Real Property Records.

ALTA/ACSM LAND TITLE SURVEY

SURVEYOR'S CERTIFICATION

TO: SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP, FIRST AMERICAN TITLE COMPANY, CAHILL GORDON, LYONDELLBASELL, CITIBANK, N.A., CITIBANK, N.A., AS COLLATERAL AGENT UNDER THE CREDIT AGREEMENT AND BRIDGE LOAN AGREEMENT

THIS IS TO CERTIFY THAT THIS PLAT AND THE SURVEY ON WHICH IT IS BASED, WERE MADE IN ACCORDANCE WITH THE "MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS," JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS IN 2005, AND INCLUDES ITEMS 2, 3, 4, 6, 8, 9, 10, 11(a), 13 & 16 OF TABLE A THEREOF. PURSUANT TO THE ACCURACY STANDARDS AS ADOPTED BY ALTA AND NSPS AND IN EFFECT ON THE DATE OF THIS CERTIFICATION, UNDERSIGNED FURTHER CERTIFIES THAT IN MY PROFESSIONAL OPINION, AS A LAND SURVEYOR REGISTERED IN THE STATE OF TEXAS, THE RELATIVE POSITIONAL ACCURACY OF THIS SURVEY DOES NOT EXCEED THAT WHICH IS SPECIFIED THEREIN.

FIELD WORK DATE: 03/11/08
FIELD SURVEY: Michael S. Ward, PLS

For inquiries, questions or concerns about this survey contact Inquiries@ussurveyor or call 1-800-867-8783 ext. 209

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"America's Land Surveyor"
1-800- TO SURVEY

PREPARED FOR: TX4
Skadden
SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP & Affiliates

PROJECT LOCATION:
HARRIS COUNTY, STATE OF TEXAS

PROJECT ADDRESS:
8280 SHELDON ROAD
CHANNELVIEW, TX 77049

PROJECT TYPE:
ALTA/ACSM LAND TITLE SURVEY

STATE OF TEXAS REGISTERED MICHAEL FELDBUSCH 5213 PROFESSIONAL LAND SURVEYOR

MICHAEL F. FELDBUSCH
REGISTERED PROFESSIONAL LAND SURVEYOR NO.5213
DATE OF CERTIFICATION 3/12/08

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SHEET 2 OF 3

JOB NUMBER:
SS43421.DWG_MB

FLOOD DATA This property is in Zone XXXX of the Flood Insurance Rate Map, Community Panel No. XXXX which has an effective date of XXXX and IS/IS NOT in a Special Flood Hazard Area. Field surveying was not performed to determine this zone. An elevation certificate may be needed to verify this determination or apply for an amendment from the Federal Emergency Management Agency.

NOTES CORRESPONDING TO SCHEDULE B (CON'T)

(10aaa) aaa. Easement: A. J. Wilson to Industrial Gas Supply Corporation filed under Volume 7206, Page 496 in the Deed Records of the Harris County Real Property Records.

(10bbb) bbb. Easement: L. B. Hardin to Industrial Gas Supply Corporation filed under Volume 3478, Page 539 in the Deed Records of the Harris County Real Property Records.

(10ccc) ccc. Easement: F. J. Burke to Industrial Gas Supply Corporation filed under Volume 3478, Page 540 in the Deed Records of the Harris County Real Property Records.

(10ddd) ddd. Easement: G. D. Humphries to Industrial Gas Supply Corporation filed under Volume 3478, Page 543 in the Deed Records of the Harris County Real Property Records.

(10eee) eee. Easement: S. Bradford to Shell Pipe Line Corporation filed under Volume 876, Page 586 in the Deed Records of the Harris County Real Property Records.

(10fff) fff. Easement: P. J. Barraco to Shell Pipe Line Corporation filed under Volume 879, Page 291 in the Deed Records of the Harris County Real Property Records.

(10ggg) ggg. Easement: V. A. Barraco to Shell Pipe Line Corporation filed under Volume 6097, Page 440 in the Deed Records of the Harris County Real Property Records.

(10hhh) hhh. Easement: J. Collier to Shell Pipe Line Corporation filed under Volume 876, Page 584 in the Deed Records of the Harris County Real Property Records.

(10iii) iii. Easement: G. D. Humphrey to Shell Pipe Line Corporation filed under Volume 881, Page 361 in the Deed Records of the Harris County Real Property Records.

(10jjj) jjj. Easement: General Portland Cement Company to Southland Paper Mills, Inc. filed under Volume 6209, Page 265 in the Deed Records of the Harris County Real Property Records.

(10kkk) kkk. Easement: L. W. Wagner to Southland Paper Mills, Inc. filed under Volume 6213, Page 548 in the Deed Records of the Harris County Real Property Records.

(10lll) lll. Easement: V. A. Barraco to Southland Paper Mills, Inc. filed under Volume 6157, Page 142 in the Deed Records of the Harris County Real Property Records.

(10mmm) mmm. Easement: H. D. Jones to Southland Paper Mills, Inc. filed under Volume 6033, Page 24 in the Deed Records of the Harris County Real Property Records.

(10nnn) nnn. Easement: Texas Butadiene and Chemical Company to Warren Petroleum dated April 24, 1957 filed under Volume 3330, Page 629 in the Deed Records of the Harris County Real Property Records.

(10ooo) ooo. Easement: Witte to Texas Pipe Line dated October 1, 1947 filed under Volume 1678, Pages 210 and 241 in the Deed Records of the Harris County Real Property Records.

(10ppp) ppp. Easement: Ash to Sinclair Pipe Line dated October 1, 1952 filed under Volume 2522, Page 16 in the Deed Records of the Harris County Real Property Records.

(10qqq) qqq. Easement: Oldham to Colonial Pipe Line Company dated January 19, 1962 filed under Volume 4810, Page 122 in the Deed Records of the Harris County Real Property Records.

(10rrr) rrr. Easement: Oldham to Explorer Pipe Line Company dated June 25, 1970 filed under Volume 8055, Page 10 in the Deed Records of the Harris County Real Property Records.

(10sss) sss. Easement: Kilpatrick to Shell Pipe Line June 30, 1931 filed under Volume 876, Page 705 in the Deed Records of the Harris County Real Property Records.

(10ttt) ttt. Easement: Wilson to Southland Paper Mills dated November 30, 1965 filed under Volume 6157, Page 153 in the Deed Records of the Harris County Real Property Records.

(10uuu) uuu. Easement: Burk to Southland Paper Mills dated December 9, 1965 filed under Volume 6170, Page 295 in the Deed Records of the Harris County Real Property Records.

(10vvv) vvv. Easement: Foland to Southland Paper Mills dated November 30, 1965 filed under Volume 6157, Page 149 in the Deed Records of the Harris County Real Property Records.

(10www) www. Easement: Feland to Shell Pipe Line Company dated June 29, 1931 filed under Volume 885, Page 230 in the Deed Records of the Harris County Real Property Records.

(10xxx) xxx. Easement: Kostal to Shell Pipe Line Company dated July 28, 1931 filed under Volume 879, Page 561 in the Deed Records of the Harris County Real Property Records.

(10yyy) yyy. Easement: Banks to Shell Pipe Line Company dated June 30, 1931 filed under Volume 876, Page 585 in the Deed Records of the Harris County Real Property Records.

(10zzz) zzz. Easement: Burk to Explorer Pipe Line Company dated October 9, 1970 filed under Volume 8174, Page 191 in the Deed Records of the Harris County Real Property Records.

(10aaaa) aaaa. Easement: Burk to Colonial Pipe Line Company dated July 6, 1963 filed under Volume 4790, Page 29 in the Deed Records of the Harris County Real Property Records.

(10bbbb) bbbb. Easement: Sonka to Sinclair Pipe Line Company dated September 11, 1932 filed under Volume 2501, Page 479 in the Deed Records of the Harris County Real Property Records.

(10cccc) cccc. Easement: Sonka to Texas Pipe Line Company dated September 17, 1947 filed under Volume 1666, Page 191 in the Deed Records of the Harris County Real Property Records.

(10dddd) dddd. Easement: Feland to Explorer Pipe Line Company dated October 23, 1970 filed under Volume 8107, Page 210 in the Deed Records of the Harris County Real Property Records.

(10eeee) eeee. Easement: Feland to Colonial Pipe Line Company dated September 25, 1962 filed under Volume 4876, Page 350 in the Deed Records of the Harris County Real Property Records.

(10ffff) ffff. Easement: Feland to Sinclair Pipe Line Company dated August 25, 1952 filed under Volume 2494, Page 213 in the Deed Records of the Harris County Real Property Records.

(10gggg) gggg. Easement: Feland to Texas Pipe Line Company dated April 13, 1948 filed under Volume 1757, Page 293 in the Deed Records of the Harris County Real Property Records.

(10hhhh) hhhh. Easement: Sinclair Petrochemical to Industrial Gas Supply dated July 19, 1965 filed under Volume 5998, Page 609 in the Deed Records of the Harris County Real Property Records.

(10iiii) iiii. Easement: Roberts Foundation to Explorer Pipe Line Company dated October 1, 1970 filed under County Clerk's File No. D192688 of the Harris County Real Property Records.

(10jjjj) jjjj. Easement: Roberts Foundation to National Lead Company dated October 19, 1968 filed under Volume 7411, Page 367 in the Deed Records of the Harris County Real Property Records.

(10kkkk) kkkk. Easement: Weber to Texas Pipe Line Company dated September 17, 1947 filed under Volume 1666, Page 193 in the Deed Records of the Harris County Real Property Records.

(10llll) llll. Easement: Bonner to Colonial Pipe Line Company dated June 17, 1962 filed under Volume 4790, Page 34 in the Deed Records of the Harris County Real Property Records.

(10mmmm) mmmm. Easement: Bonner to Suid Pipe Line Company dated September 22, 1932 filed under Volume 2522, Page 11 in the Deed Records of the Harris County Real Property Records.

(10nnnn) nnnn. Easement: Weber to Colonial Pipe Line Company dated September 21, 1962, filed under Volume 4810, Page 128 in the Deed Records of the Harris County Real Property Records.

(10oooo) oooo. Easement: Marcella Thompson Berkley to Sinclair Pipe Line Company dated May 16, 1966 filed under County Clerk's File No. C310736 of the Harris County Real Property Records.

(10pppp) pppp. Easement: Marcella Thompson Berkley to Industrial Gas Supply Corporation dated January 30, 1958 filed under No. 1871528M of the Harris County Real Property Records.

(10qqqq) qqqq. Easement: Grant to Explorer Pipe Line Company filed under County Clerk's File No. D188485 of the Harris County Real Property Records.

(10rrrr) rrrr. Easement: Sinclair Petrochemicals, Inc. to Shell Pipe Line Corporation dated October 8, 1963 filed under County Clerk's File No. B972033 of the Harris County Real Property Records.

(10ssss) ssss. Easement: Sinclair Petrochemicals, Inc. to Sinclair Pipe Line Company dated December 2, 1965 filed under Volume 7356, Page 98 in the Deed Records of the Harris County Real Property Records.

(10tttt) tttt. Easement: Willis K. Goodman to Colonial Pipeline Company dated June 25, 1962 filed under Volume 4790, Page 40 in the Deed Records of the Harris County Real Property Records.

(10uuuu) uuuu. Easement: Amendment to Texas Pipe Line easement dated February 2, 1973 filed under County Clerk's File No. D795466 of the Harris County Real Property Records.

(10vvvv) vvvv. Easement: Joe Johnston to Explorer Pipe Line Company dated July 6, 1962 filed under County Clerk's File No. B530428 of the Harris County Real Property Records.

(10wwww) wwww. Easement: Emma T. Johnston to Explorer Pipe Line Company dated October 30, 1978 filed under County Clerk's File No. D207505 of the Harris County Real Property Records.

(10xxxx) xxxx. Easement: Thomas M. Johnson to Colonial Pipe Line Company dated June 25, 1962 filed under County Clerk's File No. B530427 of the Harris County Real Property Records.

(10yyyy) yyyy. Easement: Velma Johnson to Explorer Pipe Line Company dated June 5, 1978 filed under County Clerk's File No. D122162 of the Harris County Real Property Records.

(10zzzz) zzzz. Easement: Thomas M. Johnson to Colonial Pipe Line Company dated October 31, 1978 filed under County Clerk's File No. F833035 of the Harris County Real Property Records.

(10aaaaa) aaaaa. Easement: Frances Konecny to Sinclair Pipe Line Company dated October 4, 1965 filed under County Clerk's File No. C177511 of the Harris County Real Property Records.

(10bbbbb) bbbbb. Easement: Gladys McRae to Sinclair Pipe Line Company dated October 12, 1965 filed under County Clerk's File No. C177510 of the Harris County Real Property Records.

(10ccccc) ccccc. Easement: Joseph Hornberger to ARCO Pipe Line Company dated January 29, 1976 filed under County Clerk's File No. E663105 of the Harris County Real Property Records.

(10ddddd) ddddd. Easement: Arthur J. Wilson to Industrial Gas Supply Corporation dated July 27, 1968 filed under Volume 7206, Page 496 in the Deed Records of the Harris County Real Property Records.

(10eeeee) eeeee. Easement: Linnie Bell Hardin to Industrial Gas Supply Corporation dated January 29, 1958 filed under Volume 3478, Page 541 in the Deed Records of the Harris County Real Property Records.

(10fffff) fffff. Easement: S. Bradford to Humble Pipe Line Company dated March 29, 1930 filed under Volume 837, Page 433 in the Deed Records of the Harris County Real Property Records.

(10ggggg) ggggg. Easement: M. C. Wagner to Humble Pipe Line Company dated March 28, 1930 filed under Volume 837, Page 432 in the Deed Records of the Harris County Real Property Records.

(10hhhhh) hhhhh. Easement: Edmond Pinnoff to Shell Pipe Line Company dated June 19, 1931 filed under Volume 878, Page 353 in the Deed Records of the Harris County Real Property Records.

(10iiiii) iiiii. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated November 11, 1985 filed under County Clerk's No. K285609 of the Harris County Real Property Records.

(10jjjjj) jjjjj. Easement: Atlantic Richfield Company to Valero Transmission Company dated February 11, 1985 under County Clerk's File No. J894177 of the Harris County Real Property Records.

(10kkkkk) kkkkk. Easement: Atlantic Richfield Company to Lone Star Gas Company dated April 13, 1983 under County Clerk's File No. J081454 of the Harris County Real Property Records.

(10lllll) lllll. Easement: Atlantic Richfield Company to Exxon Gas System, Inc. dated December 29, 1986 under County Clerk's File No. K896119 of the Harris County Real Property Records.

(10mmmmm) mmmmm. Easement: Atlantic Richfield Company to Interesin Corporation dated January 17, 1986 under County Clerk's File No. K373949 of the Harris County Real Property Records.

(10nnnnn) nnnnn. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated July 1, 1987 filed under County Clerk's File No. L352668 of the Harris County Real Property Records.

(10ooooo) ooooo. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated July 1, 1987 filed under County Clerk's File No. L352669 of the Harris County Real Property Records.

(10ppppp) ppppp. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated July 1, 1987 filed under County Clerk's File No. L352670 of the Harris County Real Property Records.

(10qqqqq) qqqqq. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated July 1, 1987 filed under County Clerk's File No. L352671 of the Harris County Real Property Records, as amended by instrument filed for record under Harris County Clerk's File No. P547128.

(10rrrrr) rrrrr. Easement: Atlantic Richfield Co. to Gulf Refining Co. filed 1-5-76 under clerk's file No. E 640170 of the Harris County Real Property Records.

(10sssss) sssss. Easement: Atlantic Richfield Co. to Phillips Pipe Line Co., filed 1-13-76 under clerk's file No. F 012278 of the Harris County Real Property Records.

(10ttttt) ttttt. Easement: Atlantic Richfield Co. to Phillips Pipe Line Co., filed 1-13-76 under clerk's file No. F 012279 of the Harris County Real Property Records.

(10uuuuu) uuuuu. Easement: Atlantic Richfield Co. to Phillips Pipe Line Co., filed 1-13-76 under clerk's file No. F 012280 of the Harris County Real Property Records.

(10vvvvv) vvvvv. Easement: Atlantic Richfield Co. to Phillips Pipe Line Co., filed 1-13-76 under clerk's file No. F 518560 of the Harris County Real Property Records.

(10wwwww) wwwww. Easement: Atlantic Michfield Co. to Colonial Pipeline Co. filed 8-28-79 under clerk's file No. G215065 of the Harris County Real Property Records.

(10xxxxx) xxxxx. Easement: Leon Vetrano to Shell Pipe Line Corp., 1-19-34, filed in Volume 955 p. 62 Deed Records of Harris County, TX.

(10yyyyy) yyyyy. Easement: Paul Weber to Sinclair Pipe Line Co. 3-26-53, filed in Volume 2592 p. 233 Deed Records of Harris County, TX.

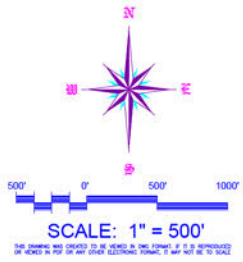
(10zzzzz) zzzzz. Easement: Warren Petroleum Corp. to Sinclair Pipe Line Co. 10-30-56, filed in Volume 3251 p. 329 Deed Records of Harris County, TX.

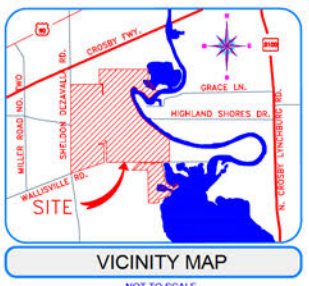
(10aaaaaa) aaaaaa. Easement: T. M. Johnson to Sinclair Pipe Line Co., 9-9-52, filed in Volume 2490 p. 523 Deed Records of Harris County, TX.

(10bbbbbb) bbbbbb. Easement: Warren Petroleum Corp. to Colonial Pipeline Co. 7-11-62 filed in Volume 4810 p. 124 Deed Records of Harris County, TX.

(10cccccc) cccccc. Easement: Frank J. Burke to Southland Paper Mills, Inc. 9-8-65 filed Volume 6170 p. 295 Deed Records Harris County, TX.

(10dddddd) dddddd. Easement: Modification of Shell Pipe Line Easement, filed Volume 3049 p. 533 Deed Records of Harris County, TX.





VICINITY MAP
NOT TO SCALE

NOTES CORRESPONDING TO SCHEDULE B (CON'T)

(10eeeeee) eeeeee. Easement: Warren Petroleum Corp. to Samuel Robert Nobel Foundation, reservation of easement, instrument dated 11-20-67 filed C614514, clerk's file number Harris County, TX.

(10ffffff) ffffff. Easement: Humphreys Foundation to Southland Paper Mills, Inc. 5-11-66 filed under Clerk's file number C307344, Harris County, TX.

(10gggggg) gggggg. Easement: Atlantic Richfield Co. to Big Three Industries, Inc. dated 11-3-75 filed E628355, under Clerk's file number Harris County, TX.

(10hhhhhh) hhhhhh. Easement: Atlantic Richfield Co. to Big Three Industries, Inc., dated 11-3-75, filed E628430 clerk's file number Harris County, TX.

(10iiiiii) iiiiii. Easement: Atlantic Richfield Co. to Gulf Refining Co. 12-19-75, filed E640170 clerk's file number Harris County, TX.

(10jjjjj) jjjjjj. Easement: Atlantic Richfield Co. to ARCO CHEMICAL CO., 9-24-87 filed under L342667, L342668, L342669, L342670, L342665, clerk's file number Harris County, TX.

Easements:

(10kkkkkk) kkkkkk. Easement: Atlantic Richfield Company to Southwestern Bell Telephone Company dated July 30, 1980 under County Clerk's File No. G620135 of the Harris County Real Property Records.

(10llllll) llllll. Easement: Atlantic Richfield Company to Southwestern Bell Telephone Company dated June 27, 1980 under County Clerk's File No. G583172 of the Harris County Real Property Records.

(10mmmmmm) mmmmmm. Easement: Atlantic Richfield Company to Southwestern Bell Telephone Company dated December 8, 1983 under County Clerk's File No. J271387 of the Harris County Real Property Records.

(10nnnnnn) nnnnnn. Easement: Atlantic Richfield Company to Southwestern Bell Telephone Company dated February 3, 1984 under County Clerk's File No. J356051 of the Harris County Real Property Records.

(10oooooo) oooooo. Easement: Easement for railroad purposes, drilling sites, and roadway easement retained in deed dated November 12, 1980, Southern Pacific Transportation Company to Atlantic Richfield Company recorded under County Clerk's File No. G763300.

(10pppppp) pppppp. Easement: Texas Butadiene to Houston North Shore Railway Company dated December 8, 1958 filed under Volume 3072, Page 249 in the Deed Records of the Harris County Real Property Records.

(10qqqqqq) qqqqqq. Easement: Arco Chemical Co. to Southwestern Bell Telephone Co., dated 7/3/1974, filed E222424, clerk's file number Harris County, TX.

(10rrrrrr) rrrrrr. Easement: Sanitary Control Easement granted in instrument filed for record under Clerk's File No(s). V821936 and 20070563131, Official Records, H.C.T.

(10ssssss) ssssss. Easement: Hydraulic Actuator Easement granted to ARCO Chemical Company, a Delaware corporation, as set forth in instrument filed for record under Harris County Clerk's File No. T098678.

(10tttttt) tttttt. Easement: Atlantic Richfield Company to County of Harris dated April 2, 1980 under County Clerk's File No. G485156 of the Harris County Real Property Records.

(10uuuuuu) uuuuuu. Easement: Atlantic Richfield Company to County of Harris dated June 6, 1979 under County Clerk's File No. G107956 of the Harris County Real Property Records.

(10vvvvvv) vvvvvv. Easement: Atlantic Richfield Company to County of Harris dated January 26, 1981 under County Clerk's File No. H028237 of the Harris County Real Property Records.

(10wwwwww) wwwwww. Easement: Oldham to County of Harris dated June 22, 1966 filed under Volume 6440, Page 151 in the Deed Records of the Harris County Real Property Records.

(10xxxxxx) xxxxxx. Easement: Weber to County of Harris dated January 15, 1945 filed under Volume 1343, Page 326 in the Deed Records of the Harris County Real Property Records.

(10yyyyyy) yyyyyy. Easement: Atlantic Richfield Company to Harris County Flood Control District dated November 27, 1979 under County Clerk's File No. G332681 of the Harris County Real Property Records.

(10zzzzzz) zzzzzz. Easement: Atlantic Richfield Company to Harris County Flood Control District filed under Volume 1231, Page 666 in the Deed Records of the Harris County Real Property Records.

(10aaaaaaa) aaaaaaa. Easement: Kostal to Harris County Flood Control District dated June 1, 1938 filed under Volume 1143, Page 392 in the Deed Records of the Harris County Real Property Records.

(10bbbbbbb) bbbbbbb. Easement: Albert Lanza to Harris County Drainage District dated June 13, 1946 filed under Volume 1330, Page 175 in the Deed Records of the Harris County Real Property Records.

(10ccccccc) ccccccc. Easement: Joe Balcar to Harris County Drainage District dated February 4, 1936 filed under Volume 1003, Page 274 in the Deed Records of the Harris County Real Property Records.

(10ddddddd) ddddddd. Easement: Jacob Konecny to Harris County Drainage District dated May 28, 1938 filed under Volume 1145, Page 627 in the Deed Records of the Harris County Real Property Records.

(10eeeeeee) eeeeeee. Easement: Atlantic Richfield Company to County of Harris dated October 31, 1978 filed under County Clerk's File No. G107956 of the Harris County Real Property Records.

(10fffffff) fffffff. Easement: Andrew V. Askew to County of Harris dated January 14, 1942 filed under Volume 1231, Page 666 in the Deed Records of the Harris County Real Property Records.

(10ggggggg) ggggggg. Easement: J. E. Leonard to County of Harris dated January 13, 1942 filed under Volume 1231, Page 664 in the Deed Records of the Harris County Real Property Records.

(10hhhhhhh) hhhhhhh. Easement: George Shanabarger to County of Harris dated January 13, 1942 filed under Volume 1231, Page 665 in the Deed Records of the Harris County Real Property Records.

(10iiiiiii) iiiiiii. Easement: S. Bradford to County of Harris dated March 24, 1942 filed under Volume 1244, Page 303 in the Deed Records of the Harris County Real Property Records.

(10jjjjjj) jjjjjjj. Easement: Atlantic Richfield Company to County of Harris dated January 9, 1978 filed under County Clerk's File No. F539196 of the Harris County Real Property Records.

(10kkkkkkk) kkkkkkk. Easement: August Lehman to Harris County Drainage District dated June 7, 1944 filed under Volume 1330, Page 174 in the Deed Records of the Harris County Real Property Records.

(10lllllll) lllllll. Easement: Joe Balcar to Harris County Drainage District #5 dated 6-5-44, filed Volume 1334 p. 61 Deed Records Harris County, TX.

(10mmmmmmm) mmmmmmm. Easement: Hughes Club to County of Harris 6-28-50 filed Volume 2129 p. 78 Deed Records Harris County, TX.

(10nnnnnnn) nnnnnnn. Easement: Atlantic Richfield Company to Houston Lighting and Power Company dated July 29, 1985 under County Clerk's File No. K129737 of the Harris County Real Property Records.

(10ooooooo) ooooooo. Easement: Atlantic Richfield Company to Houston Lighting and Power Company dated June 30, 1986 under County Clerk's File No. K741639 of the Harris County Real Property Records.

(10ppppppp) ppppppp. Easement: M. Kilpatrick to Houston Lighting and Power Company filed under Volume 3071, Page 71 in the Deed Records of the Harris County Real Property Records.

(10qqqqqqq) qqqqqqq. Easement: Paul Weber to Houston Lighting and Power Company dated September 27, 1961 filed under Volume 3020, Page 32 in the Deed Records of the Harris County Real Property Records.

(10rrrrrrr) rrrrrrr. Easement: Gladys Feland to Houston Lighting and Power Company filed under Volume 3020, Page 36 in the Deed Records of the Harris Real Property Records.

(10sssssss) sssssss. Easement: Atlantic Richfield Company to Houston Lighting and Power Company dated September 16, 1975 filed under County Clerk's File No. F541999 of the Harris County Real Property Records.

(10ttttttt) ttttttt. Easement: Atlantic Richfield Company to Houston Lighting and Power Company dated September 16, 1975 filed under County Clerk's File No. F542001 of the Harris County Real Property Records.

(10uuuuuuu) uuuuuuu. Easement: Atlantic Richfield Company to Houston Lighting and Power Company dated September 16, 1975 filed under County Clerk's File No. F542000 of the Harris County Real Property Records.

(10vvvvvvv) vvvvvvv. Easement: Sinclair Petrochemicals, Inc. to Houston Lighting and Power Company dated November 29, 1967 filed under County Clerk's File No. C635219 of the Harris County Real Property Records.

(10wwwwwww) wwwwwww. Easement: Atlantic Richfield Company to Houston Lighting and Power Company dated November 1, 1976 filed under County Clerk's File No. E938239 of the Harris County Real Property Records.

(10xxxxxxx) xxxxxxx. Easement: Atlantic Richfield Company to Houston Lighting and Power Company dated July 29, 1985 filed under County Clerk's File No. K129737 of the Harris County Real Property Records.

(10yyyyyyy) yyyyyyy. Easement: Atlantic Richfield Co. to Houston Lighting and Power by instrument dated 1-14-76 filed E687016 clerk's file number Harris County, TX.

(10zzzzzzz) zzzzzzz. Easement: Atlantic Richfield Co. to Houston Lighting and Power by instrument dated 1-28-76 filed E686988 clerk's file number Harris County, TX.

(10aaaaaaaa) aaaaaaaa. Waste Disposal Site Description filed under County Clerk's File No. G839278 dated January 23, 1981 of the Harris County Real Property Records.

(10bbbbbbbb) bbbbbbbb. Easement: Atlantic Richfield Company to ARCO Pipe Line Company dated October 17, 1980 under County Clerk's File No. G720631 of the Harris County Real Property Records for electrical conduit easement.

(10cccccccc)

NOTES CORRESPONDING TO SCHEDULE B (CON'T)

10kkkkkkkkk kkkkkkkkk. All reservations contained in Deed from S. R. Noble Foundation, Inc. dated August 17, 1972 filed under County Clerk's File No. D669855 of the Harris County Real Property Records.

10lllllllll lllllll. All reservations contained in Deed from Lillian R. Reed to Texas National Bank dated August 22, 1968 filed under County Clerk's File No. C769556 of the Harris County Real Property Records.

10mmmmmmmm mmmmmmmm. All reservations contained in Deed from Emma T. Johnson to Atlantic Richfield Company dated January 4, 1979 filed under County Clerk's File No. F918629 of the Harris County Real Property Records.

10nnnnnnnnn nnnnnnnn. All reservations contained in deed from E. Bonner et al to Ho North Shore Railway Company dated September 24, 1955 filed under Volume 3015, Page 66 in the Deed Records of the Harris County Real Property Records.

10ooooooooo ooooooooo. All reservations contained in Deed from E. Lee White to John Bukowski dated May 21, 1973 filed under County Clerk's File No. D885888 of the Harris County Real Property Records.

10ppppppppp pppppppp. All reservations contained in deed from Joseph Hornberger to Southland Paper Mills, Inc. dated June 18, 1965 filed under County Clerk's File No. C141937 of the Harris County Real Property Records.

10qqqqqqqqq qqqqqqqq. Terms, Conditions, and Stipulations in the Agreement by and between: Parties:Atlantic Richfield Company and Power Systems Engineering, Inc. Recorded:in County Clerk's File No. J779725, of the Real Property records, of Harris County, Texas. Type:easement agreement

10rrrrrrrr rrrrrrrr. All exceptions contained in Deed American Plant Food to Atlantic Richfield Company dated June 11, 1974 filed under County Clerk's File No. E237982 of the Harris County Real Property Records.

10sssssssss sssssssss. All reservations contained in deed from Southern Pacific to Southland Paper Mills, Inc. dated November 30, 1965 filed under County Clerk's File No. C206104 of the Harris County Real Property Records.

10ttttttttt ttttttttt. All reservations contained in deed from Louis Wagner to Southland Paper Mills, Inc. dated January 18, 1966 filed under Volume 6213, Page 548 in the Deed Records of the Harris County Real Property Records.

10uuuuuuuuu uuuuuuuuu. Atlantic Richfield Company to American Distribution Company dated April 7, 1987 filed under County Clerk's File No. L059242 of the Harris County Real Property Records. (Meter site easement)

10vvvvvvvvv vvvvvvvv. All reservations contained in deed from T. J. Rock to A. W. Erxleben dated June 12, 1934 filed under Volume 948, Page 557 in the Deed Records of the Harris County Real Property Records.

10wwwwwwww wwwwwww. All reservations contained in Deed from Rose Adams to T. A. Burke filed under Volume 559, Page 502 in the Deed Records of the Harris County Real Property records as to 30' x 40' burial place, and right of ingress and egress. With amendment see E235155 Clerk's File Number Harris County, Texas.

10xxxxxxxxx xxxxxxxx. All reservations contained in deed from Guy A. Thompson to Houston North Shore Railway Company dated October 7, 1955 filed under Volume 3061, Page 362 in the Deed Records of the Harris County Real Property Records.

10yyyyyyyyy yyyyyyyy. Terms, Conditions, and Stipulations in the Agreement by and between: Parties:Oxirane Chemical Company Recorded:in County Clerk's File No. E608587, of the Real Property records, of Harris County, Texas. Type:lease agreement

10zzzzzzzzz zzzzzzzz. Terms, Conditions, and Stipulations in the Agreement by and between: Parties:Oxirane Chemical Company Recorded:in County Clerk's File No. E810369, of the Real Property records, of Harris County, Texas. Type:lease agreement

10aaaaaaaaaa aaaaaaaaa. All easements as shown on subdivision plats filed for record Volume 4 Page 12, Volume 5 Page 61 and Volume 24 Page 11, of Map Records Harris County, Texas.

10bbbbbbbbb bbbbbbbbb. All reservations contained in deed from Southern Pacific Co. to Carl W. DeLong dated 1-3-69, recorded in Volume 7484 Page 467 Deed Records Harris County, Texas.

Roadway Easements:

10ccccccccc cccccccc. As described in instrument recorded in deed recorded Volume 1114, Page 582 and Volume 1122, Page 86 in the Deed Records of the Harris County Real Property Records.

10ddddddddd ddddddddd. As described in instrument recorded in Volume 655, Page 382 in the Deed Records of the Harris County Real Property Records.

10eeeeeeeee eeeeeeeee. As recorded in Volume 2564, Page 198 in the Deed Records of the Harris County Real Property Records.

10fffffffff fffffffff. As recorded in Volume 7610, Page 555 in the Deed Records of the Harris County Real Property Records.

10ggggggggg ggggggggg. As recorded in Volume 1231, Page 666 in the Deed Records of the Harris County Real Property Records.

10hhhhhhhhh hhhhhhhhh. As recorded in Volume 1231, Page 664 in the Deed Records of the Harris County Real Property Records.

10iiiiiiiii iiiiiiiii. As recorded in Volume 1231, Page 665 in the Deed Records of the Harris County Real Property Records.

10jjjjjjjjj jjjjjjjjj. As recorded in Volume 1244, Page 303 in the Deed Records of the Harris County Real Property Records.

10kkkkkkkkk kkkkkkkkk. Atlantic Richfield Company to ARCO Pipe Line Company dated July 1, 1987 filed under County Clerk's File No. L352665 of the Harris County Real Property Records.

LEGAL DESCRIPTION

PARCEL I:

PART 1

BEING A TRACT OF LAND IN THE AMY WHITE SURVEY, A-81, THE REUBEN WHITE SURVEY, A-84, THE R.T. BIBBS SURVEY, A-1631, THE M. STROIN SURVEY, A-1559, AND THE A. PETERSON SURVEY, A-1530 IN HARRIS COUNTY, TEXAS, AND BEING PORTIONS OF LOTS 8, 9, 10, 13, 14, 15, 16, 17, AND 18 OF HOUSTON FARMS SUBDIVISION AS PER PLAT RECORDED IN VOLUME 5, PAGE 61, OF THE HARRIS COUNTY MAP RECORDS AND ALL OF LOTS 2, 7A, 11, 12, AND 12A OF THE SUBDIVISION OF THE NORTHEAST PART OF THE AMY WHITE SURVEY LEFT UNPLATTED ON HOUSTON FARMS SUBDIVISION AS PER PLAT RECORDED IN VOLUME 655, PAGE 382, OF THE HARRIS COUNTY DEED RECORDS AND BEING A PORTION OF THAT TRACT OF LAND SOLD TO TEXAS BUTADIENE AND CHEMICAL COMPANY AS DESCRIBED IN DEED RECORDED IN VOLUME 3012, PAGE 167 (SECTION I), OF THE HARRIS COUNTY DEED RECORDS TOGETHER WITH PORTIONS OF THOSE TRACTS OF LAND SOLD TO ATLANTIC RICHFIELD COMPANY AS DESCRIBED IN DEEDS RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBERS D 962905 (SECTIONS II THROUGH IV), D 962903 (SECTIONS V AND VII), D 962902 (SECTION VI), E 140826 (SECTION VIII), E 237982 (SECTION XI), F 700906 (SECTION XVI), E 837116 (SECTION XVII), F 211524 (SECTION XVIII), G 763300 (SECTION XXXI), AND E 515898 AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS WITH ALL BEARINGS AND COORDINATES BEING BASED ON THE NORTH PLANT COORDINATE SYSTEM, SAID BEARING SYSTEM BEING ROTATED 2 48' CLOCKWISE FROM THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE:

BEGINNING AT A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING THE INTERSECTION OF THE NORTH RIGHT-OF-WAY LINE OF WALLISVILLE ROAD (VARIABLE WIDTH) WITH THE EAST RIGHT-OF-WAY LINE OF SHELDON ROAD AS WIDENED TO 100.00 FEET AS PER INSTRUMENT RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBERS E 655120, E 655127, AND F 103764 AND THE SOUTHWEST CORNER OF SAID SECTION VIII, SAID POINT BEING ON A CURVE CONCAVE TO THE EAST AND HAVING COORDINATES OF SOUTH 3598.71 AND WEST 5215.62;

THENCE ALONG THE EAST RIGHT-OF-WAY LINE OF SAID SHELDON ROAD AS FOLLOWS:

NORTHERLY, 196.56 FEET ALONG THE ARC OF SAID CURVE CONCAVE TO THE EAST, HAVING A CENTRAL ANGLE OF 04 00' 03", A RADIUS OF 2814.94 FEET, AND WHOSE CHORD BEARS N 02 20' 11" W, 196.52 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING THE POINT OF TANGENCY OF SAID CURVE;

N 00 20' 09" W, 5462.05 FEET TO A 5/8 INCH IRON ROD IN CONCRETE FOUND MARKING THE POINT OF CURVATURE OF A CURVE TO THE RIGHT;

NORTHERLY, 191.19 FEET ALONG THE ARC OF SAID CURVE TO THE RIGHT, HAVING A CENTRAL ANGLE OF 03 53' 30", A RADIUS OF 2814.79 FEET, AND WHOSE CHORD BEARS N 01 36' 36" E, 191.15 FEET TO A 5/8 INCH IRON ROD IN CONCRETE FOUND MARKING THE POINT OF TANGENCY OF SAID CURVE TO THE RIGHT;

N 03 38' 31" E, 100.20 FEET TO A 5/8 INCH IRON ROD IN CONCRETE FOUND MARKING THE POINT OF CURVATURE OF A CURVE TO THE LEFT;

LEGAL DESCRIPTION (CON'T)

NORTHERLY, 197.98 FEET ALONG THE ARC OF SAID CURVE TO THE LEFT, HAVING A CENTRAL ANGLE OF 03 53' 30", A RADIUS OF 2914.79 FEET, AND WHOSE CHORD BEARS N 01 36' 36" E, 197.94 FEET TO A 5/8 INCH IRON ROD IN CONCRETE FOUND MARKING THE POINT OF TANGENCY OF SAID CURVE TO THE LEFT;

N 00 20' 09" W, 2355.42 FEET TO A CONCRETE MONUMENT WITH BRASS DISK MARKING AN ANGLE POINT;

N 00 02' 31" W, 656.09 FEET TO A CONCRETE MONUMENT WITH BRASS DISK MARKING THE POINT OF CURVATURE OF A CURVE TO THE LEFT;

NORTHERLY, 197.98 FEET ALONG THE ARC OF SAID CURVE TO THE LEFT, HAVING A CENTRAL ANGLE OF 03 53' 30", A RADIUS OF 2914.79 FEET, AND WHOSE CHORD BEARS N 01 59' 16" W, 197.94 FEET TO A CONCRETE MONUMENT WITH A BRASS DISK FOUND MARKING THE POINT OF TANGENCY OF SAID CURVE TO LEFT;

N 03 56' 01" W, 100.02 FEET TO A CONCRETE MONUMENT WITH A BRASS DISK FOUND MARKING THE POINT OF CURVATURE OF A CURVE TO THE RIGHT;

NORTHERLY, 191.19 FEET ALONG THE ARC OF SAID CURVE TO THE RIGHT, HAVING A CENTRAL ANGLE OF 03 53' 30", A RADIUS OF 2814.79 FEET, AND WHOSE CHORD BEARS N 01 59' 16" W, 191.15 FEET TO A CONCRETE MONUMENT WITH A BRASS DISK FOUND MARKING THE POINT OF TANGENCY OF SAID CURVE TO THE RIGHT;

N 00 02' 31" W, 89.74 FEET TO A CONCRETE MONUMENT WITH A BRASS DISK FOUND MARKING THE INTERSECTION OF THE EAST RIGHT-OF-WAY LINE OF SAID SHELDON ROAD WITH THE SOUTH RIGHT-OF-WAY LINE OF LEONARD ROAD, 70.00 FEET WIDE AT THIS POINT;

THENCE ALONG THE RIGHT-OF-WAY LINE OF SAID LEONARD ROAD AS FOLLOWS:

N 89 16' 06" E, 3112.69 FEET TO A 1 INCH IRON PIPE FOUND MARKING AN ANGLE POINT;

N 89 00' 18" E, 371.73 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING AN "ELL" CORNER AND A TRANSITION TO A 60.00 FOOT RIGHT-OF-WAY;

S 00 07' 44" E, 415.50 FEET TO A 1 INCH GALVANIZED IRON PIPE FOUND MARKING AN ANGLE POINT;

S 00 16' 00" E, 715.71 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING AN "ELL" CORNER;

N 89 44' 00" E, 60.00 FEET TO A 2 INCH IRON PIPE FOUND MARKING AN "ELL" CORNER;

N 00 16' 00" W, 715.71 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING AN ANGLE POINT;

N 00 07' 44" W, 471.26 FEET TO A VERTICAL RAIL FOUND MARKING AN "ELL" CORNER AND A TRANSITION TO A 70.00 FOOT RIGHT-OF-WAY;

N 89 00' 16" W, 382.25 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING THE INTERSECTION OF THE NORTH RIGHT-OF-WAY LINE OF SAID LEONARD ROAD WITH THE EAST RIGHT-OF-WAY LINE OF WALTON ROAD, 50.00 FEET WIDE;

THENCE N 00 32' 12" W, 839.12 FEET ALONG THE EAST RIGHT-OF-WAY LINE OF SAID WALTON ROAD TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD.PROPERTY CORNER" SET MARKING AN ANGLE POINT;

THENCE N 00 20' 12" W, 719.77 FEET ALONG THE EAST RIGHT-OF-WAY LINE OF SAID WALTON ROAD TO A 1 INCH IRON PIPE FOUND MARKING THE NORTHEAST CORNER OF SAID WALTON ROAD AND A POINT IN THE SOUTH LINE OF THAT TRACT OF LAND SOLD TO WALTON TRANSPORTATION COMPANY AS DESCRIBED IN DEED RECORDED IN VOLUME 6006, PAGE 505, OF THE HARRIS COUNTY DEED RECORDS;

THENCE N 89 59' 21" E, 5371.69 FEET ALONG THE SOUTH LINE OF SAID WALTON TRANSPORTATION COMPANY TRACT TO A CONCRETE MONUMENT FOUND MARKING THE NORTHWEST CORNER OF THAT TRACT OF LAND SOLD TO PARKER BROTHERS & CO. AS DESCRIBED IN DEED RECORDED IN VOLUME 7607, PAGE 71, OF THE HARRIS COUNTY DEED RECORDS;

THENCE S 00 00' 22" E, 1359.18 FEET ALONG THE WEST LINE OF SAID PARKER BROTHERS & CO. TRACT TO AN ANGLE POINT FALLING IN THE WATER OF A LAKE CREATED BY EXCAVATION;

THENCE S 43 03' 57" E, APPROXIMATELY 1416.71 FEET ALONG THE WEST LINE OF SAID PARKER BROTHERS & CO. TRACT TO A POINT ON THE WEST EDGE OF THE SAN JACINTO RIVER;

THENCE DOWNSTREAM ALONG THE WEST EDGE OF THE SAN JACINTO RIVER AS APPROXIMATED BY THE FOLLOWING MEANDERS PERFORMED IN JANUARY, 1979:

S 31 04' 53" W, 86.11 FEET;
S 52 31' 35" W, 84.77 FEET;
S 68 39' 10" W, 66.05 FEET;
S 48 55' 29" W, 107.41 FEET;
S 54 21' 24" W, 116.81 FEET;
S 41 25' 16" W, 256.22 FEET;
S 46 18' 37" W, 268.98 FEET;
S 15 22' 56" E, 13.23 FEET;
S 61 39' 22" W, 178.24 FEET;
S 86 33' 07" W, 32.98 Hkl;
N 75 18' 56" W, 92.28 FEET;
N 37 20' 52" W, 523.41 FEET;
N 44 58' 57" W, 180.84 FEET;
N 60 20' 46" W, 100.59 FEET;
N 66 09' 30" W, 139.13 FEET;
N 64 06' 58" W, 132.63 FEET;
N 54 05' 05" W, 65.43 FEET;
N 71 11' 33" W, 133.85 FEET;
N 83 14' 54" W, 64.90 FEET;
N 71 49' 36" W, 66.79 FEET;
N 64 21' 37" W, 83.90 FEET;
N 19 14' 25" W, 86.64 FEET;
N 14 23' 02" W, 95.18.FEET;
N 38 42' 36" W, 115.42 FEET;
N 55 10' 16" W, 56.28.FEET;
N 57 46' 39" W, 91.54 FEET;
N 74 39' 40" W, 97.46 FEET;
N 64 25' 39" W, 86.64 FEET;
S 59 39' 50" W, 50.99 FEET;
S 45 11' 11" W, 173.36 FEET;
S 36 55' 41" W, 218.76 FEET;
S 24 14' 47" W, 79.32 FEET;
S 05 18' 56" W, 141.00 FEET;
S 03 23' 48" E, 181.92 FEET;
S 01 21' 06" E, 261.46 FEET;
S 21 33' 26" E, 123.48 FEET;
S 22 51' 52" E, 601.35 FEET;
S 24 28' 08" E, 126.60 FEET;
S 15 06' 22" E, 51.47 FEET;
S 60 15' 42" E, 23.20 FEET;
S 22 41' 18" E, 155.49 FEET;
S 35 52' 44" E, 78.53 FEET;
S 26 06' 39" E, 152.25 FEET;
S 26 36' 29" E, 208.44 FEET;
S 30 17' 43" E, 122.09 FEET;
S 08 57' 01" E, 63.31 FEET;
S 42 37' 29" E, 39.86 FEET;
S 35 05' 03" W, 19.15 FEET;
S 24 03' 36" E, 82.99 FEET;
S 67 20' 11" E, 17.98 FEET;
S 20 02' 06" E, 53.39 FEET;

THENCE CONTINUING DOWNSTREAM ALONG THE WEST EDGE OF THE SAN JACINTO RIVER AS APPROXIMATED BY THE FOLLOWING MEANDERS PERFORMED IN JULY, 1977:

S 37 52' 30" E, 113.02 FEET;
S 26 37' 52" E, 232.13 FEET;
S 42 08' 37" E, 93.65 FEET;
S 30 17' 09" E, 209.63 FEET;

THENCE CONTINUING DOWNSTREAM ALONG THE WEST EDGE OF THE SAN JACINTO RIVER AS APPROXIMATED BY THE FOLLOWING MEANDERS PERFORMED IN JULY, 1962:

S 45 09' 21" E, 839.85 FEET;
S 47 26' 00" E, 555.65 FEET;
S 60 33' 00" E, 291.95 FEET;
S 45 54' 00" E, 359.65 FEET;
S 55 37' 00" E, 340.25 FEET;
S 49 24' 00" E, 478.44 FEET;

THENCE CONTINUING DOWNSTREAM ALONG THE WEST EDGE OF THE SAN JACINTO RIVER AS APPROXIMATED BY THE FOLLOWING MEANDERS PERFORMED IN JANUARY, 1975:

S 48 52' 12" E, 87.70 FEET;
S 59 35' 08" E, 261.04 FEET;
S 54 44' 15" E, 408.41 FEET;
S 56 53' 48" E, 249.89 FEET;
S 62 42' 38" E, 142.31 FEET TO THE NORTHWEST CORNER OF THAT TRACT OF LAND QUITCLAIMED TO AMERICAN PLANT FOOD CORPORATION AS DESCRIBED IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER E 480858;

THENCE S 00 05' 58" W, AT 165.35 FEET PASS A INCH IRON PIPE IN CONCRETE FOUND MARKING THE SOUTHWEST CORNER OF SAID AMERICAN PLANT FOOD CORPORATION TRACT AND THE NORTHWEST CORNER OF THAT TRACT OF LAND SOLD TO AMERICAN PLANT FOOD CORPORATION AS DESCRIBED IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER E 146098, AND CONTINUING IN ALL A TOTAL DISTANCE OF 2533.36 FEET ALONG THE WEST LINE OF SAID AMERICAN PLANT FOOD CORPORATION TRACT TO A INCH IRON PIPE IN CONCRETE IN THE NORTH RIGHT-OF-WAY LINE OF SAID WALLISVILLE ROAD FOUND MARKING THE SOUTHWEST CORNER OF SAID AMERICAN PLANT FOOD CORPORATION TRACT;

THENCE ALONG THE NORTH RIGHT-OF-WAY LINE OF SAID WALLISVILLE ROAD AS FOLLOWS:

S 89 23' 25" W, 610.15 FEET TO A FENCE CORNER FOUND MARKING AN ANGLE POINT;

S 89 51' 43" W, 2649.68 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING AN ANGLE POINT;

S 89 41' 24" W, 3620.72 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING THE INTERSECTION OF THE NORTH RIGHT-OF-WAY LINE OF SAID WALLISVILLE ROAD WITH THE EAST RIGHT-OF-WAY LINE OF THAT 150.00 FOOT FEE STRIP SOLD TO HOUSTON NORTHSHORE RAILROAD COMPANY (NOW MISSOURI PACIFIC RAILROAD COMPANY) AS DESCRIBED IN DEED RECORDED IN VOLUME 4187, PAGE 220, OF THE HARRIS COUNTY DEED RECORDS AND TO MISSOURI PACIFIC RAILROAD COMPANY AS DESCRIBED IN DEEDS RECORDED IN VOLUME 3389, PAGE 327, AND VOLUME 3135, PAGE 663, OF THE HARRIS COUNTY DEED RECORDS;

THENCE N 00 41' 04" W, 2371.18 FEET ALONG THE EAST RIGHT-OF-WAY LINE OF SAID MISSOURI PACIFIC RAILROAD COMPANY FEE STRIP TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING THE NORTHEAST CORNER OF SAID STRIP AND AN "ELL" CORNER;

THENCE N 89 59' 57" W, 150.00 FEET ALONG THE NORTH LINE OF SAID MISSOURI PACIFIC RAILROAD FEE STRIP TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING THE NORTHWEST CORNER OF SAID FEE STRIP AND AN "ELL" CORNER;

THENCE S 00 40' 37" E, 300.00 FEET ALONG THE WEST RIGHT-OF-WAY LINE OF SAID MISSOURI PACIFIC RAILROAD COMPANY FEE STRIP TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING THE NORTHEAST CORNER OF THE RESIDUE OF THOSE TRACTS OF LAND SOLD TO HOUSTON LIGHTING AND POWER COMPANY AS DESCRIBED IN DEEDS RECORDED IN VOLUME 3049, PAGE 533, VOLUME 6008, PAGE 13, VOLUME 3160, PAGE 282, VOLUME 3046, PAGE 618, AND VOLUME 5880, PAGE 363, OF THE HARRIS COUNTY DEED RECORDS AND AN "ELL" CORNER;

LEGAL DESCRIPTION (CON'T)

THENCE ALONG THE WESTERN PERIMETER OF SAID RESIDUE TRACT AS FOLLOWS:

N 89 59' 57" W, 400.00 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING THE NORTHWEST CORNER OF SAID MISSOURI PACIFIC RAILROAD COMPANY TRACTS AND AN "ELL" CORNER;

S 00 40' 37" E, 11.72 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING AN "ELL" CORNER;

N 89 42' 14" W, 298.93 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING AN "ELL" CORNER;

S 00 17' 46" W, 100.00 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING AN "ELL" CORNER;

S 89 42' 14" E, 551.55 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING AN ELL" CORNER;

S 00 41' 50" E, 20.00 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING AN "ELL" CORNER;

S 89 33' 50" E, 50.01 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING AN "ELL" CORNER;

S 00 41' 50" E, 712.67 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING AN ANGLE POINT;

S 00 39' 48" E, 1230.39 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" SET MARKING A POINT IN THE NORTH RIGHT-OF-WAY LINE OF SAID WALLISVILLE ROAD;

THENCE S 71 24' 45" W, 1572.57 FEET ALONG THE NORTH LINE OF SAID WALLISVILLE ROAD TO A 5/8 INCH IRON ROD IN THE EAST LINE OF SAID R.T. BIBBS SURVEY FOUND MARKING AN ANGLE POINT;

THENCE S 71 23' 12" W, 1567.69 FEET CONTINUING ALONG THE NORTH LINE OF SAID WALLISVILLE ROAD TO THE POINT OF BEGINNING OF THE HEREIN DESCRIBED TRACT AND ENCLOSING A GROSS AREA OF 1995 ACRES;

LESS AND EXCEPT A TRACT OF LAND DESCRIBED AS FOLLOWS:

BEING A 5.0000 ACRE TRACT OF LAND IN THE AMY WHITE SURVEY, ABSTRACT NO. 81, HARRIS COUNTY, TEXAS AND BEING ALL OF THAT 5.0000 ACRE TRACT OF LAND SOLD TO INTERESIN CORPORATION BY ATLANTIC RICHFIELD COMPANY AS DESCRIBED IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NO. K 373948 AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS WITH ALL BEARINGS AND COORDINATES BEING BASED ON THE NORTH PLANT COORDINATE SYSTEM, SAID BEARING SYSTEM BEING ROTATED 02 48' CLOCKWISE FROM THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE:

COMMENCING AT THE SOUTHWEST CORNER OF THAT TRACT OF LAND SOLD TO ATLANTIC RICHFIELD COMPANY BY THE AMERICAN PLANT FOOD CORPORATION AS DESCRIBED IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NO. E 237982 AND BEING A POINT IN THE NORTH RIGHT-OF-WAY LINE OF WALLISVILLE ROAD AND A POINT IN THE COMMON LINE OF THE EAST RIGHT-OF-WAY LINE OF A MISSOURI PACIFIC RAILROAD COMPANY 100-FOOT FEE STRIP AS DESCRIBED IN DEED RECORDED IN VOLUME 4187, PAGE 220 OF THE HARRIS COUNTY DEED RECORDS AND THE WEST RIGHT-OF-WAY LINE OF A 60.00-FOOT WARREN PIPELINE EASEMENT AS DESCRIBED IN DEED RECORDED IN VOLUME 7001, PAGE 466 OF THE HARRIS COUNTY DEED RECORDS;

THENCE ALONG THE NORTH RIGHT-OF-WAY LINE OF SAID WALLISVILLE ROAD, N 89 41' 24" E, 504.16 FEET TO A POINT;

THENCE LEAVING THE NORTH RIGHT-OF-WAY LINE OF SAID WALLISVILLE ROAD, NORTH, 200.00 FEET TO A 5/8 INCH IRON ROD FOUND MARKING THE POINT OF BEGINNING AND SOUTHEAST CORNER OF THE HEREIN DESCRIBED TRACT, AND THE SOUTHWEST CORNER OF AN ADJOINING 16.4247 ACRE TRACT; SAID POINT HAVING COORDINATES OF SOUTH 2170.80 AND WEST 832.26;

THENCE PARALLEL WITH AND 200.00 FEET NORTH OF THE NORTH RIGHT-OF-WAY LINE OF SAID WALLISVILLE ROAD, S 89 41' 24" W, 346.54 FEET TO A 5/8 INCH IRON ROD FOUND MARKING THE SOUTHWEST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE PARALLEL WITH AND 100.00 FEET EAST OF THE EAST RIGHT-OF-WAY LINE OF SAID WARREN PIPELINE EASEMENT, N 00 41' 04" W, 516.25 FEET TO A 5/8 INCH IRON ROD FOUND MARKING THE NORTHWEST CORNER OF THE HEREIN DESCRIBED TRACT AND A POINT IN A CURVE CONCAVE TO THE SOUTHEAST;

THENCE NORTHEASTERLY, 365.65 FEET ALONG SAID CURVE CONCAVE TO THE SOUTHEAST HAVING A RADIUS OF 483.42 FEET, A CENTRAL ANGLE OF 43 20' 14" AND WHOSE CHORD BEARS N 64 30' 51" E, 356.99 FEET TO A 5/8 INCH IRON ROD FOUND MARKING THE POINT OF TANGENCY OF SAID CURVE CONCAVE TO THE SOUTHEAST;

THENCE PARALLEL WITH AND 100.00 FEET SOUTH OF A 100.00-FOOT WIDE ARCO PIPELINE ALLEY, N 86 10' 58" E, 30.52 FEET TO A 5/8 INCH IRON ROD FOUND MARKING THE NORTHEAST CORNER OF THE HEREIN DESCRIBED TRACT AND THE NORTHEAST CORNER OF SAID ADJOINING 16.4247 ACRE TRACT;

THENCE ALONG THE WEST LINE OF SAID 16.4247 ACRE TRACT, SOUTH, 669.98 FEET TO THE POINT OF BEGINNING AND ENCLOSING 5.0000 ACRES (217,800 SQUARE FEET) OF LAND.

LESS AND EXCEPT 60.00 FOOT ROAD AND 60.00 FOOT CANAL RIGHTS-OF-WAY ALONG THE SOUTH LINE OF LOTS 13, 14, AND 15 OF HOUSTON FARMS SUBDIVISION AS PER PLAT RECORDED IN VOLUME 5, PAGE 61, HARRIS COUNTY MAP RECORDS AND AN ADJOINING 80.00-FOOT ROAD RIGHT-OF-WAY DESCRIBED IN DEED RECORDED IN VOLUME 2129, PAGE 78, HARRIS COUNTY DEED RECORDS TOTALING APPROXIMATELY 36 ACRES OF LAND.

AND ENCLOSING WITHIN THIS DESCRIPTION A NET AREA OF 1954 ACRES OF LAND.

PART 3

BEING A TRACT OF LAND IN THE P.J. DUNCAN SURVEY, ABSTRACT NO. 232, HARRIS COUNTY, TEXAS AND BEING A PORTION OF PORT HOUSTON PARK ADDITION AS PER PLAT RECORDED IN VOLUME 4, PAGE 12, OF THE HARRIS COUNTY MAP RECORDS AND BEING ALL OF THOSE LANDS SOLD TO ATLANTIC RICHFIELD COMPANY AS DESCRIBED IN DEEDS RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBERS E 808693, E 762025, AND E 235155 TOGETHER WITH PORTIONS OF THOSE LANDS SOLD TO ATLANTIC RICHFIELD COMPANY AS DESCRIBED IN DEEDS RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBERS E 238690, E 383636, E 241187, E 235158, E 235156, E 338483, E 413234, AND E 533188 AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS WITH ALL BEARINGS AND COORDINATES BEING BASED ON THE NORTH PLANT COORDINATE SYSTEM, SAID SYSTEM BEING ROTATED 2 48' CLOCKWISE FROM THE STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE:

COMMENCING AT A STONE FOUND MARKING THE NORTHEAST CORNER OF THE BLUNT N. SESSUMS SURVEY, ABSTRACT NO. 733, THE SOUTHEAST CORNER OF THE A. PETERSON SURVEY, ABSTRACT NO. 1530 AND A POINT IN THE NORTHWESTERLY LINE OF THE P.J. DUNCAN SURVEY, ABSTRACT NO. 232, SAID STONE ALSO MARKING THE SOUTHEAST CORNER OF A HOUSTON LIGHTING & POWER COMPANY 150.00-FOOT FEE STRIP RECORDED IN VOLUME 3071, PAGE 71 OF THE HARRIS COUNTY DEED RECORDS AND THE NORTHEAST CORNER OF A HOUSTON LIGHTING & POWER COMPANY 150.00-FOOT FEE STRIP RECORDED IN VOLUME 2379, PAGE 514 OF THE HARRIS COUNTY DEED RECORDS;

THENCE N 43 00' 34" E, ALONG THE SOUTHEASTERLY LINE OF SAID HOUSTON LIGHTING & POWER COMPANY 150.00-FOOT FEE STRIP, 915.86 FEET TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE POINT OF BEGINNING OF THE HEREIN DESCRIBED TRACT AND THE MOST NORTHERLY NORTHWEST CORNER OF THAT TRACT OF LAND SOLD TO ARCO CHEMICAL COMPANY AS DESCRIBED IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER L 352663, SAID POINT HAVING COORDINATES OF SOUTH 2414.60 AND EAST 2228.60:

THENCE N 43 00' 34" E, 1120.00 FEET ALONG THE SOUTHEASTERLY LINE OF SAID HOUSTON LIGHTING & POWER COMPANY 150.00-FOOT FEE STRIP, TO A INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND IN MARKING THE NORTHEAST CORNER OF SAID HOUSTON LIGHTING & POWER COMPANY 150.00-FOOT FEE STRIP AND BEING A POINT THE SOUTH RIGHT-OF-WAY LINE OF WALLISVILLE ROAD, VARIABLE WIDTH;

THENCE N 89 46' 27" E, 585.00 FEET ALONG THE SOUTH RIGHT-OF-WAY LINE OF SAID WALLISVILLE ROAD, TO A 5/8 INCH IRON ROD FOUND MARKING AN "ELL" CORNER;

THENCE S 00 13' 33" E, 100.00 FEET TO A 5/8 INCH IRON FOUND MARKING AN "ELL" CORNER;

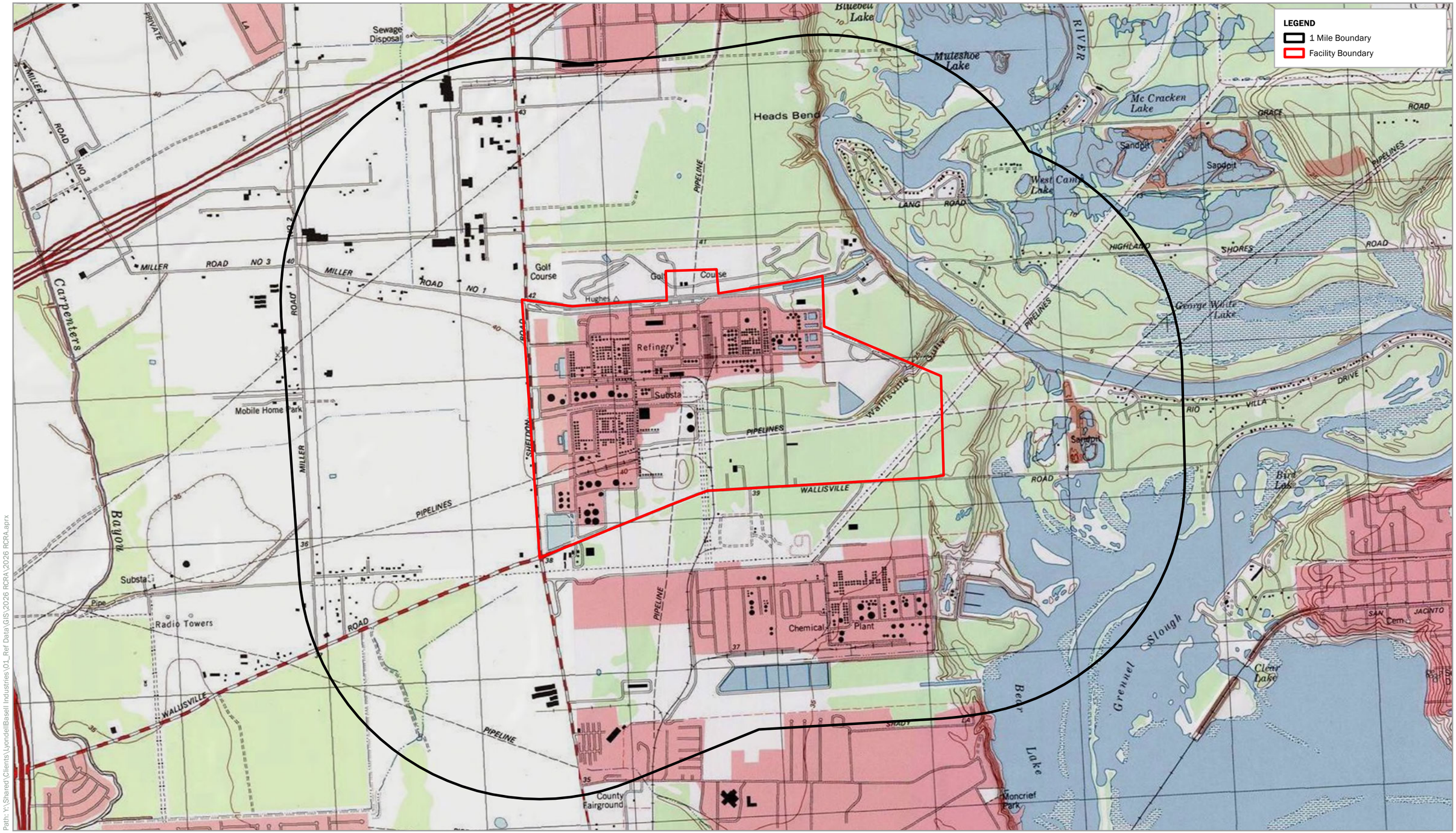
THENCE N 89 46' 27" E, 75.00 FEET TO A 5/8 INCH IRON ROD FOUND MARKING AN "ELL" CORNER;

THENCE N 89 46' 27" E, 75.00 FEET TO A 5/8 INCH IRON ROD FOUND MARKING AN "ELL" CORNER AND A POINT IN THE SOUTH RIGHT-OF-WAY LINE OF SAID WALLISVILLE ROAD;

THENCE N 00 13

Attachment C: Facility Boundaries and Adjacent Waters Map

Brown AND Caldwell



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Brown AND Caldwell

CLIENT NAME: EQUISTAR CHEMICALS, LP
PROJECT: 2026 RCRA RENEWAL

DATE: 2/5/2026
PROJECT NUMBER: 196588

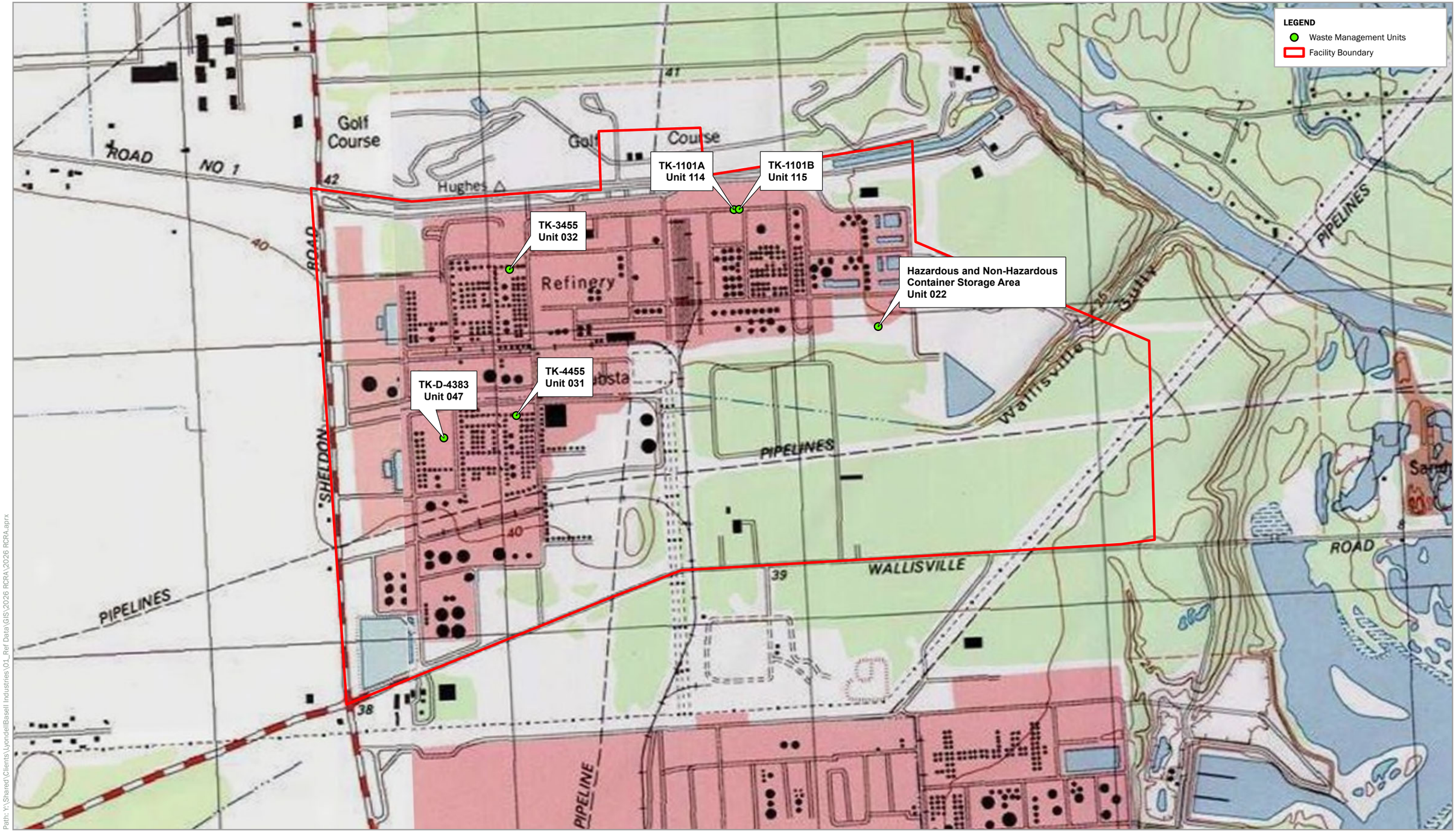
Spatial Reference Name: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Copyright:© 2013 National Geographic Society, i-cubed

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Part A - Figure C-1 A
1 Mile Boundary Map

February 2026



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Brown AND Caldwell

CLIENT NAME: EQUISTAR CHEMICALS, LP
PROJECT: 2026 RCRA RENEWAL

DATE: 2/5/2026
PROJECT NUMBER: 196588

Spatial Reference Name: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Copyright:© 2013 National Geographic Society, i-cubed

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Part A - Figure C-1 B
Location Map of Waste Management Units

February 2026



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Brown AND Caldwell

CLIENT NAME: EQUISTAR CHEMICALS, LP
PROJECT: 2026 RCRA RENEWAL

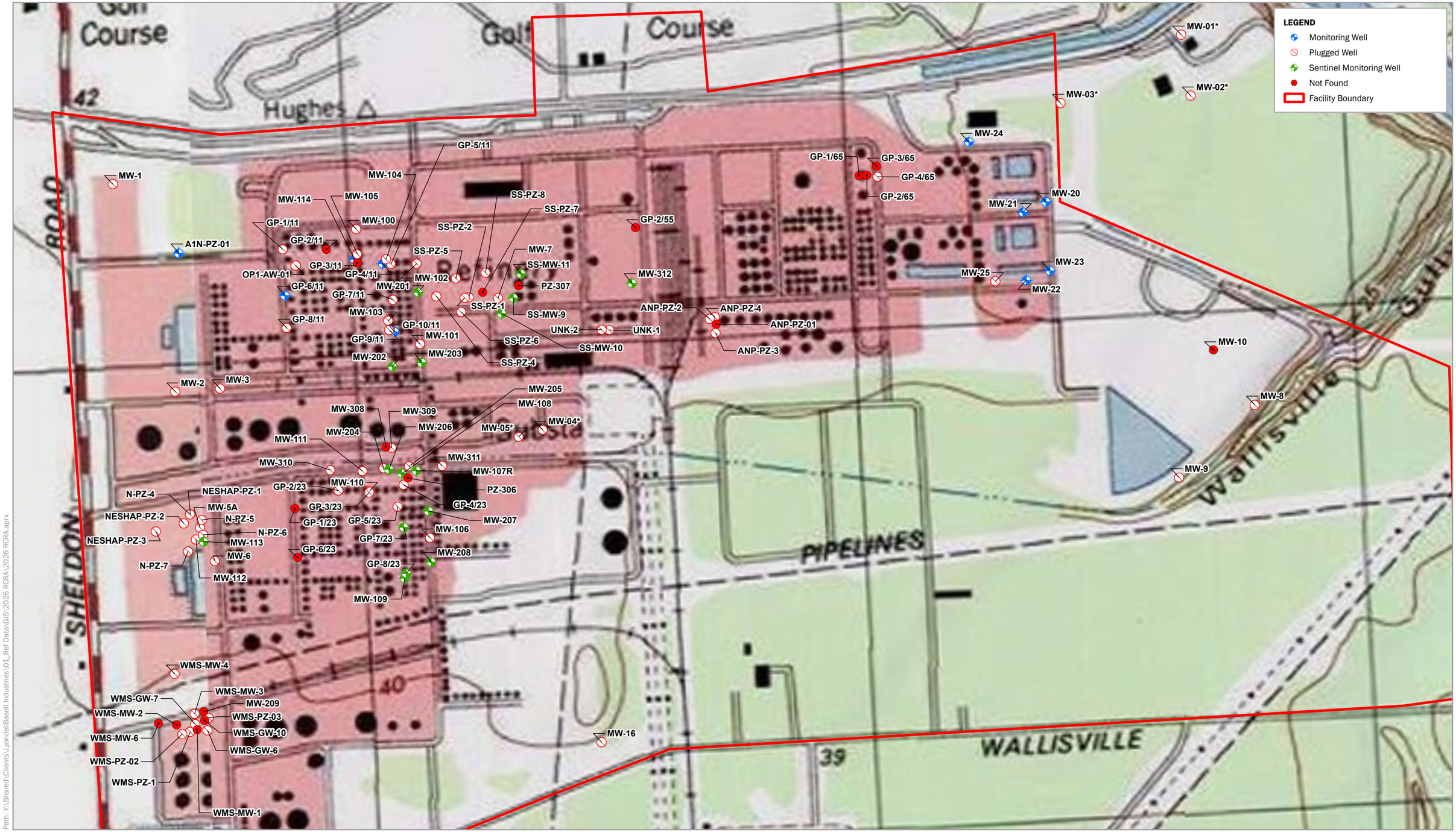
DATE: 2/5/2026
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Spatial Reference Name: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

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Part A - Figure C-1 C
Boring Locations

February 2026



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Brown AND Caldwell

CLIENT NAME: EQUISTAR CHEMICALS, LP
PROJECT: 2026 RCRA RENEWAL

DATE: 2/5/2026
PROJECT NUMBER: 196588

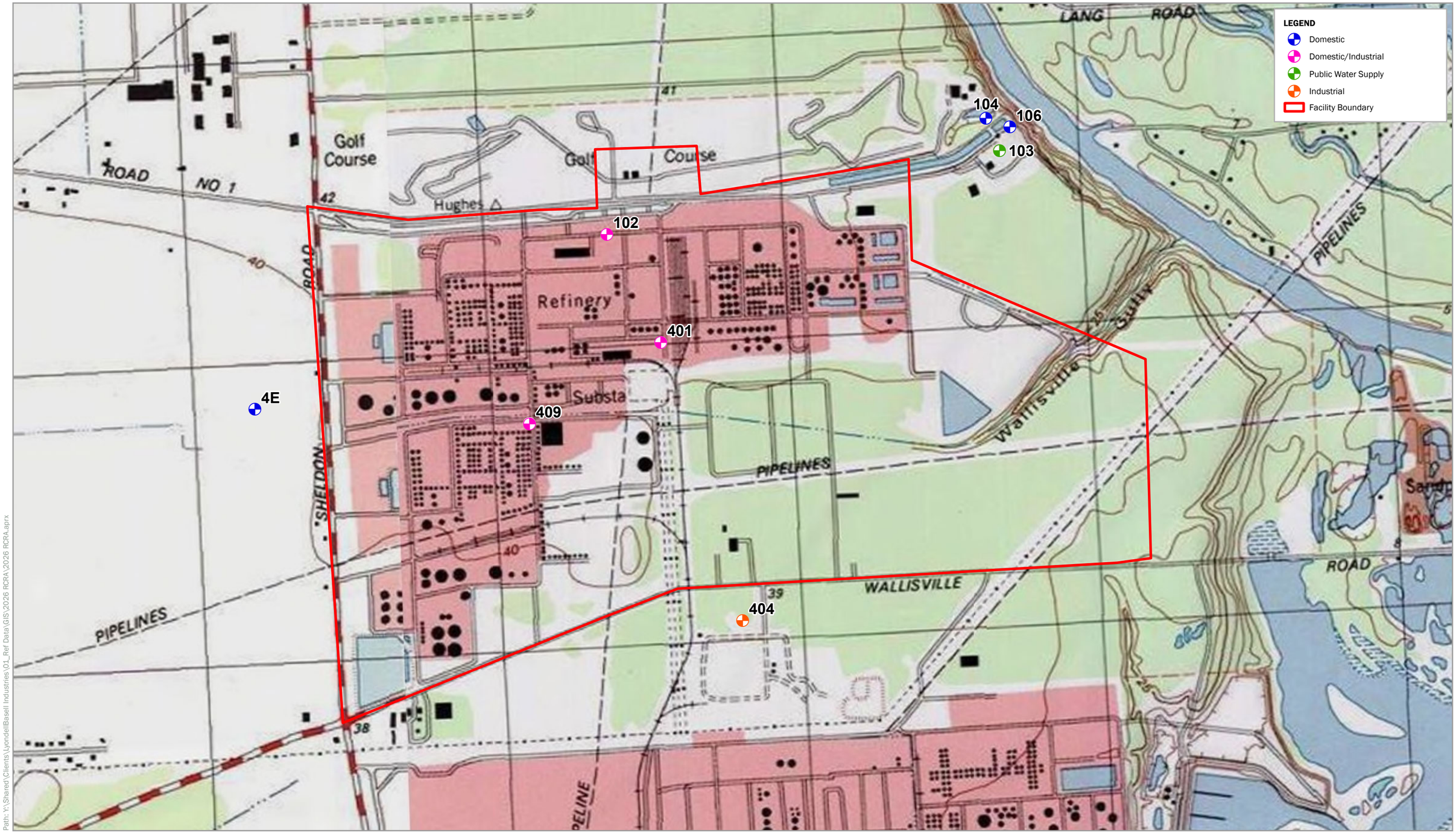
Note: * = Two wells with this name exist at this facility
Spatial Reference Name: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Copyright:© 2013 National Geographic Society, i-cubed

0 600
Feet

Part A - Figure C-1 D
Location of Monitoring Wells

February 2026



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Brown AND Caldwell

CLIENT NAME: EQUISTAR CHEMICALS, LP
PROJECT: 2026 RCRA RENEWAL

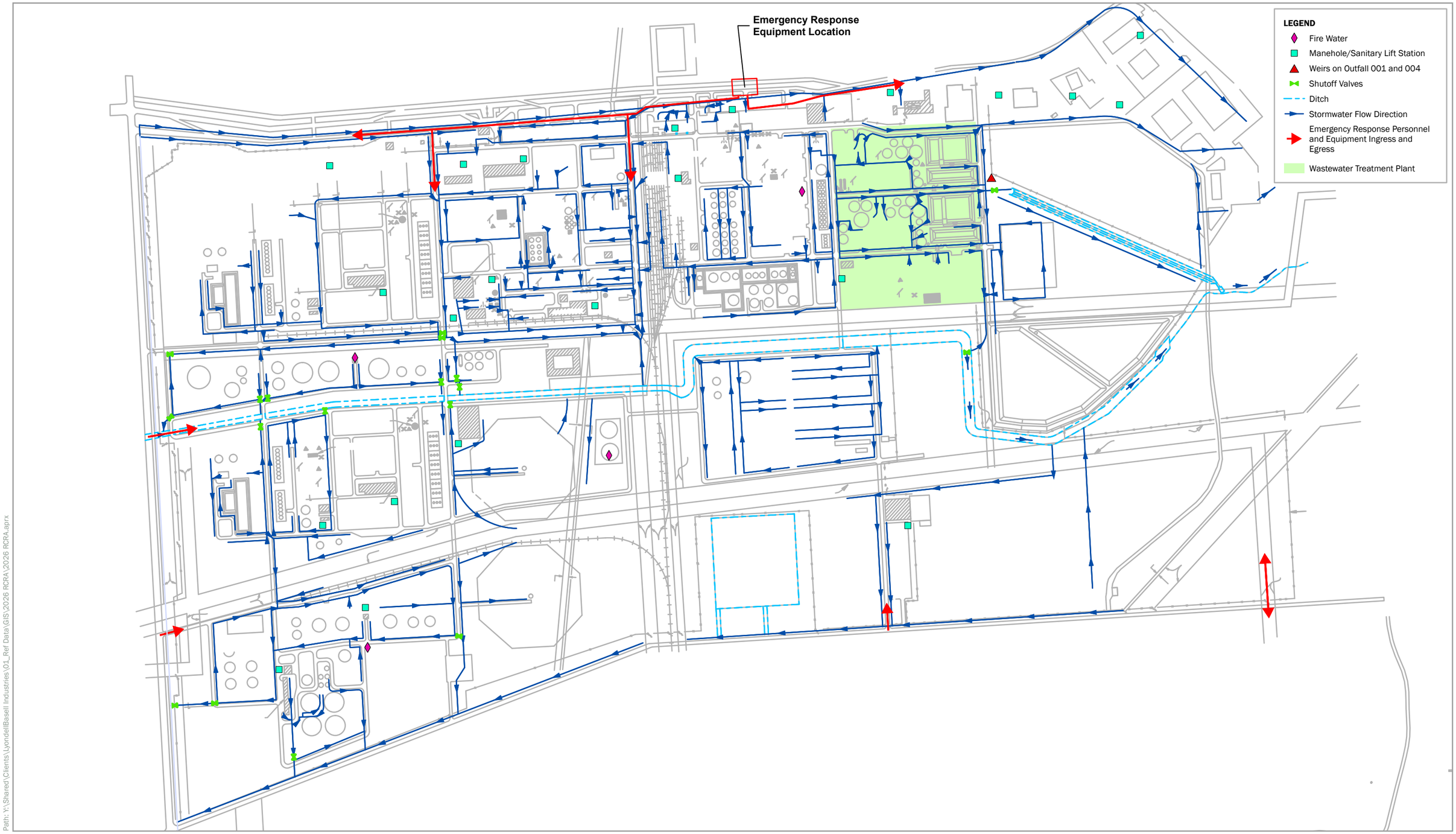
DATE: 2/5/2026
PROJECT NUMBER: 196588

Spatial Reference Name: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

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Feet

Part A - Figure C-1 E
Well Map

February 2026



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Brown AND Caldwell

CLIENT NAME: EQUISTAR CHEMICALS, LP
PROJECT: 2026 RCRA RENEWAL

DATE: 2/5/2026
PROJECT NUMBER: 196588

Spatial Reference Name: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

0 700
Feet

Part A - Figure C1-1 F
Stormwater Drainage Map

February 2026

Attachment D: Photographs

Container Storage Area



Tank TK-3455



Tank TKD -4383



Front View



Side View

Tanks –TK 1101 A & TK 1101 B



Tank TK-4455



Attachment E: Process Flow Diagram/Description

Part A Attachment E Process Flow

Olefins Process Overview

General Information

The Channelview Olefins Complex was built in 1975 and 1977 and consists of two distinct and separate olefin units, OP-1 and OP-II. The two units are identical in design with a few exceptions. The basic function of the plant is to process a low-cost heavy oil feed and turn it into individual components that have a higher value. The operation is accomplished by heating the feed and thermally cracking it into lighter products such as ethylene, propylene, crude C4s, crude C5s, and aromatics. The combined capacity of the two plants is about 6,000 gallons per minute (gpm) of feed generating about 11 million (MM) pounds (lbs)/day of ethylene, 5 MM lbs/day chemical grade propylene, 2.2 MM lbs/day of polymer grade propylene, and 32,000 lbs/day of pyrolysis gasoline. The Flex Unit is capable of producing about 2 MM lbs/day of additional polymer grade propylene. A process flow diagram (PFD) is attached.

Feed Stock

The Olefins Units receive feed stocks such as natural gas liquids, condensate, naphtha, gas oil, and refinery mix from Houston Refinery Operations (HRO), Oil Tanking of Texas Industry (OTTI) by pipeline or barge. These feed stocks are stored in separate receiving tanks and then pumped into day tanks before being routed to the furnaces. Some natural gas liquids are brought into Mt. Belvieu and pipelined directly to the furnaces with no intermediate storage. Besides the direct pipelines, there are six individual feed systems available for segregating feed stocks. OP-I has a 1st, 2nd, and 3rd feed system while OP-II has a 1st, 2nd, and 4th feed system.

The two olefins units combined consume about 170,000 barrels per day (bpd). On-site storage capacity equals about 5550,000 barrels (bbls) or a little over 3 days when full. There are approximately 2,000,000 bbls of off-site storage available or about 12 days when completely full. On average, the plant maintains about 3 to 5 days' worth of inventory. It takes about 10 to 20 days for ships to reach our facilities from across the Atlantic.

Crack and Quench

The Crack and Quench (C&Q) section of each unit consists of 17 furnaces each, a Gasoline Fractionator, a fuel oil stripper, a gas oil stripper, a quench towner, a process water stripper, and a gasoline stripper. Typically, 15 furnaces are operated with 2 units out of service for decoking. The feed is fed into each furnace along with an amount of steam and is heated up to about 1,500° F. At these conditions the feed is broken down into the desired higher valued products. The furnace effluent is then cooled down by generating 1,500 psig steam.

The effluent from the steam generators (TLEs) is fed into the Gasoline Fractionator where the heavier products are separated and removed.

The bottom product from the Fractionator is pyrolysis fuel oil (PFO). A portion of this stream is recycled into the furnace effluent to provide additional cooling (oil quench). The remainder is fed to the PFO Stripper where the remaining light components are stripped from the product and fed back into the Fractionator. The PFO is sold as product.

Pyrolysis gas oil (PGO) is drawn off from the middle of the Fractionator. This material is fed to the PGO Stripper where light components are stripped out and fed back into the Fractionator. The PGO product is used as a flush and was oil for the until with excess PGO being sold as a product.

The overhead vapors from the Fractionator are fed into the Quench Column. Hot quench water is recirculated from the bottom of the quench tower through various coolers and back into the Quench Column overhead to provide cooling. A pyrolysis gasoline product draw is also taken from the bottom of the Quench Column. A portion of this stream is used as reflux for the Gasoline Stripper column while the product is yielded to the Depentanizer column down stream. Some water is taken from the bottom of the Quench Column and fed to the process water stripper. In the stripper, any remaining hydrocarbons are stripped out of the water and fed back to the quench column. The clean water is then used for steam generation and is fed back into the furnaces. The Gasoline Stripper removes any light components and feeds them back into the Quench Column. The bottom of the gasoline stripper is another source of PGO and is fed to the down stream Depentanizer column.

The overhead vapors from the Quench Column are fed into the compression train.

Compression

The overhead vapors (Charge Gas) from the Quench Column are fed through a series of compressors, coolers, and knock out vessels. The first compressor (C-3501A) consists of three stages of compression with cooling and liquid knock out equipment between each stage. The effluent of the 3rd stage of compression is passed through a caustic wash tower to remove sulfur compounds. Waste caustic is generated from the bottom of the Caustic Wash Tower. The charge gas from the caustic wash tower is then fed into the Caustic Water Wash Tower. Here, water is used to remove any traces of caustic that may be present in the charge gas. The water and caustic from this tower are fed back into the Caustic Tower. The charge gas from the Caustic Water Wash tower is fed into the second compressor (C-3501B). This compressor consists of two stages of compression with cooling and liquid knock out equipment between each stage.

Following compression, the charge gas is passed through the charge gas dryers. Here a desiccant is used to remove any traces of water from the charge gas prior to entering the cold fractionation part of the plant.

Liquid collected after the 4th and 5th stages of compression is routed to the Condensate Stripper. Light components are vaporized in the stripper and recycled back through the compression train. The remaining liquid is drawn off of the bottom of the stripper and routed to the Depropanizer down stream.

Cold Fractionation

After the charge gas dryers, the charge gas is routed through a series of exchangers and a cold box where it is cooled to temperatures that allow recovery of products such as hydrogen, liquid methane, and ethane/ethylene. Hydrogen is yielded as a product and is partially consumed in various reactors in the plant. The methane product is generated in the Pre-Cut Demethanizer and the Demethanizer. Methane is consumed as fuel gas int eh furnaces throughout the plant.

The bottom of the Demethanizer feeds the Deethanizer where the ethane and ethylene are separated overhead and the C3 and heavier components are taken out the bottom. The combined ethane and ethylene are routed through the acetylene converters where small amounts of acetylene are partially saturated and converted primarily into ethylene and ethane. The effluent of the acetylene converter is routed to the Green Oil tower. Here, small amounts of heavy components formed int eh acetylene converter are removed and directed into the C3 and heavier stream via the Deethanizer.

The overhead of the Green Oil tower is routed to the Ethylene Dryers where final traces of water are removed prior to entering the Ethylene Fractionator. In the Ethylene Fractionator, the ethylene product is taken out the overhead while the ethane product is removed from the bottom. The ethylene product is shipped out of the plant to Mt. Belvieu via pipeline. The ethane product can be recycled back to the furnaces or it can be exported to other ethane customers via pipeline.

Cooling for the cold fractionation section of the plant is provided by a propylene refrigeration system and an ethylene refrigeration system. Temperatures as low as 200°F are achieved in the cold fractionation area.

Hot Fractionation

Feed for the hot Fractionation part of the plant comes from the Deethanizer bottoms. The Deethanizer bottoms stream is fed to the depropanizer tower where the propylene and propane are removed overhead. The propylene/propane stream is fed to the MAPD converters where methyl-acetylene and propadiene are partially saturated with hydrogen to form more propylene. After the MAPD converters, the stream is routed through the C3 Green Oil tower where heavy compounds formed in the converter are removed and recycled back into the process. The clean propylene/propane stream is then routed to the propylene dryers for final water removal and exits the plan via pipeline as chemical grade propylene. Some of this propylene stream can be routed to the propylene fractionators in OP-2 for upgrading to

polymer grade propylene. Here, the propane is removed from the stream and recycled back to the furnaces or sent to the South Plant.

The bottom of the Depropanizer is routed to the Debutanizer where the crude C4s are removed overhead and routed to the East Plant for the recovery of BD and further processing in the methyl tert-butyl ether (MTBE) and Alkylation units.

The bottom of the Debutanizer is routed to the Depentanizer where the crude C5s are removed overhead and routed through the cyclopentadiene (CPD) dimer drums to make di-cyclopentadiene (DCPD). From the dimer drums, the crude C5s are routed to the East Plant for recovery of DCPD, isoprene, and piperylenes, the product from the bottom of the Depentanizer is Raw Pygas.

Gasoline Treating (DPG-I)

The raw pygas from the bottom of the Depentanizer is “unstable”. The di-olefins contained in the stream can join together forming a heavy gummy material that is not good for gasoline engines. Therefore, the di-olefins must be eliminated by saturating them with hydrogen. This process is completed by passing the raw pygas over a bed of palladium catalyst in the presence of hydrogen. The now “stable” gasoline can be sold to gasoline blenders as a high octane blending component.

Gasoline Splitters

The now stable gasoline contains a large amount of benzene and toluene which are valuable products themselves. The pygas stream is split in the two Gasoline Fractionators located int e Mid-Plant into a heavy pygas stream from the bottoms and the DPG-II feed stream from the overhead. The heavy pygas contains no benzene and only a portion of the toluene. The overhead of the Gasoline Splitters contains all of the benzene and some of the toluene along with a large amount (~50%) of non-aromatic compounds. This stream is routed to the DPG-II for further processing.

Gasoline Treating (DGP-II)

Prior to sending the remaining gasoline stream to the Sulfolane Unit for benzene and toluene recovery, the sulfur and remaining olefins must be removed. The sulfur must be removed so that the benzene can meet its specs of less than 1 ppm of sulfur. The olefins must be removed because they tend to cause the benzene and toluene to turn a slight yellow color instead of being water white. Both the sulfur and olefins are removed by passing the gasoline over a catalyst bed containing nickel and molybdenum while in the presence of hydrogen. The olefins are fully saturated and the sulfur is converted to hydrogen sulfide (H_2S). The H_2S is recycled back to the olefins compressor where it is eventually removed by the caustic scrubber.

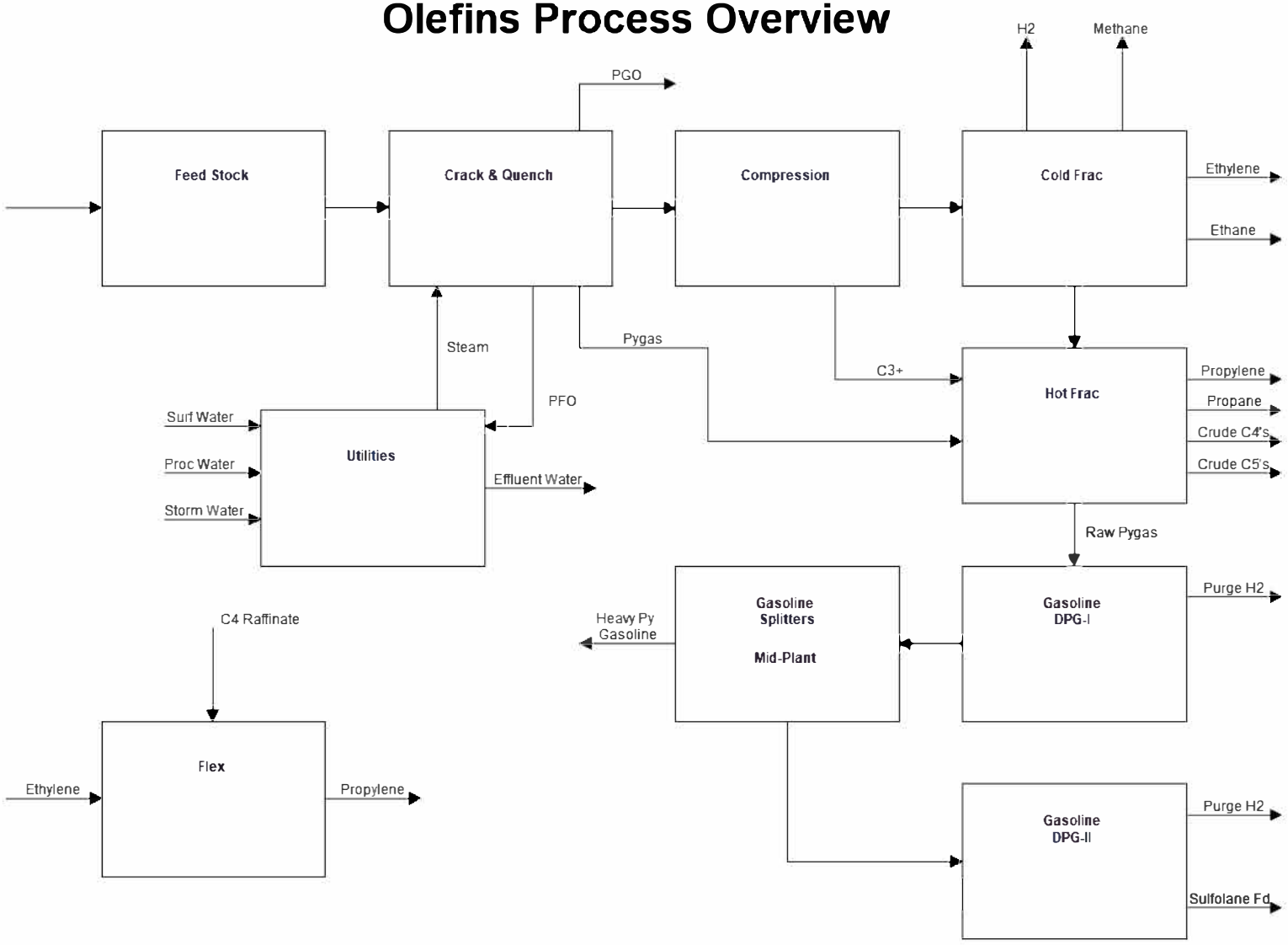
Utilities

The utilities block provides boiler feed water for steam generation The utilities block also contains a 1,500 lb steam superheater. Incremental steam needed to operate the olefins units is supplied from the Reliant Cogen Plant. The Benzene NESHAP stripper and the stormwater stripper are operated as part of utilities.

Flex

The Product Flex unit is designed to convert ethylene directly to propylene and it can also combine a C4 raffinate stream with ethylene to make propylene. Flex is divided into two main sections: the Dimerization section where ethylene is reacted to make butene and the Disproportionation section where ethylene is combined with the newly formed butene or imported C4 raffinate to make propylene. The polymer grade propylene is normally routed to the polymer grade pipeline but it can also be routed to the chemical grade pipeline.

Olefins Process Overview



Methanol Processing Unit

The Methanol (MeOH) Processing Unit uses light hydrocarbon (such as natural gas) as a feedstock. The feedstock is compressed, preheated, and pretreated to remove sulfur and chlorine compounds. The treated feed is then mixed with steam before being sent to the reformer.

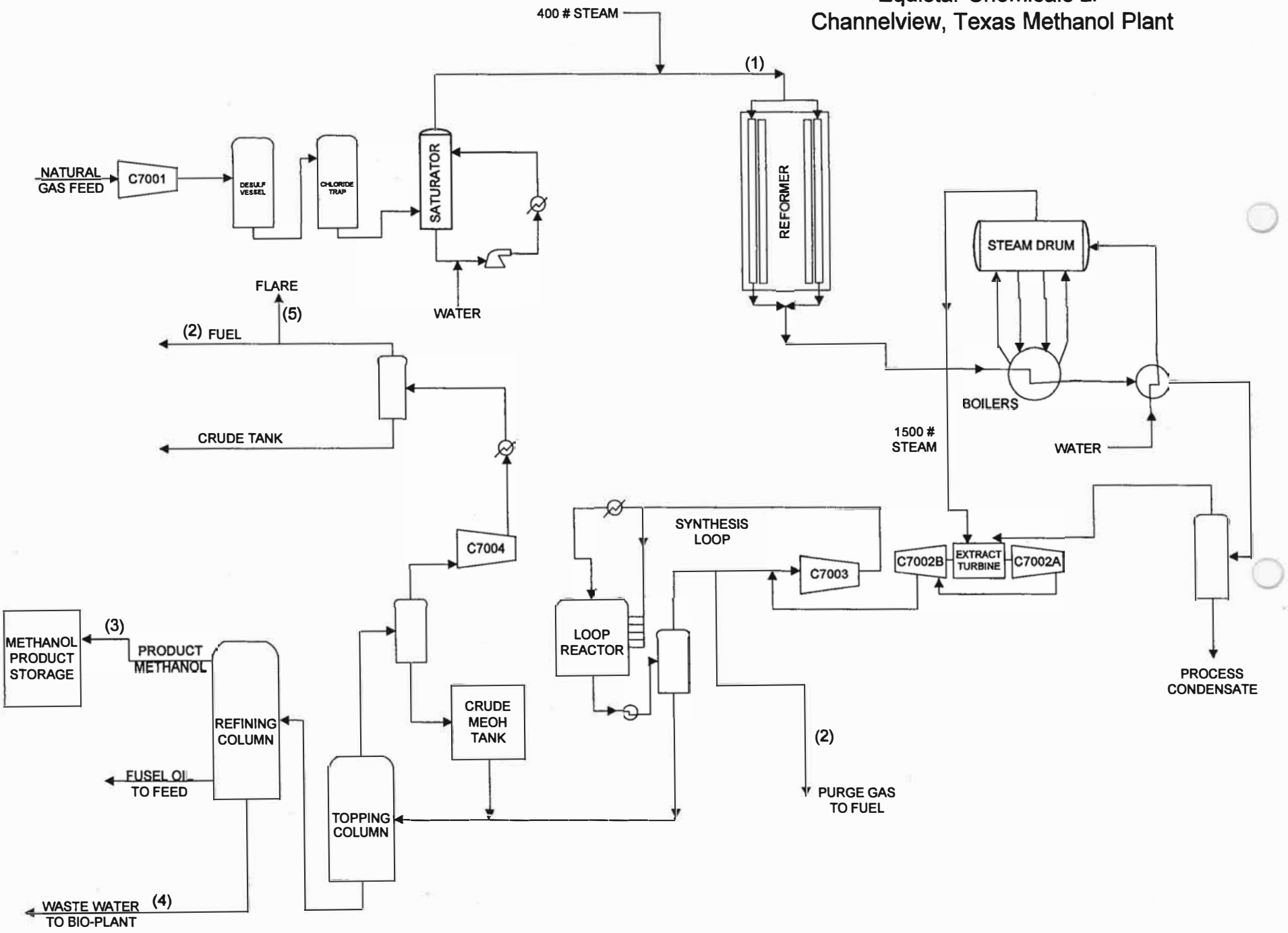
A PFD is attached.

The reformer consists of a large number of catalyst-filled tubes suspended in the radiant section of a process heater. The process stream containing light hydrocarbons and steam flows in the tubes where it is heated to reaction temperature to produce the synthesis gas. Steam required to operate the unit is produced from waste heat in the reformer. The synthesis gas is cooled, compressed, reheated, and sent to the conversion reactor. The converter effluent is cooled with the crude MeOH, separated as a liquid phase, and sent to product purification. The off-gas is recycled to the MeOH converter. The purge gas is used as fuel in the reformer fuel gas.

Light ends are removed in the topping column from the crude MeOH and used as fuel in the reformer. The topped product is sent to a refining column, where the high purity MeOH is removed as the overhead stream, cooled and sent to storage tanks and the bottom stream consisting of water with a trace of hydrocarbons is sent to on-site wastewater treatment. A refining column side stream containing water and mixed alcohol is returned to the process.

The reformer furnace is fired with a combination of natural gas and high hydrogen fuel gas. The reformer is equipped with a selective catalytic reduction (SCR) system that aids in reducing NO_x emissions by reacting it with ammonia (NH_3). The operation of the SCR results in ammonia slip emissions as unreacted NH_3.

Equistar Chemicals LP
Channelview, Texas Methanol Plant



Isoprene Process Unit

The Isoprene Process Unit separates a stream of mixed C5 components into component streams such as isoprene, DCPD, and piperylenes plus a C5 raffinate stream. A PFD is attached.

The crude C5 stream is produced in the Olefins Units and is sometimes purchased. It is fed to the deisopentanizer column where isopentane is removed in the overhead and sent to storage tanks. The bottom stream of the deisopentanizer column is sent to the dimerization drums where cyclopentadiene is converted to DCPD.

The converted DCPD dimerization drum effluent is fed to the C5 splitter where the isoprene and lighter components are separated as overhead. This overhead stream feeds the absorber column along with the extractive distillation solvent, acetonitrile (ACN). In turn, the absorber produces an overhead stream containing mainly normal pentane. This stream is sent to a water wash column to remove any trace amount of ACN and is returned to the Olefins Units.

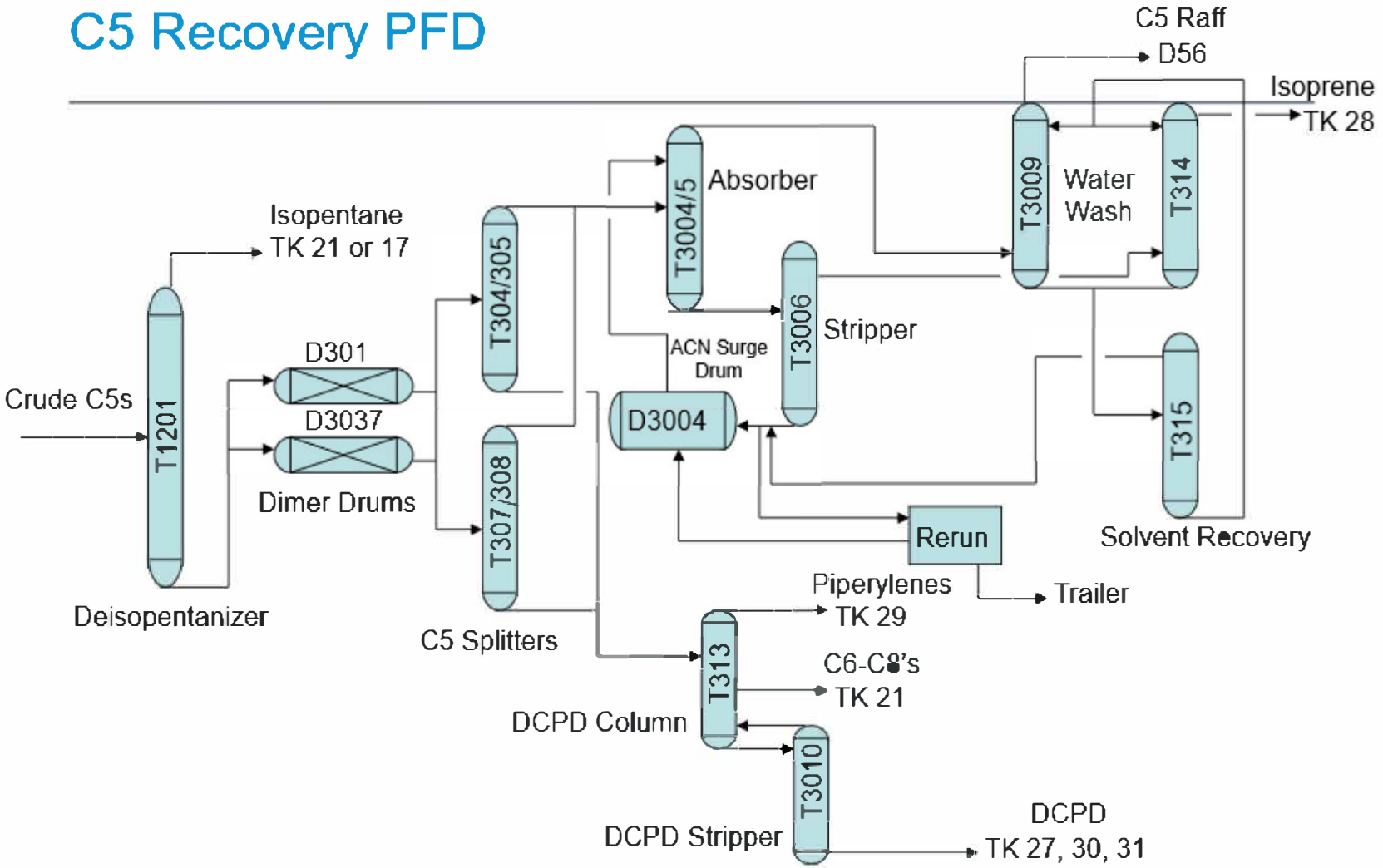
The absorber bottoms are directed to the stripper column where the isoprene product is separated as overhead, and the ACN is removed as the bottoms. The ACN is recycled back to the absorber and the isoprene is sent to water wash column to recover any tract amounts of ACN before being sent to tankage.

The bottom stream from the C5 splitter is fed to the Pips column to separate the piperylenes from DCPD. The piperylenes are removed in the column overhead and sent to tankage. This process produces a sidedraw stream which is routed into the C5 Raffinate. The sidedraw is removed and sent to tankage.

The DCPD column bottoms are routed to the DCPD stripper where the bottoms stream, the DCPD product, is collected and sent to tankage. The stripper overhead, which contains some C5/C6 material, is recycled back to the DCPD column for recovery.

The process water from the water wash columns is sent to the solvent recovery column where the ACN is recovered and the water is circulated back to the water wash columns. A slip stream of the circulation ACN solvent is routed through the ACN rerun facilities where any polymeric material present is removed.

C5 Recovery PFD



Alkylation Unit

The Alkylation Process Unit reacts light olefins (butylenes, propylenes, and amylenes) with isobutane in the presence of sulfuric acid catalyst to form the alkylate product. Alkylate is utilized in gasoline formulation especially high octane types such as aviation gasoline.

The olefin stream may contain small quantities of propane, butane, and other saturates that are not reacted in the alkylation process. Isobutane stock from Tanks 7 and 8 is combined with an isobutane recycle stream prior to being reacted with the olefin stream. A PFD is attached.

The olefin and the isobutane feed streams are cooled, and then fed to D-463 Feed Coalescer. D-463 contains filtering and coalescing media that remove solids and entrained water from the combined Alkylation process feed stream. The treated outlet stream from the D-463 Feed Coalescer feeds to sulfuric acid contactors in the reaction area of the process.

The reaction area consists of six contactors (E-402, E-403, E-4-4, E-405, E-467, and E-468). These contactors are horizontal pressure vessels that contain a mixing impeller, an inner circulation tube, and a tube bundle to remove heat generated by the alkylation reaction. Each contactor's impeller disperses the hydrocarbons in the sulfuric acid catalyst. The resulting emulsion is then cooled before the acid and hydrocarbon phases are separated which occurs in the acid settlers. These six reactors operate in parallel and the product streams combine to feed D-460 Suction Trap.

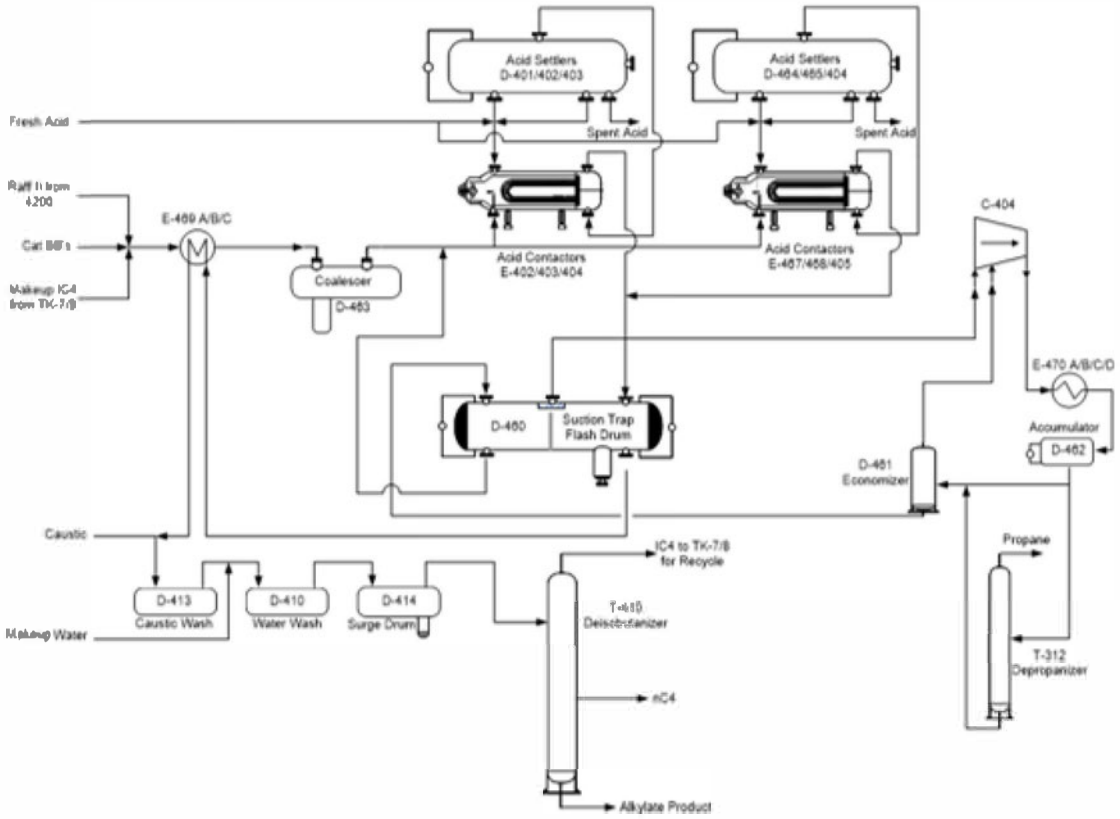
The D-460 Suction Trap separates the hydrocarbon vapors from the heavier alkylate product. The refrigerant compressor (C-404) compresses the light hydrocarbons contained in D-460. The condensed light ends are then pumped back to the contactor area as refrigerant. Propane, which builds up in the refrigeration recycle loop, must be removed. A slip stream of refrigerant recycle is fed to the depropanizer (T-312) to remove propane from the system. The overhead propane product from the depropanizer is removed as a vapor to Olefins for cracking. The depropanizer bottom stream is recycled to D-461, the Compressor Economizer.

Liquid from the suction trap is exchanged against contactor feed in E-469 A/C and sent to the caustic wash drum (D-413). The hydrocarbon stream is contacted with caustic to neutralize any entrained acid. The stream continues to the water wash settler (D-410) where it is contacted with water to remove entrained caustic.

Effluent from the water wash settler cascades to D-414, the Deisobutanizer Feed Surge Drum. From D-14, the hydrocarbon is pumped to the Deisobutanizer Column (T-410) where isobutane and butane are separated from the alkylate product. The isobutane removed overhead is recycled to each contactor as recycle isobutane for the alkylation process. N-butane is removed as a vapor side product from T-410. The n-butane is condensed in E-474 A/B before being pumped to storage from D-473, the n-butane product accumulator. The

deisobutanizer bottom stream is the alkylate product, and is cooled by cross-exchanging heat with the feed to the water wash settler (D-410) and further cooled by the fin-fan E-475.

Alkylation PFD



Butadiene Recovery Unit

A crude butadiene (BD) C4 stream produced in the Olefins Plants (OP-I/OP-II) or received from off-site is fed to the BD Recovery Units from one of the several storage spheres. The BD Recovery Unit is divided into two sections, the East and West Trains. The East and West trains are generally parallel trains that convert acetylene, and extract and purify BD. Common unit operations for solvent recovery and washwater treatment are generally shared by the two trains. A PFD is attached.

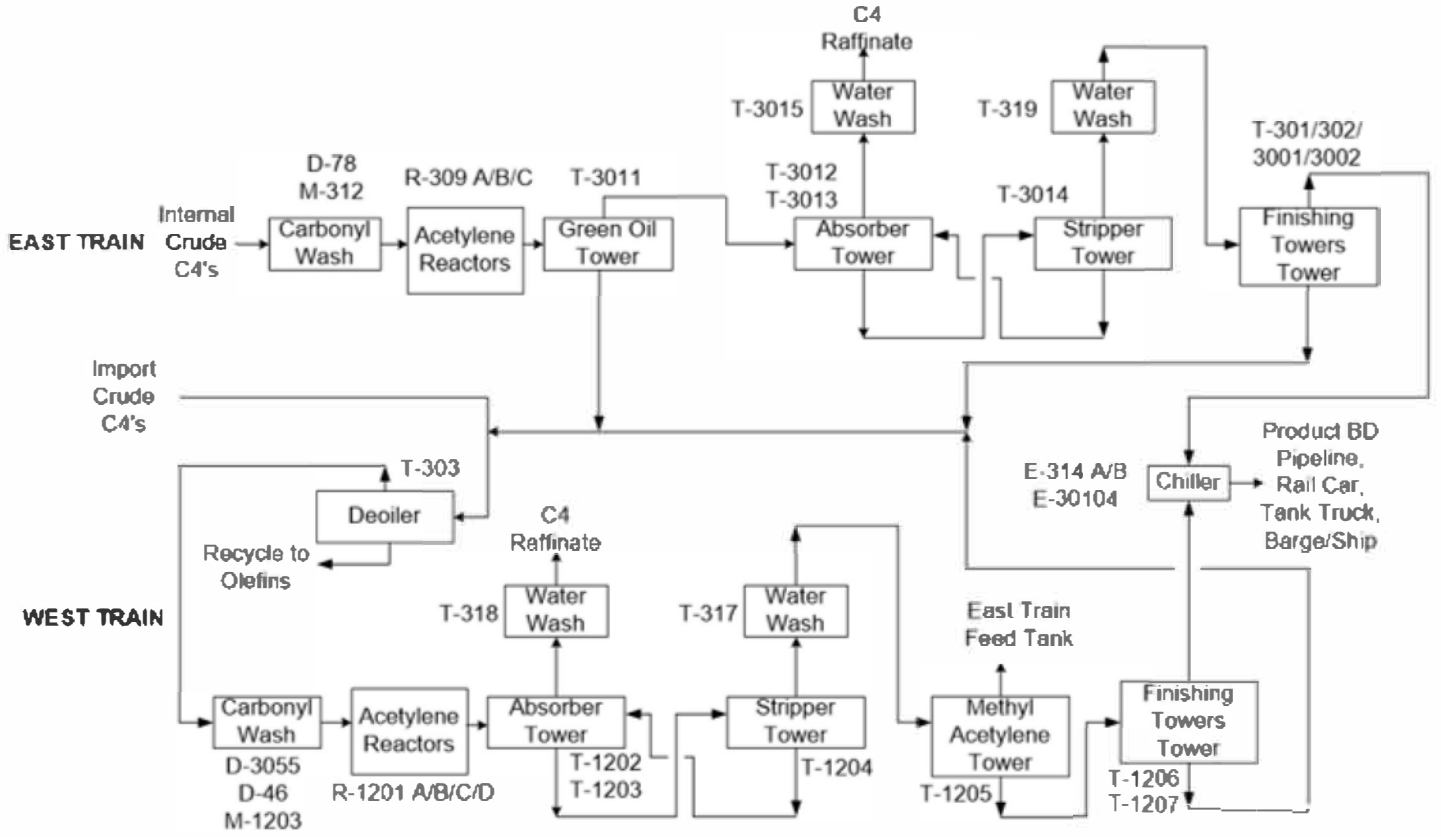
The crude C4 stream is fed to a sodium bisulfite wash drum to remove carbonyls then fed to the hydrogenation reactors to convert C4 acetylenes and then is routed to a green Oil Column (East Train only) to remove the C5+ components of the stream. The overhead of the column is sent to the absorber column of the extractive distillation section along with lean ACN , the extractive distillation solvent.

The overhead of the absorber (butylene stream) is water washed to remove the solvent and sent to storage. The bottom stream which contains solvent laden with BD is sent to the stripper column where BD is removed in the overhead and solvent is removed in the bottom stream.

The solvent steam is returned to the absorber. The overhead of the stripper column is water washed to remove traces of the solvent. Then this BD stream is sent to the finishing column where the remaining impurities are removed before being sent to storage. In the West Train, an intermediate column (the MA column) operates between the water wash column and the finishing column to remove trace amounts of methyl acetylene which are returned to the reactor feed. A Deoiler Column is used to process the bottoms stream from the finishing columns and the Green Oil Column as well as incoming crude C4 from off-site for recovery of BD from the C5+ components. The C5+ components from the bottom of the deoiler are returned to Olefins and the overhead stream is routed to the beginning of the recovery process.

The ACN rerun section processes a portion of the bottoms stream (ACN solvent) from the stripper columns to remove polymer from the circulating solvent. In addition, the circulating wash water stream is treated to recover solvent collected in the waterwash columns.

C4 Recovery PFD

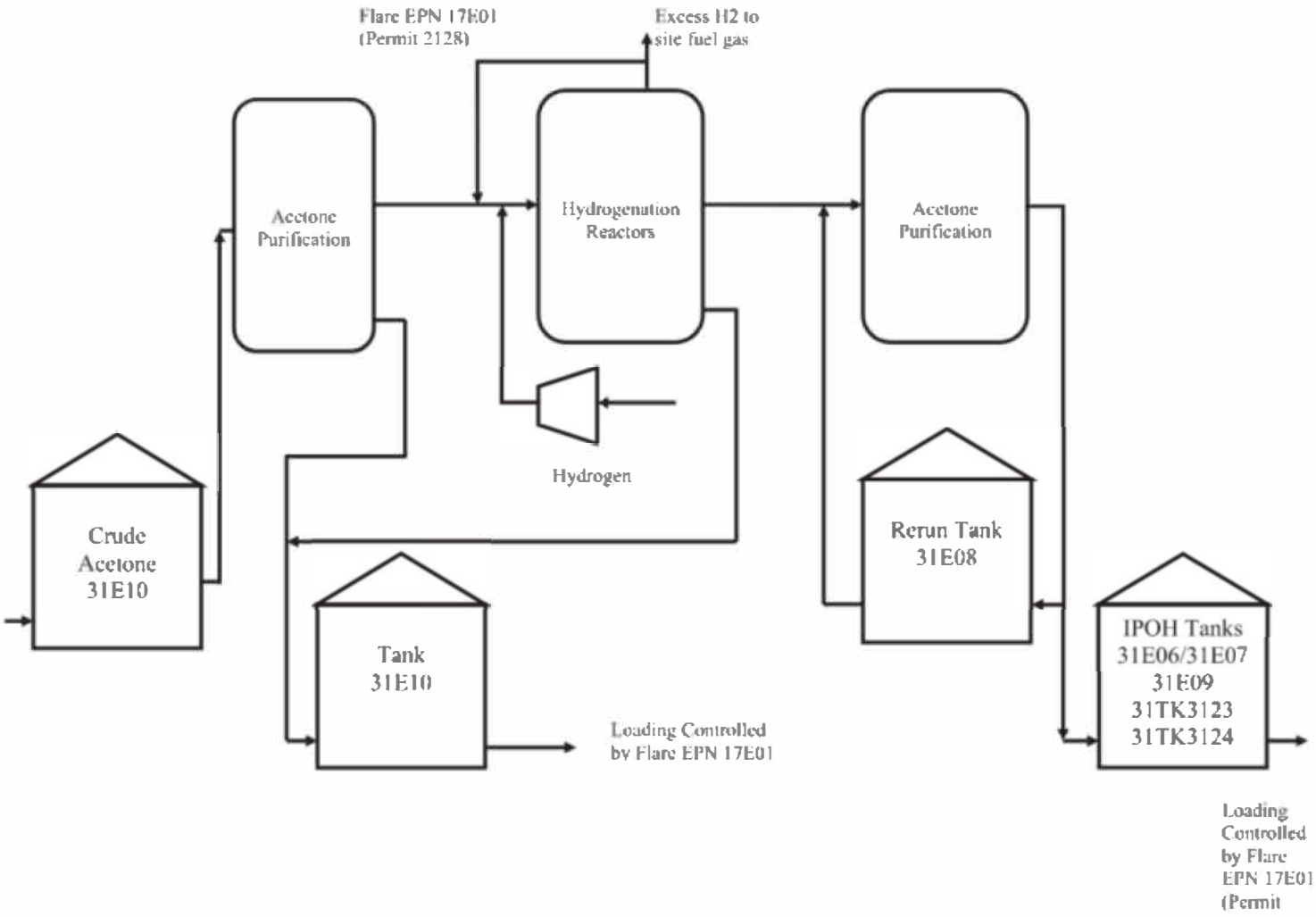


Isopropyl Alcohol Processing Unit

Crude acetone is fractionated in the acetone distillation column, T-2602, to remove methanol and other components from the acetone. A PFD is attached.

The purified acetone stream is then mixed with hydrogen and fed to the hydrogenation reactors where it reacts to form isopropanol (IPOH).

The crude IPOH stream is fractionated for the removal of unreacted acetone and other impurities. The high purity IPOH is sent to storage prior to product shipment. Any off-spec IPOH is sent to storage prior to being reprocessed in the unit. Vents from the process and product loaded are routed to the flare FL-1701 authorized in per 2128.



IPOH Process Flow Diagram

Benzene/Toluene Processing Unit

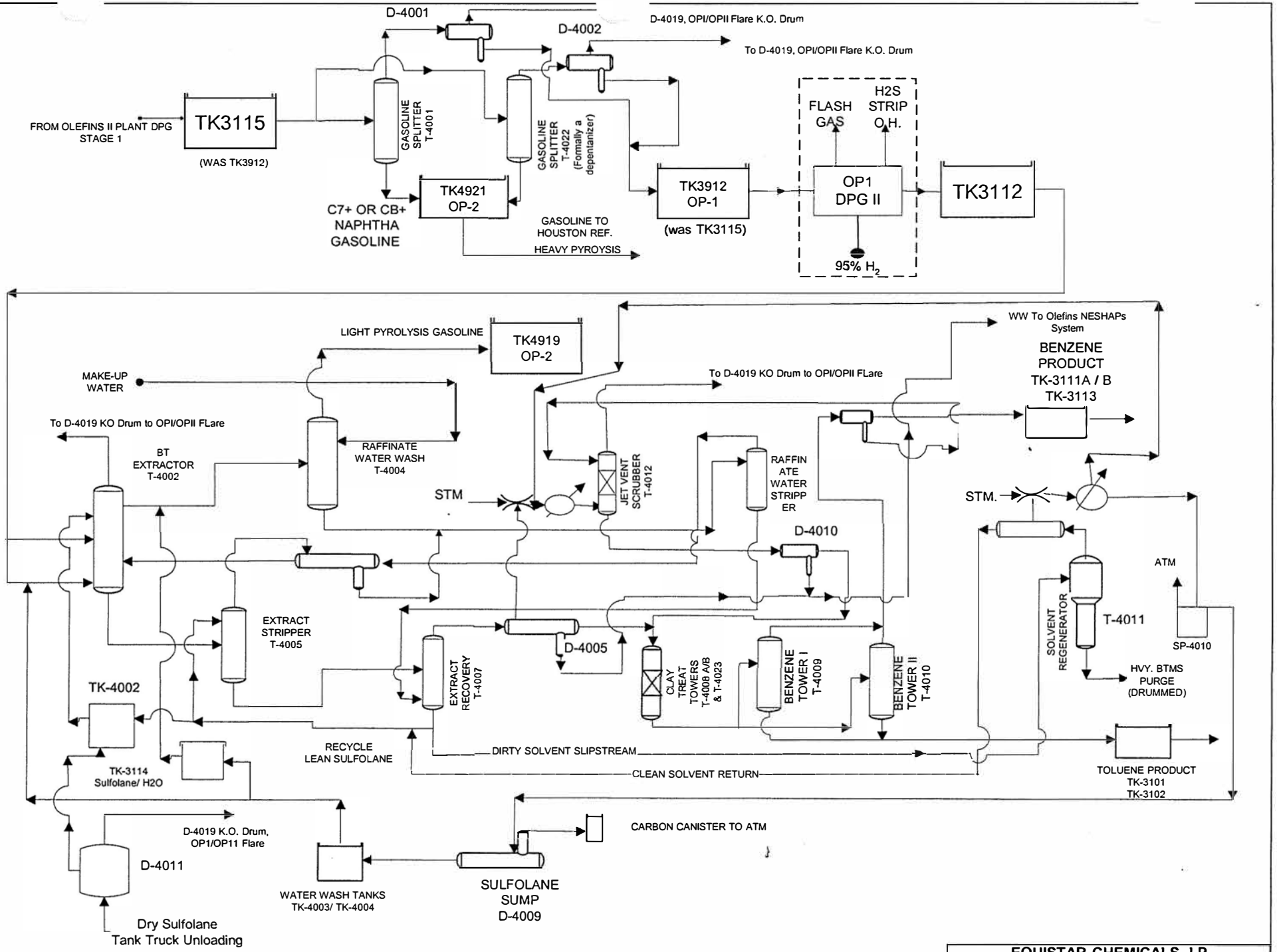
The feedstock for the Benzene/Toluene (B/T) Unit is a hydrogenated pyrolysis gasoline stream produced in the Olefins Units. This stream feeds parallel columns where the components are separated. The separated bottoms stream is held in a storage tank and ultimately sent to customers for further processing. The light ends are stored in a tank and DPG for additional hydrotreatment. A PFD is attached.

The hydrotreated effluent from the DPG unit is stored in a tank, returned to the BT Unit, and fed to the BT column along with an extractive distillation solvent. A light product is removed from the overheads and the rich solvent is removed from the bottom of the column.

The rich solvent stream from the BT unit is sent to the stripper which removes the remaining non-aromatics. The non-aromatics along with some aromatics, go overhead and are recycled to the extractor as backwash. The stripper bottoms go to the Extract Recovery Tower where extractive distillation solvent is separated from the aromatics.

Water in the aromatic stream is collected and routed to the wastewater system for treatment. The aromatic stream is sent through the towers where color bodies are removed and the slightly acidic stream is neutralized. The tower bottoms feeds the two Benzene Towers. The Benzene Towers separate the stream into benzene product and toluene product which is then stored in tanks.

Fresh extractive distillation solvent is unloaded from tank trucks into a drum which is vented to the knock-out drum.



EQUISTAR CHEMICALS, LP	
UNIT PROCESS DESCRIPTION	
BT UNIT	G:\ENVIR\AIR\PERMIT-TITLE V\BT\BT.VSD

Polybutadiene Processing Unit

The polybutadiene (Poly-BD) Unit manufactures homopolymer resins of BD.

The polymerization of BD occurs in IPOH as a solvent and hydrogen peroxide catalyzes the reaction. IPOH is received from off-site and is stored prior to use. BD is received via pipeline directly into the reactor. The feeds are added to one of seven reactors and the contents headed to a specified temperature and maintained at that temperature for a predetermined length of time and cooled to terminate the reaction. The reactor contents are pumped to a common hold drum. A PFD is attached.

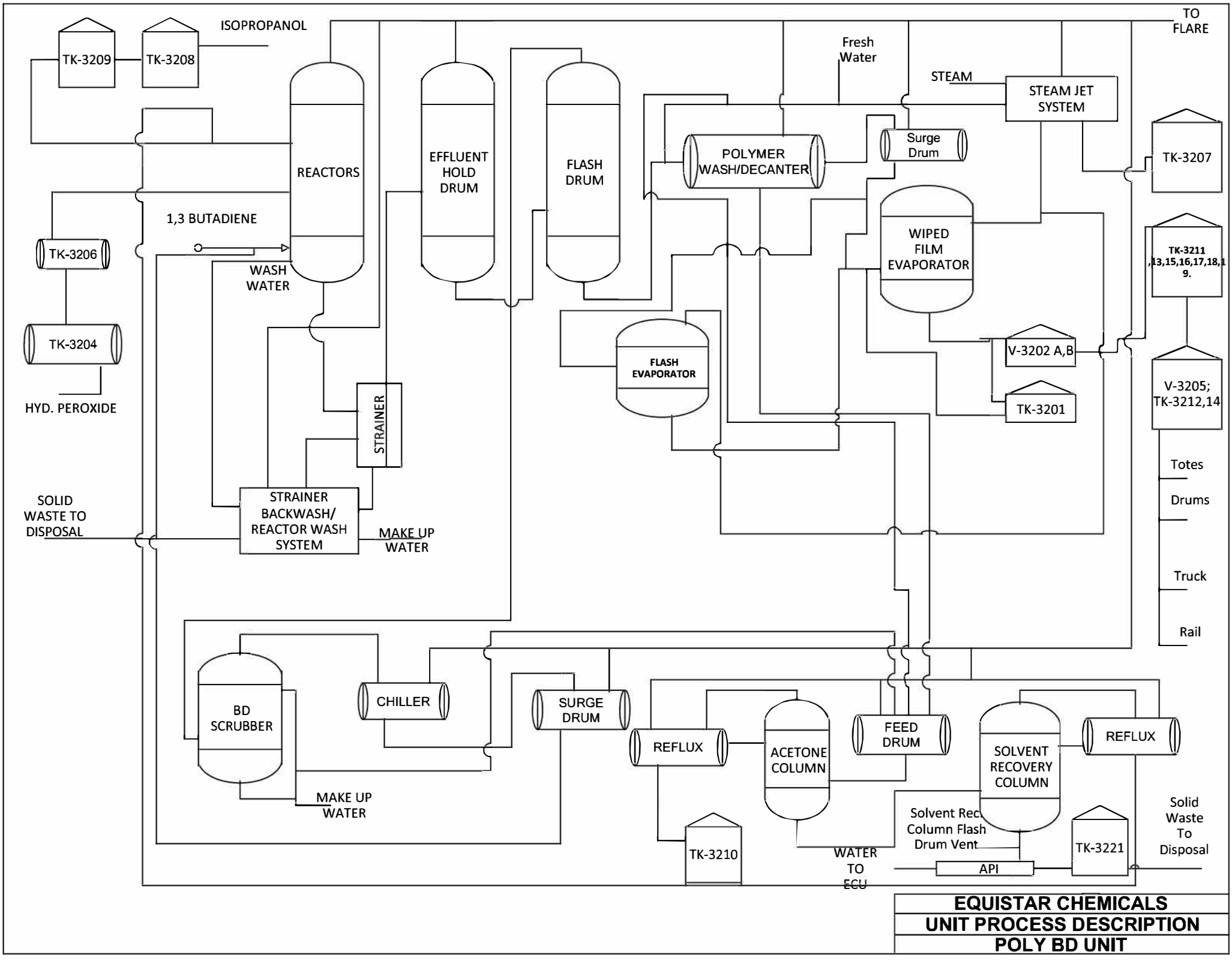
The reactor effluent is flashed to remove the unreacted BD. The polymer in the bottoms of the flash drum is then water-washed. The solvent phase from the decanter drum used during the water wash is routed to a solvent recovery system. The water phase goes to the acetone column where acetone is removed. Then the stream is sent to the polymer wash/decanter drum to remove any additional unreacted raw materials.

The next processing step includes removal of any remaining volatile compounds. This occurs under vacuum in the wiped-film evaporator. The Poly-BD liquid resin is then sent to storage for further packaging and/or shipment. The resin may be loaded into totes, drums, trucks or railcars for delivery. Additionally, materials that are not produced at the Channelview Facility are brought in and blended with the Channelview poly-BD liquid resin to create other products. These products are also loaded into totes, drums, trucks or railcars for delivery.

The final step involves purification of the unreacted BD and solvent. In this step, BD recovered from the flash drum is washed, condensed, and recycled to the reactors. The acetone column removes acetone from the alcohol/water streams routed to it. The column bottoms are routed to a solvent recovery system where water is separated from the solvent,

Vents from the reactors and BD recovery system are sent to a second BD recovery system to recover and recycle BD. The remain vents from the PolyBD Unit are directed to the unit flare through a knockout drum. The Poly BD Unit includes process fugitive components such as valves, flanges, pumps, and compressors in VOC service.

Process wastewater generated in the Poly BD Unit is conveyed to the site-wide biotreatment facility.


TK-3209
TK-3208
ISOPROPANOL
REACTORS
EFFLUENT HOLD DRUM
FLASH DRUM
Fresh Water
STEAM
STEAM JET SYSTEM
TO FLARE
POLYMER WASH/DECANTER
Surge Drum
TK-3207
1,3 BUTADIENE
TK-3206
WASH WATER
WIPED FILM EVAPORATOR
TK-3211 ,13,15,16,17,18,19.
TK-3204
HYD. PEROXIDE
FLASH EVAPORATOR
V-3202 A,B
TK-3201
V-3205; TK-3212,14
STRAINER
SOLID WASTE TO DISPOSAL
STRAINER BACKWASH/ REACTOR WASH SYSTEM
MAKE UP WATER
Totes
Drums
Truck
Rail
BD SCRUBBER
CHILLER
SURGE DRUM
REFLUX
ACETONE COLUMN
FEED DRUM
SOLVENT RECOVERY COLUMN
REFLUX
MAKE UP WATER
TK-3210
WATER TO ECU
Solvent Rec Column Flash Drum Vent
API
TK-3221
Solid Waste To Disposal
EQUISTAR CHEMICALS
UNIT PROCESS DESCRIPTION
POLY BD UNIT

Methyl Tert-Butyl Ether Unit

The production of MTBE involves an equilibrium reaction of isobutylene and MeOH in a catalytic reactor. The MTBE feed is a mixture of butenes with 15-40 weight percent being isobutylene. The MTBE feed is reacted with MeOH from an existing storage tank to produce the MTBE product. There are two MTBE production units: the 4200 MTBE unit and the 1200 MTBE unit (Cat MTBE). A PFD is attached.

4200 MTBE Unit

The 4200 MTBE unit has two trains, A & B. The butene feed stream is split and routed equally to each train and each set of reactors. In each train, there are two reactors in series, R-4201A, R-4202A, R-4201B, and R-4202B. The effluent from each set of reactors feeds a debutanizer, T-4201 & T-4206 which separates the MTBE product from the butenes, MeOH, and lighter components. The towers remove MTBE as the bottom product, and the butenes, MeOH, and lighter components are removed overhead.

The debutanizer overheads are routed to the MeOH extractors, T-4207 & T-4203, where water passes counter-current to the hydrocarbons and residual MeOH is removed. The water/MeOH mixture is sent to the MeOH stripper, T-4202, where the water and MeOH are separated. The MeOH goes overhead in the stripper and is sent to tankage. The water from the stripper bottoms is recycled to the MeOH extractors and a small water draw is taken from this stream to maintain its quality.

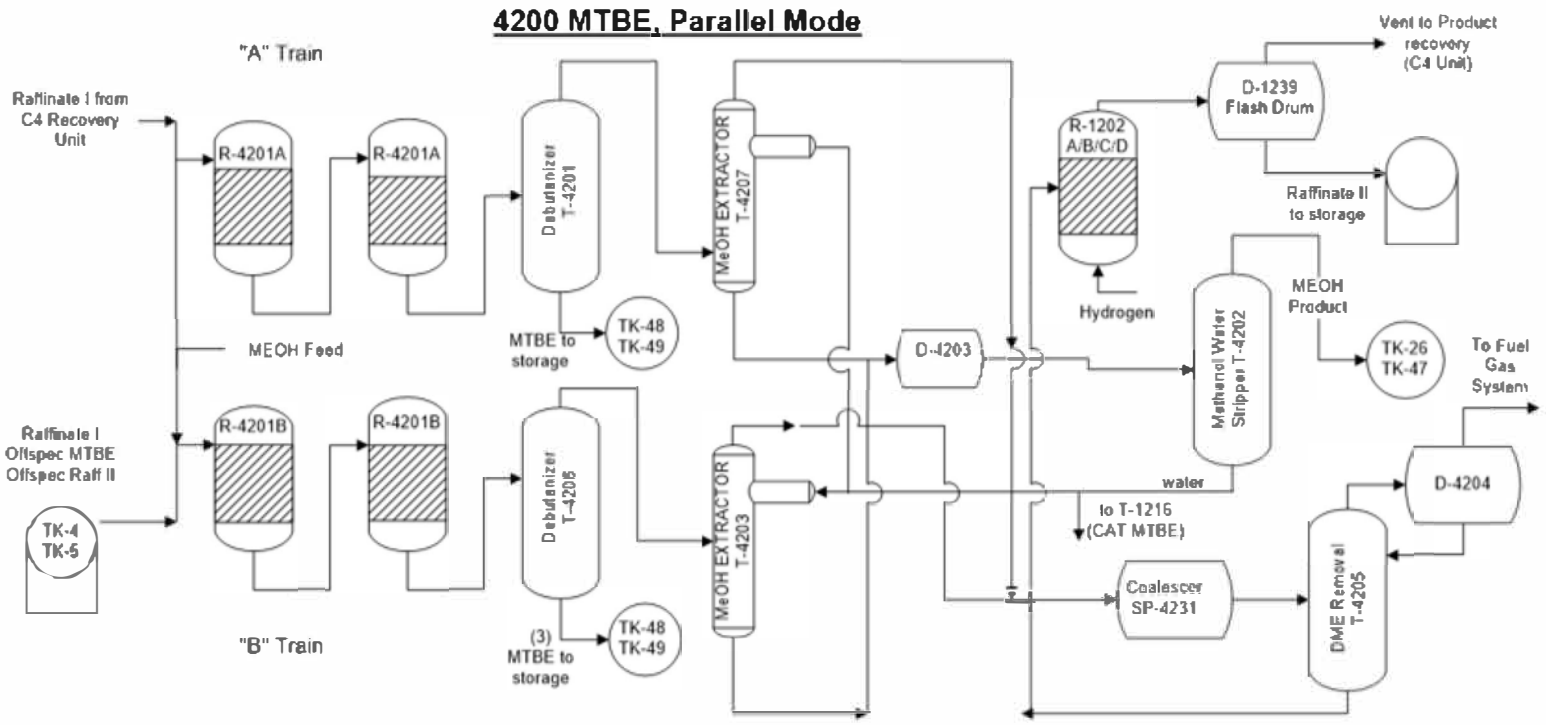
1200 MTBE unit (CAT MTBE)

The butenes and butanes (BBs) are fed to the ACN wash tower, T-1215. The wash tower removes ACN which is harmful to the catalyst in the downstream reactor. The water from the wash tower bottoms is sent to the wastewater facility. The overhead from the wash tower is sent to the reactor, R-1204. After reacting with MeOH, the stream is sent to the debutanizer, T-1209. The debutanizer separates the MTBE product from the butenes, MeOH, and lighter components. The tower removes MTBE as the bottom product, and the butenes, MeOH, and lighter components are removed overhead.

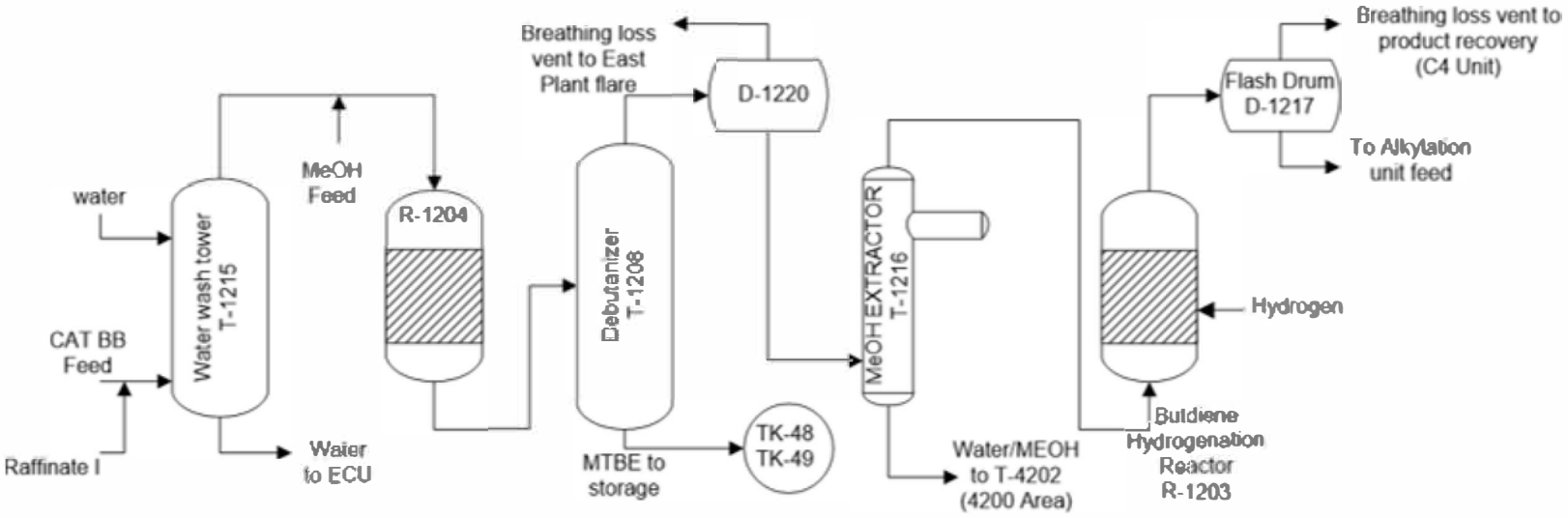
The debutanizer overhead is routed to the MeOH extractor, T-1216, where water passes counter-current to the hydrocarbons, and residual MeOH is removed. The water/MeOH mixture is sent to the MeOH stripper, T-4202, where the water and MeOH are separated. The MeOH goes overhead in the stripper and is sent to tankage. The water from the stripper bottoms is recycled back to the MeOH extractor, and a small water draw is taken from this stream to maintain its quality.

The water washed hydrocarbons exit the overhead of the MeOH extractor and flow to the BD hydrogenation reactor, R-1203. Hydrogen is added to the BB stream which is then sent over the reactor catalyst where BD is converted to butenes. The effluent from the reactor is then sent to the Alky surge drum, D-1217, for further processing in the Alkylation unit.

4200 MTBE PFD



Cat MTBE PFD


Breathing loss vent to East Plant flare
D-1220
Breathing loss vent to product recovery (C4 Unit)
Flash Drum D-1217
To Alkylation unit feed
MeOH Feed
water
R-1204
Water wash tower T-1215
Debutanizer T-1208
MeOH EXTRACTOR T-1216
Hydrogen
CAT BB Feed
Raffinate I
Water to ECU
MTBE to storage
TK-48
TK-49
Water/MEOH to T-4202 (4200 Area)
Butdiene Hydrogenation Reactor R-1203

Part B: Application

Table I: General Information

A. Applicant: Facility Operator (or Facility Owner & Operator, if same)

Name[1]	Equistar Chemicals, LP
Address	8280 Sheldon Rd.
City, State	Channelview, TX
Zip Code	77530
Telephone Number	281-862-4000
Alternate Telephone Number	
Fax:	
TCEQ Solid Waste Registration No.	30030
EPA I.D. No.	TXD058275769
Permit No.	50117
County	Harris
Regulated Entity Name	Equistar Chemicals Channelview Complex
Regulated Entity Reference Number (RN)	RN100542281
Customer Name	Equistar Chemicals, LP
Customer Reference Number:	CN600124705
Charter Number[2]	10258111
Previous or Former Names of the Facility (if applicable)	Channelview Complex, Equistar Channelview Site, Equistar

B. Facility Owner: Identify the Facility Owner if different than the Facility Operator[3]

☒ Same as Facility Operator?

Name	Equistar Chemicals Channelview Complex
Address	8280 Sheldon Rd.
City, State	Channelview, TX
Zip Code	77530
Telephone Number	
Alternate Telephone Number	
Fax:	

C. Facility Contact

1. Persons or firms who will act as primary contact:

Name, Title:	Thomas Warnement
Address	P.O. Box 777
City, State:	Channelview, TX
Zip Code	77530
Telephone Number	281-860-1272
Alternate Telephone Number	
E-mail	[redacted]
Fax:	

Persons or firms who will act as primary contact (if more than one):

Name, Title:	
Address	
City, State:	
Zip Code	
Telephone Number	
Alternate Telephone Number	
E-mail	
Fax:	

2. Agent in Service or Agent of Service (if you are an out-of-state company)[4]:

Name, Title:	C/O CT Corporation
Address	1999 Bryan St. Suite 900
City, State:	Dallas, TX
Zip Code	75201

3. Individual responsible for causing notice to be published:

Name:	Susie Geraci
Address	P.O. Box 777
City, State:	Channelview, TX
Zip Code	77530
Telephone Number	281-452-8866
Alternate Telephone Number	
E-mail	[redacted]
Fax:	

4. Public place in county where application will be made available[5]:

Name	North Channel Harris County Library
Address	15741 Wallisville Rd.
City, State	Houston, TX

Zip Code 77049

D. Application Type and Facility Status

1. Application Type

☐ Permit	☒ Amendment	☐ Modification
☐ New	☐ Major	☐ Class 3
☐ Interim status	☒ Minor	☐ Class 2
☒ Renewal		☐ Class 1[1]
☐ RD&D		☐ Class 1
☐ Compliance Plan		

2. Part of a Consolidated Permit Processing request? [30 TAC Chapter 33] No

3. Does the application contain confidential material?[6] No

4. Facility Status. Check all that apply

☐ Proposed	☒ Existing
	☒ On-Site
	☒ Off-Site
	☐ Commercial
	☐ Recycle
	☐ Land Disposal
	☐ Areal or capacity expansion
	☐ Compliance plan

5. Is the facility within the Coastal Management Program boundary? **Yes**

6. Description of Application Changes

Complete Table I.1 - Description of Proposed Application Changes.

Note: List all changes requested in Table I.1. Unlisted requests risk remaining unaddressed or possibly denied if brought to the permit application reviewer's attention at a later time.

7. Total acreage of the facility being permitted: **1246**

8. Identify the name of the drainage basin and segment where the facility is located

River Segment San Jacinto River Tidal

River Basin San Jacinto River Basin

E. Facility Siting Summary:

Is the facility located or proposed to be located:

1. Within a 100-year floodplain?	No
2. in wetlands?	No
3. In the critical habitat of an endangered species of plant or animal?	No
4. On the recharge zone of a sole-source aquifer?	No
5. In an area overlying a regional aquifer?	Yes
6. Within 0.5 mile (2,640 feet) of an established residence, church, school, day care center, surface water body used for a public drinking water supply, or dedicated public park?[7] [30 TAC 335.202] If Yes: the TCEQ shall not issue a permit for this facility.	No
7. In an area in which the governing body of the county or municipality has prohibited the processing or disposal of municipal hazardous waste or industrial solid waste? If Yes: provide a copy of the ordinance or order.	No

F. Wastewater and Stormwater Disposition

1. Is the disposal of any waste to be accomplished by a waste disposal well at this facility?	No
If Yes: List WDW Permit No(s):	
2. Will any point source discharge of effluent or rainfall runoff occur as a result of the proposed activities?	Yes
3. If Yes, is this discharge regulated by a TPDES or TCEQ permit? ☒ Yes	
TCEQ Permit No.	391000
TPDES Permit No.	391000
☐ No	
Date TCEQ discharge permit application filed	June 6, 2025
Date TPDES discharge permit application filed:	February 21, 2018

G. Information Required to Provide Notice

State Officials List [30 TAC 39]

State Senator	Carol Alvarado The Honorable Carol Alvarado PO Box 12068 Capitol Station Austin, TX 78711 (512)463-0106

[redacted]	
State Representative	Ana Hernandez Rep. Ana Hernandez PO Box 2910 Austin, TX 78711 (512)463-0614 [redacted]

Local Officials List [30 TAC 39]

Mayor	NA
Local Health Authority	Latrice Babin Executive Director 101 South Richey, Suite H Pasadena, TX 77506 (713)274-6433 [redacted]
County Judge	Lina Hidalgo 1001 Preston, Suite 911 Houston, TX 77002 (713)s74-7000 [redacted]
County Health Authority	Leah Barton Harris County Public Health Services 2223 West Loop South Houston, TX 77027 (713)439-6000 [redacted]

Based on the questions in the Bilingual Notice Instructions for this form, are you required to make alternate (Bilingual) notice for this application?	Yes
Bilingual Language(s):	Spanish
TCEQ Core Data Form Submitted?(see Section I Instructions, Item b.)	Yes
Has any information changed on the TCEQ Core Data Form since the last submittal?	No
Signature on Application Submitted? (see Section I Instructions, Item c)	Yes

1. Individual, Corporation, or Other Legal Entity Name - must match the Secretary of State's database records for the Facility)
2. If the application is submitted on behalf of a corporation, please identify the Charter Number as recorded

with the Office of the Secretary of State for Texas.

3. The operator has the duty to submit an application if the facility is owned by one person and operated by another [30 TAC 305.43(b)]. The permit will specify the operator and the owner who is listed on Part A of this application [Section 361.087, Texas Health and Safety Code].
4. If the application is submitted by a corporation or by a person residing out of state, the applicant must register an Agent in Service or Agent of Service with the Texas Secretary of State's office and provide a complete mailing address for the agent. The agent must be a Texas resident.
5. For applications for new permits, renewals, major amendments and Class 3 modifications a copy of the administratively complete application must be made available at a public place in the county where the facility is, or will be, located for review and copying by the public. Identify the public place in the county (e.g., public library, county court house, city hall), including the address, where the application will be made available for review and copying by the public.
6. For confidential information cross-reference the confidential material throughout the application to Section XIII: Confidential Material, and submit as a separate Section XIII document or binder conspicuously marked "CONFIDENTIAL".
7. Use only for a new commercial hazardous waste management facility or areal expansion of an existing commercial hazardous waste management facility or unit of that facility as defined in 30 TAC 335.202

Signature Page

I, Anthony Wood, Plant Manager,
(Operator) *(Title)*

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____ Date: 03/04/26

To be completed by the Operator if the application is signed by an Authorized Representative for the Operator

I, _____, hereby designate _____
[Print or Type Name] *[Print or Type Name]*

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

_____
Printed or Typed Name of Operator or Principal Executive Officer

_____
Signature

SUBSCRIBED AND SWORN to before me by the said Anthony Wood,

On this 4th day of March, 2026

My commission expires on the 8th day of October, 2029

Notary Public in and for Harris County, Texas

*[**Note**: Application Must Bear Signature & Seal of Notary Public]*

Cathey Kelley

CATHEY SUE KELLEY
My Notary ID # 3531440
Expires October 8, 2029

Table I.1-Description of Proposed Application Changes

Permit/Compliance Plan Application Appendix/Section	Brief Description of Proposed Change	Modification or Amendment Type	Supporting Regulatory Citation
This application is for the renewal of Permit No. HW-50117, belonging to Equistar Chemicals, LP	This application requests the continued permit authorization of existing tanks and container storage area.	Renewal	30 Texas Administrative Code (TAC) Section 305.50
Tank D-4383, permit number 5	This tank is being converted to <90-day use and will no longer be a permitted unit. This will remove permit conditiions that are no longer applicable and is a Class 1ED modification.	Minor	30 TAC 306.69(k)(A)(11)
Tank 1101-A and Tank 1101-B	These tanks have been closed and a closure report is being drafted. They are being removed from the permit. This is a Class IED permit modification as conditions no longer apply.	Minor	30 TAC 306.69(k)(A)(11)
Waste Analysis Plan	reviewed the wastes generated to make sure that they were consistent with the Notice of Registration (NOR); the waste name was updated from Safety Kleen Naptha to Spent Cleaning & Degreasing Solids and waste code D027 was applied; the waste code D038 was removed from the Poly BD Polymer, ACN and Water waste. The waste name for oily sludges was updated to hydrocarbon contaminated sludges to match the NOR;	Minor	30 TAC 306.69(k)(A)(4)(2)

Permit/Compliance Plan Application Appendix/Section	Brief Description of Proposed Change	Modification or Amendment Type	Supporting Regulatory Citation
	The following wastes are no longer generated and have been removed: Safety Kleen Solvents, lab waste - sharps, organic mixture SMA Production; cumene material and stormwater contaminated with lead.		

Table II

Table II contains the following: Table II.A, Table II.B, Table II.C, Table II.D, Table II.E and Flooding from Section II. F of the Part B Application

Table II.A - Requirements for Storage or Processing Facilities, Land Treatment Facilities, Waste Piles, Storage Surface Impoundments, and Landfills

Is the facility located or proposed to be located[1]:

In wetlands? [as applicable: 30 TAC 335.204(a)(2), (b)(2), (c)(2), (d)(2), and/or (e)(2)	No
If Yes: the TCEQ shall not issue a permit for a new hazardous waste management facility or areal expansion of an existing facility into wetlands, pursuant to 30 TAC 335.205(a)(1).	
In the critical habitat of an endangered species of plant or animal?[6] [as applicable: 30 TAC 335.204(a)(8), (b)(10), (c)(9), (d)(9), and/or (e)(11)]	No
If Yes: submit in Section V information demonstrating that design, construction, and operational features will prevent adverse effects on such critical habitat.	
On the recharge zone of a sole-source aquifer?2 [30 TAC 335.204(a)(3), (b)(3), (c)(3), (d)(3), and/or (e)(3)]	No
If Yes: then for storage and processing facilities (excluding storage surface impoundments), submit in Section V information demonstrating that secondary containment is provided to preclude migration to groundwater from spills, leaks, or discharges.	
In an area overlying a regional aquifer? [as applicable: 30 TAC 335.204(a)(4), (b)(4), (c)(4), (d)(4), and/or (e)(4)]	Yes, See Below
If Yes: submit site-specific information in Section V and/or Section VI demonstrating compliance with 30 TAC 335.205(a)(1).	
In areas where soil unit(s) are within five feet of the containment structure, or treatment zone, as applicable, that have a Unified Soil Classification of GW, GP, GM, GC, SW, SP, or SM, or a hydraulic conductivity greater than 10-5 cm/sec? [as applicable: 30 TAC 335.204(a)(5), (b)(5), (c)(5), (d)(5), and/or (e)(5)]	No
If Yes: provide additional information in Sections V and/or Section VI demonstrating compliance with 30 TAC 335.205(a)(1)	
In areas of direct drainage within one mile of a lake at its maximum conservation pool level, if the lake is used to supply public drinking water through a public water system?[6] [as applicable: 30 TAC 335.204 (a)(6), (b)(7), (c)(6), and/or (e)(8)].	No
If Yes: provide information in Section V demonstrating compliance with 30 TAC 335.205(a)(1).	

In areas of active geologic processes, including but not limited to erosion, submergence, subsidence, faulting, karst formation, flooding in alluvial flood wash zones, meandering river bank cuttings, or earthquakes?[6] [as applicable: 30 TAC 335.204(a)(7), (b)(8) ,(c)(7), (d)(7), and/or (e)(9)]	Yes, See Below
Within 30 feet of the upthrown side or 50 feet of the downthrown side of the actual or inferred surface expression of a fault that has reasonably been shown to have caused displacement of shallow Quaternary sediments or of man-made structures?[6] [as applicable: 30 TAC 335.204(a)(9), (b)(12) ,(c)(11), (d)(11), and/or (e)(13)]	No

If Yes: specify in Section V the design, construction, and operational features that will prevent adverse effects resulting from any fault movement.

If a fault is found to be present, the width and location of the actual or inferred surface expression of the fault, including both the identified zone of deformation and the combined uncertainties in locating a fault trace, must be determined by a qualified geologist or geotechnical engineer and reported in Section VI.

Table II.B. - Additional Requirements for Land Treatment Facilities [30 TAC 335.204(b)]:

Is the land treatment facility located or proposed to be located:

Within 1000 feet of an established residence, church, school, day care center, surface water body used for a public drinking water supply, or dedicated public park which is in use at the time the notice of intent to file a permit application is filed with the commission, or which is in use at the time the permit application is filed with the commission?	No
If Yes: the TCEQ shall not issue a permit for a new hazardous waste land treatment unit or an areal expansion of an existing land treatment unit, pursuant to 30 TAC 335.204(b)(6) and 335.205(a).	
Within 1000 feet of an area subject to active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?	No
If Yes: submit in Section V.F design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.	
Within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula.	No
If Yes: submit Section V.F design, construction and operational features, which will prevent adverse effects resulting from storm surge and erosion or scouring by water.	
On a barrier island or peninsula?	No
If Yes: the TCEQ shall not issue a permit for a new hazardous waste land treatment unit or an areal expansion of an existing land treatment unit, pursuant to 30 TAC 335.204(b)(11) and 335.205(a)(1).	

Table II.C. - Additional Requirements for Waste Piles [30 TAC 335.204(c)]

Is the waste pile located or proposed to be located:

Within 1000 feet of an area subject to active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?	No
If Yes: submit in Section V.E design, construction, and operational features on the facility which will prevent adverse effects resulting from storm surge and erosion or scouring by water.	
Within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula.	No
If Yes: submit Section V.E design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.	
On a barrier island or peninsula?[6]	No
If Yes: the TCEQ shall not issue a permit for a new hazardous waste pile or an areal expansion of an existing waste pile, pursuant to 30 TAC 335.204(c)(10) and 335.205(a)(1).	

Table II.D. - Additional Requirements for Storage Surface Impoundments [30 TAC 335.204(d)]

Is the land treatment facility located or proposed to be located:

Within 1000 feet of an area of active coastal shoreline erosion even though the area is protected by a barrier island or peninsula	No
If Yes: submit in Section V.D design, construction, and operational features of the facility which will prevent adverse effects resulting from storm surge and erosion or scouring by water.	
Within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula.	No
If Yes: then submit in Section V.D design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.	
On a barrier island or peninsula?[6]	No
If Yes: the TCEQ shall not issue a permit for a new hazardous waste storage surface impoundment or an areal expansion of an existing storage surface impoundment, pursuant to 30 TAC 335.204(d)(10) and 335.205(a)(1).	

Table II.E. - Additional Requirements for Landfills (and Surface Impoundments Closed as Landfills with wastes in place)

Is the landfill located or proposed to be located:

Within 1000 feet of an established residence, church, school, day care center, surface water body used for a public drinking water supply, or dedicated public park which is in use at the time the notice of intent to file a permit application is filed with the commission, or which is in use at the time the permit application is filed with the commission?	No
If Yes: the TCEQ shall not issue a permit for a new hazardous waste landfill or an areal expansion of an existing landfill, pursuant to 30 TAC 335.204(e)(6) and 335.205(a)(1).	
(For commercial hazardous waste landfills) in the 100-year flood plain of a perennial stream that is delineated on a flood map adopted by the Federal Emergency Management Agency after September 1, 1985, as zone A1-99, VO, or V1-30?	No
If Yes: the TCEQ shall not issue a permit for a new hazardous waste landfill or an areal expansion of an existing landfill, pursuant to 30 TAC 335.204(e)(7) and 335.205(a)(1).	
Within 1000 feet of an area subject to active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?	No
If Yes: then submit in Section V.G design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.	
Within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barriers island or peninsula.	No
If Yes: then submit in Section V.G design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.	
On a barrier island or peninsula?	No
If Yes: the TCEQ shall not issue a permit for a new hazardous waste landfill or an areal expansion of an existing landfill, pursuant to 30 TAC 335.204(e)(12) and 335.205(a)(1).	

Flooding (see Section II Instructions, Item F)

Is the facility within a 100-year flood plain?	No
Has a flood plain map been provided?	Yes
Has information about flooding levels and events, and other special flooding factors, been provided?[3]	
Do any flood protection devices exist at the facility (e.g., flood walls, dikes, etc.) designed to prevent washout from the 100-year flood?[3]	
If Yes: provide in Section V an engineering analysis to indicate the various hydrodynamic and hydrostatic forces expected to result at the facility as a consequence of a 100-year flood. [40 CFR 270.14(b)(11)(iv)(A)][4]	
If No: the applicant shall provide in Section V a plan for constructing flood protection devices and a schedule including specific time frames for completion. Provide engineering analyses to indicate the various hydrodynamic and hydrostatic forces expected to result at the facility as a consequence of a 100-year flood. [40 CFR 270.14(b)(11)(iv)(A)][5]	
If applicable, and in lieu of the flood protection devices from above, was a detailed description of the procedures to be followed to remove hazardous waste to safety before the facility is flooded provided?[3, 6]	
Additional Information Requirements (see Section II instructions, Item G): Submitted?	

1. Provide the source of information for all questions in the appendix.
2. Note: Land treatment facilities, waste piles, storage surface impoundments, and landfills may not be located on the recharge zone of a sole-source aquifer.
3. Only required to be submitted if the facility is subject to inundation as a result of a 100-year flood event.
4. Include structural or other engineering studies showing the design of operational units (e.g., tanks, incinerators) and flood protection devices (e.g., flood walls, dikes) at the facility and how these will prevent washout. [40 CFR 270.14(b)(11)(iv)(B)]
5. Include structural or other engineering studies showing the design of operational units (e.g., tanks, incinerators) and flood protection devices (e.g., flood walls, dikes) at the facility and how these will prevent washout. [40 CFR 270.14(b)(11)(iv)(B)]
6. The standards contained in §335.204(a)(6) - (9), (b)(7) - (12), (c)(6) - (11), (d)(6) - (11), and (e) (8) - (13) are not applicable to facilities that have submitted a notice of intent to file a permit application pursuant to §335.391 of this title (relating to Pre-Application Review) prior to May 3, 1988, or to facilities that have filed permit applications pursuant to §335.2(a) of this title which were submitted in accordance with Chapter 305 of this title and that were declared to be administratively complete pursuant to §281.3 of this title (relating to Initial Review) prior to May 3, 1988.[30 TAC 335.201(b)]

Table III.D- Inspection Schedule

Facility Unit(s) and Basic Elements	Possible Error, Malfunction, or Deterioration	Frequency of Inspection
Security Devices		
Fences	Corrosion, Holes, Other Damage	Security Inspection Daily
Gates/Doors	Damaged, Inoperable, Open	Security Inspection Daily
Surveillance Cameras	Not Operating Properly	Security Inspection Daily
Patrol Vehicles	Mechanical Problems	Annually
Warning Signs at HWMUs	Missing, Obscured, Illegible, Other Damage	Annually
Safety and Emergency Equipment		
Fire Monitors	Nozzle Obstruction, Valve / Pump Operations	Annually
Fire Extinguishers	Broken Seal, Integrity, Loss of Extinguishing Material, Bad Hose / Nozzle	Chemical: Annually Carbon Dioxide: Every 5 years Dry Chemical: Every 12 years
Eyewashes and Safety Showers	Capacity for Flow, Deterioration/Damage	Monthly
In-Plant, Two-Way Radios	Transmitter / Receiver Problem	Weekly
Public Address System	Transmitter / Speaker Problem	Weekly
Emergency Communications System	Transmitter / Receiver Problem	Weekly

Facility Unit(s) and Basic Elements	Possible Error, Malfunction, or Deterioration	Frequency of Inspection
Fire Alarm System	Sirens / Horn Inoperable	Weekly
Self-Contained Breathing Apparatus (SCBA)	Check for adequate air supply, Overall assembly free from damage and deterioration	Monthly
Deluge System	Nozzle Obstruction, Plugged Lines, Leaks	Annually
Fire Water Pumps and Hoses	Structural Integrity, Capacity for Flow	Annually
Foam and Foam Systems	Chemical Deterioration, Adequate Supply	Annually
Protective Clothing (Acid Suits)	Leaks / Inadequate Supply	Annually
Ambulance	Missing Equipment / Supplies, Mechanical Problems	Quarterly
Rescue Truck	Missing Equipment / Supplies, Mechanical Problems	Quarterly
Spill Response (HazMat) Trailer	Missing Equipment / Supplies, Mechanical Problems	Quarterly
Fire Trucks	Missing Equipment / Supplies, Mechanical Problems	Quarterly
Operating and Structural Equipment		
Tank Construction	Corrosion, Erosion, Leaks, Cracks, Other Damage	Daily
Ancillary Equipment (pumps, valves, piping, etc.)	Corrosion, Erosion, Leaks, Cracks, Other Damage	Daily

Facility Unit(s) and Basic Elements	Possible Error, Malfunction, or Deterioration	Frequency of Inspection
Container Management	Labeled, Spaced, Stacked, and / or Sealed Incorrectly	Weekly
Tank Secondary Containment	Corrosion, Spills, Leaks, Cracks, Other Damage, Not Drained	Daily
Containers	Corrosion, Erosion, Leaks, Cracks, Other Damage	Weekly
Container Area Secondary Containment	Corrosion, Spills, Leaks, Cracks, Other Damage, Not Drained	Weekly
Loading / Unloading Facilities	Evidence of Spills	Whenever Loading / Unloading Occurs

Table III.E.1- Arrangements with Local Authorities

Police

Address	Harris County Sheriff's Department 14350 Wallisville Road Houston, TX 77049
Person Contacted	Communication Division
Phone Number	(346) 286-1750
Agreed Arrangements	Crowd control, security

Fire

Address	Channel Industries Mutual Aid (CIMA) 1450 East Blvd Deer Park, TX 77536
Person Contacted	Susan Barnes
Phone Number	(281) 476-5040
Agreed Arrangements	Mutual Aid - cell 281-814-0688

Hospital

Address	Saint Luke's Patient Medical Center, 4600 East Sam Houston Parkway, South Pasadena
Person Contacted	Emergency Room
Phone Number	(713) 948-7000
Agreed Arrangements	Emergency Medical Services

Other

Organization Name	North Channel Local Emergency Planning Commission,
Address	1301 Mercury Drive, Channelview, TX 77029
Person Contacted	Lon Squyres
Phone Number	(832) 725-8954
Agreed Arrangements	Mutual Aid

Other

Organization Name	Harris County Office of Emergency Management
Address	6922 Old Katy Road, Houston, TX 77024
Person Contacted	Kristina Clarke
Phone Number	(713) 881-3000
Agreed Arrangements	

Other

Organization Name	South Lake Houston EMS
Address	14418 Beaumont Highway, Houston TX 77049
Person Contacted	Joe Fress
Phone Number	281-459-28
Agreed Arrangements	Emergency Medical Services cell 281-459-1277

Table III.E.2 - Emergency Coordinators

Name	Home Address	Office Phone(s) and/or Pager	Home Phone(s)
Primary	A Shift Shift Superintendent 8280 Sheldon Road, Channelview, TX 77530	281-452-8358	--
Primary	B Shift Shift Superintendent 8280 Sheldon Road, Channelview, TX 77530	281-452-8358	--
Primary	C Shift Shift Superintendent 8280 Sheldon Road, Channelview, TX 77530	281-452-8358	--
Primary	D Shift Shift Superintendent 8280 Sheldon Road, Channelview, TX 77530	281-452-8358	--

Name	Home Address	Office Phone(s) and/or Pager	Home Phone(s)
Alternate			
Alternate			

Table III.E.3- Emergency Equipment

Equipment	Location	Physical Description	Capability
Fixed Firewater Pumps - North Plant	East Plant Utilities Area: Mid-Plant; OP I, OPII	8 diesel driven and 3 electric driven	Each rated at 2,000 gallons per minute (gpm) at approx. 150 psi; total pumping capacity of 26,000 gpm.
Fixed Firewater Pumps - South Plant	POSM I Tank Farm and POSM II Tank Farm	4 diesel driven and 5 electric driven	Each rated at 2,500 gallons per minute (gpm) at approx. 130 psi; total pumping capacity of 22,500 gpm.
Fixed Firewater Pumps - C4 Storage	C4 Storage Spheres	2 diesel driven	each rated at 5,000 gpm at 125 psi; total puping capacity of 10,000 gpm
Firewater Storage - North Plant	Throughout North Plant	6 water storage tanks	6 million gallons total
Firewater Storage - South Plant	POSM I Tank Farm and POSM II Tank Farm	2 firewater ponds	Total capacity of 4.7 million gallons
Firewater Storage - C4 Storage	C4 Storage Spheres	1 firewater tank	3 million gallons
Fire Monitors - grade and elevated	Throughout Facility		Minimum flow of 500 gpm
Fire Hydrants, Headers, and Large Manifolds	Throughout Facility		For connection of fire response equipment
Automatic and Manual Deluge/ Water-Spray Systems	Throughout Facility		Fire control, cooling and vapor suppression
Fixed and Semi-fixed foam systems	Throughout Facility		Tank fire suppression
Telephone System	Plant-wide		General and emergency communications
Plant Radio System	Plant-wide		General and emergency communications

Equipment	Location	Physical Description	Capability
Emergency Notification and Public Address System	Plant-wide	Emergency notificaitons; controlled at Security Communications Center	
Portable Fire Extinguisher	Throughout Facility		Incipient fire suppression
Safety Showers/Eyewash Stations	Throughout Facility		First Aid and emergency decontamination
Spill Response Equipment	Barge Dock and Stores		Spill response; containment and cleanup
Spill Response Boats	Barge Dock	Three spill response boats	Deployment of containment and absorbent boom
SCBA	Haz-Mat Trailer		SCBA equipped with 45-minute cylinders for emergency response
Fire Fighting Foam	Fire Station 4 and response apparatus	Fluorinated and Fluorine Free Alcohol resistant fire fighting foam	
Ambulance	Fire Station 1 (North Plant) and Fire Station 3 (South Plant)	3 ambulances	Medic 12 is maintained at Station 1 and is Advanced Life Support (ALS) Capable. Medic 15 is maintained at Station 1 and is Basic Life Support (BLS) capable. Medic 11 is maintained at Station 3 and is ALS capable.
Rescue Truck	Fire Station 1 (North Plant)	1 Rescue Truck	1 Rescue Truck carries high angle/ confined space rescue equipment, vehicle extrication equipment and is equipped with an onboard generator.
			HazMat 16 is a 28-ft enclosed trailer and 3/4 ton pick up; this unit carries SCBAs, spare cylinders, chemical

Equipment	Location	Physical Description	Capability
Haz-Mat Truck/Trailer	Fire Station 1 (North Plant)	1 3/4 Ton Truck with 28-ft enclosed Trailer	protective clothing, decon equipment, plugging/patching equipment, and various hand tools for support of hazardous material response.
Foam Engine	Fire Station 1 (North Plant) and Fire Station 3 (South Plant)	2 Engines	Engine 12 is maintained at Station 1, is equipped with a 3,000 gpm pump, a 5,000 gpm remote controlled monitor, 1,500 gal of foam, 500 gal of water, 1,600 ft of 6: hose, 500 ft of 3" hose, two 500 gpm portable monitors and one 1,250 gpm portable monitor, and has an onboard PTO driven generator Engine 11 is maintained at Station 4, is equipped with a 3,000 gpm pump, dual remote control 2,000 gpm monitors, 750 gal of water, 1,000 ft of 6" hose, 500 feet of 3" hose, two 500 gpm portable monitors, and one-1,250 gpm portable monitor.
Foam Aerial	Fire Station 2 (South Plant)	1 Foam Aerial	Foam Aerial 10 is equipped with a 3,000 gpm pump, 100 foot aerial platform, dual 2,000 gpm remote control monitors on the platform, 500 gallons of foam, 1,000 feet of 6" hose, 200 ft of 3" hose, two 500 gpm portable monitors, and one 1,250 gpm portable monitor; the aerial platform is also equipped with high definition and infrared cameras
			Quick Attack 12 is equipped with dual remote control 2,000 gpm

Equipment	Location	Physical Description	Capability
Quick Attacks	Fire Station 1 (North Plant)	2 Quick Attacks	monitors with one equipped to deploy foam from the 425 foam tank, carries 900 ft of 6" hose, 400 ft of 3" hose, and three 500 gpm portable monitor. Quick Attack 16 is maintained at Station 1, is equipped with a 2,000 gpm monitor and 400 ft of 5" hose.
Hose Tender	Fire Station 1 (North Plant)	1 Hose Tender	Hose Tender 14 is capable of carrying 3,200 ft of 6" hose when fully loaded.
Foam Tender	Fire Station 2 (South Plant)	1 Foam Tenders	Foam Tender 16 is equipped with a 2,000 gpm monitor, and carries 2,000 gal of foam.
Breathing Air Truck	Fire Station 1 (North Plant)	1 Breathing Truck	Breathing Air 14 is equipped with a 16-cylinder breathing air cascade system, carries at least 30 45-minute SCBA, spare SCBA cylinders, a 6000 watt light tower, and a PTO driven generator.
Command Van	Fire Station 1 (North Plant)	1 Command Van	Command Van 14 is maintained Station 1, is equipped with climate controlled office area, and an onboard generator.
Rehab Vans	Fire Station 1 (North Plant) and Fire Station 3 (South Plant)	2 Rehab Vans	Rehab 12 is maintained at Station 1 and Rehab 11 is maintained at Station 3. Each unit provides a climate controlled compartment, awning for shade, and chairs for responders to rehabilitate on-scene.

Equipment	Location	Physical Description	Capability
Vacuum Truck	North Plant CSA	1 Vacuum Truck	Liquids Removal

Table IV.B. - Wastes Managed In Permitted Units

No.	Waste	EPA Hazardous Waste Numbers	TCEQ Waste Form Codes and Classification Codes
1	Spent Solid Filters	D001, D002, D003, D004, D010, D018	310H
2	Olefins Manufacturing Process Waste	D001, D002, D003, D018	109H
3	Spill Cleanup Media (Soil)	D001, D002, D003, D005, D008, D018, F002, F003, F005, U002, U003, U019, U022, U055, U147, U154, U159, U220, U239	301H
4	Acetonitrile (ACN) contaminated wastestreams	D001, D018, D035, D038	205H
5	Hydrocarbons (Mixed and Miscellaneous)	D001, D002, D003, D018, D035, F003, F005	206H
6	Spent Cleaning and Degreasing Solvents	D001, D006, D008, D018, D027, D035, D039, D040	203H
7	Spent Activated Carbon	D001, D018	404H
8	Resins - Solids/Liquids	D001, D002, D018	606H
9	Paint Waste Related Materials	D001, D035, F003, F005	209H
10	Poly BD Polymer, ACN and Water	D001, D018	606H
11	Spill Cleanup Material and Absorbents	D001, D002, D003, D008, D009, D018, D019, D022, D038, D040, F002, F003, F005, U019	310H
12	Wastewater, Industrial: ECU Hazardous	D001, D002, D018, D035	219H
13	Acid Cleaning Solutions	D001, D002, D007, D008, D018	105H
14	Caustic Cleaning Solutions	D001, D002, D007, D008, D018	110H
15	Wastewater, Industrial: Non-ECU Hazardous	D001, D002, D018, D028, D035	219H
16	Mixed Alcohols	D001, D018, D035, D038	219H
17	Fuel Purge Gas Condensate and Fuel Oil	D001	207H
18	Miscellaneous Mercury Contaminated Material	D001, D002, D006, D007, D009, D011, F003	319H
19	Hazardous Polymer	D001, D003, D018	403H

No.	Waste	EPA Hazardous Waste Numbers	TCEQ Waste Form Codes and Classification Codes
20	Spent Catalyst	D001, D002, D003, D018	219H
21	Heat Exchanger Solids	D018	304H
22	API Skimmings	D001, D018, D038	205H
23	Lab Packs	D001, D002, D003, D005, D007, D008, D009, D011, D018, D021, D022, D035, D036, F001, F002, F003, F004, F005, P003, P022, U001, U002, U003, U004, U117, U123, U154, U213, U239	003H
24	Hydrocarbon Contaminated Sludges	D001, D002, D003, D009, D018, D035	603H
25	Dimer Solution	D001, D018	203H
26	Lab Liquid Wastes	D001, D002, D009, D018, D019, D022, D035, D038, F002, F003, F005	219H
27	Contaminated Sandblasting Media	D006, D007, D008, D018	490H
28	Off-Spec/Unused Organic Liquid Products/Chemicals	D001, D002, D003, U002, U003, U055, U056, U133, U154, U220, U239	219H
29	Off-Spec/Unused Organic Solid Products/Chemicals	D001, D002, D003, U019, U055, U147	409H
30	Used Batteries (Lead-acid, NiMH, Li ion, NiCAD etc)	D001, D002, D006, D007, D008	309H
31	Hazardous Waste Tank Cleanout	D001, D018, D019, D022, D035, D038, F002, F003, F005	219H
32	Spent Catalyst	D003, D005, D007, D018	493H
33	Spent Catalyst	D001, D002, D003, D005, D007, D018, U019	393H
34	Alcohol/Organics	D001, D035, F003	207H
35	Spent Catalyst	D001, D002, D003, D018	404H
36	Alky Propane Caustic Wash	D002	109H

No.	Waste	EPA Hazardous Waste Numbers	TCEQ Waste Form Codes and Classification Codes
37	Spent Aerosol Cans	D001, D003, U226	308H
38	Organic Mixture Poly BD Production	D001	219H
39	Hazardous Debris	D008, D018	319H
40	Concentrated Inorganic Acid Solution	D002	105H
41	Concentrated Caustic Solution Generated	D002	110H
42	Sulfolane Material	D001	203H
43	IPOH Material	D001	203H
44	Methanol Material	D001	203H
45	Sulfuric Acid	D002	104H
46	Olefins Washwater	D007	102H
47	Compressed Gas Organic	D001, D003	801H

Table IV.C. - Sampling and Analytical Methods

Waste No.[1]	Sampling Location	Sampling Method[2]	Frequency	Parameter	Test Method[2]	Desired Accuracy Level[3]
1	Drum	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
2	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
3	Bulk or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
4	Tank	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
5	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
6	Container	--	As necessary	SDS	--	-
			upon process	VOCs, SVOCs,	8260, 8270,	

7	Container	grab	change or as necessary to satisfy off-site TSD and LDR Requirements	metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
8	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
9	Container	grab	as necessary	SDS	--	--
10	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
11	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
12	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
13	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
			upon process	VOCs, SVOCs,	8260, 8270,	

14	Container	grab	change or as necessary to satisfy off-site TSD and LDR Requirements	metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
15	Tank, Container, or Impoundment	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
16	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
17	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
18	--	--	process knowledge	--	--	--
19	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
20	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
			upon process			(ppm)

21	Container	grab	change or as necessary to satisfy off-site TSD and LDR Requirements	BTEX	8260	0.026 8.2 7.6 120
22	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
23	Container	--	--	--	--	--
24	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
25	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
26	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
27	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL

28	Container	grab	As needed	Use SDS	--	--
29	Container	grab	As needed	Use SDS	--	--
30	N/A	--	--	--	--	--
31	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
32	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
33	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
34	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirement	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
35	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirement	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
			upon process	VOCs, SVOCs,	8260, 8270,	

36	Tank or Container	grab	change or as necessary to satisfy off-site TSD and LDR Requirements	metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
37	N/A	--	--	Use SDS	--	--
38	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
39	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
40	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	N/A
41	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
42	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
			upon process	VOCs, SVOCs,	8260, 8270,	

43	Container	grab	change or as necessary to satisfy off-site TSD and LDR Requirements	metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
44	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
45	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
46	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs, SVOCs, metals, TPH, Reactivity, Corrosivity, Ignitability, TCLP leach as needed	8260, 8270, 6010/6020, 7470/7471, TX1005, 1010, 9040/TM-01-69, 9010/9030, 1311	MDL
47	--	--	--	Use SDS	--	--

[1] from Table IV.B, first column

[2] Sampling and Test/Analysis methods should be specified in enough detail to allow determination of whether they are suitable and correct for the purpose indicated while allowing flexibility in selection and future updates to the specified method. Standard methods, such as those from SW-846, will generally require no further submittal. Non-standard and proprietary methods may require additional information to determine suitability. ASTM methods may require submittal of a copy of the specified method.

3 Desired Accuracy Level should provide a specified numeric minimum performance level (maximum acceptable reporting limit) for method detection and quantitation limits that will be accepted from the laboratory performing the analysis and must ensure that reported data will allow determinations of compliance with regulatory limits for the parameter tested.

Table V.A. - Facility Waste Management Handling Units

TCEQ Permit Unit No. [1]	Unit Name	NOR No.[1]	Unit Description[3]	Capacity	Unit Status[2]
015	Container Storage Area Warehouse	022	Hazardous and Non-hazardous Container Storage area	62,180 gallons	Active
007	Tank 4455	031	Enclosed vertical steel above-grade tank	284,000 gallons	Active
006	Tank 3455	032	Enclosed vertical steel above-grade tank	284,000 gallons	Active
005	Tank D-4383	047	Waste caustic storage tank	12,000 gallons	Active
114	Tank 1101-A	11	RCRA Waste Storage Tank	195 gallons	Active
115	Tank 1101-B	12	RCRA Waste Storage Tank	195 gallons	Active

1. Permitted Unit No. and NOR No. cannot be reassigned to new units or used more than once and all units that were in the Attachment D of a previously issued permit must be listed.

2. Unit Status options: Active, Closed, Inactive (built but not managing waste), Proposed (not yet built), Never Built, Transferred, Post-Closure.

3. If a unit has been transferred, the applicant should indicate which facility/permit it has been transferred to in the Unit Description column of Table V.A.

Table V.B. - Container Storage Area

Permit Unit No.	Container Storage Area	N.O.R. No.	Waste Nos.[4]	Rated Capacity[3]	Dimensions	Containment Volume (including rainfall for unenclosed areas)	Unit will manage Ignitable[1], Reactive[1], or Incompatible[2] waste (state all that apply)	Unit Status
015	Hazardous and Nonhazardous Container Storage Area	022	See attached Waste Management Plan	62,150 gallons (based on 1,130 55 gallon drum equivalents (eqs) or 800 55-gal drum eqs and 3 30-yd3 containers or any combination for a maximum of 62,150 gallons)	50' x 97'.25" x 6' (covered area) 54'9" x 35' x 6' (adjacent uncovered area)	18.235 gallons (covered area) 7,157 gallons (adjacent uncovered area)	Ignitable Reactive Incompatible	Active

1. Containers managing ignitable or reactive waste must be located at least 15 meters (50 feet) from the facility's property line.
2. Incompatible waste must be separated from other waste or materials stored nearby in other containers, piles, open tanks, or surface impoundments by means of a dike, berm, wall, or other device.
3. Container Storage Areas need to include in capacity calculations any nonhazardous wastes and universal wastes managed in the unit in addition to hazardous wastes.
4. from Table IV.B, first column

Table V.C. - Tanks and Tank Systems

Permit Unit No.	Tank	N.O.R. No.	Storage and/or Processing	Waste Nos.[1]	Rated Capacity	Dimensions	Containment Volume (including rainfall for unenclosed areas)	Unit will manage Ignitable, Reactive, or Incompatible waste (state all that apply)	Unit Status
005	Tank D-4383	047	Storage	2	12,000 gallons	Horizontal 10' diameter 19' length	17,945 gallons	Ignitable Reactive	Active
006	Tank 3455	032	Storage	2	284,000 gallons	Vertical 40' diameter 32' height	Double-walled tank	Ignitable Reactive	Active
007	Tank 4455	031	Storage	2, 36	284,000 gallons	Vertical 40' diameter 32' height	Double-walled tank	Ignitable Reactive	Active
11	Tank 1101-A	114	Storage	26	195 gallons	Horizontal 28' diameter 72' length	267 gallons	Ignitable Reactive	Active
12	Tank 1101-B	115	Storage	26	195 gallons	Horizontal 28' diameter 72' length	267 gallons	Ignitable Reactive	Active

1. from Table IV.B, first column

Table VI.A.1. - Major Geologic Formations

Names Of Major Geologic Formation(s) Beneath The Facility	Lithology Of The Major Geologic Formation	Formation Thickness (Feet)	Depth To Top Of Formation	
			Feet/MSL(1)	Feet/BGS(2)
Fleming Formation	Fleming Formation and Sand	2400	400	
Goliad Sand	Goliad Sand	1800	400	
Willis Sand, Bently Formation, Montgomery Formation, and Beaumont Clay	Clay and Sand	360	40	
Alluvium	Alluvial deposites	40	0	

(1) MSL: Mean Sea Level

MLGL: Mean Low-tide Gulf Level

(2) BGS: Below Grade Surface

Table VII.A. - Unit Closure

For each unit to be permitted, list the facility components to be decontaminated, the possible methods of decontamination, and the possible methods of disposal of wastes and waste residues generated during unit closure:

Equipment or HWM Unit	Possible Methods of Decontamination[1]	Possible Methods of Disposal[1]
TK-1101 A	High Pressure Wash	Fuel Blending/Incineration
TK-1101 B	High Pressure Wash	Fuel Blending/Incineration
Tank 4383	High Pressure Wash	Fuel Blending/Incineration
Tank 3455	High Pressure Wash	Injection Well
Tank 4455	High Pressure Wash	Injection Well
Container Storage Area No. 1	High Pressure Wash	Fuel Blending/Incineration

1. Applicants may list more than one appropriate method.

Table VII.B. - Unit Closure Cost Estimate

Task		Cost
Tank 1101A		
Mobilize 3-person crew and equipment [20 hrs. @ $69.73/hr + 7 hrs@94.14/hr		$1,820.00
Material inventory – dispose, fuels blending or incineration [195 gallons (4 drums @ $1582/drum)]		$6,328.00
Wash water residues - fuels blending or incineration [669 gal @ $6.80/gal] (Triple rinse tank, est. 10% of 195 gal. per rinse, plus ext. 650 gal for containment pad = 669 gal)		$4,550.00
Transportation (6699 gal □ 5,500 gal/truck @ $1,733/load = $1733)		$1,733.00
Laboratory Analysis [4 samples @ $735/sample]		$2,940.00
Certification report		$6,456.00
Subtotal		$23,827.00
Contingency (10% minimum)		$2,383.00
Total Closure Cost	Year 2025	$26,210.00
Task		Cost
Tank 1101B		
Verbal description of task (waste amount generated x disposal cost/unit amount)		$1,820.00
Verbal description of task (waste amount generated x disposal cost/unit amount)		$6,328.00
Verbal description of task (waste amount generated x disposal cost/unit amount)		$4,550.00
Verbal description of task (waste amount generated x disposal cost/unit amount)		$1,733.00
Other tasks (such as labor, lab analysis, transportation, certifications, etc.)		$2,940.00
Other tasks		$6,456.00
Subtotal		$23,827.00
Total Closure Cost	Year 2025	$26,210.00

Task		Cost
Contingency (10% minimum)		$2,383.00
Total Closure Cost	Year 2025	$26,210.00
Task		Cost
Tank 3455		
Mobilize crew and equipment [2693 hrs. @$81.56/hr]		$219,641.00
Tank contents + decon (285,000 @$0.64/gal)] (Triple rinse tank, est.)		$182,400.00
Transportation 62 truck loads @1,733/load		$107,446.00
Laboratory Analysis [6 samples @ $734/sample]		$4,404.00
Certification Report		$16,515.00
Other tasks		
Subtotal		$530,406.00
Contingency (10% minimum)		$53,041.00
Total Closure Cost	Year	$583,447.00
Task		Cost
Tank 4455		
Mobilize crew and equipment [2693 hrs. @$81.56/hr]		$219,641.00
Tank contents + decon (285,000 @$0.64/gal)] (Triple rinse tank, est.)		$182,400.00
Transportation 62 truck loads @1,733/load		$107,446.00
Laboratory Analysis [6 samples @ $734/sample]		$4,404.00
Certification Report		$16,515.00
Total Closure Cost	Year2025	$583,447.00

Task		Cost
Other tasks		
Subtotal		$530,406.00
Contingency (10% minimum)		$53,041.00
Total Closure Cost	Year 2025	$583,447.00

Task	Cost
Tank D-4383	
Mobilize 6-person crew and equipment [830 hrs. @ $81.56/hr.]	$49,800.00
Material inventory - dispose at off-site well [12,000 gallons @ $0.64/gal]	$3,000.00
Wash water residues - dispose - at off-site well [4,700 gal @ $0.64/gal.] (Triple rinse tank, est. 10% of 12,000 gal. per rinse, plus 10,324 for ancillary pad = 11524 gal)	$2,881.00
Transportation (22,324 gallons @ 5,500 gal/truck @ $1,440.83/load = $5,763.32)	$5,763.00
Laboratory Analysis [4 samples @ $883.53/sample]	$3,534.00
Certification report	$6,457.00
Subtotal	$71,435.00
Contingency (10% minimum)	$7,144.00
Total Closure Cost Year 2025	$78,579.00

Task	Cost
Container Storage Area	
Mobilize 3-person crew and equipment [190 hrs. @ $402.28/hr.]	$76,433.00
Material inventory - dispose at approved facility [1,130 drums @ $1164/drum]	$737,540.00
Wash water residues - dispose at approved facility [23,548 gal @ $0.64/gal]	$8,006.00
Total Closure Cost Year 2025	$1,112,093.00

Task	Cost
Transportation [23,548 gal] (14 tank truck @ $744.88)	$10,428.00
Laboratory Analysis [132 samples @ $849.54/sample]	$112,139.00
Certification report Engineering Support ($19,234)	$66,448.00
Subtotal	$1,010,994.00
Contingency (10% minimum)	$101,099.00
Total Closure Cost Year 2025	$1,112,093.00

Table VII.E.1. - Permitted Unit Closure Cost Summary

Existing Unit Closure Cost Estimate	
Unit	Cost
TK-1101A	$26,209
TK-1101B	$26,209
TK-3455	$583,447
TK-3455	$583,447
TK-D-4383	$78,579
Container Storage Area	$1,112,093
Total Existing Unit Closure Cost Estimate[1] Year	$1,409,984

Proposed Unit Closure Cost Estimate	
Unit	Cost
Total Proposed Unit Closure Cost Estimate Footnote	

1 As units are added or deleted from these tables through future permit amendments or modifications, the remaining itemized unit costs should be updated for inflation when re-calculating the revised total cost in current dollars.

Table X.A. - Process Vents

List all process vents covered by this application.

I.D. No. (if any)	Process Vent	Annual Throughput	Operating Hours	Total Vent Facility Emissions
N/A				

Table X.B. - Equipment Leaks

List all process vents covered by this application.

Equipment I.D. No.	Equipment Type	Waste Management Unit N.O.R. No.	Waste Management Unit Name	% by Weight Total Organics in Haz. Waste Stream	Waste State (gas, vapor, liquid)	Method of Compliance
006	Ancillary Equipment	032	Tank 3455	>10%	L	Clean Air Act 40 CFR Overlap Position
007	Ancillary Equipment	031	Tank 4455	>10%	L	Clean Air Act 40 CFR Overlap Position

Table XII.A. - Hazardous Waste Units (For Application Fee Calculations)

Verbal Description of Unit	Rated Capacity	Surface Acreage[1]	# of Unit Types[2]	Identical Unit Justification[3]
Container Storage Area	800 drums 3 roll-off bins or 1,130 drums or any combination thereof for a total of 62,150 gal	0.026	1	
Tank 3455	284,000 gallons	0.13	1	
Tank 4455	284,000 gallons	0.13	1	
Tank D-4383	12,000 gallons	0.005	1	
Tank 1101A	195 gallons	0.0002	1	
Tank 1101B	195 gallons	0.0002		Tank 1101B is identical to Tank 1101A.
		Total[4] 0.291	Total[4] 5	

1. Number of calculated acres.
2. Enter number of units except for units identical in type and use which only count toward a single $500.00 fee.
3. Explain justification for any units claimed as identical in type and use.
4. Enter these totals on the worksheet.

Table XII.B. - Hazardous Waste Permit Application Fee Worksheet

Name of Facility: Equistar Chemicals, LP

Solid Waste Registration Number: 30030

1.Process Analysis - $1,000..... $ 1000

2.Facility Management Analysis - $500..... $ 500

3.Unit Analysis - ~~_____~~5 units @ $500 per unit..... $ 2500

4.Site Evaluation - 0.291 acres @ $100 per acre..... $ 29.1

(Maximum of 300 acres)

5.Minor amendment, Class 1, or Class 1[1] modification - $100..... $ 100

6.Cost of Providing Notice - $50 (+ $15 for a renewal) ..... $ 65

Pay This Amount **Total** $ $4,194.10

Make Checks Payable To:

Texas Commission on Environmental Quality - Fund
549 *(your canceled check will be your receipt)*

Complete And Return With Payment To:

Texas Commission on Environmental
Quality Financial Administration Division -
MC 214 P.O. BOX 13088
Austin, Texas 78711-3088

The applicant's fees are subject to evaluation by the technical staff of the Texas Commission on Environmental Quality (TCEQ). However, the TCEQ reserves the right to assess further fees as may be necessitated.

Please do not submit a photocopy of the check (or equivalent transaction submittal) with your application packet but provide only the following account information:

~~Check No~~.	Date of Check	Check Amount
582EA000714937 (epay)	2/12/2026	4259.10

Appendix I: Landowner List and Map

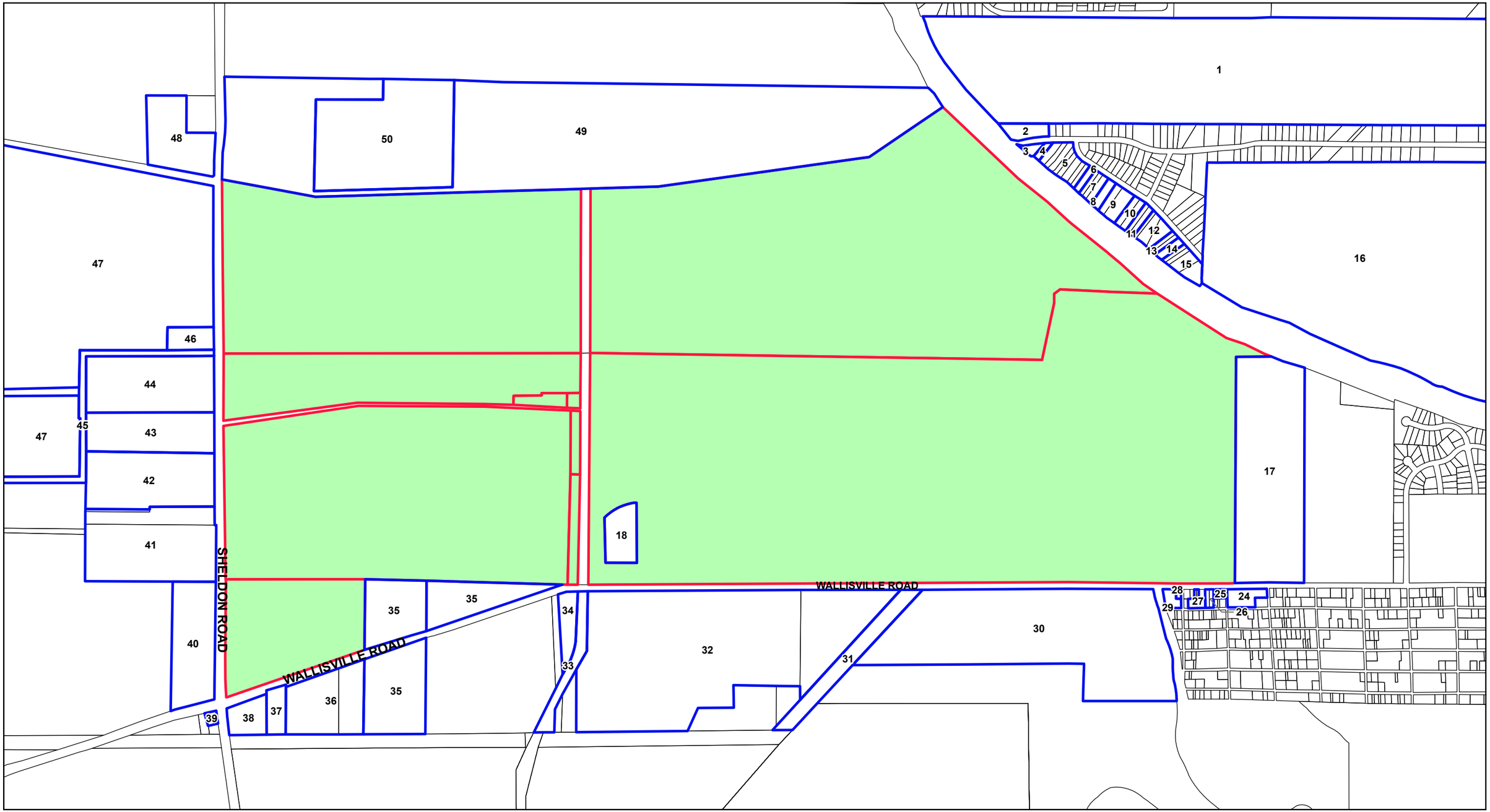
ATTACHMENT A

LANDOWNERS CROSS-REFERENCED TO ADJACENT LANDOWNER MAP

1	ADLOY LLC 6010 THOMPSON RD BAYTOWN TX 77521-1318	17	BALKE THOMAS E & MARY RENEE 20811 RIO VILLA DR HOUSTON TX 77049-3257
2	ADLOY LLC 6010 THOMPSON RD BAYTOWN TX 77521-1318	18	EQUISTAR CHEMICALS LP C/O PROPERTY TAX DEPT PO BOX 3646 HOUSTON TX 77253-3646
3	COUNTY OF HARRIS PO BOX 1525 HOUSTON TX 77251-1525	24	LOGAN JAMES 18800 WALLISVILLE RD HOUSTON TX 77049
4	ROSALES RUBIN O 5521 GLENMONT ST HOUSTON TX 77081-1891	25	TEXAN LAND & CATTLE CO PO BOX 130979 HOUSTON TX 77219-0979
5	HARRIS COUNTY FLOOD CONTROL DISTRICT 9900 NORTHWEST FWY HOUSTON TX 77092-8601	26	COLGLAZIER MARY C MD 217 NW LOCUST ST LEES SUMMIT MO 64064-1453
6	COUNTY OF HARRIS PO BOX 1525 HOUSTON TX 77251-1525	27	COULSON WILLIAM JR ESTATE C/O MARGARET COULSON - EXE 4814 KNICKERBOCKER ST HOUSTON TX 77035-3428
7	HARRIS COUNTY FLOOD CONTROL DISTRICT 9900 NORTHWEST FWY HOUSTON TX 77092-8601	28	COULSON WILLIAM JR ESTATE C/O MARGARET COULSON 4946 HEATHERGLEN DR HOUSTON TX 77096-4214
8	COUNTY OF HARRIS PO BOX 1525 HOUSTON TX 77251-1525	29	TAYLOR THOMAS N C/O THOS L BROWN ATTORNEY 7017 PASEO BLVD KANSAS CITY MO 64132-3109
9	HARRIS COUNTY FLOOD CONTROL DISTRICT 9900 NORTHWEST FWY HOUSTON TX 77092-8601	30	EQUISTAR CHEMICALS LP C/O PROPERTY TAX DEPT PO BOX 3646 HOUSTON TX 77253-3646
10	COUNTY OF HARRIS PO BOX 1525 HOUSTON TX 77251-1525	31	CENTERPOINT ENERGY HOU ELE PROPERTY TAX DEPT 38TH FLR PO BOX 1475 HOUSTON TX 77251-1475
11	HARRIS COUNTY FLOOD CONTROL DISTRICT 9900 NORTHWEST FWY HOUSTON TX 77092-8601	32	LYB CHANNELVIEW POTBA LLC % PROPERTY TAX DEPT 1221 MCKINNEY ST STE 300 HOUSTON TX 77010-2036
12	HARRIS COUNTY FLOOD CONTROL DISTRICT 9900 NORTHWEST FWY HOUSTON TX 77092-8601	33	MISSOURI PACIFIC RAILROAD COMPANY UNION PACIFIC RAILROAD CO 1400 DOUGLAS ST STOP 1640 OMAHA NE 68179-1001
13	NGC HOLDING CO INC ET AL 13430 NORTHWEST FWY STE 1200 HOUSTON TX 77040-6052	34	LYONDELL CHEMICAL ATTN TAX DEPT PO BOX 3646 HOUSTON TX 77253-3646
14	COUNTY OF HARRIS PO BOX 1525 HOUSTON TX 77251-1525	35	EQUISTAR CHEMICALS LP ATTN TAX DEPT PO BOX 3646 HOUSTON TX 77253-3646
15	HARRIS COUNTY FLOOD CONTROL DISTRICT 9900 NORTHWEST FWY HOUSTON TX 77092-8601	36	CAMO CHEMICAL PROPERTIES LLC 16950 WALLISVILLE RD HOUSTON TX 77049-5014

ATTACHMENT A
LANDOWNERS CROSS-REFERENCED TO ADJACENT LANDOWNER MAP

16	PORT OF HOUSTON AUTHORITY 111 EAST LOOP N HOUSTON TX 77029-4326	37	WILLIAMS OLEFINS PIPELINE HOLDCO LLC ONE WILLIMAS CENTER TULSA OK 74172-0153
38	CENTERPOINT ENERGY HOU ELE PROPERTY TAX DEPT 38TH FLR PO BOX 1475 HOUSTON TX 77251-1475		
39	JUBILEE VENTURES INC 6533 SHELDON RD HOUSTON TX 77049-3105		
40	EQUISTAR CHEMICALS LP ATTN TAX DEPT PO BOX 3646 HOUSTON TX 77253-3646		
41	EQUISTAR CHEMICALS LP ATTN TAX DEPT PO BOX 3646 HOUSTON TX 77253-3646		
42	EQUISTAR CHEMICALS LP ATTN TAX DEPT PO BOX 3646 HOUSTON TX 77253-3646		
43	EQUISTAR CHEMICALS LP ATTN TAX DEPT PO BOX 3646 HOUSTON TX 77253-3646		
44	EQUISTAR CHEMICALS LP ATTN TAX DEPT PO BOX 3646 HOUSTON TX 77253-3646		
45	MIDCON TEXAS PIPELINE CORP PROPERTY TAX DEPT PO BOX 4372 HOUSTON TX 77210-4372		
46	EQUISTAR CHEMICALS LP ATTN TAX DEPT PO BOX 3646 HOUSTON TX 77253-3646		
47	EQUISTAR CHEMICALS LP ATTN TAX DEPT PO BOX 3646 HOUSTON TX 77253-3646		
48	GROENDYKE TRANSPORT INC PO BOX 632 ENID OK 73702-0632		
49	EQUISTAR CHEMICALS LP ATTN TAX DEPT PO BOX 3646 HOUSTON TX 77253-3646		
50	EQUISTAR CHEMICALS LP ATTN TAX DEPT PO BOX 3646 HOUSTON TX 77253-3646		



LEGEND

- Equistar Chemicals, L.P. Property Boundary
- Adjacent Property Ownership Boundary
- Harris County Appraisal District Parcels

0 500 1,000 2,000 Feet

1:12,000

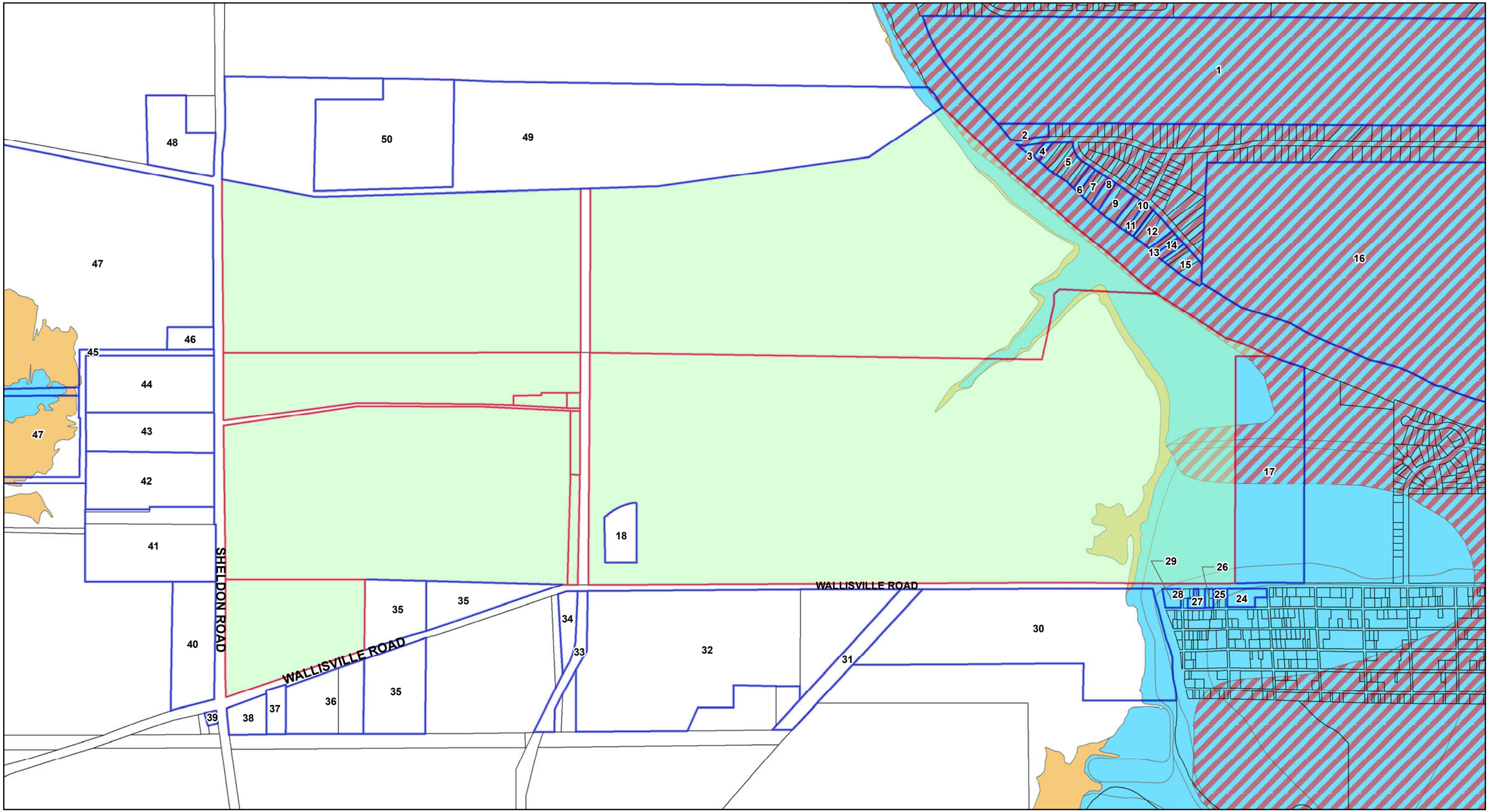
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Attachment A
Adjacent Landowners Map
Equistar Chemicals, L.P.
Channelview South Plant, Channelview, Texas

Brown AND Caldwell

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Appendix II: Siting Criteria



LEGEND

- Equistar Chemicals, L.P. Property Boundary
- Adjacent Property Ownership Boundary
- Harris County Appraisal District Parcels

FEMA Flood Zone Data

- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Regulatory Floodway

NOTE:
-Federal Emergency Management Agency (FEMA), Flood Zone Data downloaded from the FEMA National Flood Hazard Layer Database for Harris County, Texas. Download date: September 8, 2025.

0 500 1,000 2,000 Feet

1 inch = 1,000 feet

N

Attachment A
Adjacent Landowners Map
Equistar Chemicals, L.P.
Channelview North Plant, Channelview, Texas

Brown AND Caldwell

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Appendix III: Facility Management

Section III. A. – Compliance History

Section III.B. – Training Plan

Section III. C. – Security Plan

Section III. D. – Inspection Plan

Section III. E. – Contingency Plan

SECTION III.A

COMPLIANCE HISTORY

Appendix III. A.1

Compliance History – Equistar Chemicals LP, CN600124705

Ascend Performance Materials, Chocolate Bayou Plant, RN100238682
Bayport EO Plant, RN102926920
Chocolate Bayou Plant, RN100210574
Cray Valley Wallisville Road, RN102342813
Delta Group Baytown, RN106038938
Equistar Chemicals, RN100221662
Equistar Chemicals C4 Dock Rail Car Loading Facility, RN102167640
Equistar Chemicals La Porte Complex, RN100210319
Equistar Chemicals LP Bayport, RN104008610
Equistar Chemical Port Arthur Plant, RN100221308
Equistar Chocolate Bayou Polymers Plant, RN10237668
Equistar Matagorda Plant, RN100216159
Houston Polymers Terminal, RN103670048
INV Nylon Chemicals Americas Victoria Site, RN102663671
Lyondell Petrochemical Victoria, RN100215276
LyondellBasell Bayport Polymers, RN100216761
PD Glycol Beaumont Plant, RN100825413
Solvay Engineered Polymers, RN102787025
Sunoco Bayport BPT1, RN100524008
Syngenta Crop Protection, RN102344355
VoPak Terminal Deer Park, RN106033343

SECTION III.B

TRAINING PLAN

Training Plan

1.01 INTRODUCTION

The Personnel Training Plan at the Channelview Complex is designed to provide sufficient knowledge of hazardous waste management concepts.

1.02 PERSONNEL IDENTIFIED FOR HAZARDOUS WASTE TRAINING

Personnel who must be trained include those who are involved with or are occupationally exposed to hazardous waste. This may include personnel who perform any of the following tasks:

- Determining which wastes are hazardous waste
- Adding hazardous waste into accumulation containers or tanks at accumulation points
- Removing hazardous waste from accumulation tanks or containers
- Transporting hazardous waste to or from storage and treatment units
- Responding to spills, fires or explosions involving hazardous waste (medical response involves bio-hazard waste)
- Completing hazardous waste manifests, annual reports, or exception reports
- Operating or working at accumulation points
- Conducting any tasks involving occupational exposure to, or managing hazardous waste

A list of personnel identified for hazardous waste training, by job title/function, is included as Attachment 1.

1.02.1 Training Requirements

Training must be successfully completed by all the personnel identified in Attachment 1. For new personnel, training must be successfully completed within six months after assignment to the facility or to a new position at the facility. Until that time, untrained personnel are not allowed to perform any tasks involving hazardous waste management unless trained personnel supervise them.

1.02.2 Training Implementation

Unit operations training consultants, coordinators, subject matter experts, and environmental engineers from the Health, Safety & Environmental (HSE) department participate in the direction and development of the training program content and format. Job experience is gained by working in the operating facility and/or educational experience qualifies these individuals as being knowledgeable in the management of hazardous waste. As necessary, these individuals remain current in the knowledge by attending workshops, continuing education courses or with continued job experience.

1.03 TRAINING

The amount and type of training vary in accordance with the requirements of the job function. The following programs are used separately or in conjunction with one another to ensure that personnel will be able to perform their duties in a way to comply with the regulations related to the management of hazardous waste and to respond to emergencies involving hazardous waste. The format, style or content of the program may be revised to reflect updated operating facility practices

and/or policies but the required information for the management of hazardous waste will not change.

1.03.1 Training Programs

Formal classroom training to explain the aspects of hazardous waste management utilizes visual aids, such as training videos, slides, and computer-based training modules (CBTs), such as Microsoft® PowerPoint presentations. Facility Standard Procedures (SPs), which encompass requirements for hazardous waste management units, include training related to the function of emergency systems, response to fires and explosions, inspections, and the repair and replacement of monitoring equipment. This information is communicated to personnel during the operators job certification process. Personnel participate in both a skill and knowledge assessment. Any portions initially missed are reviewed and assessed until personnel pass. The assessments are completed using a Job Task Questionnaire that details the requirements for attaining and maintaining qualifications for a job. Unit Process Specialist assess and maintain the completed questionnaires to identify gaps in the process.

On-The-Job Training (OJT) provides personnel with the advantage of “hands on” experience, which is essential to normal daily operations of the facility. OJT, with appropriate supervision, is especially useful because it provides for effective explanation of hazardous waste management concepts and affords visual illustration and tangible application of those concepts. The degree of OJT required is based upon the particular job function in conjunction with evaluation of proficiency in the designated position. The proficiency evaluation may be comprised of an operating test (performance and written), a verbal test, or other means designated by the training instructor. Pending satisfactory completion of the specific training requirements for a particular job, personnel will receive supervision to ensure that duties are being conducted in a proper and safe manner. Final assignment will be contingent upon successful completion of the program.

Supplemental training may be conducted as needed to achieve a higher level of knowledge and understanding of hazardous waste management. Supplemental training may include, but is not limited to, quarterly HSE Safety Meetings, related Hazardous Waste Operations and Emergency Response (HAZWOPER) training, Department of Transportation (DOT) Hazardous Materials, Fire Brigade training, and/or group discussion to review new or existing requirements. Periodically, each of the SPs for a particular department are reviewed and revised, as necessary. As required by the Occupational Safety and Health Administration (OSHA) Process Safety Management regulation, any time that a revision, modification or new project is installed, the applicable SPs are re-evaluated or written, approved, and reviewed by appropriate personnel. As indicated, personnel may attend continuing education workshops, seminars, courses, etc.

Emergency Response Team (ERT) Program Training ensures that personnel working in the facility will respond appropriately to emergency situations through planning, use of emergency response equipment and use of personal protective equipment. Training is conducted during the quarterly ERT meetings, which include topics related to emergency recognition, emergency notification procedures, alarm systems, risks associated with hazardous materials during emergencies, hazardous material identification and evacuation procedures.

ERT training is provided to team members to prepare them to fulfill their responsibilities in emergency situations. The team includes Fire/Hazardous Materials (HazMat) Team, Rescue Team, Emergency Medical Systems (EMS) Team, Marine Spill Team, and Air Monitoring Teams. Training for Fire/ Hazmat, Rescue, and EMS are conducted quarterly for at least 8 hours in length for each team. Marine Spill training is conducted twice a year for at least 8 hours a session. Two additional 8-hour training sessions are conducted each year for ERT Leadership. Air Monitoring Team training is conducted at least annually. Training sessions may include hands-on practice, lectures, videos, and/ or slide presentations. All ERT members are included in a medical surveillance program. All new ERT members receive training for their specific discipline prior to being assigned emergency response functions. New Fire / HazMat Team members receive 24 hours of HazMat Technician training and over 40 hours of Advanced Exterior and Interior Facility Fire training. New Rescue Team members receive 40 hours of Rope and Confined Space Rescue Technician training. New EMS Team members attend Emergency Medical Technician certification training and complete certification testing for National Registered Emergency Medical Technician. New Marine Spill Team members are selected from the Fire/ HazMat Team and receive initial on-site spill response training followed by 40 hours of Oil Spill Response training through Texas A&M Engineering Extension Services (TEEX). Air Monitoring Team members receive training in portable and mobile air monitoring equipment and release modeling software. Members serving as Incident Commanders receive additional training in the Incident Command System, Strategy and Tactics, and Incident Safety Officer. If a member has a duty or role as identified in the Contingency Plan, then they will receive annual refresher training. Attachment 2 presents a copy of the training matrix from the facility's Emergency Response Program Training document.

Hazardous waste management training is conducted annually via CBTs for applicable facility personnel. The training consists of an annual review of hazardous waste management requirements and is updated, as necessary, to reflect current facility hazardous waste management practices. Environmental personnel are responsible for the development and communication of the Requirements and other information necessary to properly manage and handle hazardous waste. An outline for hazardous waste management training is provided in Attachment 3.

1.03.2 DOCUMENTATION

Training documentation may be recorded as a signature page but is normally electronically into the Company's Learning Management System. The facility maintains documents and records pertaining to personnel training requirements, including acknowledgement forms specifying hazardous waste management training and, if applicable, emergency response training. The format, style or content of the form may be revised to reflect updated facility practices and/or policies but the required regulatory information for documentation of training will not be changed. Records of training for current personnel are kept until closure of the facility. For former personnel, training records are kept for at least three years from the date personnel last worked at the facility in a job involving hazardous waste management.

ATTACHMENT 1

PERSONNEL LIST / JOB FUNCTION

TITLE/FUNCTION	RESPONSIBILITIES	QUALIFICATIONS
• Levels 1, 2, 3 & 4 Operations Personnel • Lab Analyst, Chemist & Tech Analytical Specialist • Solid Waste Contractors	• Waste accumulation and/or storage • Characteristics of waste accumulated and/or stored • Conducting and documenting required inspections • Handling, packaging and shipment of wastes • Aware of Contingency Plan	• Annual Hazardous Waste Management Training • DOT/HAZMAT training as applicable to job category • High school diploma or GED • OJT or equivalent job experience • Attend Quarterly HSE Safety Meetings
• Shift Supervisor/Front Line Supervisor • Shift Superintendent	• Ensuring required inspections performed • Ensuring corrective action completed and documented • Maintaining required records • Managing waste accumulation and/or storage • Understanding characteristics of waste accumulated and/or stored • Ensuring appropriate waste storage, handling and/or packaging • Aware of Contingency Plan procedures	• Annual Hazardous Waste Management Training • Annual review of job procedures for assigned unit • High school diploma or GED • OJT or equivalent job experience • DOT/HAZMAT training as applicable to job category • Attend Quarterly HSE Safety Meetings
• Operations Process Specialists • Planners / Scheduler	• Waste accumulation and/or storage • Understanding characteristics of waste accumulated and/or stored	• Annual Hazardous Waste Management Training • OJT or equivalent job experience • Attend Quarterly HSE Safety Meetings
• Environmental Engineer	• Training personnel in Hazardous Waste Management • Preparation of manifest • Preparation of waste characterizations • Disposal arrangements • Maintaining records and various report generation • May serve as Specialist Employee in emergencies	• Knowledge of RCRA regulations • Annual Hazardous Waste Management Training • DOT/HAZMAT training as applicable to job category • Complete continuing education courses or workshops • OJT or equivalent job experience • Attend Quarterly HSE Safety Meetings

TITLE/FUNCTION	RESPONSIBILITIES	QUALIFICATIONS
• Area Process Engineer	• Waste accumulation and/or storage • Characteristics of waste accumulated and/or stored • Preparation of waste characterization	• Annual Hazardous Waste Management Training • B.S. Degree in Engineering • OJT or equivalent job experience • DOT/HAZMAT training as applicable to job category • Annual review of job procedures for assigned unit • Attend Quarterly HSE Safety Meetings
• Health & Safety Personnel	• Waste accumulation and/or storage • Characteristics of waste accumulated and/or stored • Aware of Contingency Plan	• Annual Hazardous Waste Management Training • OJT or equivalent job experience • DOT/HAZMAT training as applicable to job category • HAZWOPER training as applicable to job duties • Attend Quarterly HSE Safety Meetings
• Emergency Response Team	Familiar with: • The Contingency Plan • Unit operations and activities • Waste accumulation and/or storage • Location and characteristics of waste handled • Unit layout	• Annual Hazardous Waste Management Training • OJT or equivalent job experience • DOT/HAZMAT training as applicable to job category • HAZWOPER training as applicable to job duties • Participation in medical surveillance program • Minimum 8 hours of emergency response training • Attend Quarterly HSE Safety Meetings

TITLE/FUNCTION	RESPONSIBILITIES	QUALIFICATIONS
• Control System and Plant Engineering • Training Coordinator	• Waste accumulation and/or storage • Characteristics of waste accumulated and/or stored • Aware of Contingency Plan	• Annual Hazardous Waste Management Training • Coordinators complete training implementation course • Attend Quarterly HSE Safety Meetings
• Security Personnel	• Awareness of Contingency Plan • Aware of manifest requirements	• Annual Hazardous Waste Management Training • Attend Quarterly HSE Safety Meetings

ATTACHMENT 2

EMERGENCY RESPONSE TEAM TRAINING

Emergency Response Program Training

Employees involved in emergency response at the RCRA storage facilities will have additional training in the elements of the Plant Emergency Response Program. These additional training elements include:

- Emergency unit shut down
- Emergency Response Plan
- Pre-emergency planning and coordination with outside parties
- Personnel roles, lines of authority and communications
- Emergency recognition and prevention
- Safe distances and places of refuge
- Site security and control
- Evacuation route and procedures
- Emergency medical treatment and first aid
- Emergency alerting and response procedures
- Critique of response and follow-up
- Personal protective and emergency equipment
- Emergency equipment procedures, inspections, repairs, replacement
- Emergency waste cut-off procedures
- Emergency communication, phone numbers, alarms
- Communication / alarm inspection activation and response
- Location, maintenance, inspection and use of emergency equipment
- Spill control and response to incidents and remediation, including response to groundwater contamination incidents
- Response to fire, explosion, or evacuation

Training Frequencies:

A Indicates annual training is required

R Indicates that training will be conducted when recommended by the Emergency Response Team trainers

I Initial training required for new members and members who have been off the team for two years

Training Responsibilities: The Loss Prevention & Emergency Services Group of the HSE Department is responsible for coordinating training for emergency response teams.

See attached CVO ERT Training Matrix

CVO ERT Training Matrix

Training Frequencies:

A indicates annual training is required

R indicates that training will be performed when recommended by the HSE department.

I initial training required for new members and members who have been off the team for two years

Subject	Regulation	Fire/ HazMat	Rescue	EMS	Marine Spill	Air Monitoring	Incident Commanders
Absorbent Materials	40 CFR 112; NVIC 7-92; 31 TAC 19	I, R			I, A		
Air Monitoring Equipment	29 CFR 1910.120	I, R	I, R		I, R	I, R	I, R
Automatic Sprinklers		I, R					R
Bandage and Splinting				I, R			
Basic First Aid	29 CFR 1910.146 (Rescue)		I, R	I			
Basic Life Support				I, R			
Bloodborne Pathogens	29 CFR 1910.1030			I, A			
Boat Handling	40 CFR 112; NVIC 7-92; 31 TAC 19				I, A		
Cardiac Emergencies				I, R			
CPR	29 CFR 1910.146		I, R	I, R			
Clean-Up Considerations		I, R			I, A		
Combined Operations		R	R	R	R	R	R
Confined Space Rescue	29 CFR 1910.146		I, A				
Containment Equipment	40 CFR 112; NVIC 7-92; 31 TAC 19				I, A		
Decontamination	29 CFR 1910.120	I, R			I, R		I, R
Electrical Fires		I, R					
Emergency Action Plan*	29 CFR 1910.120	I, A	I, A	I, A	I, A	I, A	I, A
Emergency Alarms*	29 CFR 1910.165	I, A	I, A	I, A	I, A	I, A	I, A
Emergency Medical Equipment				I, R			
Emergency Vehicle Operations		R		R			
Fire Behavior		I, R					
Fire Streams		I, R					
Foam Application		I, R					
Forcible Entry		R					
Fractures				I, R			
Hauls Systems	29 CFR 1910.146		I, R				
Hazardous Materials	29 CFR 1910.120	I, A			I, A		
Heat Related Emergencies				I, R			
Hose Handling		I, R					
Incident Command System	29 CFR 1910.120	I, R	I, R	I, R	I, R	I, R	I, R

CVO ERT Training Matrix

Training Frequencies:

A indicates annual training is required

R indicates that training will be performed when recommended by the HSE department.

I initial training required for new members and members who have been off the team for two years

Subject	Regulation	Fire/ HazMat	Rescue	EMS	Marine Spill	Air Monitoring	Incident Commanders
Initial Search and Rescue		I, R	I, R				
Knots, Ropes, and Webbing			I, R				
Legal Aspects				I, R			
Leadership	29 CFR 1910.156	R					I, R
Live Fire Training	29 CFR 1910.156	I, A					
Master Streams		I, R					
Mechanical Aids				I, R			
Mobile Fire Apparatus		R					
Negative Pressure Respirator*	29 CFR 1910.134	A	A	A	A	A	A
Patient Assessment			R	I, R			
Patient Packaging			I, R	I, R			
Poisonings				I, R			
Portable Fire Extinguishers*	29 CFR 1910.157	A	A	A	A	A	A
Portable Firewater Pumps		R					
Protective Clothing/Personal Protective Equipment	29 CFR 1910.120	I, R	I, R	I, R	I, R		
Radio Communications		R	R	R	R	R	R
Report Writing				I, R			
Rescue Hardware			I, R				
Respiratory System				I, R			
Life Safety	29 CFR 1910.120	I, R	I, R	I, R	I, R		I, R
Salvage/Overhaul		R					
Self-Contained Breathing	29 CFR 1910.134	I, A	R				
Shock				I, R			
Spill Boom Handling	40 CFR 112; NVIC 7-92; 31 TAC 19				I, A		
Strategy and Tactics		I, R					I, R
Stretcher Lashings				I, R			
Structural Fires	29 CFR 1910.156						
Trauma				I, R			
Under Flow Dams	40 CFR 112; NVIC 7-92; 31 TAC 19	I, R			R		
Ventilation - Structure Fires		R					

CVO ERT Training Matrix

Training Frequencies:

A indicates annual training is required

R indicates that training will be performed when recommended by the HSE department.

I initial training required for new members and members who have been off the team for two years

Subject	Regulation	Fire/ HazMat	Rescue	EMS	Marine Spill	Air Monitoring	Incident Commanders
Ventilation - Confined Spaces	29 CFR 1910.146		I, R				
Water Supplies		I, R					I, R

* All CVO company employees receive annual training on this subject through CBT.

CFR – Code of Federal Regulations

NVIC – US Coast Guard Navigation and Vessel Investigative Center

TAC – Texas Administrative Code

ATTACHMENT 3

EMERGENCY RESPONSE PROGRAM TRAINING OUTLINE

HAZARDOUS WASTE MANAGEMENT

TRAINING OUTLINE

I. RCRA OVERVIEW

A. Introduction

B. Objectives

1. Protect Human Health & Environment
2. Conserve Material & Energy Resources
3. "Cradle-to-Grave" Management

C. Enforcement

1. Civil Penalty
2. Criminal Penalty

D. Key Points of RCRA

1. Waste Characterization
2. Facility Inspection
3. Recordkeeping
4. Security
5. Personnel Training
6. Emergency Response Planning

E. Waste Management

1. Waste Characterization
   Distinguish between hazardous versus non-hazardous waste
   a. Analytical testing or process knowledge
   b. Hazardous by characteristics or listing
   c. Definition of solid waste
   d. Hazardous characteristics (i.e., I, C, R, T)
   e. Listed waste (i.e., F, K, P, U)
   f. Waste characterization documentation form
2. Waste Packaging
   a. Container requirements (DOT approved)
   b. Packaging requirements
3. Waste Labeling
   a. Every container must be labeled
   b. Fill Start date and accumulation start date
   c. Designated labels
4. Waste Movement
5. Vacuum Truck Services
6. Outside Services
7. Waste Storage
   a. Satellite accumulation
   b. <90-day accumulation in tanks or containers
   c. Permitted tanks, containers or other units
8. Satellite Accumulation
   a. Requirements
   b. Location
   c. Time limit for container movement
9. <90 Day Storage
   a. Requirements

    b. Secondary Containment
    c. Weekly inspections
10. Permitted Tanks
    a. Tank system definition
    b. Permitted units
    c. Secondary containment
    d. Containment liner
    e. Leak detection
    f. Response to leaks, spills or releases
    g. Daily inspections
11. Permitted Container Storage
    a. Hazardous and non-hazardous segregation
    b. Type and limit on number of containers
    c. Storage time limit
    d. Container requirements
    e. Weekly inspections
12. Manifest System
    a. Requirements
    b. Responsibilities
    c. LDR Notification
13. Recordkeeping
14. Security
15. Personnel Training
    a. Initial training
    b. Job-specific training
    c. Annual review/refresher training
    d. Documentation
16. Emergency Response Planning
    a. RCRA Contingency Plan
    b. Emergency Action Plan
    c. SPCC Plan

F. Waste Minimization
G. New Regulatory Requirements Resource

SECTION III.C

SECURITY PLAN

Revised January 2026

Revised April 2014

Revised August 2003

Revised December 1997

Revised July 1990

November 1988

SECURITY PLAN

1.0 SECURITY

The Channelview Complex maintains a comprehensive security program designed to provide continuous protection of its employees, visitors, customers, physical assets, information, and business operations against injury or loss from criminal, unethical, hostile, or malicious activities. This program ensures that unauthorized persons and livestock are prevented from entering the active portions of the facility through layered security measures. This is accomplished by the following:

1.1 Security Procedures

Uniformed security officers are stationed at designated entry gates to verify authorization badges, confirm completion of required safety training, and ensure compliance with personal protective equipment (PPE) requirements. In addition to these measures, the facility employs multiple layers of security, including perimeter fencing and barriers, controlled access gates and turnstiles, roving patrols conducted by security officers and contracted off-duty Texas peace officers, and continuous CCTV surveillance monitored by authorized personnel.

1.2 24-Hour Surveillance System

The facility maintains a 24-hour surveillance and access control system utilizing an enterprise-level electronic access control network with proximity card technology integrated across multiple sites. This system provides continuous monitoring of alarms and access points, supported by redundant servers located at separate sites to ensure reliability and secure data archiving. All alarms and gate activities are automatically logged for audit and investigative purposes. Channelview Complex security officers are able to monitor access alarms at multiple locations throughout the facility simultaneously, including the Security Operations Communication Center, ensuring comprehensive oversight and rapid response capability.

Access to the Channelview Complex is restricted to designated active entry points equipped with a computerized electronic access control system utilizing proximity card technology. All active gates and turnstiles employ this system to ensure controlled entry for authorized personnel only. Primary access points such as the North Main Gate, South Main Gate, and Gate 49 are staffed by uniformed security officers 24 hours per day, while other gates and turnstiles operate as automated entry points linked to the electronic access system. Inactive emergency gates remain locked and secured unless operationally required. To strengthen perimeter security, the facility is enclosed by chain-link fencing

topped with barbed wire and reinforced with additional barriers, including sand or water-filled barricades and structural reinforcement along public roads, as well as concrete barriers where needed to prevent unauthorized vehicle access. These measures, combined with continuous surveillance and controlled access protocols, ensure comprehensive protection of the site.

The facility maintains a minimum of eight uniformed security officers and one LyondellBasell security representative on-site at all times to ensure continuous coverage and rapid response capability. Security officers conduct patrols inside and outside the complex on a 24/7 basis, supplemented by contracted off-duty certified Texas peace officers who provide additional patrol coverage per week.

Surveillance is further enhanced through a network of cameras positioned throughout the facility, including both fixed and pan-tilt-zoom units, which can be monitored by authorized security personnel from any company assigned computer and in the security operations communication center within the complex.

Areas designated as secure locations under Maritime Transportation Security Act (MTSA) regulations are subject to additional security measures beyond standard protocols. These measures include increased patrol frequency, enhanced surveillance monitoring, and strict adherence to Transportation Worker Identification Credential (TWIC) requirements for all personnel accessing these areas. Compliance with TWIC regulations ensures that only properly vetted individuals are permitted entry, maintaining the integrity and security of critical infrastructure within the facility.

1.3 Emergency Notification Systems

The Equistar Channelview Complex utilizes three systems for emergency notification:

a) The Plant Emergency Notification System consists of emergency air horns/speakers activated by the Security Operations Communication Center or by a portable transmitting unit. When triggered, the security dispatcher announces the type of emergency and the affected zone. This system is tested weekly to ensure functionality and reliability.

b) The Community Alert System is designed to warn neighboring communities of potential hazards resulting from plant upsets. It includes perimeter sirens and the Community Awareness and Emergency Response (CAER) Line. These sirens are tested monthly to maintain operational readiness.

c) The ENotify System is a secure, contracted service to provide email and text message alerts to the Harris County Office of Homeland Security & Emergency Management in the event of a plant incident. The Security

Operations Communication Center or authorized personnel can activate this system through a secure server using login credentials. The ENotify System also supports direct community notification via automated phone messaging. It is routinely used for incidents that may draw public attention, such as smoke from fire training or external ambulance transports, and is tested annually through simulated community alert drills. This system is tested weekly to ensure functionality and reliability.

1.4 Communication

The Channelview Complex maintains multiple communication systems to ensure reliable coordination during normal operations and emergencies. Each operating unit and department is equipped with portable radios for internal communication, and these systems are maintained by the facility's Radio Shop. The site uses a combination of radio technologies, including digital trunked, UHF, and VHF systems, to support operational and emergency communications. Preventive maintenance and routine testing are conducted to ensure all equipment remains in good working order.

For external coordination, radios are available for communication with mutual aid organizations and marine response agencies when required. In addition to radios, the facility utilizes mobile phones, land-line phones, email, and a public address system to disseminate notifications and maintain communication with personnel, vessels, and emergency responders. Backup power sources are in place to ensure communication systems remain operational during outages, and mobile phones serve as an alternate communication method if primary systems fail.

Emergency response personnel can also be contacted through pagers or cell phones. In the event of an emergency, designated security personnel can initiate notifications to key personnel using these systems, which are tested regularly to ensure readiness.

Section 1.0 of the Channelview Complex Emergency Action Plan contains telephone numbers for additional resources and regulatory agencies and is available to all site personnel via the company's intranet web site.

2.0 ACCESS CONTROLS

The Channelview Complex maintains strict access control measures to protect the facility and its operations. The site is enclosed by a secure perimeter consisting of chain-link fencing topped with barbed wire, reinforced with additional barriers at strategic locations. Certain areas include supplemental barricades and structural reinforcements to prevent unauthorized vehicle access.

2.1 Barrier Controls

All perimeter gates remain locked unless actively monitored by security personnel or controlled through electronic access systems. Manual and motorized gates meet corporate security standards and are inspected regularly to ensure integrity.

2.2 Entrance Controls

All perimeter gates remain locked unless actively monitored by security personnel or controlled through electronic access systems. Manual and motorized gates meet corporate security standards and are inspected regularly to ensure integrity.

3.0 WARNING SIGNS

Access to the facility is limited to designated entry points equipped with electronic card readers or staffed by uniformed security officers. Identification badges are required for all employees and contractors, and visitors must check in at a designated security checkpoint, present valid government-issued identification, and complete orientation requirements before entry. Drivers making deliveries must provide proper documentation and identification, and all vehicles and personnel are subject to screening in accordance with applicable security directives.

Security signage is posted at all active access points and along the facility perimeter to provide clear warnings and regulatory information. At entry points, signs display the current MARSEC Level and state that entering the facility constitutes valid consent to screening or inspection. Failure to consent will result in denial or revocation of access. Additional signage at Restricted Areas indicates that unauthorized presence constitutes a breach of security, while Secure Areas require a Transportation Worker Identification Credential (TWIC) for unescorted access; non-TWIC holders must be escorted.

Perimeter signage, visible from a distance of 25 feet) is posted at entrances and along the perimeter in sufficient numbers to be seen from any approach, includes bilingual warnings such as:

- DANGER – Unauthorized Personnel Keep Out
- PELIGRO – Personas No Autorizadas Manténganse Afuera
- Private Property – No Trespassing

These signs are positioned for maximum visibility and are legible from a safe distance to ensure they can be easily observed from any normal approach to the facility.

SECTION III.D.

INSPECTION PLAN

INSPECTION PLAN

1.0 INTRODUCTION

The purpose of the Inspection Plan is to provide for the adequate inspection of all hazardous waste management units at the Channelview Complex. The Channelview Complex operates and inspects various hazardous waste management units as identified in Table III-2 of the Part A permit application.

The inspections of the hazardous waste management units, as well as associated safety, security and emergency equipment, will be conducted on a frequency sufficient to identify problems or potential problems. These units and pieces of equipment, as well as the frequency of inspection are listed on Table III.D. The inspection schedule will be maintained at the facility and will be updated accordingly to reflect changes in the facility's operations and equipment. All hazardous waste management unit inspection forms will be retained at the Channelview Complex for a minimum of three years.

2.0 SPECIFIC INSPECTION REQUIREMENTS

Trained personnel will conduct the inspections with observations recorded on appropriate inspection forms. The inspector's name, as well as the time, dates and frequency of the inspection will be documented on the inspection form. Any operational deficiencies identified during the inspection will also be noted on the inspection form. Any deficiency or malfunction of equipment or structures, which the inspection may reveal, will be remedied in a timely manner to prevent environmental and/or human health hazard. Any deficiencies noted during the inspection will be re-inspected to ensure corrective actions have been satisfactorily completed. Examples inspection reports are provided in Attachment A.

2.1 Container Storage Area

Prior to any waste being received at the Container Storage Area (CSA), a "Tracking Number" must be obtained from the Environmental Department. The "Tracking Number" serves to track the waste from its generation to either its onsite treatment or transportation offsite for disposal. An electronic recordkeeping system is used to record the individual "Tracking Number" as they are issued, along with recording specific information regarding the waste being sent to the CSA. Information includes, among other items, a description of the type of waste, quantity of waste being sent to the Container Storage Area, the production unit that generated the material, and the date the "Tracking Number" is issued.

All containers in the CSA will be inspected on a weekly basis. As a part of the inspection, all containers are inventoried, inspected to determine if any containers show signs of deterioration, or are leaking due to deterioration, or other factors. The containers will also be inspected to ensure they are properly labeled and sealed as well as to ensure they are properly segregated in their respective designated areas.

As waste is scheduled for disposal, information from the electronic recordkeeping system is moved and re-recorded onto a disposal recordkeeping system. Additional information required for disposal is recorded, such as manifest number, as well as identification of transporter and disposal facility that will be utilized. This system allows for tracking of the waste removed from the CSA.

2.2 Tank Systems

RCRA-permitted tank systems will be inspected at least once every day for evidence of discharge or threat of discharge, and/or deterioration that could result in air pollutant emissions. The tank system includes the aboveground portions of the tank, secondary containment, piping, and ancillary equipment. Monitoring data and overfill control equipment will also be inspected for any signs of malfunction. Each of the tanks is equipped with either a double bottom, or "port-holes" to visually inspect for bottom leaks for API type tanks, or pressure-regulating systems for pressure tanks. These pressure systems are included as part of the inspection. Records of the inspections are maintained that include a unique tank system identification, the date that each inspection is conducted, and specific information regarding any defects detected (i.e., location and description of defect, date of detection, and corrective action to mitigate defect).

In addition to the above inspections, the internal floating roof components of fixed roof tanks that have such components will also be inspected at least once every 12 months. The internal floating roof, primary seal, secondary seal (if one is in service), gaskets, slotted membranes, and sleeve seals (if any) will be visually inspected each time the tank is emptied and degassed, and at least once every 10 years. Alternatively, for an internal floating roof equipped with two continuous seals mounted one above the other, the internal floating roof, primary and secondary seals, gaskets, slotted membranes, and sleeve seals (if any) may be inspected each time the tank is emptied and degassed and at least every 5 years. Appropriate notifications will be made to the Regional Administrator prior to each of these particular inspections, as required.

In addition to the above inspections, the air emission control equipment associated with fixed roof tanks that are vented through a closed-vent system to a control device will be also be inspected annually.

If a tank system is found to be leaking or unfit for use, it will be removed from service. The system, containment, or component will remain out of service until the necessary repairs or replacement can be accomplished. Appropriate notifications will be made in accordance with 40 CFR 264.196(d). The facility will implement response to leaks and spills in accordance with the Contingency Plan included in Section III.E. Tank Components found to be leaking during testing will be replaced and/or repaired.

The facility performs emergency drills and training on an annual and quarterly basis in addition to a testing and inspection schedule. This ensures facility communications or alarm systems, fire protection equipment, spill control equipment, and decontamination equipment, are tested and maintained as necessary to ensure its proper operation in time of emergency in compliance with 40 CFR 264.33.

None of the hazardous waste tanks are in contact with soil; there, cathodic protection is not required in accordance with 40 CFR 264.192(a)(3).

Until all required secondary containment systems are installed, any existing tank system without secondary containment will have an annual leak test, internal inspection and/or tank integrity assessment completed by an independent registered professional engineer. These checks will address cracks, leaks, corrosion, and erosion.

The facility will maintain a record of assessment and inspection results of secondary

containments in accordance with 40 CFR 264.193(i)(4).

ATTACHMENT A: EXAMPLE INSPECTION FORMS

LyondellBasell Channelview		
WEEKLY WASTE CONTAINER STORAGE AREA INSPECTION		
Date:		
Time:		
Inspector (Legible Signature):		
W.M.U. Number:	**Yes**	**No**
Container Condition and Compatibility 40 CFR 264.171 and 264.172		
Are containers in good condition?		
Is container made of a material that will not react with the waste which is stored?		
Are all containers securely closed?		
Container Arrangement		
Is aisle space sufficient (18") for inspection of all containers? **40 CFR 264.35**		
For stacked containers on pallets, are containers stacked no more than two high?		
Can emergency equipment access the area? **40 CFR 264.35**		
Management of Containers 40 CFR 264.173		
Is container always closed while holding hazardous waste?		
Is container not opened, handled, or stored in a manner which may rupture it or cause it to leak?		
Is the container properly labelled? **40 CFR 262.31, 262.32 and 262.34**		
Does the container have an internal tracking number written on it?		
Containment 40 CFR 264.175		
Is there any accumulated precipitation or evidence of leaks and spills?		
Are the floor and containment free from cracks or other deficiencies?		
Is the drain valve locked in a closed position?		
Ignitable and Reactive Waste 40 CFR 264.176		
Are containers holding ignitable and reactive waste located at least 50 feet from facility property lines?		
Incompatible Waste 40 CFR 264.177		
Are incompatible wastes or materials not placed in the same containers?		
Are incompatible hazardous wastes separated from each other by a berm, dike, wall, or other device?		
Inspections 40 CFR 264.174		
Are containers inspected at least weekly for leaks and deterioration?		
Is the area free from evidence of leaks and spills?		

Preparedness and Prevention - Emergency Equipment 40 CFR 264.32 and 264.34		
Is the emergency and spill response equipment area fully stocked?		
Is a communication device available and functioning?		
Number of Containers/Roll-offs in Permitted CSA Permit Number 50117		
What is the total number of containers in the CSA and note any roll-offs in permitted area adjacent to CSA	**# Containers**	**# Roll-offs**

If NO, describe in the space below

Date Problem Found	Description of Problem	Action Taken to Correct	Date Problem Corrected	Inspector's Signature of Corrective Action Verification

TANK Name:_____

Date	Name of Person Completing the Inspection	Tank Level	Evidence of Leak at Transfer Line to Loading Rack? Check for leaks and defects on all ancillary piping equipment (i.e., piping, stationary, mechanical, rotating, and IEA equipment)	Evidence of Spills for Loading/ Unloading? Check for leaks and defects on all ancillary piping equipment (i.e., piping, stationary, mechanical, rotating, and IEA equipment)	Evidence of Inner Tank Leak? Check bleed between tank walls for liquids.	Evidence of Tank Base Leak? Check bleed under Tank base for liquids.	Evidence of any cracks, leaks, discoloration, bubbling, or peeling of the paint? Check all ancillary equipment (i.e., piping, vessels, stationary equipment)	Evidence of leaks on any lines? Check for leaks and defects on all ancillary equipment (i.e., piping, stationary, mechanical, rotating and IEA equipment)	Is the NFPA labeling in good condition? Must state that it is hazardous waste and have the equipment number visible.	Time Inspection was completed in military time	Were corrective actions necessary?	Action competed	Verified by? Signature and date

Report any defects, malfunctions, and alarms to Environmental, Specialists and EPCs.

Example Tank Inspection Form

RCRA HAZARDOUS WASTE < 90 DAY ACCUMULATION AREA
WEEKLY INSPECTION LOG (40 CFR 265.174)

Plant: _____ **Storage Location:** _____ **Date In:** _____

Contents: _____ **Box Make & Number:** _____

Date Shipped: _____ **TSDF:** _____ **89th Day:** _____

Week	1	2	3	4	5	6	7	8	9	10	11	12	89th Day
Date & Time													
W.M.U. Number													
Name													
Signature													
Is the container closed or covered?													
Is container free of leaks and in good condition?													
Is the container properly labeled?**													

**Needs a Hazardous Waste Label, Accumulation Start Date on Label, and Proper DOT name or Common Waste Name on Label.

Corrective Actions:

Date Problem Found	Corrective Action	Date Problem Corrected	Inspector's Signature

VOC Readings (40 CFR 265 Subpart CC) - Required one time after box has VOC waste in it.

Date	Technician	PPM Results	Corrective Action	Corrective Reading and Date

SECTION III.E

CONTINGENCY PLAN

Brown AND Caldwell

CONTINGENCY PLAN

1.0 INTRODUCTION

The Contingency Plan (the plan) has been written to meet the regulatory requirements of 40 CFR 264 Subpart C (Preparedness and Prevention) and Subpart D (Contingency Plan and Emergency Procedures). The provisions of the Plan must be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents from onsite hazardous waste management units which could threaten human health or the environment.

2.0 FACILITY DESCRIPTION

The Channelview Complex is located in Harris County, Texas, approximately six miles north of Interstate Highway 10 on Sheldon Road, and approximately 15 miles east of downtown Houston. The facility generates hazardous waste as a result of its chemical manufacturing processes. The facility owner/operator and mailing address are as follows:

Equistar Chemicals, LP
8280 Sheldon Road
Post Office Box 777
Channelview, Texas 77530
Telephone: (281) 862-4000

Location maps for the Channelview Complex can be found in Attachment B of the Part A permit application.

2.1 Hazardous Wastes

The Channelview Complex generates a variety of hazardous wastes, which are summarized in Table IV.B of the Waste Analysis Plan.

2.2 Hazardous Waste Management Units

The various hazardous waste management units used to manage these wastes are summarized in Table III-2 of the Part A permit application. The types of hazardous waste management units include a container storage area, tanks, and surface impoundments. Each type of unit has built-in features, structures, and equipment to minimize releases and facilitate response activities. A brief description by type of unit is provided below.

2.2.1 Container Storage Area

The Container Storage Area (CSA) consists of a three-sided steel building with an adjacent uncovered section. Both the covered and uncovered sections were constructed with a concrete floor and surrounding concrete dikes. The covered portion has sufficient curbed capacity to contain the volume of the largest container. The uncovered section has sufficient curbed capacity to contain the volume of the largest container plus stormwater from the 24 hour 25 year rainfall event. Waste stored in the CSA may be containerized in either drums or large rolloff bins. The CSA is inspected as described in the Inspection Plan (Section 3 of the Part B permit application). The types of wastes that can be stored at the CSA are summarized in Table IV.B of the Waste Analysis Plan. Ignitable and reactive wastes are stored in such a manner that is protected from any material or condition that may cause the waste to ignite or react. Emergency equipment in the vicinity of the CSA is shown on Figure III.E.1.

2.2.2 Tanks

Tanks are utilized to store hazardous wastes throughout the facility. The specific tanks are listed in Table III-2 of the Part A permit application. To provide for spills or structural failure, tanks are equipped with either secondary containment or are double-walled (See Engineering Sections for specifications for each tank). Each containment system has been designed to hold the volume of the respective tank plus stormwater from the 24 hour 25 year rainfall event.

Tanks have overfill prevention controls consisting of high-level alarms. The leak-detection system is designed and operated to detect the failure of either the primary or secondary containment structure or presence of any release of hazardous waste or accumulated lique in the secondary containment system within 24 hours. Spilled or leaked waste and accumulated precipitation are removed from the secondary containment system within 24 hours, or in as timely a manner as is possible to prevent harm to human health and the environment.

Tank systems are inspected as described in the Inspection Plan (Section 3 of the Part B permit application). The type of waste stored in each tank is provided in Table IV.B of the Waste Analysis Plan. Emergency equipment in the vicinity of each tank is shown on Figure III.E.1.

2.2.3 Tank Cars

In accordance with 40 CFR 270.14(b)(8)(i-iv), prior to loading/unloading operations, the tank car/truck is spotted in appropriate location and then secured by setting the brake and/or chocking the wheels in both directions. The tank car driver is instructed to shut off motor and electrical equipment. A loading rack operator is present within 25 feet of the vehicle during the entire loading/unloading operation and also wears an instrinsically safe plant communication radio during the loading/unloading activiites. A complete visual inspection of the tank and car/truck is performed to identify defects. A written inspection report is completed. The tank car/truck is not allowed to leave the spotted location until all disconnections have been made. All drains and outlets are cheked for leakage and all openings secured prior to releasing the

car/truck. The tanks have secondary containment systems constructed to be capable of containing material so that any discharge will not escape the containment to other areas of the facility or facility's water supply before cleanup occurs. In case of equipment failure or power outages, tank levels are monitored through direct-vision gauges and manual flow cut-off is implemented.

3.0 EMERGENCY EQUIPMENT

Onsite emergency response resources include both fixed fire protection equipment as well as mobile fire and first aid equipment. A list of both the various fire protection equipment (e.g. water storage tanks, water pumps, hydrants, deluge systems, fire extinguishers, etc.) and the various mobile equipment (e.g., command van, foam truck, rescue truck, and ambulance) available for emergency response are included in Table III.E.3. A map showing emergency equipment locations can be found as Figure III.E.1.

Maintenance of the emergency equipment is part of the facility overall preventative maintenance program. The facility program is set up to follow the specific manufacturer recommended maintenance program. A computer-based system is used to automatically schedule the maintenance.

4.0 EMERGENCY OPERATIONS

The Incident Commander (IC) is responsible for coordinating all emergency response measures during implementation of the Plan, and has been given authority to commit resources necessary to implement the Plan. The IC is familiar with the facility layout, records, operations, support staff and available resources. While the IC may delegate tasks and assignments as appropriate, the IC retains full responsibility for implementation of the Plan.

Within the Plan, the term IC refers to either the primary IC or any duly authorized alternate. Table III.E.2 includes the role and telephone numbers of the primary IC.

The IC will be the acting on scene person that will be responsible for responding and coodinating emergency response measures.

5.0 EMERGENCY PROCEDURES

5.1 REPORTING AN EMERGENCY

Facility personnel handling hazardous waste have access to internal alarm or emergency communications devices in accordance with 40 CFR 264.34. Facility personnel report an emergency by dialing extension 8911 or contacting the Main Gate on CVO OPs frequency and providing the Security Officer their name, the type of emergency, the effected zone(s) and the exact location. The Security Officer will then activate the Channelview Emergency Notification System, and send the proper notifications via E-Notify to the local athorties and neighboring facilities. Per 40 CFR 264.56(d)(2), the Emergency Coordinator must immediately notify the

government official designated as the on-scene coordinator for that geographical area or the the National Response Center and report 40 CFR 264.56(d)(2)(i)-(vi). Since the EPA has not defined immediate action, or set a time frame, the extent of the response will be determined by the emergency coordinator (on-scene IC) responding to the release, fire, or explosiion. The response will not exceed 4 hours.

5.1.1 Emergency Zones

The large area covered by the Channelview Complex allows for zoning into ten separate Emergency zones. Zones 1–4, 11 and 12 cover the Equistar Channelview site and Zones 5-10 and 13 are not specific to the Equistar Channelview site but are still supported under Equistar Emergency procedures.

Each zone is described as follows:

ZONE 1	All areas East of 4th Street in CVO North including PMDI area.
ZONE 2	All areas East of 8th Street and West of 4th Street and North of the Rail Road tracks.
ZONE 3	All areas West of 8th Street and East of Sheldon Road, bounded on the South by Avenue "E".
ZONE 4	All areas South of Avenue "E" and North of Wallisville Road.
ZONE 5	Off –site Terminal Facility in Mont Belvieu Tx
ZONE 6	North Cogeneration Facility
ZONE 7	All areas from the East fence line at Ave. A west to Ave. C and South from 1st street to the backside of the Deep Well Area and Barge Dock. This zone also covers the CVOS Central Control Room.
ZONE 8	All area from Ave C west to Ave E and along the Cogen easement and south from 1st street to the backside of the Land Farm.
ZONE 9	All area from the west of Ave. E to Sehldon Road from the main entrance road southward to POSM II metering skid and Service Center.
ZONE 10	Houston Technology Center located North of Channelview Complex.
ZONE 11	This area includes all non-MTSA areas at the new complex to include the CVON Administration building, Gymnasium, CVO Central Warehouse, employee/visitor parking at the CVON Admin building, and clubhouse.
ZONE 12	Areas include the North Campus Central Control Room, Crane & Rigging, Auto Shop, Maintenance Shops, and east of Zone 1.
ZONE 13	Area includes POTBA.

5.1.2 Emergency Notification (alarms)

The Channelview Plant is equipped with an emergency alarm and emergency information broadcast system that will alert and notify employees of an emergency situation in the operating areas and all buildings within the boundary of the plant.

5.1.3 Emergency Broadcasts

The Comms Center will record the incoming information from the individual reporting the emergency and begin the notification and communication process to the CVO facility. Emergency information will be broadcast over all Building PA systems, Whelen systems, and CVO Radios.

After the alarm tone has ended, a voice message will broadcast simultaneously through the loud speakers and plant radios. Plant radios will emit a loud tone prior to the broadcast message.

5.1.4 Emergency Alarm Types And Tones

Fire or Gas Release

This alarm is called the "Whelen Tone". This continuous tone has duration of 20 seconds followed by a 5 second wind down.

Evacuation

This alarm is called the "HiLo Tone". This alternating hilo tone has a duration of 20 seconds followed by a 5 second wind down.

All Clear

This alarm is called the “Air Horn Tone.” This pulsing low pitch tone has duration of 20 seconds followed by a 5-second wind down.

In Plant Alarm Test

The fire or gas release alarm, evacuation alarms, and all clear signal are tested each Wednesday at noon.

Community Alert System

This alarm is called the “Whip Tone.” This multiple, low to hi intensity sound has a duration of 20 seconds followed by a 5 second wind down.

Community Alert Test

The community alert alarm is tested on the first day of each month. Prior to the test an announcement shall be made stating: This is a test of the Community Alert Sirens.

5.1.5 Mobile Notification System

Depending on the response needed notification of off- site personnel can be made via text messages to Emergency Responders mobile devices.

The text message will be sent out identifying the type, level and location of the emergency.

Level 1 - This level of the emergency is being handled by emergency response personnel on duty. This level of notification will only be received by selected page group member's mobile devices. (Managers, Safety Personnel…)

Level 2 - The emergency may affect another Zone; be visible to the public, exceed Channelview's property line, or require additional support. Security will send out the notification and communications process by initiating the ERT notification paging system or when requested by the IC.

Level 3 - The emergency has exceeded Channelview's property or the magnitude of the emergency requires all support personnel to respond. The text notification will be received by all page groups.

5.1.6 Radio Communications

When the Emergency Notification System is activated, multiple radio channels can be utilized by the Responders and Emergency Operations Center (EOC).

5.2 EMERGENCY OPERATIONS CENTER

The EOC is the location from which primary support activities are performed. The Primary EOC is located in the Health & Safety Building in Zone 1 with alternate EOC locations at the Houston Engineering Center (HEC). The EOC is designed to support the IC and response activities that are occurring in the field during an emergency event. The EOC provides strategic management and support to the IC. The EOC organization is included in Figure III.E.2.

The Incident Command Post is the location near the emergency scene staffed by the IC and associated staff from which all emergency control activities are coordinated. The Command Van is staged at the Command Post to provide communications equipment, resource information, lighting, and space for the Command Post staff. All incident operations are directed from the Command Post.

5.3 DETERMINATION OF THE CHARACTER, SOURCE, AMOUNT, AND EXTENT OF RELEASE

The IC response objectives are based on the following priorities: Live safety, incident containment and stabilization, and Environmental Impact and Asset protection. The IC will immediately begin to identify strategies and tactics to accomplish these objectives. They will identify the character, source, amount, and extent of any released material. This determination may be made by visual inspection, communications with emergency response team members,

review of facility records (e.g., engineering drawings, chemical analyses, Safety Data Sheets (SDSs), etc.), and/or any other available sources of information. Once the materials have been identified and the assessment is substantially complete, the IC will determine whether there are any onsite and/or offsite hazards from the release. The facility operations and technical support staff will provide information as needed to assist the IC in determining any potential hazards.

5.4 EMERGENCY PROCEDURES

During an emergency, all reasonable efforts will be taken to ensure that the situation does not recur or spread to other areas of the facility. The measures may involve shutdown of equipment, units, isolating tanks, removing wastes or transferring wastes to other tanks or containers. If the facility has to shutdown operation of the units, supervisory and other key personnel may be deployed to monitor for and report any leaks, pressure buildup, gas generation, or ruptures in process or containment systems.

The general procedures mentioned above apply to all areas of the facility. Containment/control procedures specific to each type of hazardous waste management unit are detailed below.

5.4.1 Human Health and Environmental Impact Determination

In case of an emergency involving a release, fire, or explosion, the IC will immediately assess all possible hazards to human health and/or the environment per 40 CFR 256. Direct and indirect effects resulting from any toxic, irritating, or asphyxiating gases, or hazards associated with surface water run-off, or chemical agents used in controlling explosions, as well as any other conditions that may arise from the emergency will be assessed. The IC will use the procedures outlined in Sections 5.3 and 5.4, as well as general facility knowledge to ensure that the requirements will be met.

5.4.2 Container Storage Area

The Container Storage Area (CSA) is designed for the management of a maximum of 1,130 (55-gallon) drums, or 800 drums plus 3 roll-offs, or a combination thereof, for a maximum capacity of 62,150 gallons. Additional information regarding the CSA dimensions and capacities can be found in the CSA Engineering Report (Section 5 of the Part B permit application).

Spills or Leaks

Minor spills or releases from the CSA would be contained within the secondary containment system and would be cleaned up by the application of an absorbent. The absorbent would then be containerized and properly disposed.

Major spills would also be contained within the secondary containment system and picked up by vacuum truck or pumps, re-containerized in either drums or roll off bins and transported offsite for treatment/disposal. Following removal of the spilled material, the containment slab will be washed. Industrial detergents will be used if necessary. The wash water will be collected and

removed for either onsite treatment in the facility waste treatment system or transported offsite for treatment/disposal.

Fire or Explosion

Any fire or explosion would receive immediate response from the emergency response team. Portable fire extinguishers, fixed fire protection equipment and/or mobile firefighting equipment would be used as needed to contain and control the release. Additional outside resources would also be called as needed to assist in controlling the release.

5.4.3 Tanks

Emergency response activities for all tanks are covered below while tank specific information is discussed in individual sub-sections.

Spills or Leaks

In accordance with 40 CFR 264.196(a), if a tank system is found to be leaking or unfit for use, the flow of hazardous waste will be stopped and system will be inspected to determine the cause of the release.

In accordance with the requirements of 40 CFR 264.196(b), appropriate measures to remove the waste from the tank system and secondary containment will be taken within 24 hours or a the earlies practicable time as described below:

- Releases from tank system or secondary containment will be picked up by vacuum truck, stored in onsite tanks and transported offsite for treatment / disposal or cleaned up by the application of an absorbent, which would then be containerized and properly disposed.
- Minor spills or releases from these tanks would be contained within the secondary containment system and would be cleaned up by the application of an absorbent. The absorbent would then be containerized and properly disposed.
- Major spills would be contained within the secondary containment system and picked up by vacuum truck or pumps, stored in onsite tanks and transported offsite for treatment/disposal. In the event of a major spill, the immediate area will be evacuated and access limited. In addition, any potential sources of ignition will be eliminated. The IC will determine if extinguishing media should be applied. Following removal of the spilled material, the containment slab will be washed. Industrial detergents will be used if necessary. The wash water will be collected and removed for either onsite treatment in the facility wastewater treatment system or transported offsite for treatment/disposal.
- In addition, inspection and containment of visible releases will be addressed in accordance with 40 CFR 264.19(c) to prevent further migration to soil or surface water. Releases will be picked up by vacuum truck, stored in onsite tanks and transported offsite for treatment/disposal or cleaned up by the application of an absorbent, which would then be containerized and properly disposed.

If a tank system is found to be leaking or unfit for use, it will be removed from service. The system, containment, or component will remain out of service until the necessary repairs or

replacement can be accomplished. Appropriate notifications will be made in accordance with 40 CFR 264.196(d). Tank components found to be leaking during testing will be replaced and/or repaired.

In addition, no tank systems will remain open or be re-opened after a leak has been discovered until the facility satisfies the requirements of 40 CFR 264.196(e)(2-4). The facility will make repairs and remove waste as needed before returning the tanks to service. The facility will also not return a tank system to service until a qualified Professional Engineer certifies the repaired system is capable of handling hazardous wastes without future release for the intended life of the system in accordance with 40 CFR 264.196(f).

Fire or Explosion

Any fire or explosion would receive immediate response from the emergency response team. Portable protection equipment such as foam lines, field monitor systems, hoses, lines and fire extinguishers are provided. Shift and Day Fire and Rescue Teams have been established for the purpose of providing safe and immediate rescue, first aid, and long-term fire protection and prevention. In addition, offsite resources will respond if needed. In the event of a fire or explosion, operators are responsible for shutting down pumps, relieving line pressure, isolating lines to the affected area, and making whatever switches are necessary if the situation allows them to safely do this. If the event occurs at the Barge Dock, the dock attendants block in the necessary valves, notify the appropriate parties involved, and have the vessel shut down transfer operations if necessary.

5.4.4 Miscellaneous Hydrocarbon Tanks Associated with On-site Laboratory

The tanks, TK-1101A and TK- 1101B, collect the laboratory miscellaneous waste streams. Additional information regarding tank dimensions and capacities can be found in Table III-2 of the Part A permit application.

The materials stored in these tanks are the various mixtures of liquid hydrocarbons. Additional information regarding the material stored in these tanks can be found in either Table III-1 of the Part A permit application or the waste profiles kept onsite in the facility files. In accordance with the requirements of 40 CFR 264.198.1.2, ignitable or reactive waste is stored in such a way that it is protected from any material or condition that may cause the waste to ignite or react. In addition, Tanks 1101 A and 1101B are equipped with a flame arrester.

5.4.5 Waste Caustic Tanks

Waste caustic is stored in Tanks TK-3455, TK-4455, and D-4383. Additional information regarding tank dimensions and capacities can be found in Table III-2 of the Part A permit application.

The wastes in these tanks are primarily aqueous but may also contain sulfide (TK-3455, TK-4455, and D-4383) and benzene (TK-3455 and TK-4455). Additional information regarding the material stored in these tanks can be found in Table III. 1 of the Part A permit application.

5.5 REGULATORY AGENCY NOTIFICATIONS

Per 40 CFR 264.56(d)(2), the IC must immediately notify the government official designated as the on-scene coordinator for that geographical area or the National response Center and report 40 CFR 264.56(d)(2)(i)-(vi). Since EPA has not defined immediate, the time frame and extent of the response will be determined by the IC (incident on-scene commander) responding to the release, fire, or explosion. Should notifications be required, the IC will utilize Figure III.E.3 for the appropriate telephone numbers that are included in Table III.E.5.

If any of the hazardous waste tanks systems are in need of major repairs (as defined in 40 CFR 264.196(f)), the tank system(s) will not be returned to service unless a certification has been obtained from an independent, qualified, registered, professional engineer in accordance with 40 CFR 270.11(d). This certification will be submitted to the TCEQ Executive Director within seven (7) days after returning the tank system to use.

5.6 COMMUNITY ALERT

If there is an Emergency Action at this facility, the IC’s responsibility is to advise Harris County Office of Emergency Management (HCOEM) of the potential hazards and the possibility of the public being affected. The Community Alert System is owned and operated by the Channelview facility but will only be activated when instructed by the Harris County Office of Emergency Management.

5.7 FACILITY EVACUATION

Should a release occur that requires evacuation of the facility, the IC will initiate the evacuation alarm. This alarm is called the "Hi-Lo Tone". This alternating hi-lo tone has duration of 20 seconds followed by a 5-second wind down.

When this alarm is sounded, all activity must cease. All non-essential personnel shall exit by the designated safe route to the assembly area, identified as Rally Point. Evacuation signs have been placed around the facility to direct personnel to the rally points. Pre-designated operations personnel will remain in the area and conduct the Emergency 5-7 Minute Shut-Down Procedures when directed by the IC. All affected personnel will assemble at their assigned area and wait for further instructions or until the all clear signal is given.

5.8 CLEANUP MEASURES

During or immediately after an emergency, the IC will provide for cleanup, treating, storing, or disposing of all spilled released waste and contaminated soil or water. The IC will ensure that in the affected area(s) of the facility:

Any waste material placed in drums will be transferred from the point of generation to the Container Storage Area (CSA). The material will remain in the CSA until waste characterization, transportation, and disposal arrangements have been completed. Any waste material in a roll off container will also be transferred from the point of generation to the CSA.

The majority of hazardous waste generated at the facility are either ignitable or TCLP toxic. The only incompatible material generated onsite are small quantities of reactive waste. Any reactive material generated from a release will be collected and containerized separately from any other waste. The reactive material will also be stored in an adjacent but separate area within the CSA. Ignitable or reactive waste is stored in such a way that is protected from any material or condition that may cause the waste to ignite or react.

All waste will then be evaluated for the following:

- wastewater streams will be evaluated for treatment in the facility main wastewater treatment system permitted under the Clean Water Act;
- hydrocarbon streams will be evaluated for either combustion in the industrial boilers or reuse in the manufacturing process; and/or,
- any waste material that cannot be returned to either the wastewater treatment system or manufacturing process will be sent offsite to a commercial treatment/disposal facility.

Emergency equipment listed in the contingency plan will be cleaned and fit for its intended use before being returned to service. Emergency equipment requiring decontamination will be taken to the facility onsite heat exchanger bundle cleaning area. This is a concrete lined and curbed area with high pressure water system normally used to clean heat exchanger bundles but is also used to clean other facility equipment as needed. The area has a concrete sump where the waste can be held until it is evaluated as described above.

5.9 ARRANGEMENTS WITH LOCAL AUTHORITIES

The Channelview Complex is structured to handle most emergencies that may arise by utilizing onsite Emergency response Teams trained in fire, HAZMAT, Medical and Rescue. However, in the event that an emergency is outside of the capabilities of the facility, a listing of outside emergency resources is provided in Table III.E.4.

To make sure local police, fire departments, and emergency response teams are familiar with hazards, facility layout and evacuation routes, the Channelview Complex sends letters requesting they attend CEMA and LEPC meetings in accordance with 40 CFR 264.37(a)(1).

5.10 RECORDKEEPING AND REPORTING

The facility will note in the operating record the time, date, and details of any incident that requires implementing the Plan. Within 15 days after the incident, a written report will be submitted to the TCEQ Executive Director and the TCEQ Regional Office. The report will include the following:

- Name, address, and telephone number of the owner or operator;
- Name, address, and telephone number of the facility;
- Date, time, and type of incident (e.g., fire, explosion);
- Name and quantity of material involved;
- The extent of injuries, if any;
- An assessment of actual or potential hazards to human health or the environment, where this is applicable; and
- Estimated quantity and disposition of recovered material that resulted from the incident.

6.0 COPIES AND AMENDMENT OF THE CONTINGENCY PLAN

Copies of the Contingency Plan must be submitted to all local fire departments, police departments, hospitals, and State and local emergency response teams. The Contingency Plan will be reviewed and amended, if necessary whenever:

- The facility permit is revised;
- The plan fails in an emergency;
- The facility changes in design, construction, operation, maintenance, or if other circumstances materially increase the potential for fires, explosions, or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in any emergency;
- The list of emergency coordinators changes;
- The list of emergency equipment changes significantly; and/or
- Applicable regulatory changes necessitate revision.

Whenever the plan is amended the applicable local authorities and emergency response agencies will be notified and a copy of the changes will be offered.

TABLE III.E.1. - ARRANGEMENTS WITH LOCAL AUTHORITIES

Police: Harris County Sheriff Department	
Address: 14350 Wallisville Road, Houston, TX 77049	
Person Contacted: Communication Division	Phone: (346) 286-1750
Fire: Channel Industries Mutual Aid (CIMA)	
1450 East Blvd., Deer Park, TX 77536	
Person contacted: Susan Barnes	Phone: (281) 814-0688
North Channel Local Emergency Planning Commission	
Address: 1301 Mercury Drive, Channelview, TX 77029	
Person Contacted: Lon Squyres	Phone: 832-725-8954
Fire: South Lake Houston EMS	
Address: 14418 Beaumont Highway, Houston, TX 77049	
Person Contacted: Joe Fress	Phone: (281) 459-2807 Cell: (281)459-1277
Hospital: Saint Luke's Patient Medical Center	
Address: 4600 East Sam Houston Parkway, South Pasadena Tx, 77505	
Person contacted: Emergency Room	Phone: (713) 948 7000
Harris County Office of Emergency Management	
Address: 6922 Old Katy Road, Houston, TX 77024	
Person Contacted: Kristina Clarke	Phone: (713) 881-3000

TABLE III.E.2 - PRIMARY INCIDENT COMMANDERS

Name	Address	Phone and/or Pager
A Shift Shift Superintendent	8280 Sheldon Road Channelview, TX 77530	281 452 8358
B Shift Shift Superintendent		281-452-8358
C Shift Shift Superintendent		281-452-8358
D Shift Shift Superintendent		281-452-8358

TABLE III.E.3 EMERGENCY EQUIPMENT (includes but not limited to)

Equipment Identification	Location	Physical Description/ Outline of Capabilities
Fixed Firewater Pumps – North Plant	East Plant Utilities Area; Mid-Plant; OP I; OP II	8 diesel driven and 3 electric driven; each rated at 2,000 gpm or 2,500 gpm at 150 psi; total pumping capacity of 26,000 gpm
Fixed Firewater Pumps – South Plant	POSM I Tank Farm and POSM II Tank Farm	4 diesel driven and 5 electric driven; each rated at 2,500 gpm at 130 psi; total pumping capacity of 22,500 gpm
Fixed Firewater Pumps – C4 Storage	C4 Storage Spheres	2 diesel driven; each rated at 5,000 gpm at 125 psi; total pumping capacity of 10,000 gpm
Firewater Storage – North Plant	Throughout North Plant	6 water storage tanks with total capacity of 6 million gallons
Firewater Storage – South Plant	POSM I Tank Farm and POSM II Tank Farm	2 firewater ponds with total capacity of 4.7 million gallons
Firewater Storage – C4 Storage	C4 Storage Spheres	1 firewater storage tank with capacity of 3 million gallons
Fire Monitors – grade and elevated	Throughout Facility	Minimum flow of 500 gpm
Fire Hydrants, Headers, and Large Manifolds	Throughout Facility	For connection of fire response equipment
Automatic and Manual Deluge/ Water-Spray Systems	Throughout Facility	Fire control, cooling and vapor suppression
Fixed and Semi-Fixed Foam Systems	Throughout Facility	Tank fire suppression
Telephone System	Plant-wide	General and emergency communications
Plant Radio System	Plant-wide	General and emergency communications
Emergency Notification and Public Address System	Plant-wide	Emergency notifications; controlled at Security Communications Center
Portable Fire Extinguisher	Throughout Facility	Incipient fire suppression

Equipment Identification	Location	Physical Description/ Outline of Capabilities
Safety Showers/ Eyewash Stations	Throughout Facility	First aid and emergency decontamination
Spill Response Equipment	Barge Dock and Stores	Spill response; containment and cleanup
Spill Response Boats	Barge Dock	Three spill response boats for deployment of containment and absorbent boom
SCBA	Haz-Mat Trailer	SCBA equipped with 45-minute cylinders for emergency response
Fire Fighting Foam	Fire Station 4 and response apparatus	Fluorinated and Fluorine Free Alcohol resistant firefighting foam
Ambulance	Fire Station 1 (North Plant) and Fire Station 3 (South Plant)	3 ambulances Medic 12 is maintained at Station 1 and is Advanced Life Support (ALS) Capable. Medic 15 is maintained at Station 1 and is Basic Life Support (BLS) capable. Medic 11 is maintained at Station 3 and is ALS capable.
Rescue Truck	Fire Station 1 (North Plant)	1 Rescue Truck carries high angle/confined space rescue equipment, vehicle extrication equipment and is equipped with an onboard generator.
Haz-Mat Truck/Trailer	Fire Station 1 (North Plant)	HazMat 16 is a 28-ft enclosed trailer and 3/4 ton pick-up; this unit carries SCBAs, spare cylinders, chemical protective clothing, decon equipment, plugging/patching equipment, and various hand tools for support of hazardous material response.

Equipment Identification	Location	Physical Description/ Outline of Capabilities
Foam Engine	Fire Station 1 (North Plant) and Fire Station 3 (South Plant)	Engine 12 is maintained at Station 1, is equipped with a 3,000 gpm pump, a 5,000 gpm remote controlled monitor, 1,500 gal of foam, 500 gal of water, 1,600 ft of 6: hose, 500 ft of 3" hose, two 500 gpm portable monitors and one 1,250 gpm portable monitor, and has an onboard PTO driven generator Engine 11 is maintained at Station 4, is equipped with a 3,000 gpm pump, dual remote control 2,000 gpm monitors, 750 gal of water, 1,000 ft of 6" hose, 500 feet of 3" hose, two 500 gpm portable monitors, and one-1,250 gpm portable monitor.
Foam Aerial	Fire Station 2 (South Plant)	Foam Aerial 10 is equipped with a 3,000 gpm pump, 100 foot aerial platform, dual 2,000 gpm remote control monitors on the platform, 500 gallons of foam, 1,000 feet of 6" hose, 200 ft of 3" hose, two 500 gpm portable monitors, and one 1,250 gpm portable monitor; the aerial platform is also equipped with high definition and infrared cameras
Quick Attacks	Fire Station 1 (North Plant)	Quick Attack 12 is equipped with dual remote control 2,000 gpm monitors with one equipped to deploy foam from the 425 foam tank, carries 900 ft of 6" hose, 400 ft of 3" hose, and three 500 gpm portable monitor. Quick Attack 16 is maintained at Station 1, is equipped with a 2,000 gpm monitor and 400 ft of 5" hose.

Equipment Identification	Location	Physical Description/ Outline of Capabilities
Hose Tender	Fire Station 1 (North Plant)	Hose Tender 14 is capable of carrying 3,200 ft of 6" hose when fully loaded.
Foam Tender	Fire Station 2 (South Plant)	Foam Tender 16 is equipped with a 2,000 gpm monitor and carries 2,000 gal of foam.
Breathing Air Truck	Fire Station 1 (North Plant)	Breathing Air 14 is equipped with a 16-cylinder breathing air cascade system, carries at least 30 45-minute SCBA, spare SCBA cylinders, a 6000 watt light tower, and a PTO driven generator.
Command Van	Fire Station 1 (North Plant)	Command Van 14 is maintained Station 1, is equipped with climate controlled office area, and an onboard generator.
Rehab Vans	Fire Station 1 (North Plant) and Fire Station 3 (South Plant)	Rehab 12 is maintained at Station 1 and Rehab 11 is maintained at Station 3. Each unit provides a climate controlled compartment, awning for shade, and chairs for responders to rehabilitate on-scene.
Vacuum Truck	North Plant CSA	Liquids Removal

TABLE III.E.4 - OUTSIDE EMERGENCY RESOURCES

Channel Industries Mutual Aid
281-476-5040 or Dispatch 281-864-4402 or contacted by radio

Channelview Fire Department
16010 Ridlon
Channelview, TX 77530
281-452-5782

North Channel Emergency Medical Services
332 Freeport
Houston, TX 77049
713-637-0900

Harris County Sheriff's Department
1301 Franklin Street
Houston, TX 77002
713-221-6000
911 (Emergencies)

Quantix Transport Services
12214 Aqueduct RD
Houston, TX 77044
832-895-8292

Clean Harbors Environmental
500 Independence Pkwy
Deer Park, TX 77536

Methodist Hospital
4401 Garth Road
Baytown, TX 77521
281-420-8600

Garner Environmental Services
1717 West 13th Street
Pasadena, TX 77536
281-930-1200
800-424-1716

St. Luke’s Patient Medical Center
4600 East Sam Houston Parkway
South Pasadena, TX 77505
713-948-7000 (Emergency Room)

TABLE III.E.5 AGENCY NOTIFICATIONS

Organization	Phone
Texas Commission on Environmental Quality (TCEQ) Region 12 (Houston Office)	(713) 767-3500
Harris County Pollution Control	(713) 920-2831
National Response Center	(800) 424-8802
U. S. Coast Guard	Sector Main Number +1 (281) 464-4800 Sector Command Center (281) 464-4840
LEPC (Harris County Office of Emergency Response)	(832) 725-8954
USEPA Region 6	1-866-EPASPIL (1-866-372-7745)
Texas General Land Office	(800) 998-4456
Railroad Commission of Texas	(512) 463-6788

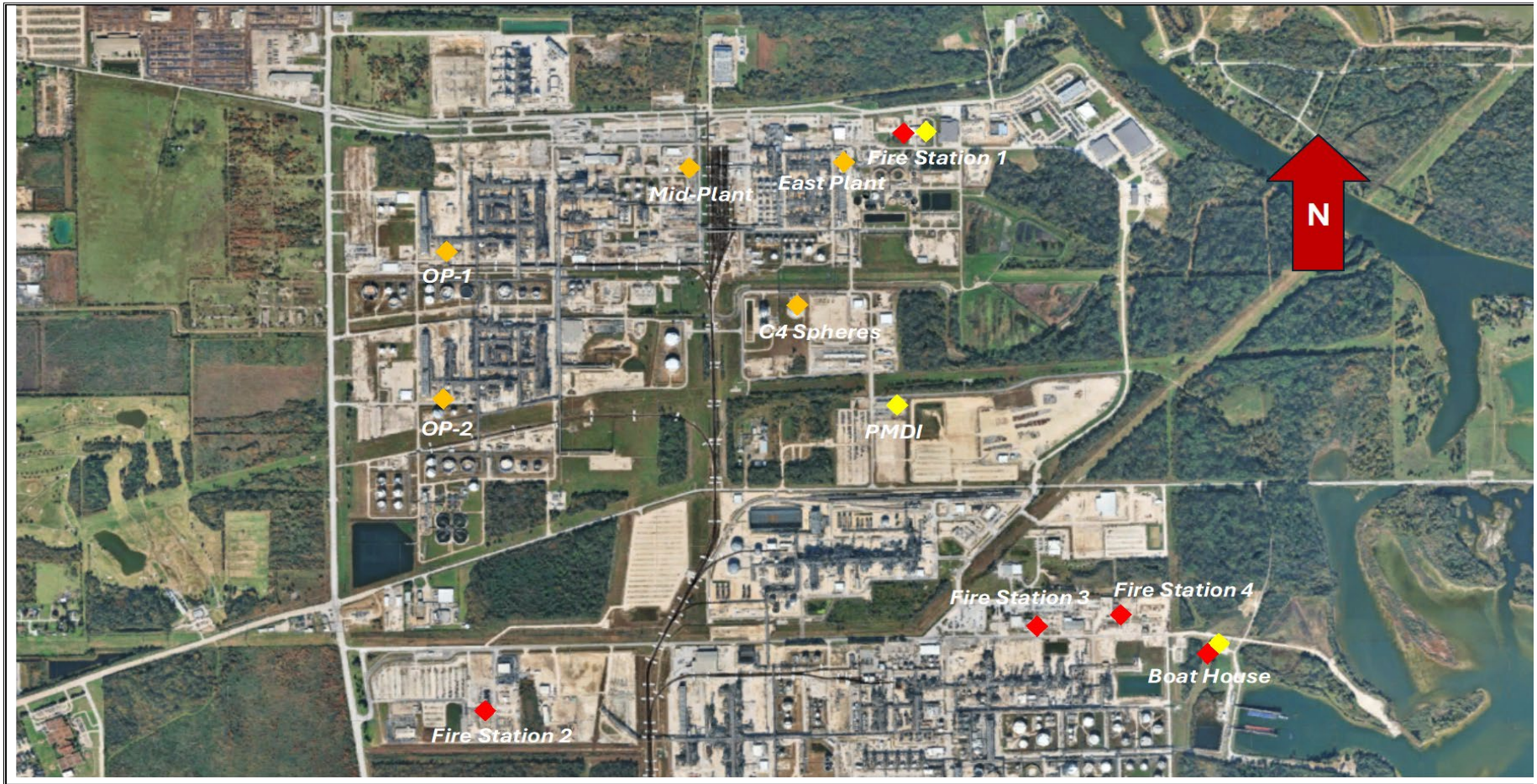


Figure III.E.1
Facility Map of Emergency Equipment Locations

Equistar Chemicals, L.P.
Channelview, TX

FIGURE III.E.3.2 - EMERGENCY OPERATIONS CENTER

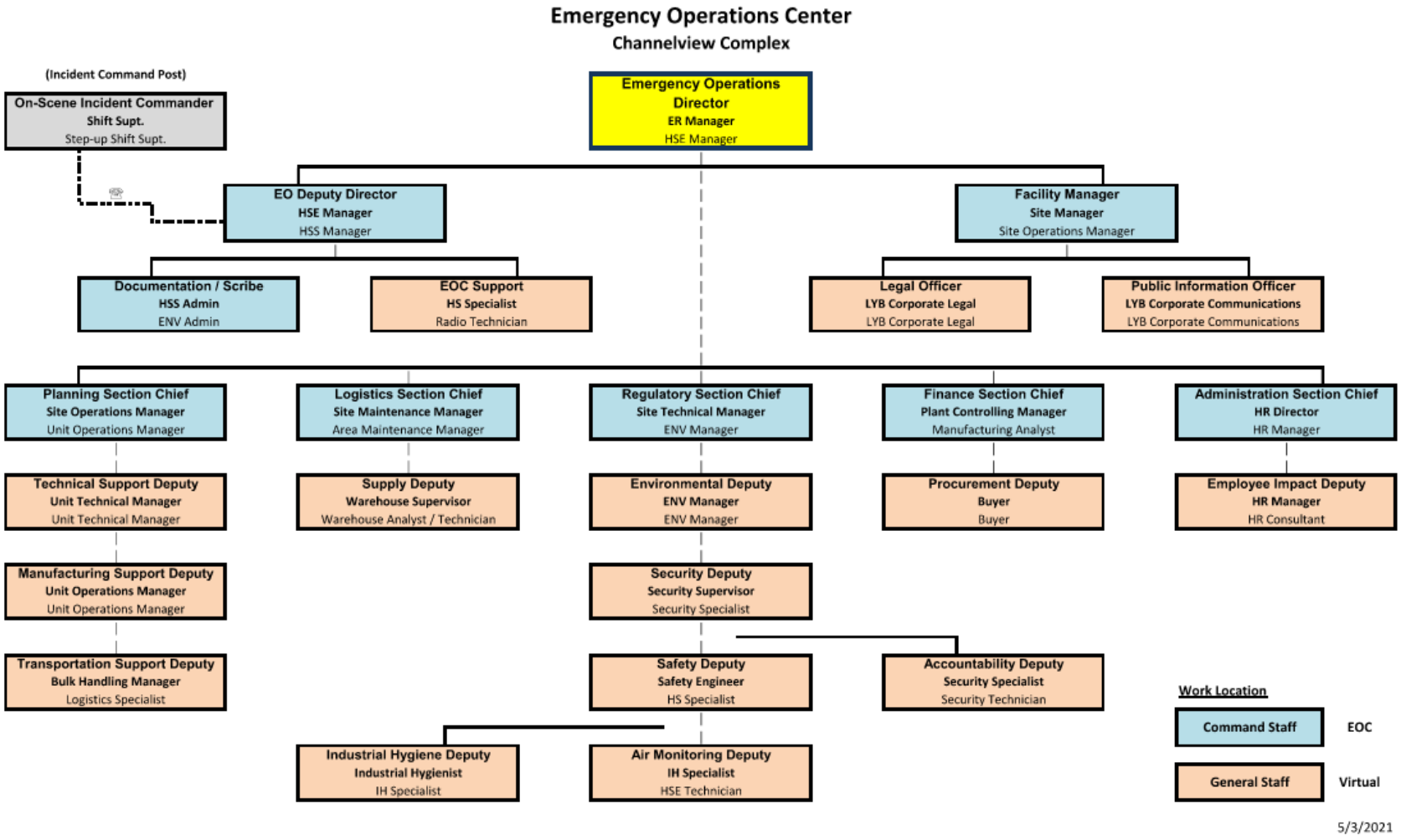
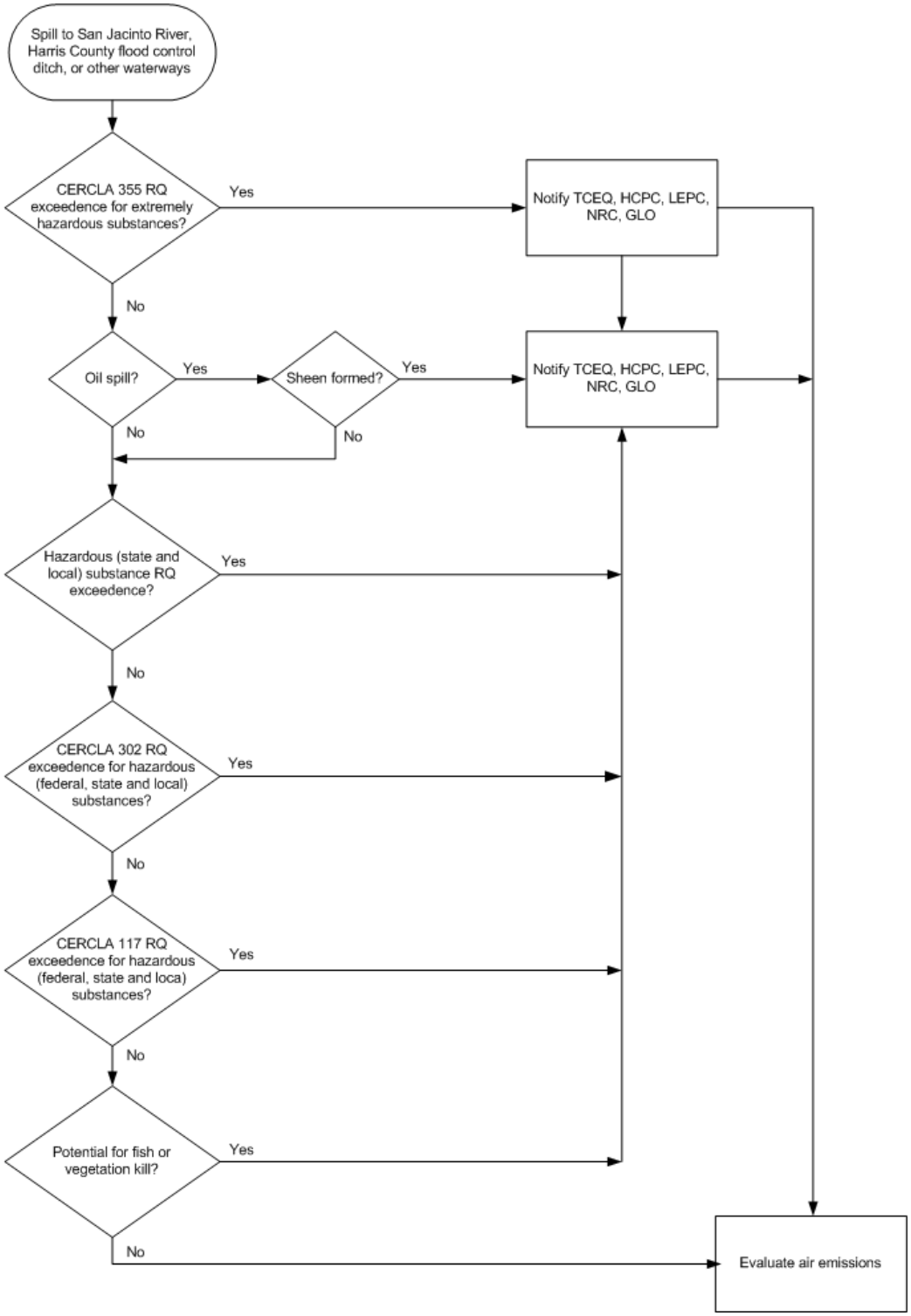


FIGURE III.E.3
NOTIFICATION REQUIREMENTS SPILL TO NAVIGABLE BODY OF WATER



APPENDIX IV

WASTE ANALYSIS PLAN

IV. WASTE ANALYSIS PLAN
EQUISTAR CHEMICALS LP (EQUISTAR)
CHANNELVIEW PLANT

This Waste Analysis Plan (WAP) has been prepared in accordance with Title 30 Texas Administrative Code (30 TAC) §305.50(9) and Title 40 Code of Federal Regulations (40 CFR) §270.14(b)(3) which requires owners and operators of facilities seeking hazardous waste management permits to address sampling and analysis requirements for wastes managed in permitted storage, treatment or disposal units. The Equistar Chemicals, LP (Equistar), Channelview Plant operates a permitted hazardous waste storage facility in accordance with the requirements of the Resource Conservation and Recovery Act (RCRA).

The information contained in this WAP meets the requirements of 40 CFR §264.13 and §264.17, and the requirements of 30 TAC §335.152. In addition to meeting the above requirements, Equistar will be compliant with Test Methods for Evaluating Solid waste Physical/Chemical Methods, SW-846 as well as the most recent Quality Assurance Project Plan for Environmental Monitoring and Measurement Act Relating to RCRA and Underground Injection Control.

This WAP describes the waste characterization and analytical procedures necessary to characterize the physical and chemical properties of wastes generated at the Channelview Facility as well as offsite wastes that will be received offsite from Lyondell and Equistar subsidiaries and the methods necessary to determine to ensure they are managed properly and safely. The waste analysis plan documents sampling methodologies, analytical parameters, analytical test methods, testing frequencies, process knowledge employed, and overall procedures used to manage hazardous wastes generated at the Channelview Plant. In addition, this WAP also addresses 40 CFR §268.7 concerning waste analysis requirements under the land disposal restrictions (LDRs).

IV.1. FACILITY DESCRIPTION

IV.1.1. Process Description

Equistar produces the following products at its Channelview facility:

Alkylate
Benzene
Butadiene
Butylenes
Ethylene
Hydrogen
Isoprene
Isopropyl Alcohol
Methanol
Methyl Tertiary Butyl Ether
Poly Butadiene
Propane
Propylene
Pyrolysis Fuel Oil
Pyrolysis Gas Oil

IV.1.2. Hazardous Wastes

Hazardous waste managed at the Equistar Channelview Facility are generated on site and received offsite from Lyondell and Equistar subsidiaries. Hazardous wastes consist of organic liquids, inorganic liquids, organic solids, inorganic solids, inorganic sludges,

and lab packs. These wastes come from the following general sources: material storage and handling, process units, utility plant, facility and equipment maintenance and clean-up, wastewater treatment, product barge decant water in Equistar's wastewater treatment facility, and terminals storing Equistar products in storage tanks.

The Equistar facility will meet the requirements of 40 CFR 264.13(a)(1-4). Waste that is either initially received onsite or from off-site facilities must first undergo a chemical and physical analysis of the waste prior to its receipt on site. The analysis is conducted to ensure that the waste determination is correctly characterized as to its waste determination. Equistar will reevaluate initial testing as necessary to ensure accurate and up to date information on the waste stream. Should the process or operation producing the hazardous waste change then the stream will be reevaluated upon reacceptance into the facility or upon inspection determine that the waste stream has changed and no longer matches the initial analysis and characterization determination. The analysis will be kept on file at the facility.

The wastes addressed by this WAP are hazardous either because they exhibit a hazardous characteristic (per 40 CFR §261 Subpart C) or because they are a listed hazardous waste (per 40 CFR §261 Subpart D). Section IV.3.1 of this WAP addresses procedures for hazardous waste determinations.

IV.1.3. Hazardous Waste Management Units

The Channelview Facility operates the following permitted hazardous waste management units. These units are identified on Equistar procedures 0117 and Notice of Registration (NOR) No. 30030. These units are utilized for storage and/or processing of hazardous waste:

Description	NOR Unit No.
TK-1101A	114
TK-1101B	115
Hazardous and Non-Hazardous Container Storage Area	022
TK-4455	031
TK-3455	032
TK-D-4383	047

The hazardous waste managed in these units, the EPA hazard codes, the TCEQ form codes and hazard classification codes are shown on Table IV.B. The Channelview Facility also operates less than 90-day storage units, and RCRA exempt wastewater treatment units for management of hazardous wastes

IV.2. WASTE SAMPLING AND ANALYSIS PARAMETERS

IV.2.1. Sample Collection and Handling

IV.2.1.1. Sampling Equipment

Prior to sample collection, the sampling activity will be coordinated with the laboratory to ensure that the proper sample collection equipment is available. Samples will be collected in equipment that is clean and inert to the waste being sampled. The sampling equipment

will be selected on the basis of (a) the physical properties of the waste, (b) volume of sampled needed for analysis, and (c) the chemical properties of the waste.

IV.2.1.2. Sample Collection

Representative samples from tanks and process equipment will be collected from sample ports, valves, pipe openings, or downstream discharge points. Containers will be sampled individually or as a group depending on the quantity of the individual waste stream. As a general rule, grab samples will be collected from a location as close as possible to the point of waste generation or the point where the waste enters the waste management unit. However, in some cases, it may be more appropriate to utilize composite sampling (e.g. , when there is a large quantity of the same waste) to ensure the sample is representative

When samples are to be analyzed for both the toxicity characteristic (TC), volatile organics and nonvolatile contaminants, one - two aliquots of the sample will be collected. Table IV.C. identifies sample locations and collection methods for each waste.

IV.2.1.3. Sample Handling

Samples will be collected and handled in a manner that minimizes the potential for cross-contamination, loss of volatile constituents, and other influences that may alter the composition of the waste from its original make-up. After collection, the sample container will be secured with a tight-fitting lid and labeled. The label will include the following information: sample identification/description, time and date of collection, initials of sample collector, and any other identifying information that may be appropriate. The samples will be placed on ice for preservation purposes and transported to the laboratory.

All samples shipped to a laboratory will be accompanied by a chain-of-custody (COC) form. The COC will identify each sample and analysis to be performed. Each individual handling the samples will be responsible for managing them in a manner that protects the integrity of the sample. Whenever custody of the samples is transferred, the individuals relinquishing and receiving the samples will sign and date the COC form. The original copy of the COC form will accompany the shipment to the laboratory and the Environmental group will retain the second copy for records.

IV.2.2. Sample Analysis

IV.2.2.1. Analytical Methods

Waste analysis requirements will vary depending on the waste type, method of treatment, storage or disposal, and other management considerations. Typically, analysis is conducted for the following purposes:

- to aid in classifying the waste per EPA and TCEQ criteria,
- to evaluate potential treatment, recycling and/or reclamation options,
- to evaluate disposal options,
- to assess requirements of the LDRs, and/or
- to determine the applicability of organic air emission standards.

Analytical test parameters, test methods, and regulatory levels are identified on Table IV.D. It should be noted that the tables identify the more standard test methods that can be used. In some cases, it may be necessary to utilize other test methods to obtain results because the preferred methods may be adversely impacted by interferences due to waste matrix, constituent concentrations or other variables.

IV.2.2.2. Analytical Quality Assurance/Quality Control

The Channelview Facility will require laboratories to apply quality assurance/quality control (QA/QC) procedures consistent with EPA guidance. These QA/QC procedures may include analysis of method blanks, matrix spike samples, and matrix spike duplicates. Analysis of laboratory QA/QC samples should be conducted at a frequency recommended by EPA guidelines. Results of the QA/QC analyses will be compared to the control limits for precision and accuracy established by laboratory using statistics (e.g., matrix spikes) or utilized to monitor potential contamination in the laboratory (e.g., blanks).

IV.2.2.3. Frequency of Analysis

Initially, the Channelview Facility will utilize process knowledge supplemented with a baseline analysis to characterize each waste. Sufficient analysis will be performed to ensure proper waste classification and safe management practices. Subsequently, wastes will be retested when the process changes or when Equistar has determined through process knowledge that the variability in waste characteristics during normal operations requires a retesting program.

IV.3. HAZARDOUS WASTE MANAGEMENT

IV.3.1. Hazardous Waste Determinations

Prior to taking any action that affects the manner in which an industrial solid waste is processed, treated, stored, disposed, or recycled, the Channelview Facility will need to determine if the waste is a hazardous waste. A solid waste is a hazardous waste if it is listed as per 40 CFR §261 Subpart D or exhibits a hazardous characteristic as per 40 C FR §261 Subpart C, provided it is not excluded pursuant to 40 CFR §261.4. Hazardous waste criteria are detailed as follows:

IV.3.1.1. Listed Hazardous Waste

40 CFR Section §261.31 through §261.33 contains a listing of hazardous waste generated from various sources. The lists are described as follows:

- §261.31 lists wastes generated from non-specific sources. These are known as "F-wastes."
- §261.32 lists wastes generated from specific sources. These are known as "K-wastes."
- §261.33 lists wastes that are discarded commercial chemical products and other materials that become hazardous wastes when they are discarded or intended to be discarded.

In addition, a waste would also be hazardous per the above listings if it meets the following circumstances:

- If it is a mixture containing a hazardous waste listed in §261.31, §261.32, or §261.33,
- If it is soil or debris contaminated with a hazardous waste listed in §261.31, §261.32, or §261.33,
- If it is derived from the treatment of a hazardous waste listed in §261.31, §261.32, or §261.33.

IV.3.1.2. Characteristically Hazardous Waste

Hazardous wastes are defined in section §261.20 if they have the properties described in 40 CFR §261.21 through §261.24, which would cause them to be classified as having the characteristics of ignitability, corrosivity, reactivity, or toxicity. Characteristic wastes are identified by sampling a waste or using appropriate records concerning the nature of the waste, to determine whether it exhibits properties that exceed regulatory threshold levels. Specific criteria for characteristic wastes are shown in Table IV.D-1.

IV.3.2. Land Disposal Restrictions

Restrictions on the land disposal of hazardous wastes are detailed in 40 CFR Part 268. Solid wastes generated by the Channelview Facility may require off-site treatment if they are determined to be listed wastes or if they exhibit hazardous characteristics. In accordance with the LDR regulations, wastes shipped off site may need to be analyzed to determine whether the waste meets the applicable LDR treatment standards contained in 40 CFR §268.40, "Treatment Standards for Hazardous Wastes". Testing will be conducted on hazardous waste (not hazardous debris) only to certify that the waste meets LDR treatment standards. If it is known that the waste does not meet applicable LDR treatment standards based on process knowledge, no testing is necessary. Each waste for which a treatment standard has been set will be evaluated for the applicable parameters in 40 CFR Part 268 Subpart D.

In the case of hazardous soils and hazardous debris, the LDRs allow for the use of alternative treatment standards. As appropriate, the Channelview Facility may treat hazardous soils such that all underlying hazardous constituents subject to treatment and that are present in a given volume of contaminated soil at concentrations greater than 10

times the universal treatment standards (UTS), will be treated to a 90 percent reduction capped at 10 times the UTS. Similarly, hazardous debris may be alternatively treated in accordance with the technology and performance standards specified in 40 CFR §268.45.

Wastes resulting from facility operations that exceed applicable LDR treatment standards will be sent off site to a permitted treatment facility. LDR notifications will be performed as per §268.7. Any waste that is able to meet the specified treatment standard may be land disposed without further treatment. An LDR certification, including all analytical records to support the certification, will be prepared for wastes that do not require further treatment to meet LDR standards.

The facility will comply with the appropriate testing, tracking, and recordkeeping requirements undergo 40 CFR §268.7 for generators or TSDs depending on the ultimate disposition of wastes subject to LDR. If wastes are shipped off-site for treatment and disposal, the generator requirements under 40 CFR §268.7(a) will be the basis of compliance. If the wastes are treated and disposed of on site, the requirements of 40 CFR §268.7(b) will be met. The appropriate testing, tracking, and recordkeeping requirements will be applied to both onsite and offsite wastes received at the facility.

IV.3.3. Manifesting

All hazardous wastes shipped off-site for storage, treatment, or disposal will be accompanied by a uniform hazardous waste manifest. Hazardous wastes received at the Channelview facility from off-site Lyondell Chemical Company, Equistar Chemical, LP or it subsidiary facilities and off-site terminal facilities used by Lyondell Chemical Company, Equistar Chemical, LP or it subsidiary facilities will also be accompanied by a uniform hazardous waste manifest. The manifests will be completed and records filed as specified in 40 CFR §262 Subpart B. Records of each waste shipment will be maintained for a period of at least three years from the date of shipment in accordance with §262.40.

IV.3.4. Ignitable, Reactive, and Incompatible Wastes

Per 40 CFR §264.177 and §264.199, the Channelview Facility will not commingle incompatible wastes in the same container or in the same tank. Based on process knowledge, previously characterized wastes, a review of 40 CFR Part 264 Appendix V, and TCEQ Technical Guideline No. 9, the Channelview Facility ensures that incompatible waste are not commingled. All generated wastes are evaluated and classified according to compatibility groups as outlined in TCEQ Technical Guideline No. 9. If any wastes are determined to be incompatible, they will be segregated and stored separately.

Ignitable, corrosive, and reactive wastes are generated onsite and stored in the permitted container storage area (NOR Unit No. 22) in accordance with 40 CFR §264.176 which requires that containers holding ignitable or reactive wastes be at least 50 feet from the property line. The permitted container storage area meets this requirement as it is located more than 50 feet from the nearest property line.

The following permitted units store corrosive and ignitable wastes. 40 CFR §264.198 requires tanks storing ignitable or reactive wastes to be maintained a protective distance from the property line in accordance with requirements of the National Fire Protection Association's "Flammable and Combustible Liquids Code". The tanks are located more than

150 feet to the nearest property line and are compliant with this requirement:

Description	NOR Unit No.
TK-1101A	114
TK-1101B	115
TK-4455	031
TK-3455	032
TK-D-4383	047

All ignitable and reactive wastes, whether stored in the permitted container storage area or permitted tanks are stored in a manner that protects these wastes from materials or conditions which may cause the waste to ignite or react. The measures utilized include the elimination of ignition sources in the vicinity of the storage tanks or containers, prohibition of the introduction of incompatible materials to the tanks, regular inspections to identify and mitigate leaks from containers or tanks.

Wastes identified as reactive or corrosive in accordance with the test methods outlined in Table IV.D-1 will be stored in containers compatible with the waste. For instance, corrosive wastes will not be stored in unlined steel containers.

IV.3.5 Offsite Wastes

The Channelview facility is authorized to receive hazardous or non-hazardous waste from off-site Lyondell Chemical Company, Equistar Chemical, LP or its subsidiary facilities and off-site terminal facilities used by Lyondell Chemical Company, Equistar Chemical, LP or its subsidiary facilities. Equistar has significant experience managing these wastes and performs all required analyses prior to acceptance consistent with the procedures applied to comparable site generated waste with the same form code and management method.

Shipments received at the Channelview facility from other offsite Lyondell facilities will be inspected upon arrival to verify that the waste received from the offsite location is a properly characterized waste stream previously identified for the offsite location. The contents of the shipment (such as wastewater) will be compared to the accompanying hazardous waste manifest. In the unlikely event that the offsite waste stream cannot be verified, the waste shipment will be segregated at the facility and sampling and characterization of the waste will be completed in accordance with Sections IV.2 and IV.3 of this plan. Rejection criteria will include discrepancy between waste characterization and the manifest.

IV.4. RECORDKEEPING REQUIREMENTS

The Channelview Facility will maintain an operating record that includes the laboratory testing results, hazardous waste characterization information and LDR records.

TABLE IV.B WASTES MANAGED IN PERMITTED UNITS

No.	Waste	EPA Waste Codes	TCEQ Waste Codes
1	Spent Solid Filters	D001, D002, D003, D004, D010, D018	310H
2	Olefins Manufacturing Process Waste	D001, D002, D003, D018	109H
3	Spill Cleanup Material (Soil)	D001, D002, D003, D005, D008, D018, F002, F003, F005, U002, U003, U019, U022, U055, U147, U154, U159, U220, U239	301H
4	Acetonitrile (ACN) contaminated waste streams	D001, D018, D035, D038	205H
5	Hydrocarbons, Mixed and Miscellaneous	D001, D002, D003, D018, D035, F003, F005	206H
6	Spent Cleaning & Degreasing Solvents	D001, D006, D008, D018, D027, D035, D039, D040	203H
7	Spent Activated Carbon	D001, D018	404H
8	Resin - Solids/Liquids	D001, D002, D018	606H
9	Paint Waste Related Materials	D001, D035, F003, F005	209H
10	Poly BD Polymer, ACN and Water	D001, D018	606H
11	Spill Cleanup Material and Absorbents	D001, D002, D003, D008, D009, D018, D019, D022, D038, D040, F002, F003, F005, U019	310H
12	Wastewater, Industrial: ECU Hazardous	D001, D002, D018, D035	219H
13	Acid Cleaning Solution	D001, D002, D007, D008, D018	105H
14	Caustic Cleaning Solution	D001, D002, D007, D008, D018	110H
15	Industrial Wastewater— Non ECU	D001, D002, D018, D028, D035	219H
16	Mixed Alcohol	D001, D018, D035, D038	219H
17	Fuel Purge Gas Condensate and Fuel Oil	D001	207H
18	Miscellaneous Mercury Contaminated Material	D001, D002, D006, D007, D009, D011, F003	319H
19	Hazardous Polymer	D001, D003, D018	403H
20	Spent Catalyst	D001, D002, D003, D018	219H
21	Heat Exchanger Solids	D018	304H

No.	Waste	EPA Waste Codes	TCEQ Waste Codes
22	API Skimmings	D001, D018, D038	205H
23	Lab Packs	D001, D002, D003, D005, D007, D008, D009, D011, D018, D021, D022, D035, D036, F001, F002, F003, F004, F005, P003, P022, U001, U002, U003, U004, U117, U123, U154, U213, U239	003H
24	Hydrocarbon Contaminated Sludge	D001, D002, D003, D009, D018, D035	603H
25	Dimer Solution	D001, D018	203H
26	Lab Liquid Waste	D001, D002, D009, D018, D019, D022, D035, D038, F002, F003, F005	219H
27	Contaminated Sandblasting Media	D006, D007, D008, D018	490H
28	Off-Spec/Unused Organic Liquid Products/Chemical	D001, D002, D003, U002, U003, U055, U056, U133, U154, U220, U239	219H
29	Off-Spec/Unused Organic Solid Products/Chemicals	D001, D002, D003, U019, U055, U147	409H
30	Used Batteries (Lead- acid, NiMH, Li Ion, NiCad, etc)	D001, D002, D006, D007, D008	309H
31	Hazardous Waste Tank Cleanout	D001, D018, D019, D022, D035, D038, F002, F003, F005	219H
32	Spent Catalyst	D003, D005, D007, D018	493H
33	Spent Catalyst	D001, D002, D003, D005, D007, D018, U019	393H
34	Alcohol/Organics	D001, D035, F003	207H
35	Spent Catalyst	D001, D002, D003, D018	404H
36	Alky Propane Caustic Wash	D002	109H
37	Spent Aerosol Cans	D001, D003, U226	308H
38	Organic Mixture-PolyBD Production	D001	219H
39	Hazardous Debris	D008, D018	319H
40	Concentrated Inorganic Acid Solution	D002	105H
41	Concentrated Caustic Solution	D002	110H
42	Sulfolane Material	D001	203H
43	IPOH Material	D001	203H

No.	Waste	EPA Waste Codes	TCEQ Waste Codes
44	Methanol Material	D001	203H
45	Sulfuric Acid	D002	104H
46	Olefins Washwater	D007	102H
47	Compressed Gas Organic	D001, D003	801H

TABLE IV.C SAMPLING AND ANALYTICAL METHODS

Waste No.[1]	Waste Description.[1]	Sampling Location	Sampling Method	Frequency	Parameter	Test Method	Desired Accuracy Level
1	Spent Solid Filters	Drum	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
2	Olefins Manufacturing Process Waste	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI,	See Tables IV.D-1 and IV.D-2	MDL
3	Spill Cleanup Material (Soil)	Bulk or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
4	ACN Contaminated Waste streams	Tank	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
5	Hydrocarbons, Mixed and Miscellaneous	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
6	Spent Cleaning & Degreasing Solvents	Container	NA	As necessary	SDS	N/A	N/A

Waste No.[1]	Waste Description.[1]	Sampling Location	Sampling Method	Frequency	Parameter	Test Method	Desired Accuracy Level
7	Spent Carbon	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
8	Resin - Solids/Liquids	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
9	Paint Waste Related Materials	Container	grab	N/A	NA	NA	NA
10	Poly BD Polymer, ACN and Water	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
11	Spill Cleanup Material and Absorbents	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
12	Wastewater, Industrial: ECU Hazardous	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL

Waste No.[1]	Waste Description.[1]	Sampling Location	Sampling Method	Frequency	Parameter	Test Method	Desired Accuracy Level
13	Acid Cleaning Solution	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
14	Caustic Cleaning Solution	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
15	Industrial Wastewater—Non ECU	Tank, Container, or Impoundment	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
16	Mixed Alcohol	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
17	Fuel Purge Gas Condensate and Fuel Oil	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
18	Miscellaneous Mercury Contaminated Material	NA	NA	process knowledge	N/A	N/A	N/A

Waste No.[1]	Waste Description.[1]	Sampling Location	Sampling Method	Frequency	Parameter	Test Method	Desired Accuracy Level
19	Hazardous Polymer	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	see Tables IV.D-1 and IV.D-2	MDL
20	Spent Catalyst	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
21	Heat Exchanger Solids	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	VOCs (BTEX only)	See Tables IV.D-1 and IV.D-2	MDL
22	API Skimming's	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
23	Lab Packs	N/A	N/A	N/A	NA	NA	NA
24	Hydrocarbon Contaminated Sludge	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL

Waste No.[1]	Waste Description.[1]	Sampling Location	Sampling Method	Frequency	Parameter	Test Method	Desired Accuracy Level
25	Dimer Solution	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
26	Lab Liquid Waste	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
27	Contaminated Sandblasting Media	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
28	Off-Spec/Unused Organic Liquid Products/Chemical	Container	grab	As needed	Use SDS	N/A	N/A
29	Off-Spec/Unused Organic Solid Products/Chemicals	Container	grab	As needed	Use SDS	N/A	N/A
30	Used Batteries (Lead-acid, NiMH, Li, Ion, NiCad, etc)	N/A	N/A	N/A	N/A	N/A	N/A

Waste No.[1]	Waste Description.[1]	Sampling Location	Sampling Method	Frequency	Parameter	Test Method	Desired Accuracy Level
31	Hazardous Waste Tank Cleanout	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
32	Spent Catalyst	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
33	Spent Catalyst	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
34	Alcohol/Organics	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
35	Spent Catalyst	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL

Waste No.[1]	Waste Description.[1]	Sampling Location	Sampling Method	Frequency	Parameter	Test Method	Desired Accuracy Level
36	Alky Propane Caustic Wash	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	see Tables IV.D-1 and IV.D-2	MDL
37	Spent Aerosol Cans	NA	NA	N/A	Use SDS	N/A	N/A
38	Organic Mixture-PolyBD Production	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
39	Hazardous Debris	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
40	Concentrated Inorganic Acid Solution	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
41	Concentrated Caustic Solution	Tank or Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL

Waste No.[1]	Waste Description.[1]	Sampling Location	Sampling Method	Frequency	Parameter	Test Method	Desired Accuracy Level
42	Sulfolane Material	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
43	IPOH Material	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
44	Methanol Material	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
45	Sulfuric Acid	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
46	Olefins Washwater	Container	grab	upon process change or as necessary to satisfy off-site TSD and LDR Requirements	Total VOCs, SVOCs, metals; TCLP (as necessary based on total analysis), RCI, TPH	See Tables IV.D-1 and IV.D-2	MDL
47	Compressed Gas Organic	NA	NA	N/A	Use SDS	N/A	N/A

[1]from Table IV.B, first column

NA – Not Applicable

N/A – Not Analyzed

TABLE IV.D-1

General Characteristics

GENERAL HAZARDOUS CHARACTERISTICS			
Parameter	Regulatory Level	EPA Analytical Method	Method Description
Ignitability (I) (D001)	<140°F	1010	Pensky-Marten Closed Cup Tester
Corrosivity (C) (D002)	pH≤2 or ≥12.5 s.u	9040 or TM-01-69	pH Meter or Steel Corrosion Test
Reactivity (R) (D003)	Explodes or Generates Toxic Gas	9010 9030	CN release H_2S release

OTHER CHARACTERISTICS			
Parameter	Regulatory Level	EPA Analytical Method	Method Description
VOC	≥500 ppmw = Subpart CC	Method 25D	Volatile Organic Compounds
TPH	N/A	TX 1005	Total Petroleum Hydrocarbons

ANALYTICAL CHEMISTRY			
Parameter	Regulatory Level (ppm)	EPA Analytical Method	Method Description
Total Volatiles (VOCs)	Same as Table IV-D-2	Same as Table IV-D-2	Same as Table IV-D-2
Benzene, toluene, ethylbenzene, and xylene (BTEX)	0.026 8.2 7.6 120	8260	Purge & Trap, GC/MS
Total Semivolatiles (SVOCs)	Same as Table IV-D-2	Same as Table IV-D-2	Same as Table IV-D-2
Total Metals	Same as Table IV-D-2	Same as Table IV-D-2	Same as Table IV-D-2

TABLE IV.D-2

Toxicity Characteristics (TCLP)

VOLATILE ORGANICS Parameter	Regulatory Level (ppm)	EPA Analytical Method	Method Description
Benzene (D018)	0.5	8260	Purge & Trap, GC/MS
Carbon Tetrachloride (D019)	0.5	8260	Purge & Trap, GC/MS
Chlorobenzene (D021)	100.0	8260	Purge & Trap, GC/MS
Chloroform (D022)	6.0	8260	Purge & Trap, GC/MS
1,2 Dichloroethane (D028)	0.5	8260	Purge & Trap, GC/MS
Methyl Ethyl Ketone (D035)	200.0	8260	Purge & Trap, GC/MS
Tetrachloroethylene (D039)	0.7	8260	Purge & Trap, GC/MS
Vinyl Chloride (D043)	0.2	8260	Purge & Trap, GC/MS

BASE/NEUTRAL EXTRACTABLE ORGANICS Parameter	Regulatory Level (ppm)	EPA Analytical Method	Method Description
1,4-Dichlorobenzene (D027)	7.5	8270	GC/MS: Capillary Column
2,4-Dichlorotoluene (D030)	0.13	8270	GC/MS: Capillary Column
Hexachlorobenzene (D032)	0.13	8270	GC/MS: Capillary Column
Hexachlorobutadiene (D033)	0.5	8270	GC/MS: Capillary Column
Hexachloroethane (D034)	3.0	8270	GC/MS: Capillary Column
Nitrobenzene (D036)	2.0	8270	GC/MS: Capillary Column
o-Cresol (D023)	200.0	8270	GC/MS: Capillary Column
m-Cresol (D024)	200.0	8270	GC/MS: Capillary Column
p-Cresol (D025)	200.0	8270	GC/MS: Capillary Column
Cresol (D026)	200.0	8270	GC/MS: Capillary Column
Pentachlorophenol (D037)	100.0	8270	GC/MS: Capillary Column
2,4,5 Trichlorophenol (D041)	400.0	8270	GC/MS: Capillary Column
2,4,6 Trichlorophenol (D042)	2.0	8270	GC/MS: Capillary Column

METALS Parameter	Regulatory Level (ppm)	EPA Analytical Method	Method Description
Antimony	NS	6010/6020	ICP/ICPMS
Arsenic (D004)	5.0	6010/6020	ICP/ICPMS
Barium (D005)	100.0	6010/6020	ICP/ICPMS
Beryllium	NS	6010/6020	ICP/ICPMS
Cadmium (D006)	1.0	6010/6020	ICP/ICPMS
Chromium (D007)	5.0	6010/6020	ICP/ICPMS
Lead(D008)	5.0	6010/6020	ICP/ICPMS
Mercury (D009)	0.2	7470/7471	AA, Cold Vapor

METALS			
Parameter	Regulatory Level (ppm)	EPA Analytical Method	Method Description
Nickel	NS	6010/6020	ICP/ICPMS
Selenium (D010)	1.0	6010/6020	ICP/ICPMS
Silver (D011)	5.0	6010/6020	ICP/ICPMS

Appendix V: Engineering Plans

Section V

General Engineering Report Addendum

V ENGINEERING REPORT COVER

The Engineering Report provided in this section is a copy of the original engineering documents submitted during the original application review. Design, construction, and operation of the units remain substantively unchanged from that which was evaluated during the original permitting process. There is nothing in this application that proposed changes in the configuration, construction, or capacity of the structure.

Written assessments that were reviewed and certified by an independent, registered professional engineer were submitted during the original permit application review. Copies of these assessments are included with the engineering report provided in this section of the permit renewal application.

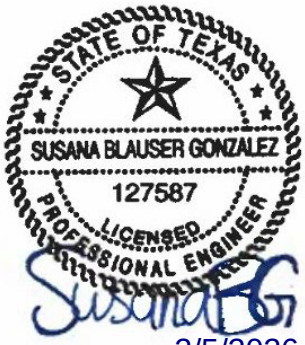
The Engineering Report submitted in the October 2004 and resubmitted in May 2014 contain information about hazardous waste tanks that have been clean closed and approved by the Texas Commission on Environmental Quality (TCEQ). The following is a list of the closed tanks. Engineer drawings associated with closed tanks were not submitted in this permit application. TCEQ approval documentation was submitted in the 2015 permit renewal application.

Tank	NOR	Date of Closure
Tank- 3110	045	12/23/2000
Tank- 3210	042	12/23/2000
Tank- 3221	007	6/12/2013
Tank- 2812	044	12/23/2000
Tank- D-59	043	12/11/2012
Tank- 3207	046	12/23/2000
Tank- D82	056	6/12/2013
Tank- D83	057	6/12/2013
OP-1 Aeration Basin	053	3/13/2014
OP-II Aeration Basin	054	3/13/2014

The Engineering Drawing Figure III.B.1 Paving Plan for the North Container Storage Area contains coating requirements in the resloping and Lining Notes section. The coating requirement noted in the drawing is not a RCRA requirement and has been redlined in Engineering Drawing Figure III.B.1.

The Engineering Report submitted in December 2004 additionally states that Tank D-4383 is not in secondary containment. Secondary containment was added to the tank and approved in a May 2009 permit modification. Engineering drawings for that modification are included in this report.

Calculations have been provided to demonstrate that the waste stored in Tank D-4383 will be turned-over in <90-days; therefore, the tank will be used as a <90-day tank and does not require permitting are provided as an attachment to this appendix. These calculations are the only new items that are submitted in this portion of the application and are the only portion of this section to be sealed for submission in 2026.



2/5/2026
Susana Blauser Gonzalez, P.E.

Brown and Caldwell is Registered Engineering Firm No. 2139

Tank D-4383 Residence Time Calculations

The attached spreadsheet presents the residence time of waste in Tank D-4383 which is rated at 12,000 gallons. Periodically, as the level in D-4383 rises to an average of 4.82 feet (ft) or 7,789 gallons (gal), a tanker truck is filled and disposes of the waste at a permitted treatment, storage, and disposal facility. The level in D-4383 after lading is 3.01 ft (4,251 gal) on average. Using a conservative estimate of 50 gallons per hour (gph), the maximum volume of waste in D-4383 (7,789 gal) is generated every 155.8 hours or 6.5 days. During peak times, the flow rate is 100 gph which corresponds to a residence time of 77.9 hours or 3.2 days. The permitted 12,000 gal tank volume would turn over every 10 days during slow periods and every 5 days during maximum flow rate. The spreadsheet presents the tank level reading from the IP21 data processor plotted against the volume of waste in the tank to determine a strapping chart to convert operator recorded level indication to tank volumes. The tank levels for the period of June 24, 2025 to December 22, 2025 as generated by the operator rounds are also presented. These data indicate that the waste is removed from the tank approximately twice a week. Therefore, waste is resident in Tank D-4383 for <90 days and the tank is not required to be permitted. Tank D-4383 will be formally closed as a hazardous waste tank after it is no longer being used by the facility. The July 24, 2002 Final Rule entitled “Zinc Fertilizers Made from Recycled Hazardous Secondary Materials” made clear EPA’s intent on the requirements for closing hazardous waste tanks that were subsequently utilized to store the same material. Therefore, formal closure at this time is not required.

Tank D-4383 Assumptions

Total Capacity	12000	gal
Working Capacity	7788.957	gal
Flow rate (normal)	50	gph
Flow rate (high flow)	100	gph
Working Cap. Turnover (normal flow)	155.7791	hours
	6.490797	days
Working Cap. Turnover(high flow)	77.88957	hours
	3.245399	days
Total Residence Time(normal flow)	240	hours
	10	days

Facts and assumptions

- Every 3 to 4 days a truck is loaded from D-4383 per IP21 data on tab "iP21 Data"
- On average 4251 gallons remains on the drum after each load, with a max level of 7789 gal before loading.
- The waste caustic flowrate entering D-4383 is average 50 gph being conservative since at dimer maximum rates the flowrate can reach 100 gph which will make the turnover faster.

Attachment A-1. D4383 Tank Levels

Time	| Actuals (ft)	High Level (ft)	Low Level (ft)
6/24/2025 4:45	4.42		
6/25/2025 4:54	4.42		
6/26/2025 7:23	3.5		3.5
6/27/2025 7:01	4.08		
6/28/2025 11:08	4.67	4.67	
6/29/2025 8:52	2.92		2.92
6/30/2025 7:54	3.5		
7/1/2025 11:00	4.25		
7/2/2025 6:25	4.75	4.75	
7/3/2025 5:33	2.75		2.75
7/4/2025 7:15	2.83		
7/5/2025 10:40	3.58		
7/6/2025 8:03	4.04		
7/7/2025 4:38	4.67	4.67	
7/8/2025 7:57	2.75		
7/9/2025 5:36	2.75		
7/10/2025 4:17	2.75		
7/11/2025 4:06	4		
7/12/2025 10:55	4.33		
7/13/2025 5:10	4.33		
7/14/2025 5:41	3.04		3.04
7/15/2025 10:25	3.67		
7/16/2025 5:39	4.67	4.67	
7/17/2025 7:18	2.5		2.5
7/18/2025 7:11	3.17		
7/19/2025 5:15	3.5		
7/20/2025 6:33	4.25		
7/21/2025 5:11	4.25		
7/22/2025 5:18	5.25	5.25	
7/23/2025 5:19	2.92		2.92
7/24/2025 4:22	3.5		
7/25/2025 4:17	4.33	4.33	
7/26/2025 4:48	2.5		2.5
7/27/2025 4:49	3.17		
7/28/2025 5:08	4	4	
7/29/2025 5:10	1.75		1.75
7/30/2025 5:17	2.42		
7/31/2025 4:48	3		
8/1/2025 6:57	3.67		
8/2/2025 8:52	4.25		
8/3/2025 5:02	4.75	4.75	
8/4/2025 7:13	3.17		3.17

Attachment A-1. D4383 Tank Levels

Time	| Actuals (ft)	High Level (ft)	Low Level (ft)
8/5/2025 5:05	3.92		
8/6/2025 4:18	4.5	4.5	
8/7/2025 4:33	2.67		2.67
8/8/2025 5:00	3.5		
8/9/2025 4:47	3.92		
8/10/2025 4:29	4.67		
8/11/2025 4:53	5.5	5.5	
8/12/2025 4:54	3.25		3.25
8/13/2025 8:28	3.75		
8/14/2025 7:33	4.25	4.25	
8/15/2025 4:54	3.25		
8/16/2025 4:42	2.92		
8/17/2025 7:39	2.92		
8/18/2025 4:52	3.83	3.83	
8/19/2025 6:41	2.33		2.33
8/20/2025 9:12	3.17		
8/21/2025 4:46	4.33	4.33	
8/21/2025 6:55	3.33		
8/21/2025 10:18	3.33		
8/22/2025 4:59	3.33		
8/23/2025 4:30	4.25	4.25	
8/24/2025 7:06	3.58		3.58
8/25/2025 4:18	4.75		
8/26/2025 4:18	5.5	5.5	
8/27/2025 5:34	3.58		3.58
8/28/2025 4:25	4.42		
8/29/2025 5:39	4.42		
8/30/2025 5:39	3.17		3.17
8/31/2025 5:07	3.83		
9/1/2025 8:11	4.25		
9/2/2025 4:38	4.75		
9/3/2025 10:14	5.33	5.33	
9/4/2025 4:30	3.42		3.42
9/5/2025 4:34	4		
9/6/2025 6:31	4.83		
9/7/2025 5:00	5.75	5.75	
9/8/2025 5:24	3.83		3.83
9/9/2025 4:33	4.92	4.92	
9/10/2025 4:50	3.25		3.25
9/11/2025 4:34	3.75		
9/12/2025 4:48	4.25		
9/13/2025 5:09	4.92		

Attachment A-1. D4383 Tank Levels

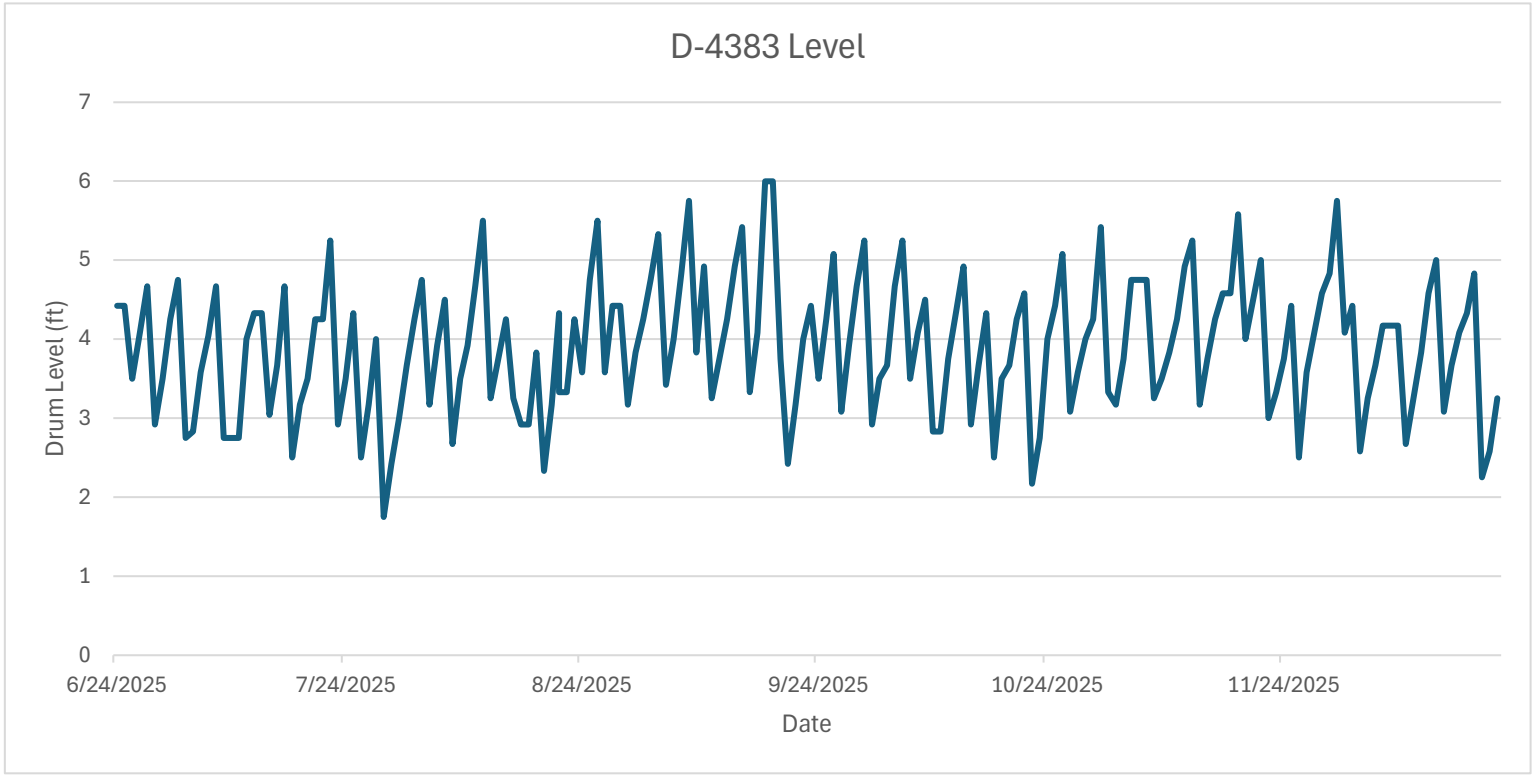
Time	| Actuals (ft)	High Level (ft)	Low Level (ft)
9/14/2025 12:12	5.42	5.42	
9/15/2025 5:04	3.33		3.33
9/16/2025 10:18	4.08		
9/17/2025 5:11	6		
9/18/2025 9:33	6		
9/19/2025 6:58	3.75		
9/20/2025 11:24	2.42		2.42
9/21/2025 5:08	3.17		
9/22/2025 4:30	4		
9/23/2025 4:44	4.42	4.42	
9/24/2025 5:36	3.5		3.5
9/25/2025 5:45	4.25		
9/26/2025 6:39	5.08	5.08	
9/27/2025 5:19	3.08		3.08
9/28/2025 5:20	3.92		
9/29/2025 5:10	4.67		
9/30/2025 8:43	5.25	5.25	
10/1/2025 7:32	2.92		2.92
10/2/2025 5:44	3.5		
10/3/2025 5:35	3.67		
10/4/2025 5:18	4.67		
10/5/2025 5:20	5.25	5.25	
10/6/2025 9:18	3.5		3.5
10/7/2025 9:49	4.08		
10/8/2025 7:33	4.5	4.5	
10/9/2025 4:50	2.83		
10/10/2025 5:34	2.83		
10/11/2025 5:18	3.75		
10/12/2025 5:37	4.33		
10/13/2025 5:20	4.92	4.92	
10/14/2025 5:17	2.92		2.92
10/15/2025 6:14	3.67		
10/16/2025 8:30	4.33	4.33	
10/17/2025 6:03	2.5		2.5
10/18/2025 11:02	3.5		
10/19/2025 7:46	3.67		
10/20/2025 5:35	4.25		
10/21/2025 7:24	4.58	4.58	
10/22/2025 9:48	2.17		2.17
10/23/2025 8:49	2.75		
10/24/2025 5:09	4		
10/25/2025 3:58	4.42		

Attachment A-1. D4383 Tank Levels

Time	| Actuals (ft)	High Level (ft)	Low Level (ft)
10/26/2025 5:09	5.08	5.08	
10/27/2025 8:11	3.08		3.08
10/28/2025 10:01	3.58		
10/29/2025 9:33	4		
10/30/2025 5:59	4.25		
10/31/2025 7:03	5.42	5.42	
11/1/2025 8:00	3.33		
11/2/2025 4:11	3.17		3.17
11/3/2025 7:25	3.75		
11/4/2025 7:41	4.75		
11/5/2025 9:34	4.75		
11/6/2025 7:47	4.75		
11/7/2025 6:07	3.25		3.25
11/8/2025 9:52	3.5		
11/9/2025 8:22	3.83		
11/10/2025 6:43	4.25		
11/11/2025 7:16	4.92		
11/12/2025 5:57	5.25	5.25	
11/13/2025 7:06	3.17		3.17
11/14/2025 6:04	3.75		
11/15/2025 6:35	4.25		
11/16/2025 7:23	4.58		
11/17/2025 6:52	4.58		
11/18/2025 5:03	5.58	5.58	
11/19/2025 6:46	4		4
11/20/2025 10:30	4.5		
11/21/2025 8:28	5	5	
11/22/2025 7:43	3		3
11/23/2025 7:09	3.33		
11/24/2025 6:47	3.75		
11/25/2025 5:05	4.42	4.42	
11/26/2025 6:53	2.5		2.5
11/27/2025 7:05	3.58		
11/28/2025 6:59	4.08		
11/29/2025 5:08	4.58		
11/30/2025 7:36	4.83		
12/1/2025 4:30	5.75	5.75	
12/2/2025 7:55	4.08		4.08
12/3/2025 11:09	4.42	4.42	
12/4/2025 5:19	2.58		2.58
12/5/2025 7:04	3.25		
12/6/2025 5:23	3.67		

Attachment A-1. D4383 Tank Levels

Time	| Actuals (ft)	High Level (ft)	Low Level (ft)
12/7/2025 4:56	4.17		
12/8/2025 4:35	4.17		
12/9/2025 4:43	4.17		
12/10/2025 8:56	2.67		2.67
12/11/2025 5:33	3.25		
12/12/2025 5:39	3.83		
12/13/2025 4:48	4.58		
12/14/2025 8:35	5	5	
12/15/2025 6:01	3.08		3.08
12/16/2025 6:12	3.67		
12/17/2025 6:04	4.08		
12/18/2025 6:11	4.33		
12/19/2025 4:37	4.83	4.83	
12/20/2025 7:33	2.25		2.25
12/21/2025 9:19	2.58		
12/22/2025 5:40	3.25	3.25	


D-4383 Level
Drum Level (ft)
7
6
5
4
3
2
1
0
6/24/2025
7/24/2025
8/24/2025
9/24/2025
10/24/2025
11/24/2025
Date

SECTION V

GENERAL ENGINEERING REPORT

LYONDELL PETROCHEMICAL COMPANY

CHANNELVIEW COMPLEX

CHANNELVIEW TEXAS

Revision November 1998
June 1990
September 1993
January 1997
May 2014
FEBRUARY 2026

GENERAL ENGINEERING REPORT

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GENERAL ENGINEERING REPORT

1.0 GENERAL INFORMATION

Located at the Channelview Complex are various hazardous waste management units (HWMUs) which are utilized for the management of hazardous waste residues generated from the facility's chemical manufacturing processes. The existing hazardous waste management units may be found in table IV.B.

All of the HWMUs are located inside the permimeter fenced boundaries of the Complex. A plan view, show in Attachment C of the Part A application, notes the locations of HWMUs in relationship to the facility boundaries and indicates a more than sufficient buffer zone required for the management of ignitable or reactive wastes. A topographic map of the facility is shown in Attachment E of part A.

2.0 Features to Mitigate Unsuitable Site Characteristics

N/A

3.0 PLANNING AND CONSTRUCTION SCHEDULES

With the exception of caustic tank, D-4383; the Channelview Complex has upgrades the existing permitted hazardous waste tank systems with secondary containment structures which comply with the requirements outlined in 40 CFR Section 264.193. Engineering designs will be developed and installed for D-4383 by the mandated time frame. The caustic tank system will continue to be asses on an annual basis to determine the tank system's integrity as outlined in 40 CFR Section 264.191.

4.0 DETAILED PLANS AND SPECIFICATIONS

Detailed descriptions and engineering drawings are provided for each permitted HWMU at the Channelview Complex in the appropriate dividers of this section.

5.0 FACILITY DESIGN AND WASTE MANAGEMENT PROCEDURES

The Channelview Complex is designed, constructed, and operated to properly manage, control and prevent and/or minimize any adverse human or environmental impact. Operational and safety procedures are instituted to train employees in the proper management of hazardous materials. The

permitted hazardous waste management tanks are designed with cut-off valves and by-pass systems to prevent releases, while the container storage area is designed with ramps and aisle spacing for use with specialized equipment (i.e. forklift) for the safe management of waste containers.

The Channelview Complex has ongoing routine inspection and maintenance program which is carried out to minimize equipment failures which may result in releases to the environment. Backup systems and equipment are utilized along with shutdown procedures for process units in the event of power outages as a means to minimize any resulting adverse environmental or health impacts.

Existing and proposed secondary containment systems – dikes, curbing, sumps, and ditch gate valves associated with the hazardous waste management units along with operating and safety procedures will serve to effectively contain waste spills or contaminated rainfall until it can be removed. The design of the secondary containment systems is described in the following information.

The off-site migration of wastes which could potentially contaminate waster supplies is also greatly minimized through the utilization of the aforementioned methods of containment and the expeditious removal of any leakage or spillage of waste materials.

6.0 ANCILLARY COMPONENT DESCRIPTION

Ancillary components associated with the hazardous waste management units at the Channelview Complex are detailed and described are in each of the respective unit engineering reports of the Part A permit application in the form of piping and instrumentation diagrams and process flow diagrams.

7.0 FLOOD PROTECTION

The extreme eastern portion of LPC-owned property either borders on or is partially located in the 100-year floodplain boundary, according to the Federal Emergency Management Agency (FEMA) flood map, found in Attachment F of Section II in the Part B permit application. This portion of the property is undeveloped acreage and includes no operational portion of the Channelview Complex. The nearest hazardous waste management unit (container storage area) to the 100-year floodplain boundary is approximately 1,800 feet away. The container storage structures are constructed above grade with containment structures to prevent run-on of surface water, thus providing an added

measure of protection from potential flooding. Since no hazardous waste management units are located within the 100-year floodplain boundary, no additional flood control measures are required.

8.0 TOPOGRAPHIC INFORMATION

8.1 Topographic Map, Including Scale, Date North Arrow, and Surface Waters

Attachment F of the Part A application provides a topographic map that shows a distance of at least 1,000 feet around the hazardous waste management facility. The drawing also shows surface waters (watercourses), including intermittent streams and drainage ditches.

8.2

The 100-year floodplain area is shown in Attachment F of Section II in the Part B permit application. No hazardous waste management units are located within the 100-year floodplain.

8.3 Surrounding Land Uses

Surrounding land uses (e.g. residential, commercial, agricultural, industrial, recreational) are shown on Adjacent Landowners Map of the Part A permit application.

8.4 Wind Rose

A wind rose (i.e. prevailing wind speed and direction) has been provided in the General Engineering portion of Section V of the Part B application, Attachment V–4.

8.5 Legal Boundaries of the HWM Facility

Legal boundaries of the Channelview Complex are depicted in Attachment B-1 and are described in Attachment B of the Part A permit application.

8.6 Access Control

Access control (e.g., fences, gates) or surveillance equipment is described in the Security Plan and depicted in Attachment III-1.

8.7 Injection and Withdrawal Wells, Monitor-Well Locations

The on-site injection well locations are shown in Attachment D of the Part A permit application. On-site and off-site withdrawal wells are also shown on this drawing.

9.0 HAZARDOUS WASTE MANAGEMENT FACILITIES

Hazardous waste management facility installations are shown on Attachment D of the Part A permit application.

9.1 Buildings are show on Attachment III-1 in Section III (Facility Management) of the Part B permit application.

9.2 Access and Internal Roads

Primary access into the Channelview Complex is via the main plant road, east of Sheldon Road. Secondary access roads, off Sheldon Road and Wallisville Road, are also utilized by outside contractors. These entry points are controlled by security personnel when they are being utilized.

The access points have electronically controlled gates which are activated either by the security personnel or by other authorized facility personnel. Perimeter fencing and surveillance cameras are also utilized to control unauthorized entry.

The access roads leading to the Channelview Complex as well as designated in-plant roads are engineered and constructed to provide sufficient load bearing capacities for vehicular traffic utilizing the facility. The designated facility roadways are shown on Attachment III-1 in the Security Plan in Section III.

As designated, Class I and II roads consist of a prepared base material of compacted cement stabilized oyster shell or crushed limestone topped with a water surface of approximately 1-1.2 inches of asphaltic concrete. Class I roads are twenty (20) feet wide with a minimum three (3) foot wide stabilized shoulder and Class II roads are

eighteen (18) wide with similarly constructed shoulders. Class III roads consists of an eight (8) inch compacted stabilized base and are twelve (12) feet wide. Attachment V-1 in the General Engineering section provides engineering standards for each of the described road classifications.

The main plant road off Sheldon Road is divided by a median and is designated as one way for ingressing and egressing traffic. The remaining in-plant roads and parking areas are all designated for two way travel. The majority of vehicular traffic is confined to the main plant and parking areas, outside the process areas. The average number of vehicles utilizing the Channelview Complex is between approximately 24,000 to 36,000 per month. Of these, approximately 21,300 to 32,000 vehicles are employees travelling to the facility, approximately 1,500 to 2,500 are tank trucks making deliveries or pickups at the facility, and approximately 1,100 to 1,600 are various other trucks making deliveries or pickups at the facility.

9.3 Control Measures

Traffic control signs are posted along the main plant road to the facility, at the facility entrances, and within the plant complex itself. These traffic control signs are in the form of posted speed limits signs and directional signs. The purpose of these signs is to provide for a safe and orderly flow of vehicular traffic outside and inside the facility and to reduce the potential for accidents which may involve hazardous material releases or pose a threat to human health.

9.4 Sewerage Systems

Storm, sanitary, and process sewerage systems are shown on Attachment V-2 of the General Engineering section.

9.5 Barriers for Drainage, Flood, and/or Run-Off Control

Barriers for drainage, flood and/or run-off control (such as spill-control and perimeter dikes and ditches) are shown on Attachment V-2.

9.6 Loading and Unloading Areas

Existing loading and unloading areas are in the immediate vicinity of Tanks D-4383, 3455, 4455, 2606, 3221, 1101 A, 1101 B, and the Container Storage Area. These are found in Attachment III-1 of the Security Plan.

9.7 Fire Control Facilities

The location and capability of fire-control facilities are described in Attachment III.E. in the Emergency Preparedness and Contingency Plan.

9.8 Recreation Areas

An employee recreation area is located at the northeast corner of the facility boundary.

9.9 Aisle Spaces

All hazardous waste management facilities have been designed for emergency equipment access, or have fire monitors in the immediate vicinity. The existing container storage area is designed with a minimum of 18 inches of aisle space for emergency response personnel to respond with emergency equipment when needed.

10.0 LOCATON AND SIZE OF HWM UNITS

The location and size of each hazardous waste management unit(s) are shown in Attachment C of the Part A permit application.

ATTACHMENT V-1

ENGINEERING STANDARDS FOR ROAD CLASSIFICATIONS

Revised January 1997

THE LUMMUS COMPANY A SUBSIDIARY OF COMBUSTION ENGINEERING, INC.
2000 WEST LOOP SOUTH, HOUSTON, TEXAS 77027 POST OFFICE BOX 22105

LUMMUS

ENGINEERING SPECIFICATION

NO. AE-151

PERMANENT ROADS

ARCO CHEMICAL COMPANY
ARCO OLEFINS PLANT II
CHANNELVIEW, TEXAS

LUMMUS JOB NO. T-7402

REV.	DATE	REVISION DESCRIPTION	PAGES	PREP. BY	APPR. BY
1	3-27-75	General Revisions per Rev. 2 on I-7060	9		
0	7/30/74	Per Rev. 1 on I-7080 Approved for Construction	8		

THIS SPECIFICATION IS A DUPLICATE OF ARCO I, LUMMUS JOB NO. 7080

PREPARED BY	DATE 8/6/74	APPROVED BY	DATE 8-7-74
REVIEWED BY	DATE 8-7-74	APPR. BY CLIENT	DATE 8/19/74

LUMMUS	ENGINEERING SPECIFICATION	NO. AE-151
		PROJECT T-7402
DATE 7/30/74	PERMANENT ROADS	PAGE 1 OF 9

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1.0 DEFINITIONS

1.1 Class I Roads: Major roadways designed to support heavy equipment. Wear surface to be 1-1/2 inch asphaltic concrete.

1.2 Class II Roads: Minor roadways designed to support moderate load and traffic conditions. Wear surface to be 1-1/2 inch asphaltic concrete.

1.3 Class III Roads: Minor roadways designed to support light loads, seldom traveled. Wear surface to be crushed stone or oyster shell.

1.4 Sub-Base: Prepared natural soils after removal of deleterious organic material.

1.5 Base: Select natural or artificial materials, placed and compacted as the load bearing support surface.

1.6 AASHO: American Association of State Highway Officials.

1.7 ASTM: American Society for Testing Materials.

2.0 GENERAL

2.1 Drainage: All roads shall be crowned at the centerline and sloped 1/8 inch per foot on paved surfaces and sloped 1/4 inch per foot on crushed stone or oyster shell surfaces.

2.2 Shoulders: All surfaced roadways shall have a minimum three (3) foot wide shoulder of cement stabilized oyster shell or crushed limestone and sloped 1/2 inch per foot width into roadside drainage canals. ⚠

2.3 Class I Roads shall be twenty (20) feet wide with an 8 inch compacted cement stabilized oyster shell or crushed limestone base. ⚠

2.4 Class II roads shall be eighteen (18) feet wide with a 6 inch compacted cement stabilized oyster shell or crushed limestone base. ⚠

2.5 Class III roads shall be twelve (12) feet wide with a 8 inch compacted cement stabilized sand and shell or crushed limestone base.

3.0 ROAD SITE PREPARATION (ALL ROADS)

3.1 The area to be paved shall be surveyed and staked for line and grade.

3.2 Top soil containing organic or other deleterious matter shall be stripped to a minimum depth of six inches.

3.3 Excavations shall conform to the given dimensions and elevations as called for on the construction drawings.

3.4 Excess excavation material shall be removed to an area for disposal as directed by ARCO inspector.

3.5 Excavation shall be graded true to finish grade to within plus or minus two inches.

4.0 ROAD SUB-BASE PREPARATION FOR CLASS I AND II ROADS

4.1 Upon completion of excavation, the sub-base shall be thoroughly cleaned of all deleterious materials and lime stabilized if required in accordance with section 11.0 of this specification.

4.2 The sub-base shall be compacted, using ten ton sheeps foot, pneumatic tire wobble wheel, or other approved rolling and compacting equipment to a density of at least 95% Proctor at optimum moisture content. Compaction equipment shall exert a pressure from 85 to 125 psi at the contact surface. Note, however, that compaction around underground pipes shall be carried out in accordance with procedure shown on Page 8 of 8. After 5'0" of fill over pipes have been compacted by light equipment, heavy equipment may be used.

4.3 In the event the compacted elevation of the sub-base is below acceptable limits or the compacted density is below standards, the sub-base shall be loosened by plowing, scarifying or other approved methods, to a depth of six inches and back-fill placed and compacted to a density of 95% maximum Proctor at optimum moisture content.

4.4 After the sub-base is compacted, the completed work shall be firm, uniform smooth, true to finish grade and shall be maintained in that condition until application of base material.

5.0 CEMENT STABILIZED OYSTER SHELL ROAD BASE FOR CLASS I AND II ROADS

5.1 Materials

5.1.1 Shall be graded as follows:

Crushed Oyster Shell		Crushed Limestone	
U.S. Sieve Series	% (by wt.) Retained	U.S. Sieve Series	% (by wt.) Retained
2"	0 - 8	2"	0 - 10
1"	5 - 35	1"	5 - 35
1/4"	45 - 75	No. 4	45 - 65
No. 200	85 - 95	No. 40	55 - 85

⚠

5.1.2 Portland Cement, Type I as per ASTM C-150.

5.1.3 Water shall be clean and clear, free of oils, acids, alkalies and organic substances.

5.2 Proportioning of Materials and Mixing

5.2.1 The mix shall consist of 1-1/2 sacks of cement per ton (2000 lbs) of crushed oyster shell or crushed limestone. Water shall be added only in sufficient amounts to produce a workable mixture. 

5.2.2 Mixing of the materials shall be accomplished using a pugmill type mixer of two ton (4000 lb) capacity. Mixing time shall be a minimum of 1-1/2 minutes from the time all materials are introduced to the mixer.

5.3 Placing of Base Materials

5.3.1 The mixed cement stabilized oyster shell or crushed limestone material shall be placed in a single course and compacted, within 30 minutes of placing, to 95% maximum density using 10 ton steel wheel or pneumatic tired rolling equipment. 

5.3.2 The required compacted base course thickness shall be as indicated on the construction drawings and acceptable tolerances of plus or minus 1/2 inch of grade elevations required to obtain finish paving elevations as shown on the drawings.

5.3.3 A curing time for the cement stabilized oyster shell or crushed limestone, after final shaping, shall be no less than three days before installation of surface material. 

During the curing period, the base shall be protected to prevent it from being damaged. Any damage resulting to the base course, from equipment or vehicles, shall be repaired before prime coat application.

5.4 Prime Coat

5.4.1 Prior to placing the asphaltic concrete wear surface the cement stabilized oyster shell or crushed limestone base shall be power and/or hand swept of all mud, dirt and debris. It shall then be treated with a prime coat of an approved MC-70 or RC-30 liquid asphalt conforming to the requirements of AASHO specification M-82. 

5.4.2 The prime coat shall be applied by distributor uniformly over the entire area to be paved at a rate sufficient to waterproof the surface, plug voids, bond loose particles and promote adhesion between the base and surface course.

5.4.3 The temperature of the prime coat shall be between 125 and 200°F when applied and at no time heated to a temperature in excess of 200°F. The atmospheric temperature shall be at least 50°F when the prime coat is applied.

5.4.4 The prime coat shall cure a minimum of forty-eight (48) hours after application or longer if necessary. Blotting sand may be applied after three days from time of application if primer is not curing due to overdose. An application rate of 0.3 gal. per sq yd should be sufficient.

6.0 ASPHALTIC CONCRETE MATERIALS AND MIX

6.1 Asphaltic cement 60-70 penetration at 77°F, 100g, 5 sec shall be used.

6.2 Aggregate and mix type IVb, gradation all in accordance with the Asphalt Institute Specification Series #1 dated June 1964 (hereafter referred to as SS #1) sections 2.07 and 3.09 through 3.13 inclusive.

6.3 The percentage of wear for coarse aggregate shall not exceed 40% when tested according to ASTM C-131 specifications.

6.4 Fine aggregate shall have a satisfactory soundness record or shall be tested for soundness according to ASTM C-88. When tested for soundness the maximum loss in a sodium sulphate solute at 5 cycles shall be no greater than 12%.

6.5 The mix composition shall correspond to the recommendation of SS #1 Section 2.07 for type IVb mix, and proportioned and mixed in accordance with SS #1 sections 3.30 through 3.36 inclusive.

7.0 ASPHALTIC CONCRETE PLACING

7.1 The mixture shall be spread by means of a self-propelled spreading, racking and finishing machine or by an Owner approved alternate method.

7.2 Placing shall be done only when the primed surface is clean and dry, the weather is not rainy or otherwise unsuitable and the atmospheric temperature is above 50°F.

7.3 Asphaltic concrete shall be placed in a full course thickness as indicated on the construction drawings, plus 1/2 inch tolerance acceptable to maintain final grade and section.

7.4 As soon after spreading as is practical, without causing undue displacement, the asphalt course shall be rolled with a self-propelled steel or rubber tired roller weighing at least 10 tons. Roller wheels shall be equipped with scraping and sprinkling devices and shall be kept clean and moistened at all times.

7.5 Longitudinal rolling followed by cross rolling shall be accomplished if deemed necessary for smooth profile. Longitudinal rolling shall start at outside edge and progress toward the center in the logitudinal run. Each trip of the roller shall overlap the previous trip by at least one foot.

7.6 The finish surface shall be uniform in texture and appearance and true to the established cross section and grades. The finish surface shall not vary by more than 1/8" in ten feet from profile and cross-section.

7.7 Where jointing existing asphalt paving, the edge of the previous work shall be cut back to an even vertical face for the full thickness of the course and jointed as per recommendations of the Asphalt Institute. Joint shall be neat in appearance and sound in construction.

8.0 CLASS III ROAD SUB-BASE PREPARATION

8.1 Upon completion of excavation as required under paragraph 3.0 of this specification the sub-grade shall be compacted, using a ten ton sheeps foot, pneumatic tire wobble wheel or other approved rolling and compaction equipment to a density of at least 95% Proctor at optimum moisture content.

8.2 The entire road bed shall be filled with a 60-40 sand clay mixture, compacted to 95% maximum density, to develop a sub-base of four inches.

8.3 The completed sub-base work shall be firm, uniformly smooth and true to finish grade within plus or minus one inch, and maintained in that condition until application of the base material.

9.0 CLASS III ROAD BASE

9.1 The entire road bed shall be filled to form a compacted base of cement stabilized sand and shell or crushed limestone, eight (8) inches deep.

9.2 1-1/2 sacks per ton (2000 lbs) cement stabilized sand and shell shall be placed and compacted in two 4-inch layers. Compaction shall be with 10 ton steel wheel or pneumatic tire rolling equipment.

9.3 Crushed magnesium base limestone, when used, shall be placed in two 4-inch (compacted depth) layers. Each layer shall be spread uniformly across the road bed, sprinkled with water as required and rolled with pneumatic tired rollers until a uniform compaction of 95% maximum density is obtained. Crushed limestone shall be graded approximately as follows:

U. S. Sieve Series	% Passing
2"	100
1"	90
1/2"	75
No. 3	50
No. 20	40
No. 100	30
No. 200	10

9.4 Class III road bases shall be uniformly smooth and true to finish grade to within plus or minus 1/2 inch.

10.0 CLASS III ROAD SURFACE

10.1 A tack coat of MC-30 liquid asphalt shall be applied to the prepared road base with a truck mounted distributor at a rate of one half gallon per square yard.

10.2 The American Asphalt Institute application's temperature and climatic condition recommendations shall be followed.

10.3 A road sealer of bank run sand or crushed magnesium base limestone dust shall be applied uniformly at a rate of 42 pounds per square yard.

10.4 Blotting may be used in pocketed areas where tack coat liquid asphalt has cured for three days.

10.5 Finished road surface shall be uniformly smooth and true to finish design profile.

11.0 ROAD BED LIME STABILIZATION

11.1 After the road bed has been stripped of all organic and other deleterious materials, the area of the road bed shall be pulverized to a depth of at least six (6) inches. Not more than 55% of the pulverized material shall be retained on a number four (4) sieve after pulverizing.

11.2 Commercial quality hydrated quick lime shall be applied at a rate of 2.5 lbs per square foot evenly over the proposed road bed and shoulder area.

11.3 The lime shall be disc harrowed into the six inch pulverized soil until a uniform lime-soil consistency is obtained.

11.4 The soil mixture shall be lightly watered and compacted to 95% maximum density as determined in accordance with ASTM D-1557-88-T (modified compaction, with moisture content 0 to 5 percent over optimum).

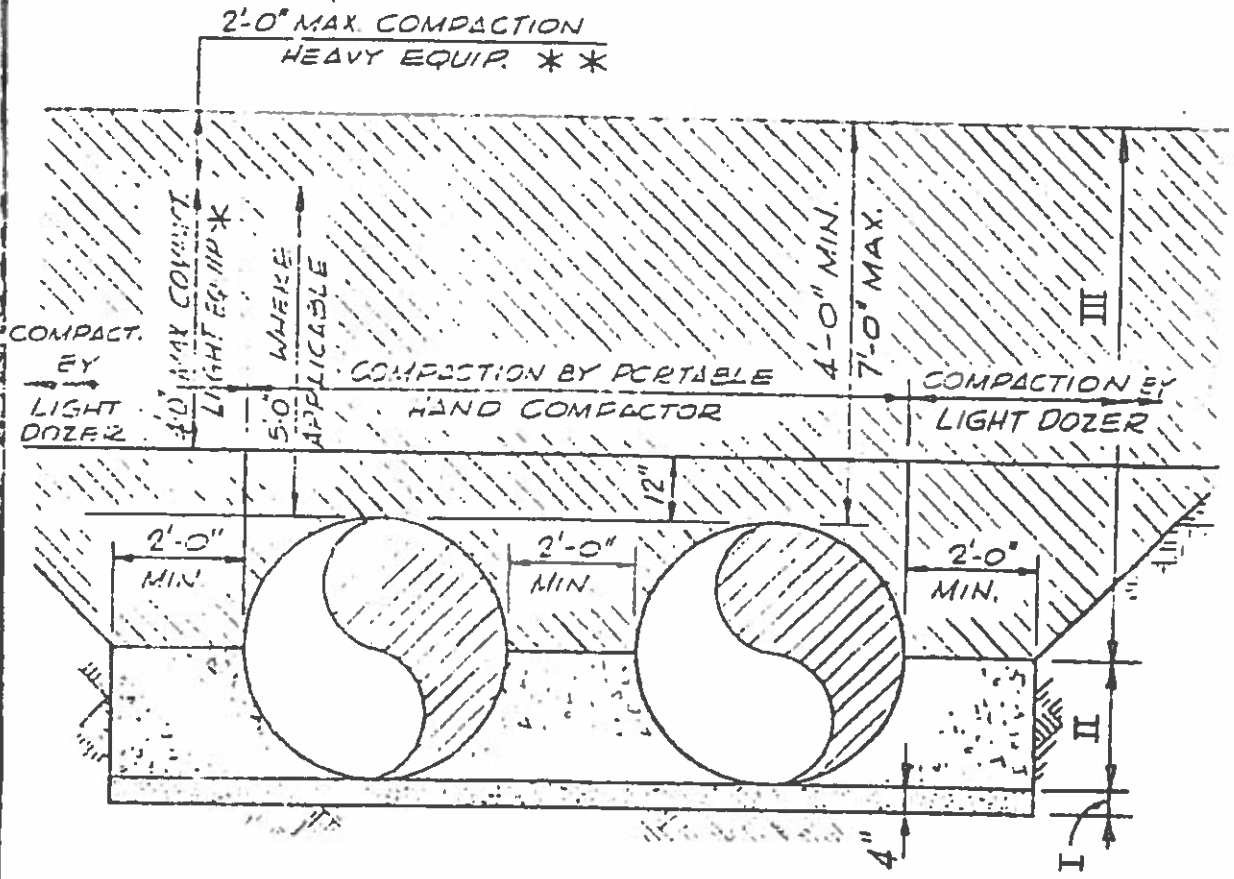
11.5 Successive six inch lifts of borrowed clay fill material shall be lime stabilized using the same procedure as outlined above until the road bed elevation as shown on construction drawings has been reached.

12.0 COMPACTION AROUND UNDERGROUND PIPES

See Page 9.

* LIGHT COMPACTION EQUIPMENT -- SUCH AS FORDSON OR JOHN DEERE TRACTOR, OR D4/D6 BULLDOZER USED WITH RUBBER TIRE COMPACTOR. THE WEIGHT OF COMPACTOR SHALL BE SUCH THAT THE TRACK DEPTH SHALL NOT EXCEED 1¼".

** HEAVY COMPACTION EQUIPMENT -- SUCH AS EQUIPMENT SPECIFIED IN FIRST PARAGRAPH OF SECTION 4.2 THIS SPECIFICATION.



I. 4" BEDDING SAND

II. CEMENT STABILIZED SAND - 1½ BAGS CEMENT TO 1 CU. YD. SAND POURED IN SLURRY FORM (8" SLUMP) FROM B.O.P. TO SPRING LINE OF PIPE.

III. SELECT BACK-FILL TO BE COMPACTED TO 95 % OF MAXIMUM DENSITY AT OPTIMUM MOISTURE AS DETERMINED BY MODIFIED AASHO - F 120.

JOB Nº T-7402 AREA

DES	CHK	DESCRIPTION
		AS PER ACTUAL FIELD CONST.
		ALLIED NOTES
		APPROVED FOR CONSTRUCTION

SPECIFICATION AE-151
PERMANENT ROADS

SCALE — DWG. NO. PAGE 5 of 5

Attachment V-2

Drainage Patterns and Spill Control Gates or Valves

NORTH PROPERTY LINE

PLANT

EMPLOYEE'S RECREATION AREA

San Jacinto River

EAST PLANT

OP-I

OP-II

MEK

TANK FARM

RAILROAD YARD

MAINT. WAREHOUSE

MAINTENANCE

ELEC.

LAB.

ADMINISTRATION

UTILITY

ACCESS ROAD

UNITED GAS METER STATION

138 KV SUB-STA.

P.M.D.L. SITE

SEE GATE LOCATION DETAIL

SLUDGE LAGOONS

120' HARRIS CO. FLOOD CONTROL DITCH & MAINT ESMTS

50' FLOOD CONTROL EASEMENT (ABANDONED)

100' PIPE LINE EASEMENT

WARREN PIPE LINE CO EASEMENT

120' PIPE LINE EASEMENT

100' ARCO PIPE ALLEY

16' PIPE LINE EASEMENT

HOUSTON LIGHTING & POWER 100' FEE STRIP

MISSOURI PACIFIC R.R. 100' FEE STRIP

WARREN PIPE LINE CO. 50' FEE STRIP

ARCO 50' PIPE ALLEY

SHELDON 100' EASEMENT

HL&P CO 100' EASEMENT

4-D-04
4-D-05
4-D-06
4-D-07
4-D-08
4-D-02
4-D-03
SUMP PUMP

GATE LOCATION IN CIRCLED AREA
NTS

WALLISVILLE ROAD

BARGE UNLOADING DOCK FACILITIES

DEER ANE

HL&P CO LYONDELL SUB-STA

ARCO PIPELINE MAINT.

ARCO SEC. II

ARCO SEC. III

ARCO SEC. IV

NUMBERING KEY

XX-Y-ZZ

XX = STREET

Y = AVENUE

ZZ = GATE OR VALVE NO.

ARCO SEC. XX

LEGEND

- UNDERGROUND DRAIN
- DITCH & FLOW DIRECTION
- XX-Y-ZZ — EXISTING DRAINAGE GATES OR VALVES
- PROPOSED DRAINAGE GATES OR VA'S.
- PROPERTY BOUNDARY LINES.
- EASEMENT & PIPE ALLEY BOUNDARY LINES
- CLASS I & II NON-UNIT ROADS
- PAVED PARKING & CLASS III ROADS
- BUILDINGS

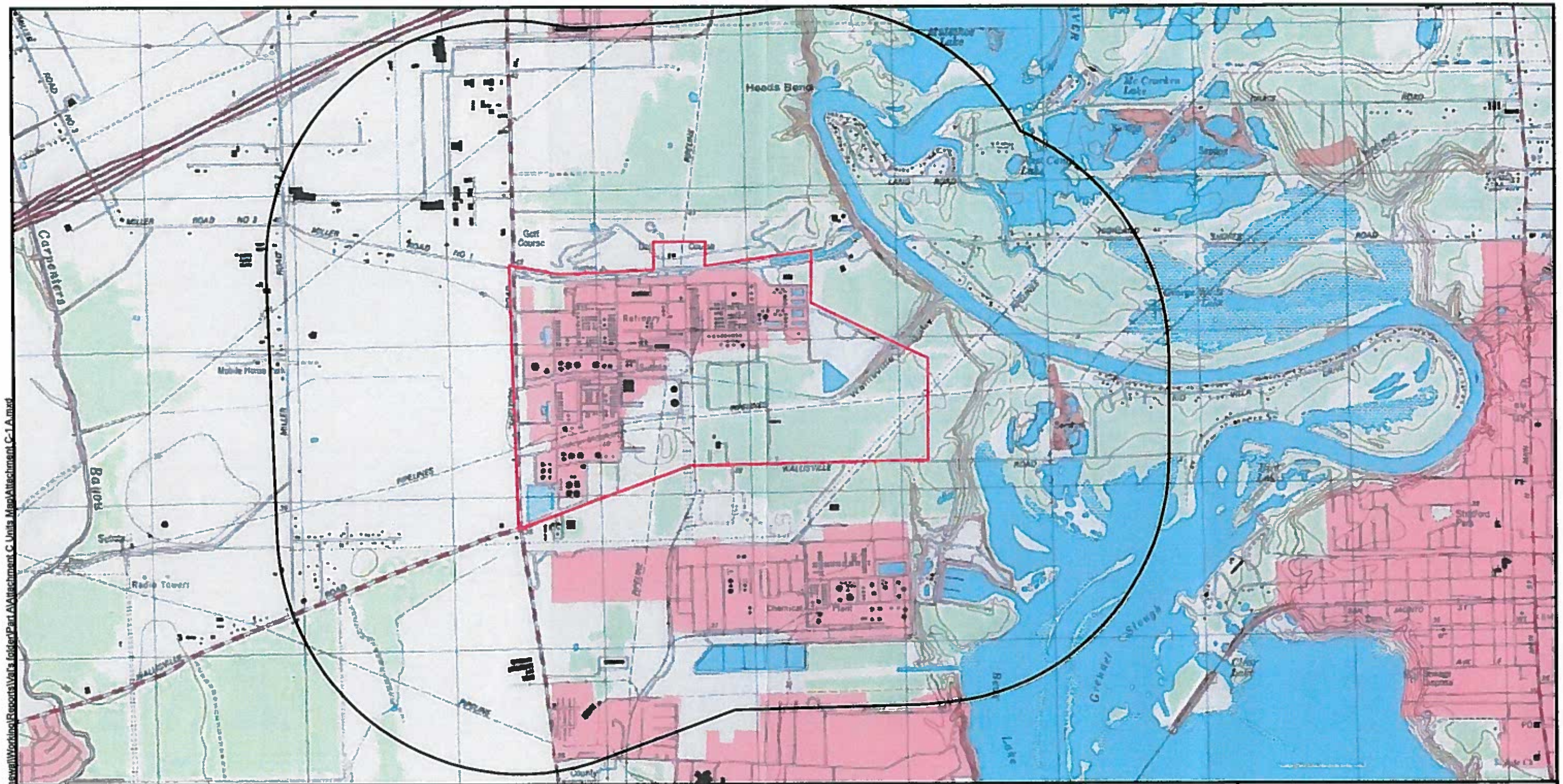
S.I.P. INC.
Engineers & Constructors
HOUSTON, TEXAS

ARCO Chemical Company
LYONDELL OPERATIONS

PLOT PLAN
DRAINAGE PATTERNS & SPILL CONTROL GATES OR VALVES
LYONDELL PLANT SITE

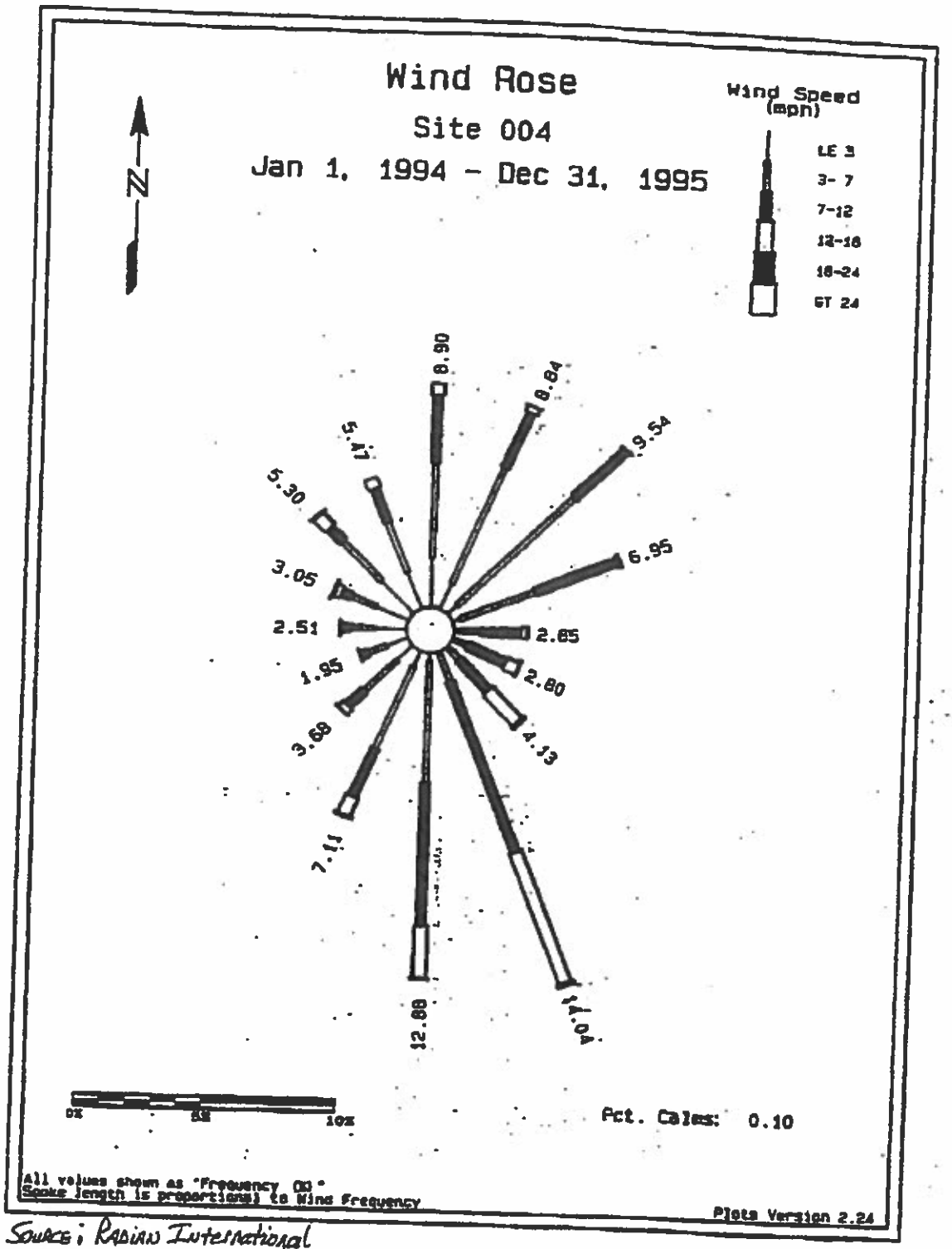
SCALE	DRAWING NUMBER	REV.
1"=300'	E 99 L 3158	3

ATTACHMENT V


Heads Bend
Carpenters
Bayou
Golf Course
Refinery
Mobile Home Park
Radio Tower
Chemical Plant
Stafford Park
Clear Lake
Miller Road No 3
Miller Road No 1
Pipelines
Railroad
Path: P:\Projects\144754 - CVO-N RGRA Permit Renewal\Working\Exports\Word's folder\Part A\Attachment C Units Map\Attachment C-1 A.mxd
1 Mile Boundary
Facility Boundary Line
N
0 1,350 2,700 5,400 Feet
Figure C-1 A
1 MILE BOUNDARY MAP
Equistar Chemicals, LP.
Channelview Complex
Channelview, Texas
Brown AND Caldwell
Date: 5/6/2014

Attachment V-4

Wind Rose



SOURCE: RADIAN INTERNATIONAL

ATTACHMENT II-4

ATTACHMENT II

CLASS I MODIFICATIONS FOR ANCILLARY EQUIPMENT SECONDARY CONTAINMENT

Plant	Type of Change	Explanation
Poly-Butadiene (Poly-BD)	Replace Valves	Replace approximately 20 feet of piping, a couple of pipe fittings, and eight small diameter (≤ 2 inch) valves with sealless, bellows-type valves
	Concrete Slab	Install concrete pavement in approximately 1200 sq. ft. of earthen ditch to close the perimeter drainage loop.
Isopropyl Alcohol (IPOH)	Replace Valves	Replace six (6) - ¾ inch valves with sealless, bellows-type valves
	Sealed Flange Protector	Install enclosure around two sets of flanges
	Collection Pan	Install metal tray under valve at the West API which drains back to the API.
	Concrete Slab	Install curbed concrete pad around pump and valving at the IPOH flare and West API separator.
	Concrete Structure	Install a concrete retention wall and gate valve in the east perimeter ditch to prevent backflow into the earthen portion of the ditch.
Styrene Maleic Anhydride (SMA)	Concrete Slab	Install concrete pavement on approximately 2000 sq. ft. area between the process equipment and the dike wall of storage tank TK-2812
East Plant	Replace Valves	Replace thirteen (13) - ¾ inch valves with sealless, bellows-type valves.
	Replace Pipe Fittings	Replace a set of flanges with a welded coupling and install another welded coupling at a different location
	Concrete Slab	Construct two concrete pavement areas, one which drains to an existing concrete ditch and the other is a curbed concrete slab with an isolation drain valve.
	Sealed Flange Protector	Install enclosures around five sets of flanges
	Isolation	Provide isolation for four (4) 1-1/2 inch sets of flanges on piping from a closed RCRA storage tank system (D-7039) by installing a metal plate between the flanges.

S & B ENGINEERS and CONSTRUCTORS, LTD.
P.O. BOX 26645
HOUSTON, TEXAS 77207-6245
(713)645-4141
FAX 645-6094
7825 PARK PLACE BLVD
HOUSTON, TEXAS 77087

January 25, 1999

Letter No.: SBLLP-001
Project Title: East Plant RCRA Upgrade
Client Job No.:
S&B Job No.: E4792
File: 601.001

Mr. Todd Marler
Equistar Chemicals, LP
8280 Sheldon Road
Channelview, Texas 77530

Subject: Ancillary Equipment RCRA Certification

Dear Todd,

The intent of this letter is to provide RCRA certification in accordance with Code of Federal Regulations paragraph 40 CFR 264.192, 264.193 and 270.11 (d). This certification covers the Ancillary Equipment in the following production area:

East Plant Facility

The plant has identified and retrofitted with secondary containment all Ancillary Equipment that are associated with the transportation or storage of hazardous waste in the East Plant production facility to conform to the requirements of section 40CFR 264.193 (b, c & f)

In general, the affected Ancillary Equipment are defined in the following:

Enclosure 1 P&IDs for the facility
Enclosure 2 System isometric drawings

I have inspected the Ancillary Equipment covered in these projects and found that all components satisfy the secondary containment requirements of Section 40 CFR 264.193.

In accordance with CFR 270.11 (d) the following specific certification is made:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to be the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for

Submitting false information, including the possibility of fine and imprisonment for knowing violations."



Sincerely,

, P. E.

Harif Atobajeun
Senior Process Engineer

HA/msf
cc: Rick Barringer
Janice Seward
Project File

S & B ENGINEERS and CONSTRUCTORS, LTD.
P.O. BOX 26643
HOUSTON, TEXAS 77207-6243
(713)645-4141
FAX 645-6094
7825 PARK PLACE BLVD.
HOUSTON, TEXAS 77087

December 15, 1998

Letter No.: SBLLP-001
Project Title: Poly BD RCRA Upgrade
Client Job No.:
S&B Job No.: E4794
File: 601.001

Mr. Todd Marler
Equistar Chemicals, LP
8280 Sheldon Road
Channelview, Texas 77530

Subject: Ancillary Equipment RCRA Certification

Dear Todd,

The intent of this letter is to provide RCRA certification in accordance with Code of Federal Regulations paragraph 40 CFR 264.192, 264.193 and 270.11 (d). This certification covers the Ancillary Equipment in the following production area:

Poly BD facility

The plant has identified and retrofitted with secondary containment all Ancillary Equipment that are associated with the transportation or storage of hazardous waste in the Poly BD production facility to conform to the requirements of section 40CFR 264.193 (b, c, & f).

In general, the affected Ancillary Equipment are defined in the following:

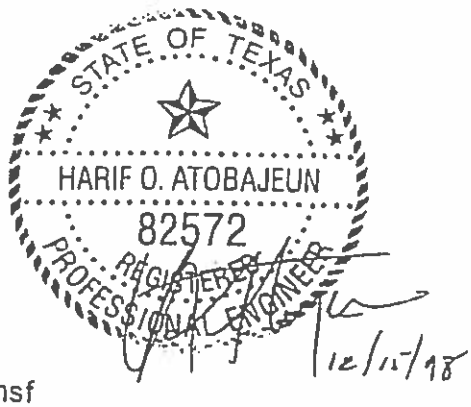
Enclosure 1 P&IDs for the facility
Enclosure 2 System isometric drawings

I have inspected the Ancillary Equipment covered in these projects and found that all components satisfy the secondary containment requirements of Section 40 CFR 264.193.

In accordance with CFR 270.11 (d) the following specific certification is made:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to be the best of my knowledge and elief, true, accurate, and complete. I am aware that there are significant penalties for

Submitting false information, including the possibility of fine and imprisonment for knowing violations."



Sincerely,

Harif Atobajeun, PE
Senior Process Engineer

HA/msf
cc: Rick Barringer
Janice Seward
Project File

S & B ENGINEERS and CONSTRUCTORS, LTD.
P.O. BOX 26645
HOUSTON, TEXAS 77207 6245
(713)643-4141
FAX 645-6094
7825 PARK PLACE BLVD.
HOUSTON, TEXAS 77087

December 15, 1998

Letter No.: SBLLP-001
Project Title: IPOH RCRA Upgrade
Client Job No.:
S&B Job No.: E4791
File: 601.001

Mr. Todd Marler
Equistar Chemicals, LP
8280 Sheldon Road
Channelview, Texas 77530

Subject: Ancillary Equipment RCRA Certification

Dear Todd,

The intent of this letter is to provide RCRA certification in accordance with Code of Federal Regulations paragraph 40 CFR 264.192, 264.193 and 270.11 (d). This certification covers the Ancillary Equipment in the following production area:

IPOH facility

The plant has identified and retrofitted with secondary containment all Ancillary Equipment that are associated with the transportation or storage of hazardous waste in the IPOH production facility to conform to the requirements of section 40CFR 264.193 (b, c & f)

In general, the affected Ancillary Equipment are defined in the following:

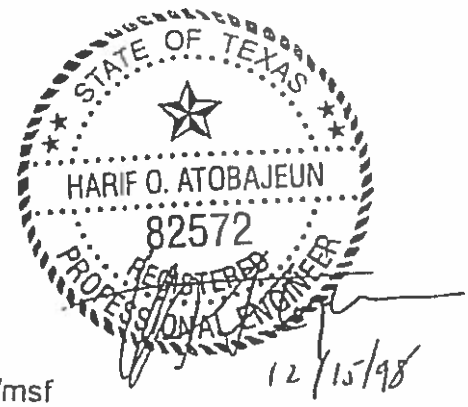
Enclosure 1 P&IDs for the facility
Enclosure 2 System isometric drawings

I have inspected the Ancillary Equipment covered in these projects and found that all components satisfy the secondary containment requirements of Section 40 CFR 264.193.

In accordance with CFR 270.11 (d) the following specific certification is made:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to be the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for

Submitting false information, including the possibility of fine and imprisonment for knowing violations."



12/15/98

Sincerely,

, PE

Harif Atobajeun
Senior Process Engineer

HA/msf
cc: Rick Barringer
Janice Seward
Project File

S & B ENGINEERS and CONSTRUCTORS, LTD.
P.O. BOX 26645
HOUSTON, TEXAS 77207 6245
(713)643-4141
FAX 643-6094
7825 PARK PLACE BLVD.
HOUSTON, TEXAS 77087

December 15, 1998

Letter No.: SBLLP-001
Project Title: SMA RCRA Upgrade
Client Job No.:
S&B Job No.: E4793
File: 601.001

Mr. Todd Marler
Equistar Chemicals, LP
8280 Sheldon Road
Channelview, Texas 77530

Subject: Ancillary Equipment RCRA Certification

Dear Todd,

The intent of this letter is to provide RCRA certification in accordance with Code of Federal Regulations paragraph 40 CFR 264.192, 264.193 and 270.11 (d). This certification covers the Ancillary Equipment in the following production area:

SMA facility

The plant has identified and retrofitted with secondary containment all Ancillary Equipment that are associated with the transportation or storage of hazardous waste in the SMA production facility to conform to the requirements of section 40CFR 264.193 (b, c, & f).

In general, the affected Ancillary Equipment are defined in the following:

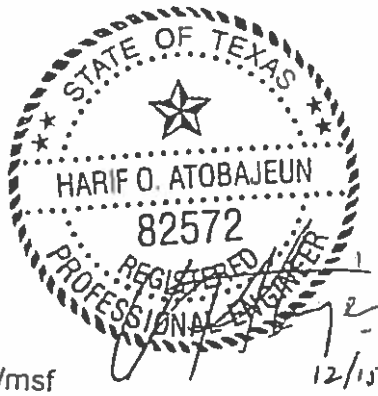
Enclosure 1 P&IDs for the facility
Enclosure 2 System isometric drawings

I have inspected the Ancillary Equipment covered in these projects and found that all components satisfy the secondary containment requirements of Section 40 CFR 264.193.

In accordance with CFR 270.11 (d) the following specific certification is made:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to be the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for

Submitting false information, including the possibility of fine and imprisonment for knowing violations."



12/15/98

Sincerely,

, PE

Harif Atobajeun
Senior Process Engineer

HA/msf
cc: Rick Barringer
Janice Seward
Project File

Engineering Report for Tanks 1101 A &B

LYONDELL PETROCHEMICAL CO.
CHANNELVIEW, TX

HAZARDOUS WASTE STORAGE TANK
TK-1101A

September 12, 1991

THE HENDRIX GROUP, INC.

METALLURGICAL ENGINEERING • CORROSION • TESTING

September 12, 1991

Lyondell Petrochemical Co.
P.O. Box 777
Channelview, TX 77530

Attention: Steve Newcomb,

Subject: Hazardous Waste Storage Tank System Assessment
Tank No. TK-1101A
Lyondell Petrochemical Co.
Channelview, TX

The Hendrix Group is pleased to submit this report of an assessment of hazardous waste storage tank system TK-1101A located at the Lyondell Petrochemical Company in Channelview, TX. The guidelines contained in 40 CFR Subsections 264.192 and 265.192, Assessment of New Tank system's Integrity, dated July 14, 1986, were followed in conducting the assessment. The purpose of the assessment is to review the tank design and installation to verify that the tank system is suitable for its intended service and that it was not damage during installation.

Our work on this project and this report was requested by Mike Trujillo of Lyondell Petrochemical Co. Written authorization was provided by Mr. D. G. Sampson with Work Order No. ACL-90-0066 August 15, 1990. It has been our pleasure working with you on this project. If you have any questions concerning the contents of this report, please do not hesitate to call.

Sincerely,

David E. Hendrix, P.E.
The Hendrix Group, Inc.

P.O. BOX 35717 • HOUSTON, TX 77235

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Section I	Project Information
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Section VI	Certification Statement
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SECTION I- PROJECT INFORMATION

Tank 1101A is a new, horizontal, aboveground atmospheric storage tank measuring 28" in diameter by 72" long, storing waste chemicals from an analytical laboratory located at Lyondell Petrochemical Co.'s (LPC) Channelview, TX facility. Tank 1101A is the West tank in an identical, two tank storage system at this location. The tank was fabricated and installed in 1990.

Tank 1101A requires an assessment per 40 CFR subsection 265.192, Assessment of New Tank System's Integrity, until such time as secondary containment for the tank is established. The present assessment consisted of a visual observation of Tank 1101A and its ancillary equipment to establish that the tank was installed without sustaining any damage that would prevent safe operation.

The assessment also included a limited review of the tank design to determine that the design wall thickness and support structure are adequate for the intended operation, that the venting capacity of the tank is sufficient to meet normal and emergency venting requirements, and that the tank materials of construction are compatible with the presently stored waste. An internal inspection of Tank 1101A was not conducted due to an ability to access and observe the entire tank exterior. This assessment governs the tank operation for the year 1990.

SECTION II- SCOPE OF SERVICES

The Hendrix Group was requested to provide the necessary services to assess Tank 1101A, a new, above-ground hazardous waste storage tank system, located at Lyondell Petrochemical Co.'s Channelview, TX facility. The requirements of 40 CFR, subsections 264.192 and 265.192, Assessment of New Tank System's Integrity were followed in conducting the assessment.

Our assessment included the following work:

- Perform a limited visual and non-destructive inspection of the exterior of Tank 1101A and its ancillary equipment.
- Review available drawings and perform calculations as needed to verify that the tank wall thickness and vent capacity are adequate for the intended service.
- Verify the compatibility of the tank materials with the contained waste.
- Submit a written report containing the results of our assessment.
- Submit a certification statement, as appropriate, which indicates that Tank 1101A is currently fit for its intended use.

SECTION III- OBSERVATIONS AND DISCUSSION

On August 14, 1990, representatives of The Hendrix Group conducted an inspection of Tank 1101A while the tank was in operation. Our inspection included visual observation of the tank and its ancillary equipment and a limited ultrasonic wall thickness survey of the shell, head, and connecting piping. Our visual inspection followed the guidelines of the American Petroleum Institute, "Guide For Inspection of Refinery Equipment, where appropriate.

Visual observation indicates that Tank 1101A is of welded construction using type 304 stainless steel shell plate and flat unstayed heads welded to the shell. The 2" inlet piping and 3" outlet piping are manufactured from 304LSS sch. 40 and sch. 10 piping, respectively. The piping is connected with 3000# sockolet fittings and 150# 304LSS flanges. Photographs of the tank and associated piping can be seen in Appendix A.

Tank 1101A also includes a 2" inch Groth Md. 7618 Flame Arrestor (which it shares with its sister tank 1101B) and a 6" quick release gage hatch. This gage hatch has been modified to allow the vent to act as an emergency vent by permanently removing the wing nut securing the vent cap to the shell. This modification allows the cap to swing up freely in the event of an emergency release.

The tank is supported by two 1/4" thick "L" brackets welded to reinforcing pads which, in turn, are welded to the shell. Tank 1101A sets on a 7" high concrete foundation which has been painted. Chemicals gravity flow from individual sinks in the laboratory into the tank and are pumped out of the tank with a vacuum truck.

The tank, inlet piping, outlet piping and vent piping visually appeared in good condition. All welded piping connections were of good visual quality and no indications of leakage from connections or valves was observed. The foundation was in good condition with no spalling, chemical attack or other damage noted.

Ultrasonic wall thickness measurements were taken on the tank shell, heads, and inlet and outlet piping to verify design thicknesses as indicated on drawings supplied by LPC. All measurements indicated uniform wall thicknesses and were above design minimums. The ultrasonic measurements can be seen in Appendix B.

Calculations using ASME Section VIII div. 1 formulas were conducted to verify the tank shell and head thicknesses for internal pressure, external loads and saddle support placement (Appendix D.) Calculations were also conducted using API-2000 to verify venting capacity requirements (Appendix G). The results of the calculations indicate that the tank and its venting system are adequately designed for the present service.

The waste composition stored in Tank 1101A was reviewed to evaluated the compatibility of the stored waste with the tank materials of construction. Details of the waste composition, as supplied by LPC can be found in Appendix E. The review indicated that the presently stored waste should be compatible with the 304 stainless steel at present conditions. Available literature references were consulted to verify the waste compatibility including The Corrosion Resistance Tables by Schweitzer, The Corrosion Handbook by Uhlig, and Corrosion Resistance Tables by NACE.

SECTION IV- CONCLUSIONS

Based on the limited visual and ultrasonic wall thickness survey performed by The Hendrix Group, the available information provided by LPC, and our experience with similar projects, it is the opinion of The Hendrix Group that Tank 1101A and its ancillary equipment is fit for the intended service, is currently not leaking, and is compatible with the presently stored waste.

SECTION V- RECOMMENDATIONS

While the modification performed by LPC to the gage hatch of Tank 1101A will serve the purpose of API 2000 requirements in relieving internal pressures in the event an a fire or other emergency of this nature, a more permanent solution is recommended. Until a permanent emergency vent relief is installed, it is recommended that LPC install a prominent sign on or adjacent the tank indicating that the tank is an EPA regulated tank and that the gage hatch is not to be modified in any manner.

SECTION VI- CERTIFICATION STATEMENT

TANK 1101A
LYONDELL PETROCHEMICAL CO.
CHANNELVIEW, TX

Based on our visual survey, wall thickness measurement results, calculations, information provided by Lyondell Petrochemical Co. concerning the tank system contents and operating conditions, and our experience with similar projects, it is the opinion of The Hendrix Group, Inc. that Tank 1101A and its ancillary equipment is structurally fit for the existing service at its present location, was installed without damaging the vessel or its components, is compatible with the currently stored hazardous waste under the stated, normal operating conditions and is currently not leaking.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

The Hendrix Group
David E. Hendrix, P.E.

IDEH

LYONDELL PETROCHEMICAL CO.
CHANNELVIEW, TX

HAZARDOUS WASTE STORAGE TANK
TK-1101B

September 12, 1991

THE HENDRIX GROUP, INC.

METALLURGICAL ENGINEERING • CORROSION • TESTING

DAVID HUNT
~~x8258~~
x 9285

October 16, 1990

TIM O'ROURKE

STEVE NAVARRO

Lyondell Petrochemical Co.
P.O. Box 777
Channelview, TX 77530

Attn: Mr. Mike Trujillo

RE: Hazardous Waste Tank Assessment- Lab Tanks TK-1101A/B
LPC Work Order ACL-90-0066
Hendrix Group Project No. H9034

Dear Mr. Trujillo,

As detailed in my letter to Mr. Donnie Sampson (D.E. Hendrix to Mr. D. G. Sampson dated July 30, 1990), certification of the subject LPC lab tanks to the requirements of 40 CFR, 264.191, requires both an installation review and a design review. One of the design review items is a review of the pressure/vacuum relief capabilities of the tank system. As discussed with you, the lab tanks' pressure relief or "venting capacity" was reviewed with respect to both normal emptying and filling operations and emergency relief as would be required if the tanks' were to be involved in a fire. The requirements of API 2000, Venting Atmospheric and Low Pressure Storage Tanks, were followed in the review.

A review of tanks 1101A/B indicates that the present venting capacity (as supplied by the common use 2" line with Groth Md. 7618 flame arrestor) is not sufficient per API-2000 to act as emergency venting relief for either tank. Therefore, I regret that I will not be able to provide a certification report for tanks Tk-1101A/B until the API-2000 emergency venting requirements are met. Upon completion of the necessary modifications, I will be happy to visit LPC and review the changes for compliance. At that time I can complete the certification reports.

If you have any questions concerning this letter, please do not hesitate to call.

Sincerely,

David E. Hendrix, P.E.
The Hendrix Group

P.O. BOX 35717 • HOUSTON, TX. 77235 • (713) 723-1203

THE HENDRIX GROUP, INC.

METALLURGICAL ENGINEERING • CORROSION • TESTING

September 12, 1991

Lyondell Petrochemical Co.
P.O. Box 777
Channelview, TX 77530

Attention: Mr. Steve Newcomb

Subject: Hazardous Waste Storage Tank System Assessment
Tank No. TK-1101B
Lyondell Petrochemical Co.
Channelview, TX

Dear Mr. Newcomb:

The Hendrix Group is pleased to submit this report of an assessment of hazardous waste storage tank system TK-1101B located at the Lyondell Petrochemical Company in Channelview, TX. The guidelines contained in 40 CFR Subsections 264.192 and 265.192, Assessment of New Tank system's Integrity, dated July 14, 1986, were followed in conducting the assessment. The purpose of the assessment is to review the tank design and installation to verify that the tank system is suitable for its intended service and that it was not damage during installation.

Our work on this project and this report was requested by Mike Trujillo of Lyondell Petrochemical Co. Written authorization was provided by Mr. D. G. Sampson with Work Order No. ACL-90-0066 August 15, 1990. It has been our pleasure working with you on this project. If you have any questions concerning the contents of this report, please do not hesitate to call.

Sincerely,

David E. Hendrix, P.E.
The Hendrix Group, Inc.

P.O. BOX 35717 • HOUSTON, TX. 77235 • (713) 723-1203

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Appendices	A. Photographs B. Ultrasonic Wall Thickness Measurements C. Drawings D. Calculations E. Chemical Waste Composition F. Correspondence G. Normal and Emergency Venting

SECTION I- PROJECT INFORMATION

Tank 1101B is a new, horizontal, aboveground atmospheric storage tank measuring 28" in diameter by 72" long, storing waste chemicals from an analytical laboratory located at Lyondell Petrochemical Co.'s (LPC) Channelview, TX facility. Tank 1101B is the East tank in an identical, two tank storage system at this location. The tank was fabricated and installed in 1990.

Tank 1101B requires an assessment per 40 CFR subsection 265.192, Assessment of New Tank System's Integrity, until such time as secondary containment for the tank is established. The present assessment consisted of a visual observation of Tank 1101B and its ancillary equipment to establish that the tank was installed without sustaining any damage that would prevent safe operation.

The assessment also included a limited review of the tank design to determine that the design wall thickness and support structure are adequate for the intended operation, that the venting capacity of the tank is sufficient to meet normal and emergency venting requirements, and that the tank materials of construction are compatible with the presently stored waste. An internal inspection of Tank 1101B was not conducted due to an ability to access and observe the entire tank exterior. This assessment governs the tank operation for the year 1990.

SECTION II- SCOPE OF SERVICES

The Hendrix Group was requested to provide the necessary services to assess Tank 1101B, a new above-ground hazardous waste storage tank system, located at Lyondell Petrochemical Co.'s Channelview, TX facility. The requirements of 40 CFR, subsections 264.192 and 265.192, Assessment of New Tank System's Integrity were followed in conducting the assessment.

Our assessment included the following work:

- Perform a limited visual and non-destructive inspection of the exterior of Tank 1101B and its ancillary equipment.
- Review available drawings and perform calculations as needed to verify that the tank wall thickness and vent capacity are adequate for the intended service.
- Verify the compatibility of the tank materials with the contained waste.
- Submit a written report containing the results of our assessment.
- Submit a certification statement, as appropriate, which indicates that Tank 1101B is currently fit for its intended use.

SECTION III- OBSERVATIONS AND DISCUSSION

On August 14, 1990, representatives of The Hendrix Group conducted an inspection of Tank 1101B while the tank was in operation. Our inspection included visual observation of the tank and its ancillary equipment and a limited ultrasonic wall thickness survey of the shell, head, and connecting piping. Our visual inspection followed the guidelines of the American Petroleum Institute, "Guide For Inspection of Refinery Equipment, where appropriate.

Visual observation indicates that Tank 1101B is of welded construction using type 304 stainless steel shell plate and flat unstayed heads welded to the shell. The 2" inlet piping and 3" outlet piping are manufactured from 304LSS sch. 40 and sch. 10 piping, respectively. The piping is connected with 3000# sockolet fittings and 150# 304LSS flanges. Photographs of the tank and its associated piping can be found in Appendix A.

Tank 1101B also includes a 2" inch Groth Md. 7618 Flame Arrestor (which it shares with its sister tank 1101A) and a 6" quick release gage hatch. This gage hatch has been modified to allow the vent to act as an emergency vent by permanently removing the wing nut securing the vent cap to the shell. This modification allows the cap to swing up freely in the event of an emergency release.

The tank is supported by two 1/4" thick "L" brackets welded to reinforcing pads which, in turn, are welded to the shell. Tank 1101B sets on a 7" high concrete foundation which has been painted. Chemicals gravity flow from individual sinks in the laboratory into the tank and are pumped out of the tank with a vacuum truck.

The tank, inlet piping, outlet piping and vent piping visually appeared in good condition. All welded piping connections were of good visual quality and no indications of leakage from connections or valves was observed. The foundation was in good condition with no spalling, chemical attack or other damage noted.

Ultrasonic wall thickness measurements were taken on the tank shell, heads, and inlet and outlet piping to verify design thicknesses as indicated on drawings supplied by LPC. All measurements indicated uniform wall thicknesses and were above design minimums. The tank measurements can be seen in Appendix B.

Calculations using ASME Section VIII div. 1 formulas were conducted to verify the tank shell and head thicknesses for internal pressure, external loads and saddle support placement (Appendix D.) Calculations were also conducted using API-2000 to verify venting capacity requirements (Appendix G). The results of the calculations indicate that the tank and its venting system are adequately designed for the present service.

The waste composition stored in Tank 1101B was reviewed to

evaluated the compatibility of the stored waste with the tank materials of construction. Details of the waste composition, as supplied by LPC, can be found in Appendix E. The review indicated that the presently stored waste should be compatible with the 304 stainless steel at present conditions. Available literature references were consulted to verify the waste compatibility including The Corrosion Resistance Tables by Schweitzer, The Corrosion Handbook by Uhlig, and Corrosion Resistance Tables by NACE.

SECTION IV- CONCLUSIONS

Based on the limited visual and ultrasonic wall thickness survey performed by The Hendrix Group, the available information provided by LPC, and our experience with similar projects, it is the opinion of The Hendrix Group that Tank 1101B and its ancillary equipment is fit for the intended service, is currently not leaking, and is compatible with the presently stored waste.

SECTION V- RECOMMENDATIONS

While the modification performed by LPC to the gage hatch will serve the purpose of API 2000 requirements in relieving internal pressures in the event an a fire or other emergency of this nature, a more permanent solution is recommended. Until a permanent emergency vent relief is installed, it is recommended that LPC install a prominent sign on or adjacent the tank indicating that the tank is an EPA regulated tank and that the gage hatch is not to be modified in any manner.

SECTION VI- CERTIFICATION STATEMENT

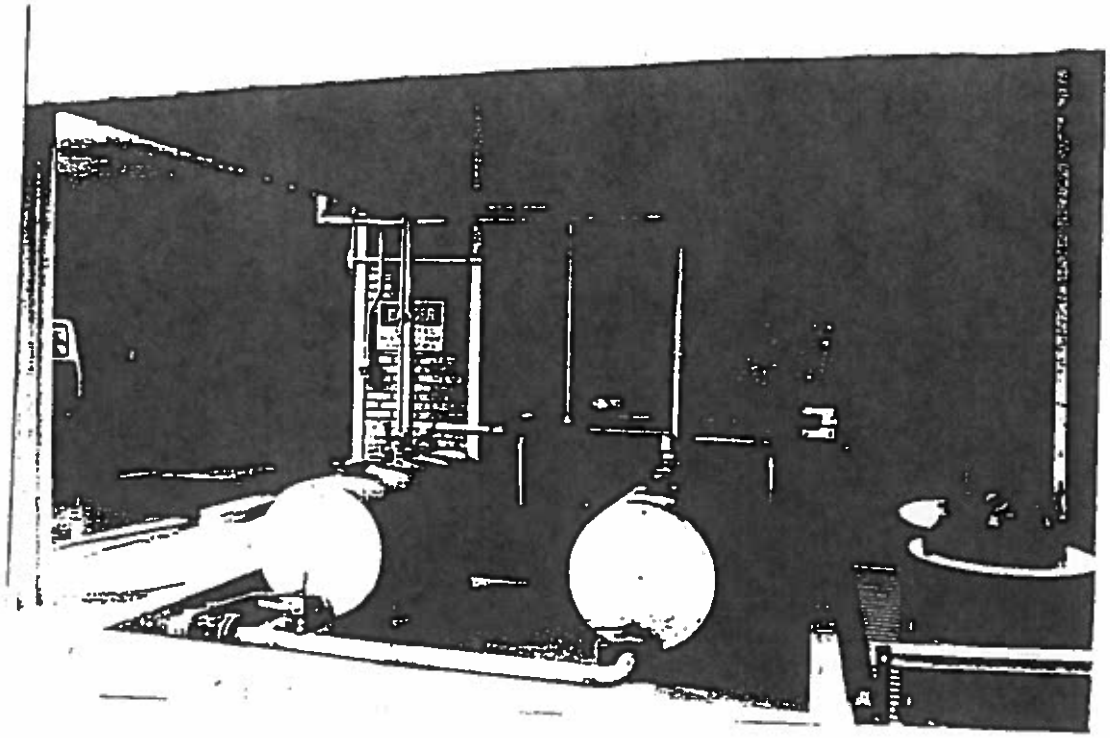
TANK 1101B
LYONDELL PETROCHEMICAL CO.
CHANNELVIEW, TX

Based on our visual survey, wall thickness measurement results, calculations, information provided by Lyondell Petrochemical Co. concerning the tank system contents and operating conditions, and our experience with similar projects, it is the opinion of The Hendrix Group, Inc. that Tank 1101B and its ancillary equipment is structurally fit for the existing service at its present location, was installed without damaging the vessel or its components, is compatible with the currently stored hazardous waste under the stated, normal operating conditions and is currently not leaking.

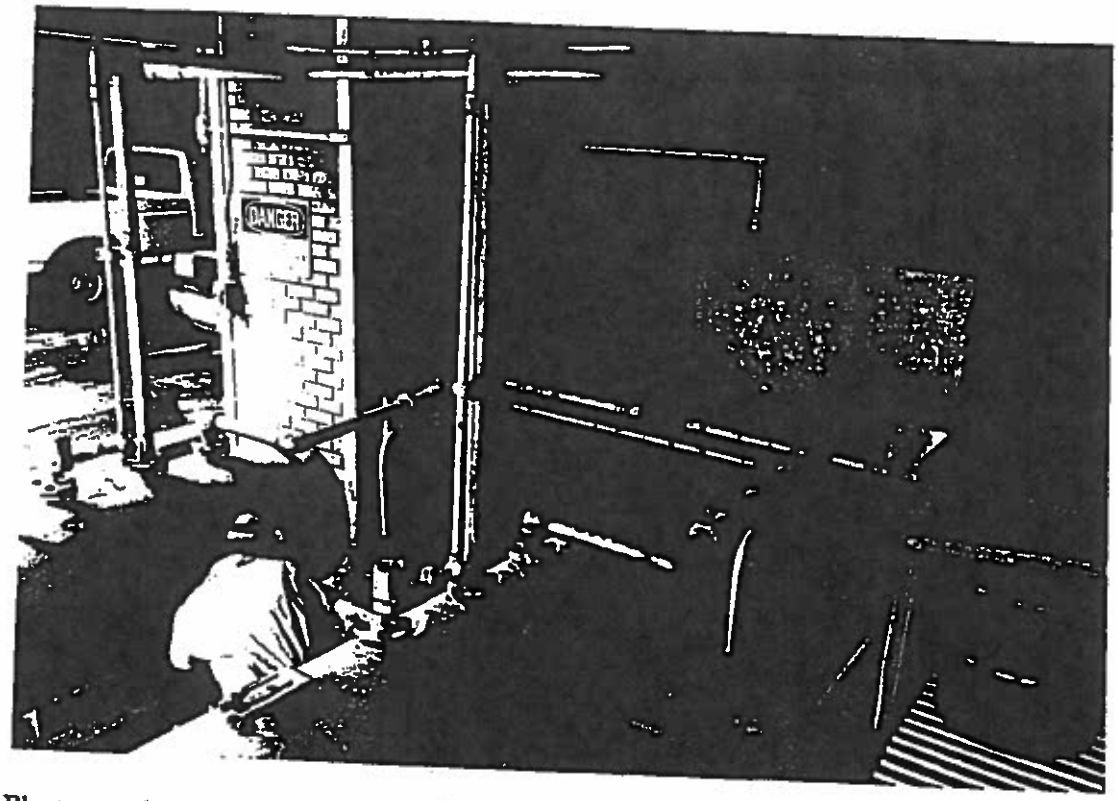
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

The Hendrix Group
David E. Hendrix, P.E.

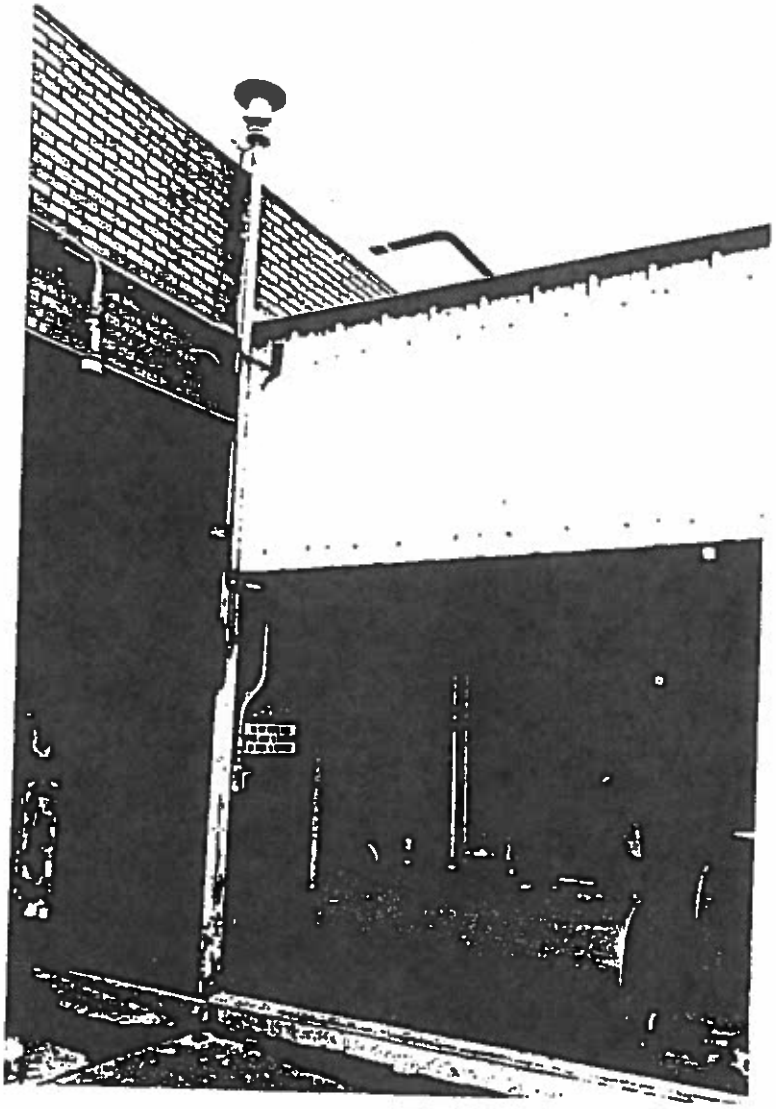
APPENDIX A- PHOTOGRAPHS



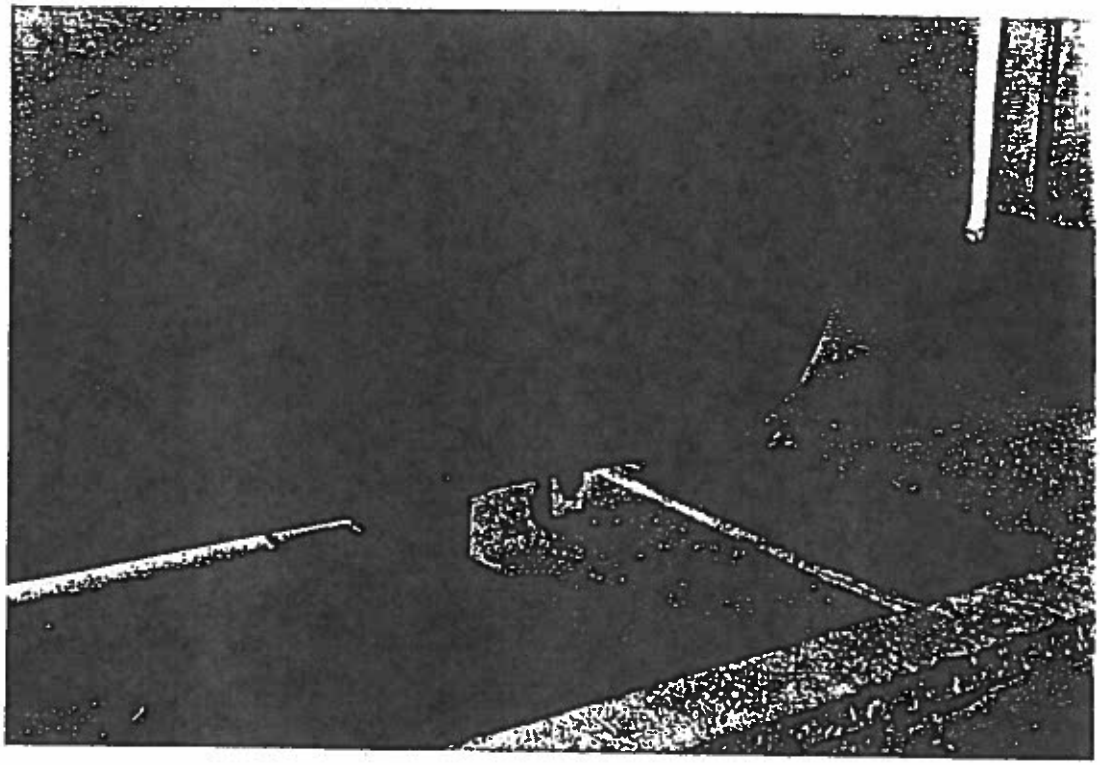
Photograph 1- Lab tanks 1101A (left) and 1101B showing inlet, outlet and vent piping.



Photograph 2- Close-up of 1101A/B lab tanks showing details of inlet and vent piping (arrow) and connections.



Photograph 3- Lab tanks vent piping and Groth #7618 flame arrestor with raincap.



Photograph 4- Tk-1101B showing saddle support, foundation and ground connector.

APPENDIX B- ULTRASONIC WALL THICKNESS MEASUREMENTS

CONAM INSPECTION, INC.
6106 Rookin Street
Houston, Texas 77074-3792
(713) 774-9657

SPOT READINGS

ON

TANK E1

FOR

THE BENDRIX GROUP
P. O. BOX 35717
HOUSTON, TEXAS 77235

LOCATION: LYONDELL CHEMICAL
CHANNELVIEW, TEXAS

CONAM JOB NO. CO-413

TECHNICIAN:
VICTOR GARCIA

REVIEWED BY:

AUGUST 14, 1990

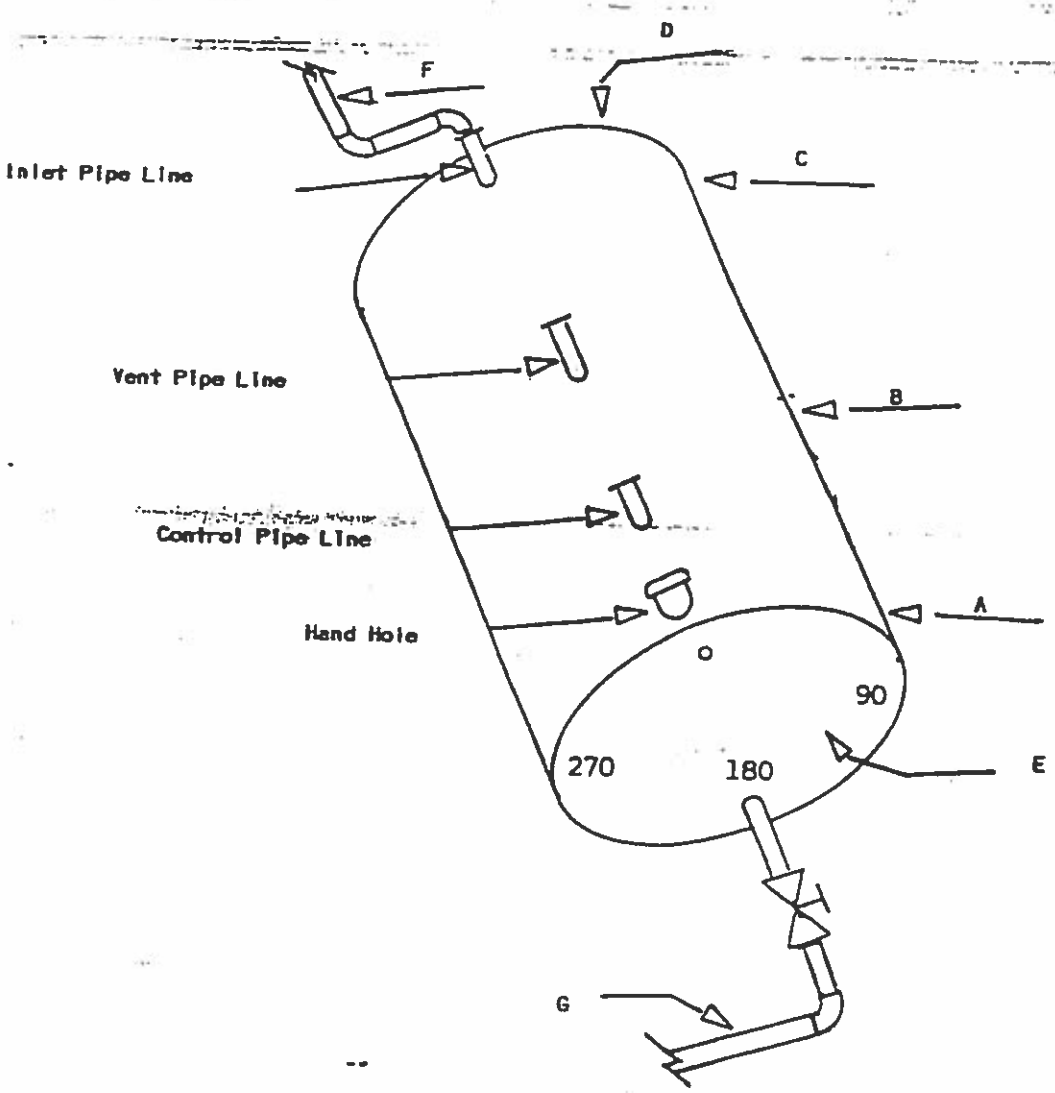
CONAM Inspection Inc.
6108 Rookin St. Houston Tx 77074

CONAM JOB NO. CO-413
DATE: August 14, 1990

E 1

POS	DESCRIPTION	SPOT READINGS 0°	90°	180°	270°	PIPE TONE	PIPE AVG	PIPE MIN	PIPE MAX
A	Discharge End	.140	.160	.160	.140				
B	Middle	.140	.160	.160	.140				
C	Inlet End	.140	.160	.160	.140				
D	Inlet Head	.135	.140	.135	.140				
E	Discharge Head	.140	.140	.140	.135				
F	Inlet Pipe	.160	.160	.170	.175				
G	Discharge Pipe	.140	.140	.145	.145				

NOTE: FOR SPOT LOCATIONS SEE ATTACHED SKETCH



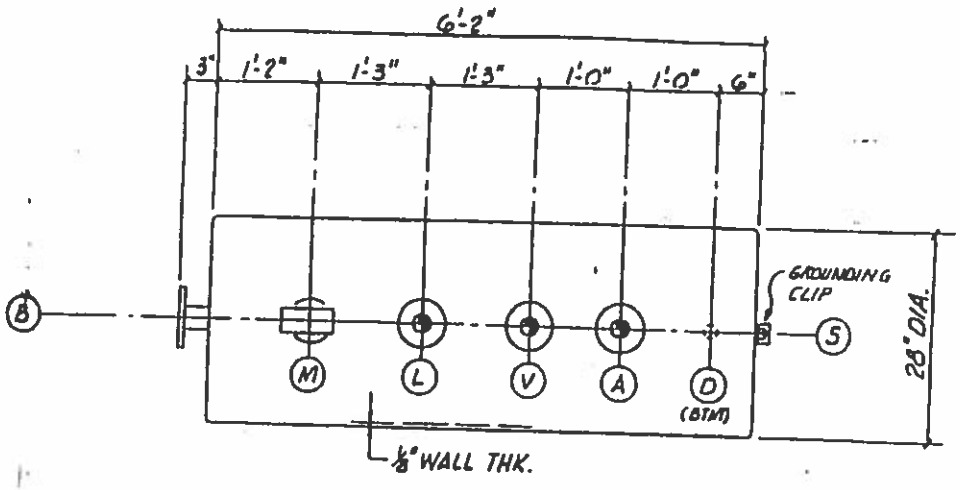
Note: Flanges A182 F304 Sch405
Pipe Lines A312, outlet 3" x Sch. 10 X 304 L
Inlet 2" x Sch. 10
Vent 2" x Sch. 10

Fittings A 403 304 L Sch. 10

Control Valve:
Riseman & Sensar
Sonsell Control
P/N RC 30753 E12
S/N 43401-5669011

CONAM INSPECTION, INC 6108 Reseda Street Houston, Texas 77074-3792 (713) 774-9457	
CUSTOMER: THE HENDRIX GROUP	
LOCATION: LYONDELL CHEMICAL, CHANNELVIEW,	
UNIT: Reflectoscope QC 400 #77572	
DATE: 14 August 1990	TANK
TECHNICIAN: VICTOR GARCIA	East 1

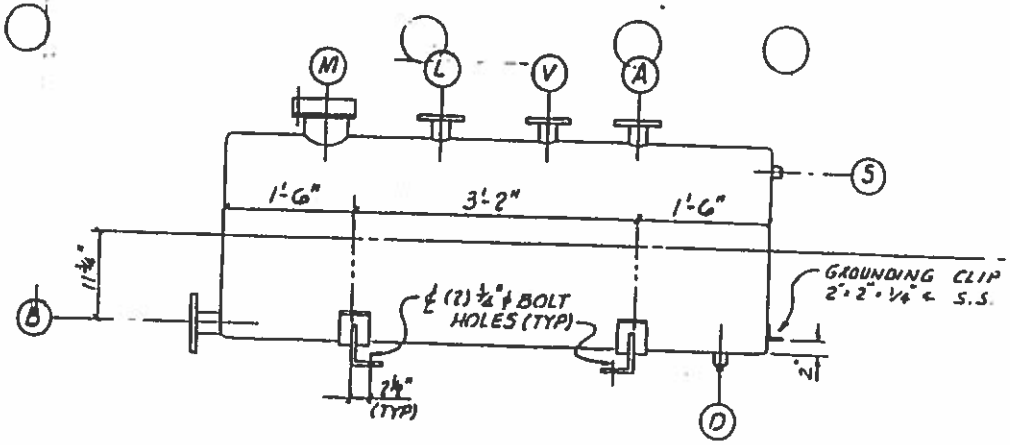
APPENDIX C- DRAWINGS



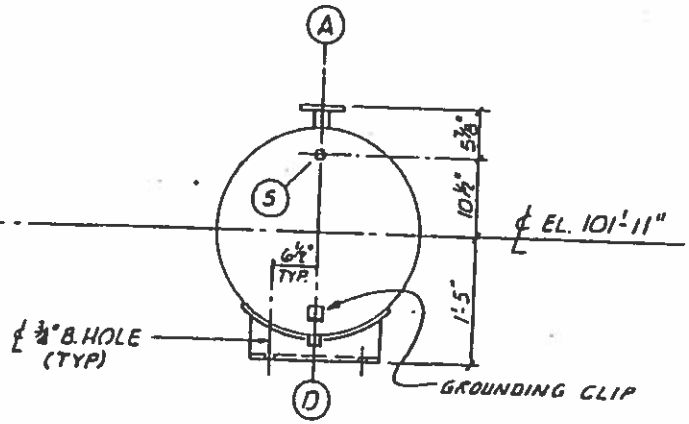
PLAN

SCHEDULE OF OPENINGS			
NOZZLE	SIZE	RATING	DESCRIPTION
A	2"	150# RF	INLET
B	3"	150# RF	VACUUM OUT
D	3/4"	3000# THD.	DRAIN
L	2"	150# RF	HIGH LEVEL ALARM
M	6"	QUICK-OPEN	INSPECTION HATCH
S	1/2"	3000# SW	SAMPLE
V	2"	150# RF	FLAME ARRESTOR / VENT

TAG Nº : TK-1101A & TK-1101B
304 S.S. CONSTRUCTION
UNDERWRITER LAB SPEC #142
AIR @ 5 TO 7 PSI



SIDE VIEW



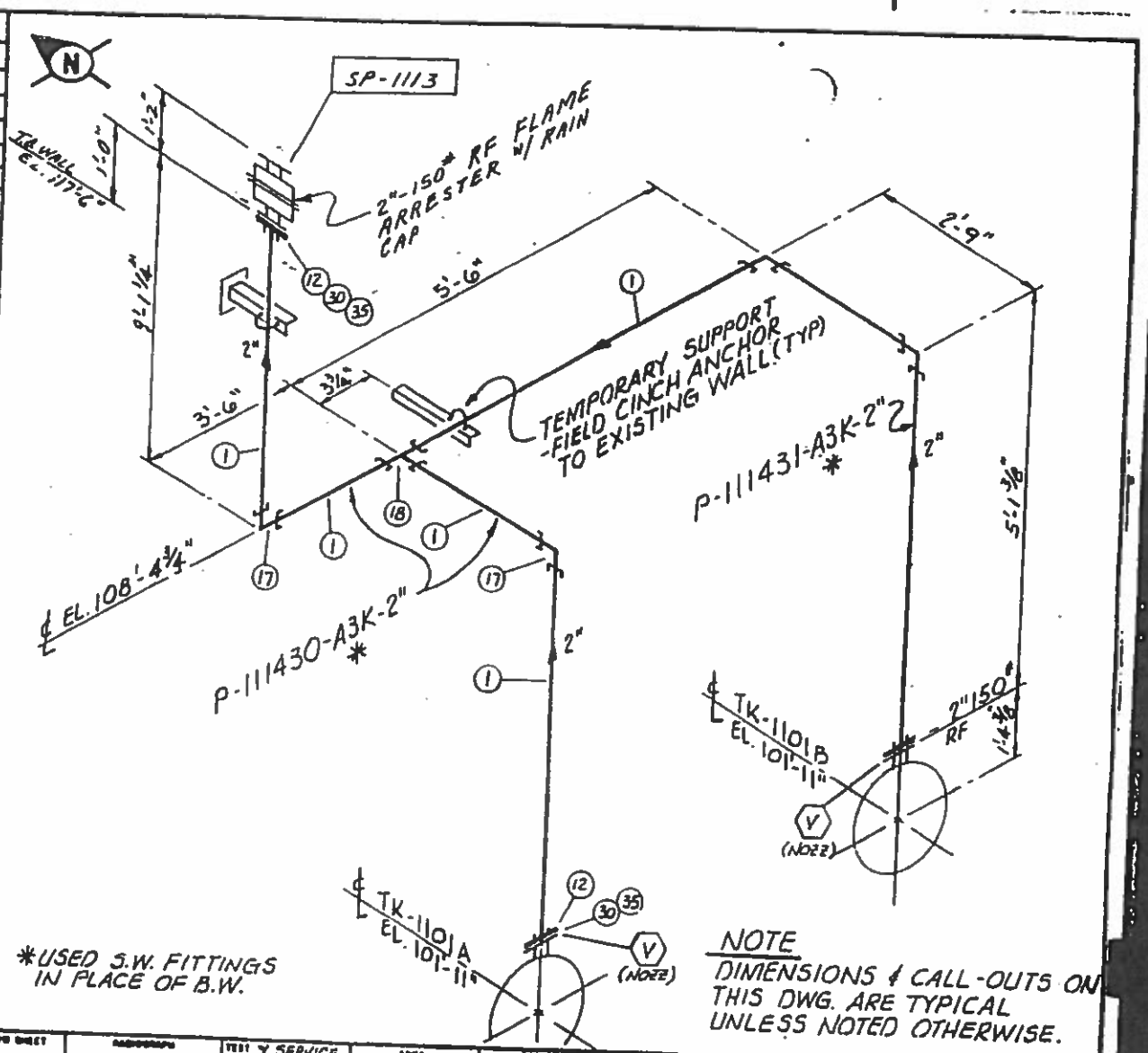
END VIEW

W.O.# LY-178062

LYONDELL PETROCHEMICAL COMPANY									LYONDELL PLANT
NO.	DATE	REVISIONS	DR.	AP.	DRN. RW	DATE 9/89	SCALE	DRAWING NUMBER	REV.
					CHK. AB	DATE 1/90	LAB SAMPLE WASTE TANK TK-1101 A/B		
					APP. STW	DATE 1/16/90	3/4"=1'-0"	B 111 V 001	0

BILL OF MATERIAL

ITEM	QTY.	SIZE	RATING or THICK.	FACE or THICK.	DESCRIPTION
1	35'-0"	2"	Sch 40	PE	PIPE, SMLS. A-312-TP304L
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12	3	2"	150#	RF	S.W. FLG. 40/BORE, A-182-F304L
13					
14					
15					
16					
17	4	2"	3000#	SW	90° ELL, A-182-F304L
18	1	2"	3000#	SW	STR. TEE, A-182-F304L
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30	12	5/8"Øx3½"LG	–		STUD BOLT, A-193-B7 W/(2)
31					HVY. HEX NUTS EA. A-194-2H
32					
33					
34					
35	4	2"	150#	RF	GASKET X .175" THK. SPI. WND.
36					FLEXITALLIC FLEXITE SUPER
37					CG, OR EQ
38					
39	2	2"			U-BOLT GRINNELL # 137 or EQ.
40	4.0 LF				2x2x¼" ∠ A-36 GALV.
41					



*USED S.W. FITTINGS IN PLACE OF B.W.

NOTE
DIMENSIONS & CALL-OUTS ON THIS DWG. ARE TYPICAL UNLESS NOTED OTHERWISE.

No.	Revisions	Date	Drn.	Chk.	App.

REFERENCE FLOW SHEET	—
REFERENCE PLAN DRAWING	—
STRESS REL.	—
TRACING	—
RADIOGRAPH	—
INSULATION	NONE
PAINT SPEC.	NONE
TEST ∇ SERVICE	AREA 111
OPER. ATM. PRES.	AMB. °F
DESIGN PRES.	°F
DRN. RW	DATE 11-89
CHK. QB	DATE 1-90
APP. SJW	DATE 3-13-90

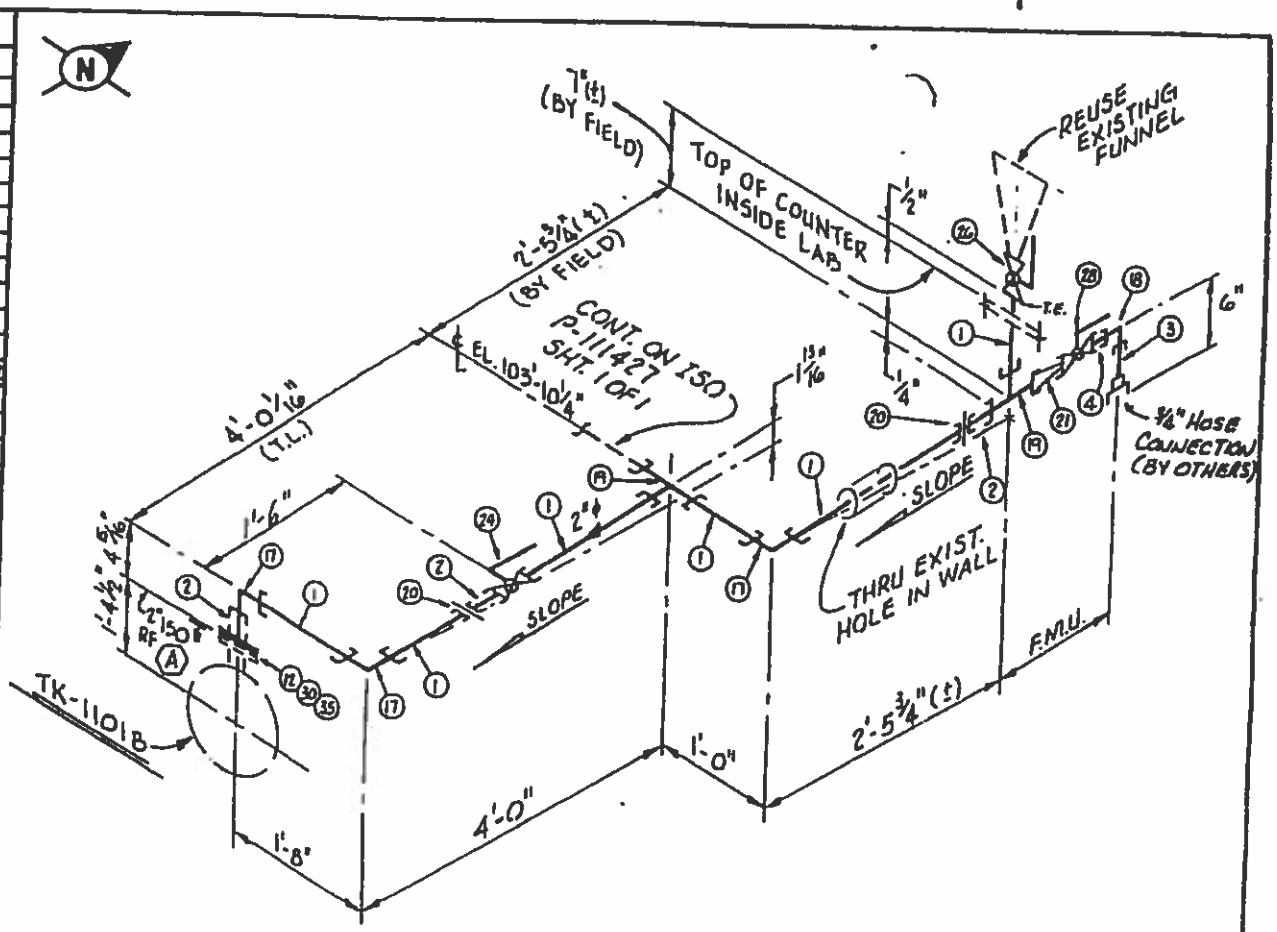
Lyondell Petrochemical Company ◇ Lyondell Plant

LINE NO. P-111430 & 31-A3K-2" COMMODITY SANITARY WASTE VENT

JOB NO. LY-178062 DRAWING NO. P-111430 SHEET NO. 1 OF 1 REV. 0

BILL OF MATERIAL

	ITEM	QTY.	SIZE	RATING OR SCHED.	END OR CONN.	DESCRIPTION
PIPE	1	10 LF	2"	5S	PE	PIPE, SMLS. A-312-TP304L
	2	3	2"x3"	5S	PBE	NIPPLE, SMLS. A-312-TP304L
	3	1 LF	¾"	5S	PE	PIPE, SMLS. A-312-TP304L
	4	1	¾"x5"	5S	PBE	NIPPLE, SMLS. A-312-TP304L
WELDING FITTINGS	5					
	6					
	7					
	8					
	9					
	10					
	11					
FLANGES	12	1	2"	150#	RF	S.W. FLG. 40/BORE A-182-F304L
	13					
	14					
	15					
	16					
SCREWED OR S.W. FITTINGS	17	3	2"	3000#	SW	90°ELL, A-182-F304L
	18	1	¾"	3000#	SW	— ditto —
	19	2	2"	3000#	SW	STR. TEE, A-182-F304L
	20	2	2"	3000#	SW	UNION, INT. SEATS, A-182-F304L
	21	1	1"x¾"	5S	PBE	CONC. SWAGE, S.S. SMLS.
	22					A-403-WP-304L
VALVES	24	1	2"	300#	SW	BALL VA. McCANNASEAL
	25					SERIES # S303-SGL-R, OR EQ.
	26	1	2"	300#	SCRD	BALL VA. McCANNASEAL
	27					SERIES # S302-SG-R, OR EQ.
	28	1	¾"	300#	S.W.	BALL VALVE, McCANNASEAL
	29					SERIES # S-303-SGL-R, OR EQ.
BOLTING	30	4	⅝"ø x 3½"16	—	—	STUD BOLT A-193-B7 W/ (2)
	31					HEX NUTS EA. A-194-2H
	32					
	33					
	34					
GASKETS	35	1	2"	150#	RF	GASKET x.175" TK. SPI. WND.
	36					FLEXITALLIC FLEXITE SUPER
	37					CG. OR EQUAL.
MISC.	38					
	39					
	40					
	41					



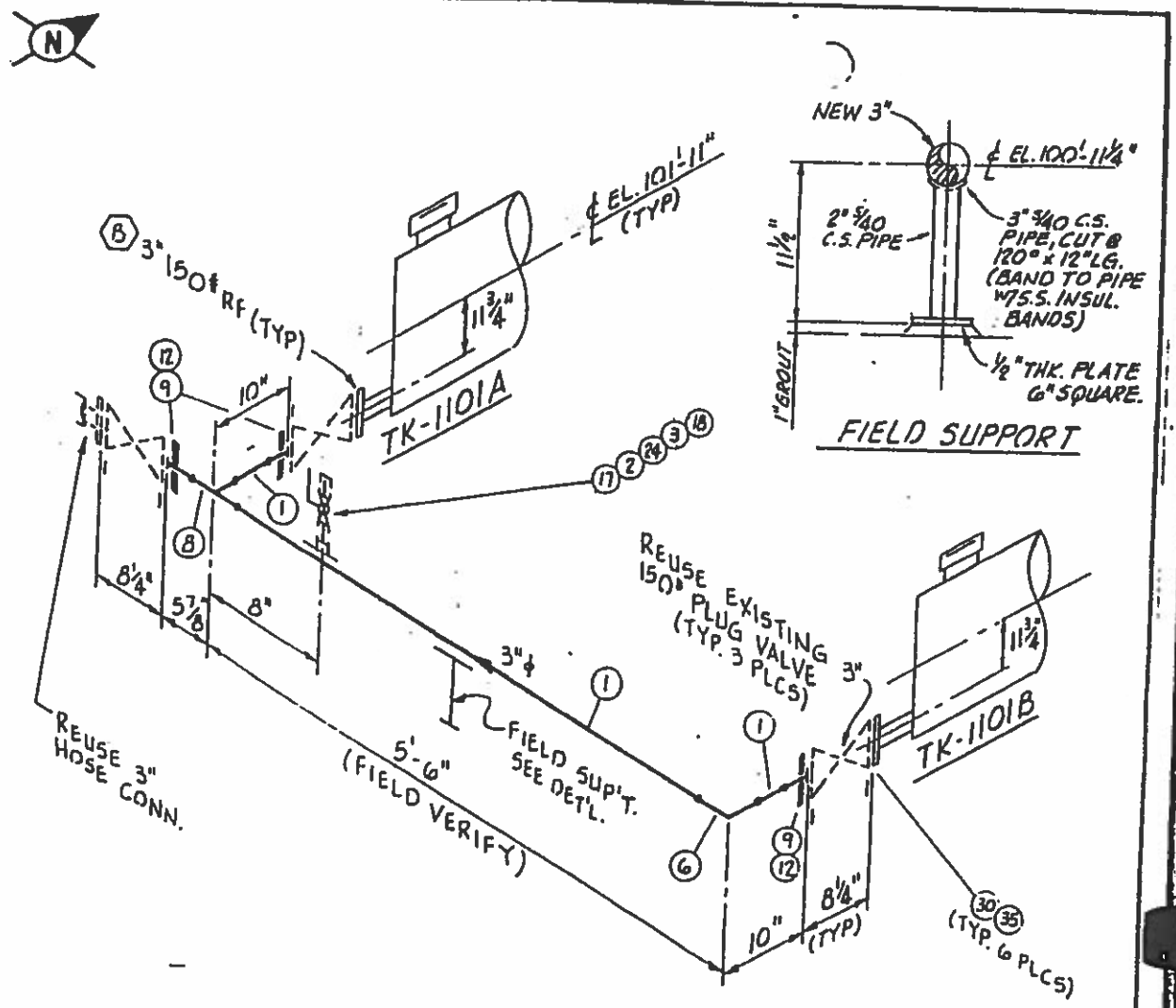
* USED S.W. FITTINGS IN PLACE OF B.W.

| | | | | |

BILL OF MATERIAL

ITEM	QTY.	SIZE	RATING OR SCH.	END OR GRADE	DESCRIPTION
1	6'-0"	3"	STD	BE	PIPE, SMLS. A-312-TP304L
2	1	3"x3"	STD	PBE	NIPPLE, SMLS. A-312-TP304L
3	1	3"x3"	STD	T&K/BE	——— DITTO ———
4					
5					
6	1	3"	STD	BW	90° LR ELL, SMLS. A-403-WP304L
7					
8	1	3"	STD	BW	STR. TEE, SMLS. A-403-WP304L
9	3	3"	STD	BW	STUB END, MSS TYPE "A"
10					A-403-WP304L
11					
12	3	3"	150#	—	LAP JOINT FLG. A-105
13					
14					
15					
16					
17	1	¾"x¾"	3000#	—	SOCKOLET, A-182-F304L
18	1	¼"	3000#	SCR'D.	PIPE CAP, A-182-F304L
19					
20					
21					
22					
23					
24	1	¼"	300#	SW	BALL VA. McCANNASEAL
25					SERIES #S-303-SGL-R OR EQ.
26					
27					
28					
29					
30	24	⅝"x 4"		—	STUD BOLT, A-193-B7 W/(2)
31					HEX NUTS EACH, A-194-2H
32					
33					
34					
35	6	3"	150#	RF	GASKET x .175" THK. SPI. WND.
36					FLEXITALLIC FLEXITE SUPER
37					CG. OR EQUAL
38					
39					
40					
41					

WELDING FITTINGS · FLANGES · FLANGED OR SW FITTINGS · VALVES · BOLTING · GASKETS · MISC.



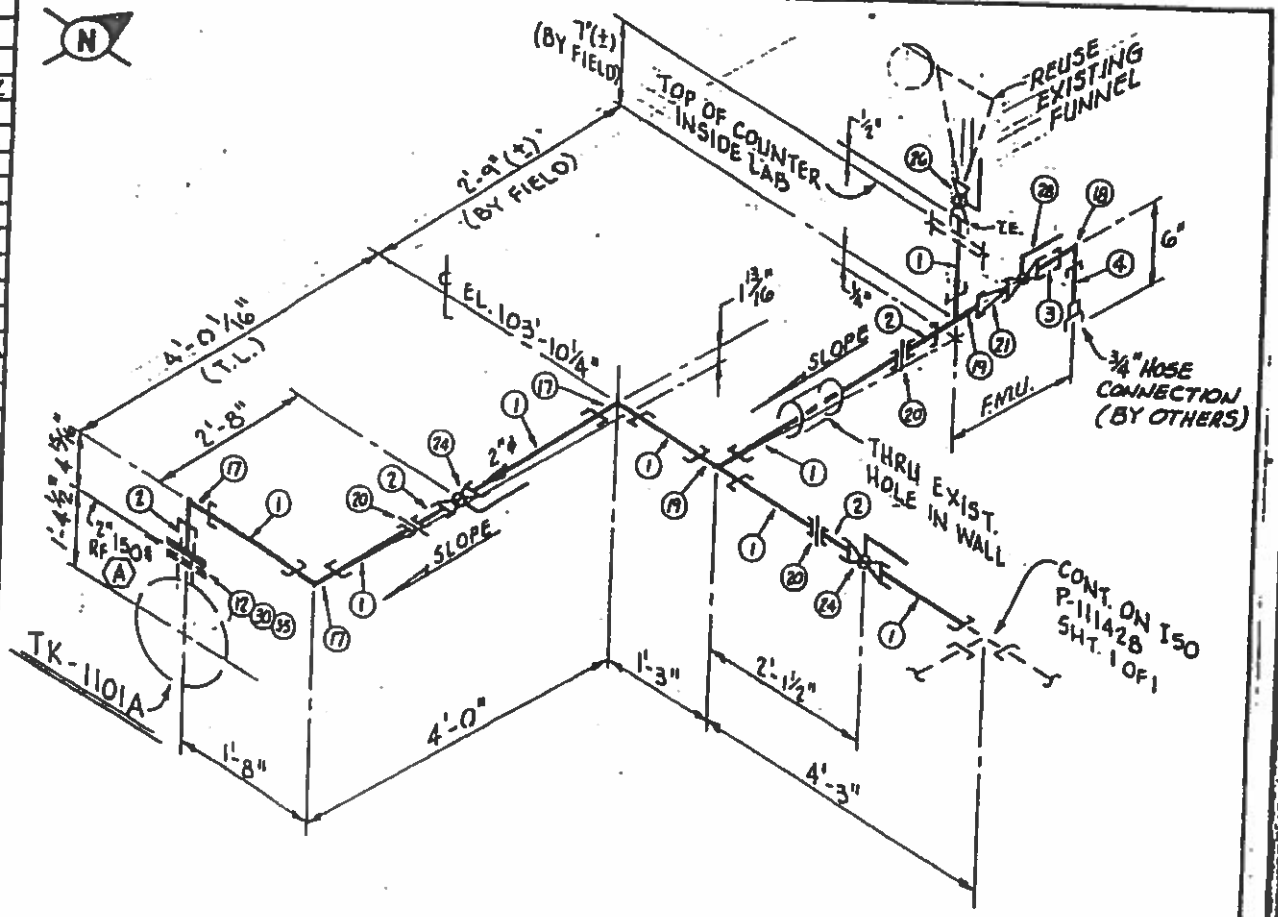
Revisions	Date	Drn	Chk	App
1				

REFERENCE FLOW SHEET —
REFERENCE PLAN DRAWING —
STRESS REL. — TRACING —
RADIOGRAPH —
INSULATION NONE
PAINT SPEC. —
TEST & SERVICE
AREA 111
OPER. ATM. PRES. AMB. °F
DRN. RW DATE 11/89
CHK. AB DATE 1-90
APP. DATE 11/89

Lyondell Petrochemical Company ◇ Lyondell Plant
LINE NO. P-111429-A3K-3" COMMODITY SAMPLE WASTE
JOB NO. Y-1797.1 DRAWING NO. P-111.100
SHEET NO. 1 / 1 REV. 2

BILL OF MATERIAL

ITEM	QTY	SIZE	RATING OR WALL	FACE OR END	DESCRIPTION
PIPE	44'	2"	SCH 40	PE	PIPE, SMLS. A-312-TP304L
	4	2"x3"	SCH 40	PBE	NIPPLE, SMLS. A-312-TP304L
	2	2"x5"	SCH 40	PBE	NIPPLE, SMLS. A-312-TP304L
	12	3/4"	SCH 40	PE	PIPE, SEAMLESS, A-312-TP304L
SW FITTINGS					
FLANGES	1	2"	150#	RF	SW FLG. 40/80 BORE A-182-F304L
	3	2"	3000#	SW	90° ELL, A-182-F304L
	1	3/4"	3000#	SW	—— DITTO ——
	2	2"	3000#	SW	STR. TEE, A-182-F304L
	1	2"	3000#	SW	UNION, INT. SEATS A-182-F304L
	1	2"x3/4"	SCH 40	PBE	CONC SWAGE, S.S. SMLS. A-403-WP304L
VALVES	2	2"	300#	SW	BALL VALVE, McCANNASEAL SERIES # S-303-SGL-R, OR EQ.
	1	2"	300#	SCRD.	BALL VALVE, McCANNASEAL SERIES # S-302-SG-R, OR EQ.
	1	3/4"	300#	SW	BALL VALVE, McCANNASEAL SERIES # S-303-SGL-R, OR EQ.
BOLTING	4	5/8"x3 1/4"	—	—	STUD BOLT, A-193-B7 W/ (2) HEX NUTS EA. A-194-2H
GASKETS	1	2"	150#	RF	GASKET x.175" TK. SPI. WND. FLEXITALLIC FLEXITE SUPER CG OR EQUAL



* USED S.W. FITTINGS IN PLACE OF B.W.

| | | | | |

APPENDIX D- CALCULATIONS

Subject: LPC CHD 1101 A/B Stress Calculations
File: H9034 By: D.E Henrix
Sheet number: 1 of 4
Date: 10/13/90

I Minimum Thickness Requirements

- Shell

- Liquid Head Pressure = height(dia) × 0.433 #/in²(H₂O) × Liquid sp.gr.
  = 2.33 × 0.433 × 0.960
  = 0.969 #/in² | CAN 1 psig

- Vapor Pressure = 0 psig w flame arrestor vent

- Thickness due to hoop stress $t = \frac{P \times R.D}{SE \times 0.4P}$ from ASME Section VIII

$t = \frac{1 \times 14}{(18{,}800 \times 0.7) + 0.4(1)}$

S = 18,880 for SA-240 304SS
E = 0.7 (No radiography)

→ { t = 0.0011 in required
  t(actual) = 0.140 in min ok ✓

- Thickness due to longitudinal stress

Longitudinal stress = ½ Hoop Stress

→ { $t_{required}$ = ½(.0011) = 0.00061 in
  t_{actual} = 0.140 in ok ✓

Subject: LPC CHD Lab Tanks 1101 A/B Stress Calculations
File: H7034
By: D.E. Hendrix
Sheet number: 1 of 4
Date: 10/13/90

I. Minimum Thickness Requirements (cont)

Heads* $t = d(CP/SE)^{1/2}$

C = 0.17
d = 28 in
P = 1 psig
S = 18,800 psi
E = 0.7

* Flat, unstayed head per ASME Section VIII div 1, UG-34, Fig UG-34(a).

$t = 28\sqrt{(0.17 \times 1) \div (18{,}800 \times 0.7)}$

$t = 28\sqrt{0.17 \div 13{,}160}$

→ $t = 0.1004$ in. required

$t_{ACTUAL} = 0.135$ min Ok ✓

II Bending Stresses at Saddle Supports

- Weight of vessel plus nozzles plus dead loads = 542#**
- Weight of vessel filled with water = 542# + 1646# = 2188#

Weight of water = $\pi r^2 \times l \times 62.4$ lb/ft³

⇒ $3.1416 \times (19/12)^2 \times 6.17 \times 62.4 = 1646$

** Weight of vessel calculated as 342# Load due to nozzles and piping estimated.

Subject: LPC CHO Tanks 1101A/B
File: H9034
By: D E HENDRIX
Sheet number: 3 of 4
Date: 10/18/90

II. Bending Stresses AT Saddle Supports (CONT.) from Pressure Vessel Handbook

$S_B = M/Z$ where $M = \frac{wx^2}{2}$; $Z = R^2 t$

$S_B = \frac{wx^2}{2R^2t}$

x = distance from support to tangent
w = load per linear foot
R = radius
t = thickness

$S_B = \frac{(2188^{\#} + 7404^{\#}) \times 18^2}{2 \times 14^2 \times 0.14}$

$S_B = 9575 \div 54.88$

$S_B = 174.47$ psi bending stress AT saddle support

TOTAL Stress AT Saddle = $S_B + S_P$

S_B = Bending Stress
S_P = Pressure Stress

$S_P = 1/2 [PR \div t]$

$= 1/2 [(1 \times 14) \div 0.14]$

$= 50$ psi ✓

TOTAL Stress AT Saddle = 174.47 psi + 50 psi

= 224.47 psi ✓

Allowable Stress = 18,800 psi ✓ ok!

Subject: LPG CHO Tk-1101 A/B Stress Calculations
File: H7034 By: D.E. Hendrix Sheet number: 4 of 4
Date: 10/13/98

III Bending Stresses at Midspan from Pressure Vessel Handbook 5th Ed.

$S_T = S_B + S_P$

$S_P = 50$ psi

$S_B = M_c \div Z$

$Z = l^2 t$

l = length

a = distance from saddle to tank end

$M_c = \frac{W}{8}(l^2 - 4a^2)$

W = #/in

$M_c = \frac{295.5}{8}(74.04^2 - (4 \times 18^2))$

$M_c = 36.9(5482 - 1296)$

$M_c = 15{,}446.34$ in-lbs

$S_B = [15{,}446.34 \div (14^2 \times 0.14)]$

$S_B = 563$ psi ✓

$S_T = 563 + 50 = 613$ psi ✓ ok

$S_{Allowable} = 18800$ psi ✓ ok

APPENDIX E- CHEMICAL WASTE COMPOSITION

Date: July 30, 1990

Subject: ANALYSIS OF LABORATORY EAST WASTE TANK BY GC MASS SPEC

TDS-24-90

From/Location: TDS T. D. Storz

To/Location: D. E. Hunt [redacted]

A request was made to determine the composition of the laboratory waste tanks. A composite sample of the east waste tank was obtained and analyzed on a 100 meter SPB-1 capillary column using a Mass Spec detector.

All compounds with a quantity of greater than 0.1 percent were identified or characterized. The compound identifications were made by using the highest probability match when searching the Mass Spec library. The quantities are Area percent and are approximations only.

CONCLUSIONS

The waste tank sample consists of compounds found in our various plant streams, feedstocks, and products. In addition are several reagents and solvents used in our laboratory. Some of these which were identified by Mass Spec and verified by Infrared detector may be seen below:

Compound	Area Percent
Chloroform	0.0215
Tetra Hydro Furan (THF)	0.3170
Carbon Tetrachloride	0.0078
1,4 Dioxane	0.1424
Pyridine	0.0098

For more details see the attached GC report.

TDS:dap

Attachment

cc: P. Mitchell
J. B. Boswell
R. J. Haynal
P. A. Yanchik
S. A. Schmitt
P. K. Eaves
S. R. Kaminski
C. E. Sellman
J. B. Shepherd
N. L. Culver

Density .9163 at 60°F
Sp. Grav. .9160 at 60°F

[redacted]

[redacted]

02006 (7/88)

Starting Delay: 0.00
Area reject: 66
Amount injected: 1.00

Ending retention time: 100.00
One sample per 0.300 sec
Dilution factor: 1.00

PK NUM	RET TIME	PEAK NAME	NORMALIZED AREA %	AREA	HEIGHT	R.FCT	B L	RF PK
1	7.12	METHANOL	0.4115%	6776	4116	1.0000	1	0
2	7.63		0.0099%	164	103	1.0000	1	
3	9.29	ACETONITRILE	0.4098%	6749	3243	1.0000	1	0
4	9.83	ACETONE	0.3640%	5995	2241	1.0000	1	0
	10.20	1,4 PENTADIENE						
5	10.52	ISOPROPANOL	2.1508%	35423	12258	1.0000	1	0
6	11.04	PENTANE	0.0574%	945	444	1.0000	1	0
	11.24	ISOPRENE						
7	11.42	t-PENTENE 2	0.0215%	354	166	1.0000	1	0
8	11.79	c-PENTENE 2 + TBA	0.0560%	923	310	1.0000	2	0
9	12.03	2-METHYL BUTENE 2	0.0297%	489	220	1.0000	2	0
10	12.15	t-1,3 PENTADIENE	0.1412%	2326	1100	1.0000	2	0
11	12.67	CYCLOPENTADIENE	0.0510%	840	335	1.0000	2	0
12	12.78	NEOC6+13PENTADIENE	0.1066%	1756	706	1.0000	2	0
13	13.74	CYCLO PENTENE	0.0864%	1423	540	1.0000	1	0
14	14.37	CYCLO PENTANE	0.0449%	740	310	1.0000	2	0
15	14.51	MET-TERT-BUT ETHER	2.2629%	37269	15047	1.0000	2	0
16	14.80	2-METHYL PENTANE	0.1642%	2705	1108	1.0000	1	0
17	15.26	METH-ETHYL KETONE	2.2900%	37714	14754	1.0000	2	0
18	15.64	3-METHYL PENTANE	0.1072%	1765	671	1.0000	2	0
19	15.96		0.0092%	151	70	1.0000	1	
20	16.11	ISOBUTANOL	1.5847%	26099	8675	1.0000	1	0
21	16.72	HEXANE	0.3808%	6272	2486	1.0000	1	0
22	16.83		0.0146%	240	58	1.0000	1	
23	17.03	CHLOROFORM	0.0219%	361	142	1.0000	1	0
24	17.17		0.0116%	192	84	1.0000	1	
25	17.35		0.0111%	182	77	1.0000	1	
26	17.55	TETRO-HYDRO FURAN	0.3225%	5311	1665	1.0000	2	0
27	17.85	ISOBUTANOL	0.1104%	1819	561	1.0000	2	0
28	17.98		0.0546%	899	197	1.0000	2	
29	18.33	METHYL CYC PENTANE	0.3442%	5668	2217	1.0000	1	0
30	18.62	4-METHYL PENTENE 1	0.0549%	904	322	1.0000	1	0
31	18.83	MET CYCLOPENTADIEN	0.0195%	321	130	1.0000	1	0
32	19.08		0.0145%	239	97	1.0000	1	
33	19.86	BENZENE + MCP=1	8.9537%	147462	49407	1.0000	1	0
	20.18	CARBON TET CHLORID						
34	20.41	CYCLO HEXANE	0.2167%	3569	1366	1.0000	2	0
35	20.62	MET CYCLOPENTADIEN	0.0558%	919	229	1.0000	2	0
36	21.00	HEXENE 1	0.1379%	2272	864	1.0000	2	0
37	21.10	2,3-DIMET PENTANE	0.0621%	1022	391	1.0000	2	0
38	21.28	1,1-DIMET-CYC C5	0.0468%	771	243	1.0000	2	0
39	21.42	CYCLO HEXENE	0.0498%	821	294	1.0000	2	0
40	21.54	3-METHYL HEXANE	0.1525%	2511	961	1.0000	2	0
41	21.95	c-1,3-DIMET CYC C5	0.0409%	674	254	1.0000	1	0
42	22.12	t-1,3-DIMET CYC C5	0.0325%	536	185	1.0000	2	0

46	23.05	HEPTANE	0.4166%	6861	2513	1.0000	2 0
47	24.13	PYRIDINE	0.0100%	165	48	1.0000	1 0
48	24.35	METHYL CYC HEXANE	0.3188%	5250	1454	1.0000	2 0
49	24.52		0.0284%	467	137	1.0000	2
50	25.07	ETHYL CYC PENTANE	0.1331%	2193	759	1.0000	1 0
51	25.20	3-METHYL HEPTANE	0.1055%	1738	572	1.0000	1 0
52	25.63		0.0193%	319	95	1.0000	1
53	26.11	3-METHYL HEXENE 1	0.0266%	438	140	1.0000	1 0
54	26.29	2,3,4-TRIMET C5	0.2838%	4674	1399	1.0000	2 0
55	26.43		0.0384%	633	196	1.0000	2
56	26.63	TOLUENE	7.7513%	127659	36199	1.0000	1 0
57	26.75		0.0321%	529	196	1.0000	1
58	26.98		0.0709%	1167	379	1.0000	1
59	27.35	2-METHYL HEPTANE	0.1873%	3086	886	1.0000	2 0
60	27.46	DIMET-CYC HEXANE	0.0363%	598	192	1.0000	2 0
61	27.63	HEXENE	0.0170%	280	63	1.0000	1 0
62	27.89	3-MET-CYC HEPTANE	0.1024%	1686	409	1.0000	1 0
63	28.17	3-METHYL HEPTANE	0.0436%	718	215	1.0000	2 0
64	28.36	1,3-DIMET-CYC C6	0.0797%	1312	316	1.0000	2 0
65	28.68	2,2,3-TRIMET C6	0.1625%	2675	688	1.0000	2 0
66	28.94		0.0270%	445	122	1.0000	2
67	29.19	UNKNOWN OXYGENATE	0.1078%	1775	500	1.0000	1 0
68	29.54	UNKNOWN OXYGENATE	0.1061%	1747	488	1.0000	2 0
69	29.66		0.0374%	615	165	1.0000	2
70	29.81	OCTANE	0.2785%	4586	1319	1.0000	2 0
71	29.96		0.0091%	150	50	1.0000	1
72	30.19		0.0118%	195	55	1.0000	1
73	31.19	2,3-DIMET HEPTANE	0.0396%	653	123	1.0000	1 0
74	31.75		0.0096%	159	50	1.0000	1
75	32.14	4-VINYL-CYC C6=1	0.3390%	5584	1454	1.0000	2 0
76	32.29	ETHYL-CYC HEXANE	0.0394%	649	168	1.0000	2 0
77	32.56	2,5-DIMET HEPTANE	0.0352%	579	141	1.0000	1 0
78	32.89		0.0308%	507	123	1.0000	2
79	33.04	1,1,3-TRIMET-CYCC6	0.0678%	1117	255	1.0000	2 0
80	33.50		0.0094%	155	41	1.0000	1
81	34.14	ETHYL BENZENE	1.9869%	32723	7774	1.0000	1 0
82	34.45		0.0147%	242	56	1.0000	1
83	34.96	META XYLENE	1.3307%	21917	4619	1.0000	2 0
84	35.06	PARA XYLENE	1.2871%	21198	5070	1.0000	2 0
85	35.55		0.0414%	682	154	1.0000	2
86	35.64	3-METHYL OCTANE	0.0626%	1031	212	1.0000	2 0
87	36.36		0.0733%	1208	223	1.0000	1
88	36.83	STYRENE + VNB	3.4183%	56298	11346	1.0000	1 0
89	37.37	ORTHO XYLENE	1.1235%	18503	3862	1.0000	1 0
90	38.13		0.0646%	1064	129	1.0000	1
91	39.47	NONANE	0.2310%	3804	746	1.0000	1 0
92	40.35		0.0176%	291	42	1.0000	1
93	41.03	CUMENE	0.0671%	1104	228	1.0000	1 0
94	41.61		0.0131%	215	51	1.0000	1
95	42.09		0.0189%	312	84	1.0000	1
96	42.27		0.0159%	262	38	1.0000	1
97	42.75		0.0262%	431	86	1.0000	1
98	42.98	ALLYL BENZENE	0.3238%	5334	1189	1.0000	2 0
99	43.26		0.0471%	776	138	1.0000	2
100	44.04	PROPYL BENZENE	0.4372%	7200	1688	1.0000	1 0

104	45.87	TET-MET-CYC HEXANE	0.0413%	680	147	1.0000	1	0
105	46.08	UNK-ISO-PARAFFIN	0.1332%	2194	293	1.0000	2	0
106	46.34	ALPHA METH STYRENE	1.5398%	25359	3712	1.0000	2	0
	46.40	ORTHO ETHYL TOLUEN						
107	46.57		0.0158%	260	54	1.0000	2	
108	46.72		0.0422%	695	173	1.0000	2	
109	46.92		0.0206%	339	60	1.0000	2	
110	47.09		0.0487%	802	164	1.0000	2	
111	47.25	CIS-BETA-MET STYRE	0.3815%	6284	1473	1.0000	2	0
112	47.53	PARA VINYL TOLUENE	3.1344%	51621	10568	1.0000	2	0
113	47.64	META VINYL TOLUENE	1.5121%	24903	6058	1.0000	2	0
114	47.76	PSEUDOCUMENE	1.8886%	31105	7325	1.0000	2	0
115	47.84	ORTHO VINYL TOLUEN	1.3093%	21563	6307	1.0000	2	0
116	48.05		0.0485%	798	174	1.0000	2	
117	48.14	CPD-ISOPRENE DIMER	0.1194%	1966	474	1.0000	2	0
118	48.38	CPD-ISOPRENE DIMER	0.5449%	8975	2275	1.0000	2	0
119	48.62		0.0729%	1201	324	1.0000	1	
120	48.84		0.0240%	396	108	1.0000	2	
121	49.11	DECANE	0.3815%	6283	1424	1.0000	2	0
122	49.29	SEC BUTYL BENZENE	0.1167%	1922	363	1.0000	2	0
123	50.04	HEMMIMELATINE+TBMS	2.4994%	41164	5869	1.0000	2	0
124	50.22		0.0352%	579	148	1.0000	2	
125	50.32	MET-BUTENYL BENZEN	0.0497%	819	117	1.0000	2	0
126	50.88	DICYCLOPENTADIENE	7.5563%	124449	24891	1.0000	2	0
	50.96	INDAN						
127	51.50	INDENE	6.9386%	114275	23978	1.0000	2	0
128	51.60	DIETHYL BENZENE-M	0.2144%	3532	849	1.0000	2	0
129	51.91	DIETHYL BENZENE-P	0.1033%	1701	450	1.0000	2	0
130	52.09	BUTYL BENZENE	0.1350%	2224	606	1.0000	2	0
131	52.29	1-MET-3-PROPYL BZ	0.3792%	6245	1625	1.0000	2	0
132	52.38	C10 ALKYL BENZENE	0.2401%	3954	999	1.0000	2	0
133	52.57	DIETHYL BENZENE-O	0.1985%	3270	700	1.0000	2	0
134	52.76	4-ET-1,2-DIMET BZ	0.3643%	6000	1593	1.0000	1	0
135	52.99		0.0109%	180	68	1.0000	1	0
136	53.08		0.0472%	778	196	1.0000	1	
137	53.25		0.0850%	1399	399	1.0000	1	
138	53.43	1-MET-2-PROP BZ	0.1944%	3201	748	1.0000	2	
139	53.70		0.0455%	750	139	1.0000	2	0
140	53.80	DIMETHYL STYRENE	0.0818%	1348	386	1.0000	2	
141	53.95	DIMETHYL STYRENE	0.1799%	2963	855	1.0000	2	0
142	54.11	DIMETHYL STYRENE	1.0350%	17046	4518	1.0000	2	0
143	54.25	DIVINYL BENZENE	0.9939%	16369	4436	1.0000	2	0
144	54.43	3-ETHYL STYRENE	0.8063%	13278	2559	1.0000	2	0
145	54.66	MET-ISOPROPYL BZ	0.8144%	13412	1864	1.0000	1	0
146	55.00	ETHYL STYRENE	0.2296%	3781	1088	1.0000	2	0
147	55.18	DIMETHYL STYRENE	0.8045%	13249	3295	1.0000	2	0
148	55.31	DIMETHYL STYRENE	0.6817%	11227	2531	1.0000	2	0
149	55.58	DIMETHYL STYRENE	0.7149%	11774	2612	1.0000	2	0
150	55.76		0.0494%	814	236	1.0000	2	
151	56.02	MET-ISOPROPYL BZ	0.2263%	3726	941	1.0000	1	0
152	56.18	UNDECANE	0.4013%	6609	1863	1.0000	2	0
153	56.24	DIVINYL BENZENE	0.4637%	7637	1713	1.0000	2	0
154	56.42		0.0527%	869	242	1.0000	2	
155	56.59	DIMETHYL STYRENE	0.0710%	1170	242	1.0000	2	0
156	56.85	DIMETHYL STYRENE	0.6204%	10218	2131	1.0000	2	0

158	57.08	MET-PROPYL BENZENE	0.5606%	9233	2762	1.0000	2	0
159	57.18		0.0529%	872	227	1.0000	2	
160	57.35	TRIMETHYL STYRENE	0.3032%	4994	1273	1.0000	2	0
161	57.50	MET-PROPENYL STYRE	0.1535%	2528	518	1.0000	2	0
162	57.71		0.0086%	142	47	1.0000	1	
163	57.95	UNK ALKYL BENZENE	0.2536%	4177	648	1.0000	2	0
164	58.10	UNK ALKYL BENZENE	0.2216%	3650	1016	1.0000	2	0
165	58.29		0.1202%	1980	277	1.0000	2	
166	58.47		0.1333%	2195	330	1.0000	2	
167	58.60	METHYL INDENE	2.5493%	41986	11144	1.0000	2	0
168	58.74	METHYL INDAN	0.3794%	6249	1284	1.0000	2	0
169	58.90	METHYL INDENE	1.5119%	24901	5816	1.0000	2	0
170	59.01	METHYL INDENE	0.6494%	10695	3031	1.0000	2	0
171	59.19	METHYL INDENE	0.1087%	1791	449	1.0000	2	0
172	59.45	DIHYDRO NAPHTHALEN	0.8993%	14810	3327	1.0000	2	0
173	59.67		0.0425%	699	184	1.0000	2	
174	59.77		0.0781%	1287	277	1.0000	2	
175	60.02		0.0474%	781	172	1.0000	2	
176	60.15		0.0525%	864	175	1.0000	2	
177	60.29		0.0825%	1358	344	1.0000	2	
178	60.39	PENTENYL BENZENE	0.0880%	1450	377	1.0000	2	0
179	60.55	NAPHTHALENE	3.3029%	54397	13934	1.0000	2	0
180	60.90		0.0323%	531	111	1.0000	2	
181	61.00		0.0369%	608	178	1.0000	2	
182	61.31	DODECANE	0.1177%	1938	553	1.0000	2	0
183	61.42		0.0431%	709	179	1.0000	2	
184	61.66		0.0156%	257	69	1.0000	1	
185	61.88	DIMETHYL INDENE	0.1776%	2925	906	1.0000	2	0
186	62.02		0.0702%	1155	244	1.0000	2	
187	62.35		0.0099%	163	60	1.0000	1	
188	62.69		0.0362%	596	145	1.0000	2	
189	62.85		0.0547%	900	162	1.0000	2	
190	63.08		0.0103%	170	47	1.0000	1	
191	63.35		0.0156%	257	83	1.0000	1	
192	63.72		0.0630%	1037	171	1.0000	1	
193	64.08		0.0483%	795	211	1.0000	1	
194	64.32		0.0842%	1387	366	1.0000	2	
195	64.48		0.0376%	620	185	1.0000	2	
196	64.61		0.0577%	950	204	1.0000	2	
197	64.81		0.0231%	381	72	1.0000	1	
198	65.06		0.0902%	1486	322	1.0000	1	
199	65.33		0.0155%	255	82	1.0000	1	
200	65.53		0.0453%	747	146	1.0000	2	
201	65.76		0.0398%	655	97	1.0000	2	
202	66.20	2-MET NAPHTHALENE	0.7277%	11985	3334	1.0000	1	0
203	66.59		0.0870%	1433	457	1.0000	1	
204	66.95	1-MET NAPHTHALENE	0.4724%	7780	2309	1.0000	1	0
205	67.38		0.0099%	164	48	1.0000	1	
206	67.68		0.0099%	163	39	1.0000	1	
207	69.63	1,1-BIPHENYL	0.0844%	1389	403	1.0000	1	0
208	69.93		0.0190%	313	62	1.0000	1	
209	70.48	TETRADECANE	0.0683%	1124	236	1.0000	2	0
210	70.58		0.0264%	434	117	1.0000	2	
211	70.70	PENTADECANE	0.0819%	1349	419	1.0000	2	0
212	70.96		0.0105%	174	64	1.0000	1	
213	71.56		0.0582%	959	255	1.0000	2	
214	71.71		0.0309%	510	111	1.0000	2	

217	72.72		0.0101%	166	40	1.0000	1
218	73.17		0.0237%	390	67	1.0000	1
219	73.76		0.0144%	237	61	1.0000	1
220	74.40		0.0506%	834	273	1.0000	1
221	77.47		0.0311%	513	145	1.0000	1
222	77.71		0.0322%	531	138	1.0000	2
223	77.82	NONADECANE	0.0624%	1028	308	1.0000	2 0
224	79.54		0.0144%	238	67	1.0000	1
225	81.04	EICOSANE	0.0519%	855	270	1.0000	1 0
226	81.40		0.0181%	298	84	1.0000	1
227	84.30		0.0519%	855	244	1.0000	1
228	84.82		0.0203%	335	77	1.0000	1
229	87.74		0.0485%	798	191	1.0000	1
230	90.19		0.0431%	709	96	1.0000	1
231	91.65		0.0377%	621	138	1.0000	1
232	96.30	HENEICOSANE	0.0266%	439	84	1.0000	1 0
		TOTAL AMOUNT =	100.0000%	1646941			

APPENDIX F- CORRESPONDENCE

Post Office Box 777
Channelview, Texas 77530
Telephone 713 452 8888

Lyondell Petrochemical Company

August 23, 1990

THE HENDRIX GROUP,INC.
Houston, Texas 77530

Attn: Eddie Hendrix

Dear Mr. Hendrix,

As per our conversation 8-20-90, listed below is the information you requested on Tanks 3455,4455, and D-4383.

The stream compositions, in-flow and out-flow rates, and operating temperatures for the above mentioned tanks have not changed since last certified in 1989. Also, there has been no repair work of any kind performed on these tanks since the last certification.

The breather vents "emergency vent" on tanks 3455 and 4455 are currently listed under our PSV program and are not due for inspection until 1992. These vents were installed in 1988 and require inspection on a 4 year frequency. They are PSV-44186-24" and 44185-8" on Tk.4455 and PSV-34256-24" and 34257-8" on Tk.3455. D-4383 is also protected with a PSV. Also sent is the information for the GROTH flame arrester model 7618, on the lab tanks 1101 A and B.

Sincerely,

Mike A. Trujillo
Mechanical Inspector
Mechanical Services

cc: LCF

THE HENDRIX GROUP, INC.

METALLURGICAL ENGINEERING • CORROSION • TESTING

October 16, 1990

Lyondell Petrochemical Co.
P.O. Box 777
Channelview, TX 77530

Attn: Mr. Mike Trujillo

RE: Hazardous Waste Tank Assessment- Lab Tanks TK-1101A/B
LPC Work Order ACL-90-0066
Hendrix Group Project No. H9034

Dear Mr. Trujillo,

As detailed in my letter to Mr. Donnie Sampson (D.E. Hendrix to Mr. D. G. Sampson dated July 30, 1990), certification of the subject LPC lab tanks to the requirements of 40 CFR, 264.191, requires both an installation review and a design review. One of the design review items is a review of the pressure/vacuum relief capabilities of the tank system. As discussed with you, the lab tanks' pressure relief or "venting capacity" was reviewed with respect to both normal emptying and filling operations and emergency relief as would be required if the tanks' were to be involved in a fire. The requirements of API 2000, Venting Atmospheric and Low Pressure Storage Tanks, were followed in the review.

A review of tanks 1101A/B indicates that the present venting capacity (as supplied by the common use 2" line with Groth Md. 7618 flame arrestor) is not sufficient per API-2000 to act as emergency venting relief for either tank. Therefore, I regret that I will not be able to provide a certification report for tanks Tk-1101A/B until the API-2000 emergency venting requirements are met. Upon completion of the necessary modifications, I will be happy to visit LPC and review the changes for compliance. At that time I can complete the certification reports.

If you have any questions concerning this letter, please do not hesitate to call.

Sincerely,

David E. Hendrix, P.E.
The Hendrix Group

P.O. BOX 35717 • HOUSTON, TX. 77235 • (713) 723-1203

APPENDIX G- NORMAL AND EMERGENCY VENTING

Subject: LPC CHO LAB Tanks 1101 A/B Venting Calculations
File: By: D E HENDRIX Date: 10/15/90

I. Normal Venting Requirements

- Tank Capacity = $\pi * (1.185)^2 \times 6.167$
  = 26.30 ft³
- Capacity in lbs = $26.30 \times 7.4805 \frac{gal}{ft^3} \div 42 \frac{lbs}{gal}$
  = 4.7 lbs

- Max Fill Rate*
  - Av. fill rate: 1 tank per 1 week
    = 0.028 lbs/hr call 0.03 lbs/hr ✓
  - Max rate: 4 x Av. = 0.12 lbs/hr

- Max. Empty Rate** = 57 lbs/hr

1. Tank Inbreathing Requirements (API 2000)
(Assume both tanks filling at same time.)
A. Oil Movement = 560 ft³ ≤ 100 lbs/hr.
B. Thermal Inbreathing 60 ft³ ≤ 60 lbs/capacity

2. Outbreathing Requirements
A. Oil Movement = 1200 ft³ ≤ 100 lbs/hr. And ≤ 100°F flash point.
B. Thermal Outbreathing = 60 ft³ ≤ 100°F flash point

Total Breathing Requirements = 560 + 60 + 1200 + 60 = 1880 ft³ ✓ ok!
Per Tank

2" Groth 7618 Vent = 7800 ft³ at 4.0 oz/in²

* Per LPC

** By Vacuum Truck Empty in ~ 5 min. per LPC = 57 lbs/hr.

Subject: LPG CRO Lab Tank 11&15 Venting Requirements
File: D.E. HENDRIX
Sheet number: 2 of 3
10/13/80

II. Emergency Venting Requirements * API-2000

• Total Wetted Area = Total Surface Area × 0.75

Surface Area = Area of heads + area of shell

$= 2\left[\pi\left(\frac{14}{12}\right)^2\right] + \pi \times \frac{28}{12} \times 16.67$

$= 54\ ft^2$

Total Wetted Area = $54 \times 0.75 = \underline{40.50\ ft^3}$

Venting Requirements per Table II by interpolation

$$\frac{50-40}{50-40.5} = \frac{52,700-42,100}{52,700-X}$$

$X = \underline{42630\ ft^3}$ per tank for emergency release

III. Venting Capacity of 2" Groth Mdl. 7612 Flame Arrestor Vapor Capacity Curve.

1. $4300\ ft^3$ AT $4.0\ oz/in^2$
2. $5500\ ft^3$ AT $8.0\ oz/in^2$

* Based on ± 1 psig pressure design

Subject: LPC CHO Lab Tanks 1101 A/B Venting Calculations
File:
By: D.E Henonix
Sheet number: 9 of 9
Date: 10/15/90

III. Venting Capacity (cont)

Correction for flow at higher temperatures (per API-2000)

$CE = \sqrt{\frac{MAP}{P_f}} \times F_1$ MAP = max allowable pressure

F_1 = Max Stress

P_f = MAWP pressure on curve

* Assume both tanks involved in fire at same time.

∴ Required emergency capacity = 42,630 x 2 = 85,260 ft³

Determine MAP to meet required venting capacity of 85260 ft³

$\sqrt{\frac{X}{\frac{4 \text{ psi}}{16}}} \times 7300 \text{ ft}^3 = 85{,}200 \text{ ft}^3$

$\left(\frac{X}{0.25}\right)^{1/2} = 11.6795$

$X = 34 \text{ psi}$

Tank Max. Allowable Pressure Per ASME Section VIII

Shell → $P = \frac{SEt}{R + 0.6t} \Rightarrow \frac{18{,}800(.7)(.14)}{14 + 0.6(.14)} \Rightarrow \frac{1842.4}{14.084} \Rightarrow 130.8 \text{ psi}$ ✓ ok

Heads → $t = d\sqrt{\frac{CP}{SE}} \Rightarrow P = \frac{t}{d}\sqrt{\frac{SE}{C}}$

$\Rightarrow = \frac{0.135}{28}\sqrt{\frac{18{,}800 \times 0.7}{0.17}}$

$= .0048(278)$

$P = 133 \text{ psi}$ ✓

Heads NOT sufficient to take emergency vent or backpressure!

Lyondell Petrochemical Company

Calculations: Chs

Sheet 1 Of 3
File TANK 1101 A & B
Date 9-10-91
By S NEWCOMB

Subject HEAD DESIGN FOR EMERGENCY TANK VENTING BACK PRESSURE.

EDDIE,

ATTACHED IS THE CALCULATIONS YOU REQUESTED FOR LYONDELL'S LAB TANKS. THE CALCULATIONS DEMONSTRATE THAT THE LID WILL LIFT AS REQUIRED FOR EMERGENCY VENTING.

ALSO ATTACHED IS A SPECIFICATION FOR THE LID. LYONDELL WILL REMOVE THE WING NUT SO LID WILL LIFT IN CASE OF OVER PRESSURE.

THIS OF COURSE IS NOT A PERMANENT SOLUTION. ADDITIONAL OPTIONS ARE BEING INVESTIGATED. WE CAN DISCUSS AT YOUR CONVENIENCE.

AS WE DISCUSSED, LYONDELL WOULD LIKE TO RECEIVE THE SAFETY ASSESMENT ON OR BEFORE 9-14-91. IF THE TANKS REQUIRE ANOTHER INSPECTION PLEASE CONTACT ME AT 452-8548 OR PAGER # 833-3313.

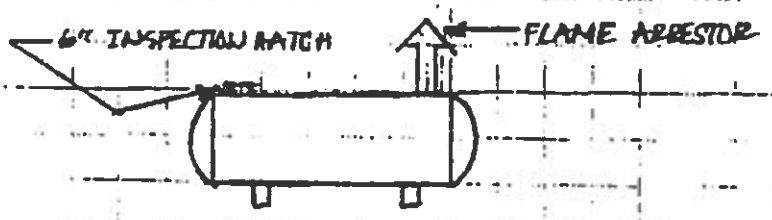
THANKS,

S. NEWCOMB

Lyondell Petrochemical Company

Sheet 1 of 3
File TK-1101 A & B
Date 9-10-91
By S. NEWCOMB

Subject HEAD DESIGN FOR EMERGENCY TANK VENTING BACK PRESSURE.



TANKS 1101 A & B

HEAD MAXIMUM ALLOWABLE PRESSURE (AS PER ASME SECT VIII)

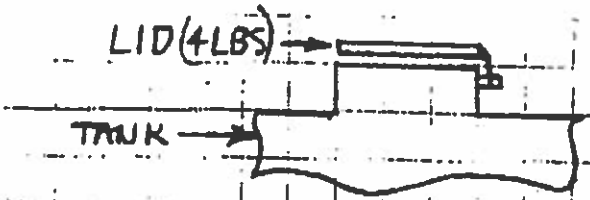
$t = d\sqrt{\frac{CP}{SE}}$ $\quad P = \frac{t}{d}\sqrt{\frac{SE}{C}}$

$S = 18{,}800$
$E = .70$
$C = .17$
$t = .135$ INCHES
$D = 28$ INCHES

$P = \frac{.135}{28}\sqrt{\frac{18000 \times .7}{.17}}$

$P = 1.31$ PSI

DEMONSTRATE INSPECTION HATCH WILL LIFT WITH LESS THAN 1.31 PSI APPLIED TO DRUM DURING EMERGENCY VENTING.



* THE LID WEIGHS APPROX. 4LBS TOTAL WEIGHT OF NOZZLE, LID AND WING NUT IS 9.5 LBS

BALANCE OF FORCES

4 LBS ≤ MAWP OF HEAD (1.33 PSI)

AREA OF LID

$A = \pi R^2 = \pi(3)^2 = 28.27\ IN^2$

$1.33\ LB_{F}/IN^2 \times 28.27\ IN^2 = 37.6\ LBF$

LBF = LBM (4 LB) (IN WEIGHT) < 37.6

Lyondell

Sheet 3 Of 5

File TK-110 Att B

Date 9-10-91

By S. NEWCOMB

Subject HEAD DESIGN FOR EMERGENCY TANK VENTING BACK PRESSURE.

MINIMUM FORCE REQUIRED TO LIFT LID CONVERTED TO PRESSURE (PSI)

X = PRESSURE TO LIFT LID (PSI)
A = AREA OF LID (IN²)
W = WEIGHT OF LID (LBF)

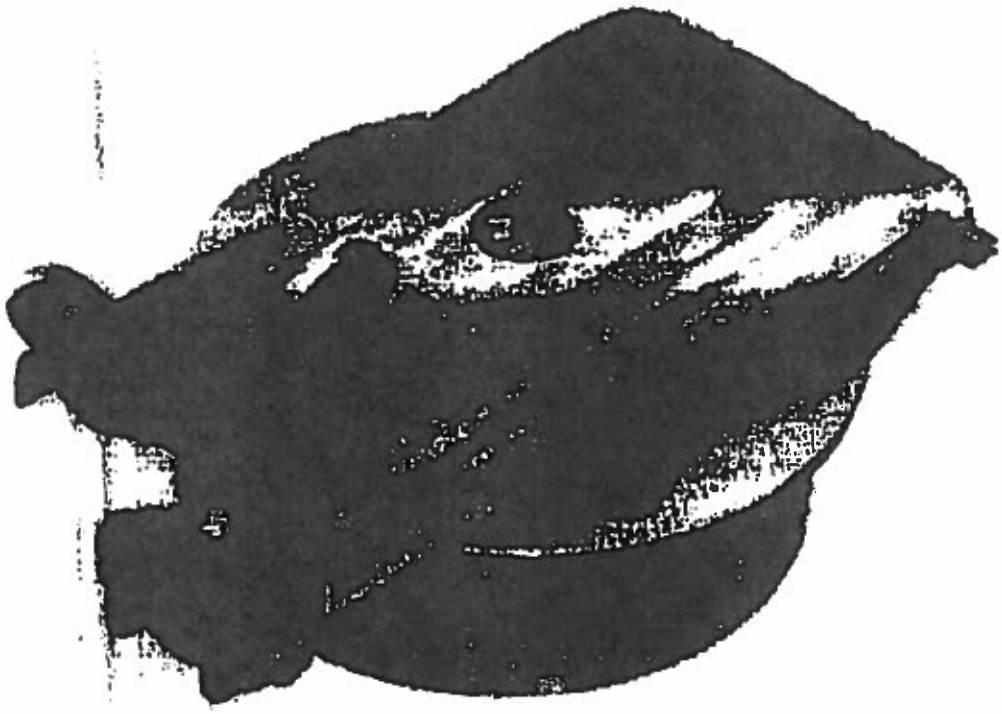
$X \times A = W$

$X \times 28.3\ IN^2 = 4\ LBF$

$X = \frac{4\ LBF}{28.3\ IN^2} = .14\ PSI$

LID WILL BEGIN TO LIFT AT .14 PSI

LH 6" FILL COVER



The KNAPP LH 6" Fill Cover is a low profile, positive seal, quick opening cap. It is available in all steel or stainless steel contact parts with external parts of plated steel.

This unit is ideally suited for use as an inspection hatch, sampling port or for small tube filling. The new design provides maximum safety and easy operation.

The standard Buna N Gasket ensures a positive seal and is easily replaced. (Other gasket materials are available.)

A 2" high weld ring provides easy installation and a low profile.

OVERALL HEIGHT: 5⅜" (Approximately) AVERAGE SHIPPING WEIGHT: 9½ pounds

MODEL		COVER MATERIAL		WELD RING 5.7" ID		GASKET		VENT	
TYPE	CODE	CONTACT PARTS	EXTERNAL PARTS	CODE	MATERIAL	CODE	MATERIAL	CODE	TYPE
LH	1	Steel	Steel	1	Steel 10 gauge	1	Black Buna N	0	No Vent
	2	SS 304	Plated	2	SS 304 11 gauge				

January, 1987

KANSAS CITY, MISSOURI 64150

Secondary Containment Volume Calculations

RADIAN CORPORATION

CALCULATION SHEET

SIGNATURE KBH DATE 6-19-90 CALC NO.

PROJECT LPC RCRA Part B CHECKED DATE

SUBJECT Secondary Cont Calc JOB NO.

SHEET 1 OF 2 SHEETS

TANK NO. 1101 A and B

DESIGN CAPACITY, GALLONS 195 EACH

I. GROSS CONTAINMENT VOLUME

L = 10' 5½" = 10.45' AND 7' 1½" = 7.05 ft

W = 9' 1" 9.05" AND 2' 8" = 2.67

H = 1'

V_g = GROSS CONTAINMENT VOLUME = L x W x H

V_g = (10.6' x 9.08' x 1') + (7.1' x 2.67' x 1') = 115.21 ft^3

II. FOUNDATION VOLUME

BASIS: 2 RECTANGULAR CONCRETE PADS 3'10" x 2' x 1' EACH

V_f = VOLUME OF FOUNDATION

V_f = 2 x (3.83 x 2' x 1') = 15.32 ft^3

III. NET CONTAINMENT VOLUME

V_N = NET CONTAINMENT VOLUME

$V_N = V_g - V_f$

V_N = 115.21 ft^3 − 15.32 ft^3 = 99.89 ft^3

@ 7.48 GAL/FT^3 = 747 GALLONS

IV. RAINFALL EVENT VOLUME (ASSUME ONLY 10% WINDBLOWN ENTERS AREA BECAUSE IT IS ROOFED WITH PARTIAL WALLS)

R = 25-YEAR, 24-HOUR RAINFALL EVENT = 10 INCHES X 0.1 = 1 INCH

Ac = CONTAINMENT AREA = (10.6' x 9.08') + (7.1' x 2.67') = 115.21 ft^2

Ve = EVENT VOLUME = (R/12)(Ac)(7.48 GAL/FT^3) = (1/12')(115.21 ft^3)(7.48) =

Ve = 71.81 GALLONS ~ 72 GALLONS

RADIAN CORPORATION

CALCULATION SHEET

SIGNATURE _____ DATE _____ CHECKED _____ DATE _____ CALC. NO _____

PROJECT _____ JOB NO _____

SUBJECT _____ SHEET 2 OF 2 SHEETS

TANK NO. 1101A AND B
DESIGN CAPACITY, GALLONS 195 EACH

V. TOTAL REQUIRED CONTAINMENT VOLUME

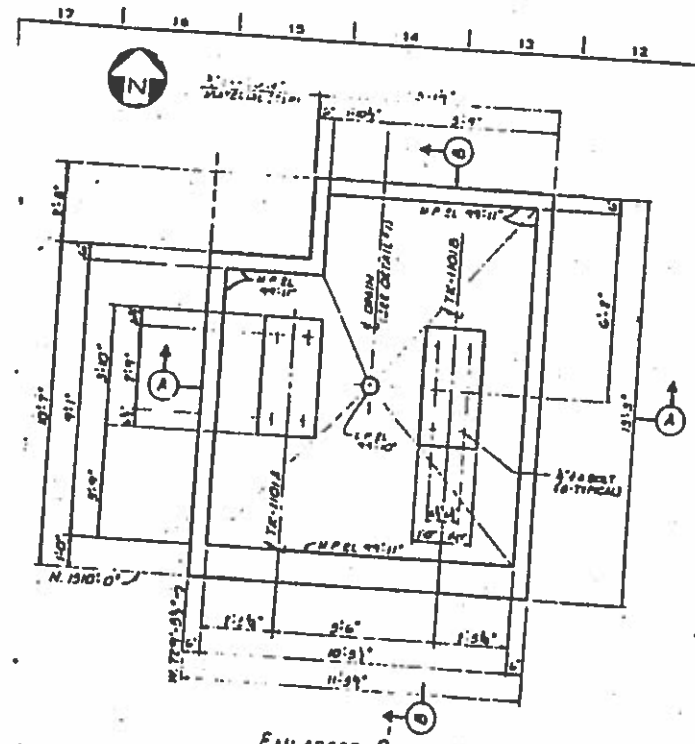
Vr = TOTAL REQUIRED CONTAINMENT VOLUME
Vr = Ve + TANK DESIGN CAPACITY
Vr = 72 GALLONS + 195 GALLON = 267 GALLONS

VI COMPARISON OF ACTUAL – VS – REQUIRED VOLUMES

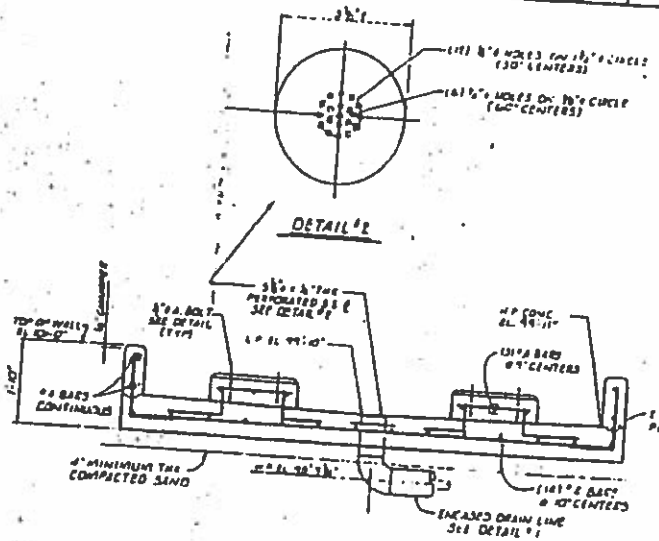
ACTUAL VOLUME = Vn = 747 GALLONS
REQUIRED VOLUME = Vr = 267 GALLONS

ACTUAL VOLUME = (Vn/Vr) X 100 = (747/267) 100 =

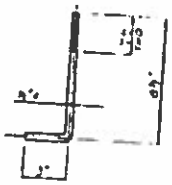
280 % OF REQUIRED VOLUME



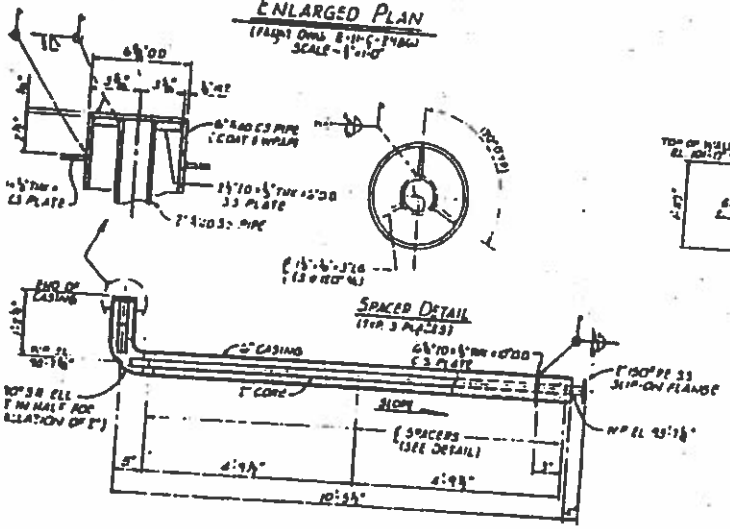
ENLARGED PLAN



SECTION "A-A"

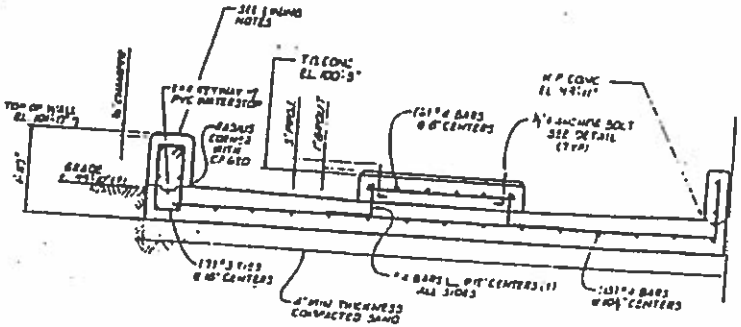


ANCHOR BOLT DETAIL



DETAIL # 1

SECONDARY CONTAINMENT DRAIN LINE



SECTION "B-B"

ISSUED FOR COMMENT

GENERAL NOTES

1. All concrete construction shall be in accordance with "ACI Control Concrete," latest revision.
2. All concrete shall be 3000 psi compressive strength in 28 days, unless otherwise specified.
3. All reinforcing bars shall be ASTM A615, Grade 60, unless otherwise specified.
4. For general concrete construction and testing data requirements see "ACI Control Concrete" Spec No. 301.
5. Provide the following concrete protective coverings for main reinforcing, unless otherwise specified.
   a. 3" for all concrete placed directly against the ground.
   b. 1" for all formed concrete exposed to weather or in contact with the ground.
6. All splices for reinforcing bars shall be 24 bar dia., unless otherwise specified. All welded wire fabric shall be lapped at least 6" and securely wired.
7. All exposed edges of concrete shall be chamfered ¾", unless otherwise specified.

INTERIOR LINING NOTES

(1) THE INTERIOR CURB WALL & FLOOR "L" SECTION
(2) ALL CONSTRUCTION JOINTS USING THE FOLLOWING
EPOXY COATING MUST BE TWO PART EPOXY MORTAR,
AFTER CONCRETE CURES FOR 28 DAYS.
— #6 (3/4) WAKE
— #5 (5/8) WAKE
— #4 (1/2) WAKE
— #3 (3/8) WAKE
— #2 (1/4) WAKE
— #1 (1/8) WAKE
(3) AREA TO BE COATED SHALL BE SWIT BLASTED
(4) CRACK AREA JOINTS TO BE SEALED WITH SIKA FLEX
POLYMER CO. OR EQUAL FLEXIBLE EPOXY SEALANT

DESIGNED NEW BEAM REMOVED
SHOWN ALSO APPROVED

No.	Revision	Date	By
1	CONDITION LOCATION PLAN		
2	ROOF STEEL PLAN & SECTIONS		

REFERENCE DRAWINGS

Lyondell Petrochemical Company

PLAN SECTIONS & DETLS
SAMPLE WASTE CONTAINMENT
SOUTH OF LABORATORY

DESIGNED	E	M	C	7999
DRAWN				
CHECKED				
APPROVED				
DATE				

0

Container Storage Area

S & B ENGINEERS and CONSTRUCTORS, LTD.
P.O. BOX 26645
HOUSTON, TEXAS 77207-6245
(713)645-4141
FAX 645-6094
7825 PARK PLACE BLVD.
HOUSTON, TEXAS 77087

November 9, 1998

Letter No.: SBLLP-001
Project Title: Storage Area Curb Cert.
Client Job No.:
S&B Job No.: E-4876
File: 601.001

Mr. Todd Marler
Equistar Chemicals, LP
8280 Sheldon Road
Post Office Box 777
Channelview, Texas 77530

Subject: North Container Storage Area Curb

Dear Mr. Marler:

I certify that the North Container Storage Area Curb was constructed in accordance with the attached Lyondell Petrochemical Company drawing E-17-D-066-1. My understanding is that this drawing was submitted as an addendum (April 16, 1997) to a Class II RCRA permit modification dated February 6, 1997 and approved by the TNRCC.

I lify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,

Ray Hester

RH/mss
Attachment

cc: Thad Scott
Janice Seward
Project File



n:\project\e4876\projsec\letters\001

CONTAINER STORAGE AREA ENGINEERING REPORT

LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW COMPLEX
CHANNELVIEW, TEXAS

Revisions:

November 1988

June 1990

January 1991

September 199

January 1997

CONTAINER STORAGE AREA ENGINEERING REPORT

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2.0 CONTAINER STORAGE AREA #1 1

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2.2 TYPES OF WASTE MANAGED 1
2.3 CONTAINMENT SYSTEM 2
2.4 CONTAINER MANAGEMENT PRACTICES 2
2.5 IGNITABLE AND REACTIVE WASTE MANAGEMENT METHODS 4
2.6 INCOMPATIBLE WASTE MANAGEMENT METHODS 5

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ATTACHMENT V-6: PAVING AND GRADING DETAIL OF CONTAINER STORAGE AREA

ATTACHMENT V-7: PAVING PLAN OF CONTAINER STORAGE AREA SOLID WASTE HANDLING FACILITIE

ATTACHMENT V-8: PAVING AND GRADING SECTIONS OF CONTAINER STORAGE AREA

CONTAINER STORAGE AREA ENGINEERING REPORT

1.0 INTRODUCTION

The Channelview Complex utilizes an existing container storage area. This report discusses the design and operation of this unit.

2.0 CONTAINER STORAGE AREA #1

2.1 Quantity and Container Type

The existing container storage area at the Channelview Complex consists of a covered building approximately 97 ft long by 50 ft wide and an adjacent paved area approximately 35 ft by 35 ft. Both areas are designed for the management of both drums and roll-off bins and if needed, tote bins. The design capacity of the facility will allow for the storage of a maximum of approximately 800 drums under the covered building and 3 roll-off bins in the open, contained area. Normally, only drums will be placed inside the covered building. However, it is possible that up to 5 roll-off bins could be stored under the building. Therefore, the total number of roll-off bins present at any one time would be eight. The maximum inventory in the Container Storage Area building occurs when 800 drums are present. However, the worst case spill is based upon the largest single container being a 30 cubic yard roll-off bin.

The drums will consist of various types and sizes with the most commonly used type being the 55-gallon steel drum. The roll-off bins to be managed at the facility will consist of either 20 or 30 cubic yard containers.

2.2 Types of Waste Managed

The types of waste which will be managed in the various size drums within the container storage area will include:

- Corrosive materials;
- Reactive materials;
- Ignitable materials;
- Toxic Constituent (TC) materials; and
- Miscellaneous materials contaminated with plant products and by-products.

The types of waste which will be managed in the various roll-off bins at the container storage area will include:

- Corrosive materials;
- Reactive materials;
- Toxic Constituent (TC) materials; and
- Miscellaneous materials contaminated with plant products and by-products.

2.3 Containment System

The base of the covered container storage area consists of an eight-inch reinforced concrete slab with approximately six-inch high perimeter concrete curbing. This base and curbing are free of cracks and are sufficiently impervious to contain leaks and spills, should they occur. Liner base selection was based on the results of extensive tests utilizing three different polymers and all applicable waste streams. Parameters used in the test included a lining that would be able to withstand the weather, sunlight, common

chemical plant vapors, minor spills and leaks, and total immersion in the appropriate waste for a maximum of five days. The compatibility study is provided in Attachment V-5.

The open section of the container storage area consists of an eight-inch reinforced concrete slab with approximately six-inch high perimeter concrete curbing.

The base for both sections is sloped to drain any liquids to a sump where any spillage or leakage will collect to be removed in a timely manner. Attachments V-6 through V-8 show the foundation and paving details associated with the container storage area and building. To further minimize the potential of liquids contacting the containers, all drums will be placed on wooden pallets, stacked a maximum of two levels. The roll-off bins are typically constructed such that they have a base which is elevated approximately 11 inches off the floor. A minimum of 18 inch aisle spacing is provided within the container storage area to allow for thorough inspection of the containers for possible deterioration or leaks.

The container storage area is designed to provide adequate containment capacity, approximately 16,000 gallons, in the event of a container rupture. A worst case estimated volume, utilizing one 30 cubic yard bin was calculated to be 6067 gallons. Therefore, the single largest container volume is used as the controlling containment capacity, which is well below the total containment capacity of the container storage building. Although some containers may contain no free liquids, containment volume estimates were calculated with the assumption that all containers do hold free liquid contents.

The entire container storage area is constructed approximately 2.5 feet above natural grade which prevents rainfall run-on into the facility. Additionally, the container storage building is sufficiently enclosed with a roof and partial side walls, extending down from

the roof, to prevent rainfall from entering the facility.

Any spills or leakage detected during routine inspections and operations will be promptly reported. Removal of liquids from the containment area or associated sumps will be performed in a timely manner to minimize the potential of containers coming in contact with the waste. Removal methods will be dependent on the characteristics of the waste (i.e. soda ash for acids, absorbent pads, vacuum trucks, etc.). The sump in the covered building is below grade. Historically, liquids were routed via piping to the sludge drying beds. This piping has been blocked with a concrete plug. Currently, liquids are removed from the sump via a drain valve (closed and capped when not in use) to a vacuum truck, and are placed into one of the two RCRA permitted aeration basins. The sump in the open area is also below grade and equipped with a drain line that is maintained with a brass plug only when roll-off bins containing hazardous waste are stored in this area. During this time, liquids that accumulate in this sump, including rainfall, are usually removed with a vacuum truck and placed into one of the two RCRA-permitted aeration basins. If the liquids are to be sent off-site for disposal, a sample of the liquids will be analyzed to determine the appropriate disposal methods.

2.4 Container Management Practices

Containers are transferred to the storage area after being labeled, lids secured, and a trip ticket issued for transfer. The containers are loaded onto a flatbed truck or trailer and transported to the storage area. The containers in the container storage area are placed in the storage area with lids and metal and/or plastic ring closers attached and locked down. Bunged drums have all bungs securely tightened. Most drums are palleted and placed in double stacked rows a minimum of 18 inches apart. The containers remain closed during storage, except when adding or removing waste and are not opened, handled, or stored in any manner that may cause them to rupture or leak.

2.5 Ignitable and Reactive Waste Management Methods

Both ignitable and reactive wastes will be managed within the container storage area. The wastes will be located a minimum of 2,500 feet from the nearest facility property line. Attachment D in the Part A permit application indicates the location of the container storage area with respect to the facility property lines, demonstrating compliance with the protective distance requirement.

2.6 Incompatible Waste Management Methods

Although the various wastes listed as being managed within the container storage area may be incompatible materials, these incompatible materials will not be stored together during the same time period. Recordkeeping and waste management procedures are undertaken to ensure potentially incompatible materials are handled and stored separately. All waste streams are placed in new or RCRA defined "clean containers".

ATTACHMENT V-5

Coating Compatibility Study

Revised January 1997

Due to the removal of Tanks: TK – 3210, TK-2812, TK-3110, TK-3207,
this memo (21 October, 1988)
is no longer applicable for those tanks.

LL5

PC-MEMO

Date: October 21, 1988 No: WBD-1021-88

To: E. R. Olivares cc: J. D. Miller
R. Smith
L. Roberts

From: W. B. Douglas

Subject: HAZARDOUS WASTE CONTAINMENT LINERS
ACL #8-015, #8-801 & #8-701 ENVIRONMENTAL UPGRADE

Construction packages are being prepared for liner installation on the subject projects per the attached schedule. The attached schedule includes all linings required for the AFCs.

Liner selection was based on the following. During the project scope definition stage, it was recognized that liner selection would have to be made without long term test results. It was also recognized that the EPA requirement of lining concrete was a bit naive, as whenever concrete cracks with age, the liner will also crack. It was agreed then by Environmental, Process and Project Engineering the approach should be economically priced unreinforced liners that were recommended for the individual services.

In trying to identify the bad component/s in each of the waste storage tanks, we were given detailed analysis sheets for some. The analysis sheets, also attached, were not helpful in identifying what we were to protect against. Subsequent conversations with Environmental and Operations gave us enough information to contact vendors.

Vendor recommendations and test liners on concrete were solicited. Of the products proposed by vendors, the three shown on the attached data sheet were selected for a short duration test with individual waste samples. All products tested showed no lining deterioration during the test.

Before the test was completed, TK-3221 experienced an unscheduled outage. Project Engineering requested we select a "cadillac" coating that was sure to work for the tank bottom since we did not yet have test results on the liners.

We brought in W. L. Welch, CHE, with Advanced Polymer Techniques to review the application with Randolph Smith. Based on their conversation concerning Tank 3221 and all other applications, the liner for TK-3221 was selected and recommendations were made for all other applications. The recommendations were the same as the test results with the exception of the TK-2812 liner being upgraded due to the presence of maleic and mene.

CTOBER 20, 1988

HAZARDOUS WASTE CONTAINMENT LINER EVALUATION
FILE: LINER

		TANK BOTTOM TREATMENT	LPC TEST RESULTS			ADV POLYMER TECH RECOMMENDATION
			I W INDUSTRIES TARPON FLAKE 151 POLYESTER 4.00/FT	GULF COAST PAINT PC 150/1400/555 2 PART EPOXY 3.90/FT	SENTRY POLYMERS CL 695 URETHANE/EPOXY 6.00/FT	
EAST TANK FARM HORIZONTAL DRUMS	SLOP ACN	NONE	OK	OK	OK	PC 150/1400/555 2 PART EPOXY 3.90/FT (CANCEL LINER)
D 59 EAST UTILITIES	ALCOHOL	NONE	OK	OK	OK	PC 150/1400/555 2 PART EPOXY 3.90/FT
TK 2812 SNA	CUMENE	LIFT/COAT	OK	OK	OK	SEMSTONE 8084/470 VINYL ESTER 12.50/FT
TK2606 W API	ACN PLUS	LIFT/COAT	OK	OK	OK	PC 150/1400/555 2 PART EPOXY 3.90/FT (95% COMPLETE)
TK 3207 TK 3210 PBD	ACETONE	LIFT/COAT	OK	OK	OK	PC 150/1400/555 2 PART EPOXY 3.90/FT
TK 3221 PBD API	WASTE PBD	LIFT/COAT	OK	OK	OK	SEMSTONE 110/145 2P REINF EPOXY 12.50/FT (BTM COMPLETE)
TK 3110 IPOH	ALCOHOL	DOUBLE BOTTOM	OK	OK	OK	PC 150/1400/555 2 PART EPOXY 3.90/FT
NEW P-31 SUMP (D 59 PRODUCT)	ALCOHOL	NONE				PC 150/1400/555 2 PART EPOXY 3.90/FT

Due to the Removal of the Tank D-59,T-3110,T-3210,T-2606,T-2812,T-3207,T-3221, East TK.FM. Horiz. Drum. This memo (August 10th,1998) is no longer applicable for those tanks.

PC-MEMO

Date: August 10, 1988 No: LGS-810-88

To: Randolph Smith cc: E. Olivares
J. D. Miller
W. B. Douglas

From: Larry Samuels

Subject: ENVIRONMENTAL UPGRADE & STORMWATER AFC'S
SECONDARY CONTAINMENT COATING OR LINING

In order to specify the coating or lining which will satisfy Article 264.193, e, 2, iv, which states: Secondary Containment must be "Provided with an impermeable interior coating or lining that is compatible with stored waste and that will prevent migration of waste into the concrete," we need to know the typical analysis or major components of the material stored in the following tanks.

D-59✓
T-3110
T-3210✓
T-2606
T-2812✓
T-3207✓
T-3221✓
EAST TK. FM. HORIZ. DRUMS-

Upon receipt of this information we plan to request bids for a coating or lining that will withstand the weather, sunlight, common chemical plant vapors, minor spills and leaks, and total immersion in the appropriate waste for a max of 5 days. (Clean up must occur in 24 hours unless it is demonstrated to the EPA Regional Administrator that it is not possible to safely accomplish clean up in 24 hours.)

Vendors will be requested to propose the most cost-effective coating or lining to accomplish the above, with the stipulation that the lining system will be repaired or replaced if necessary after a major spill (total immersion).

We believe this approach is in accordance with the direction provided at the P&ID and scope meeting June 28.

Please provide the requested information as soon as possible. We must pin down the lining specification and cost in order to verify the AFC estimated cost. Also, several tasks consist of lining existing concrete and that work can proceed as soon as the lining is specified and vendors are selected.

Thank you for your attention to this matter.

1

(713) 446-9737

DOUGLASS ENGINEERING SERVICES

WBO

PC-MEMO

Date: October 7, 1988 No: LGS-107-88

To: Randolph Smith cc: E. R. Olivares

From: Larry Samuels

Subject: SECONDARY CONTAINMENT LINING SYSTEM TEST

The three samples of proposed linings delivered to you 10-7-88 are:

1.) The large block is I.W. Industries Tarpon Flake 151 System.
2.) The smaller blocks are Applied Polymer Technology (an applicator) recommendations.

A.) The CL-695 is a new Gulf Coast Paint Co. material that is capable of elongating 100% and is thus better for covering concrete cracks or concrete which may crack; but, it has not had extensive chemical testing and unless we have excellent test results, we may want to stir away from it.

B.) The PC 558 is an older Gulf Coast Paint Product that is said to have excellent resistance to most acids, alkalies and many solvents.

The spots in the two smaller A.P.T. samples result from bugs landing on the samples before they cured. (The salesman prepared the samples over a weekend for us.)

I'm not concerned about the appearance of the samples as they were prepared under very different circumstances. A.P.T. has a very good reputation as a lining applicator and, in fact, often apply I.W. Industries products as well as other products which they select based on their knowledge of various applications.

I would like for your people to put a few drops of each product in the various blocks marked on the samples and let it stand 24 hours (according to Reg, spills will be cleaned up in 24 hours.)

At the end of 24 hours, the blocks should be flushed thoroughly with water and the results photographed and recorded.

Then the test could be repeated for say three days or longer. That way we will know how the lining products stand up to the various services.

All of the products, except as noted above, have been used for secondary containment liners by other companies according to the vendors, and the ill meet the LPC objective of providing and impervious liner at reason-

able cost. $3.50 to $7.00 per sq. ft.

The remaining question of compatibility with LPC waste will be answered by these test exposures.

As soon as the test are complete, we hopefully (depending on the results) will be in a position to specify the design for each secondary containment structure and Lawson Company can proceed with the application which I understand must be submitted November 8, 1988.

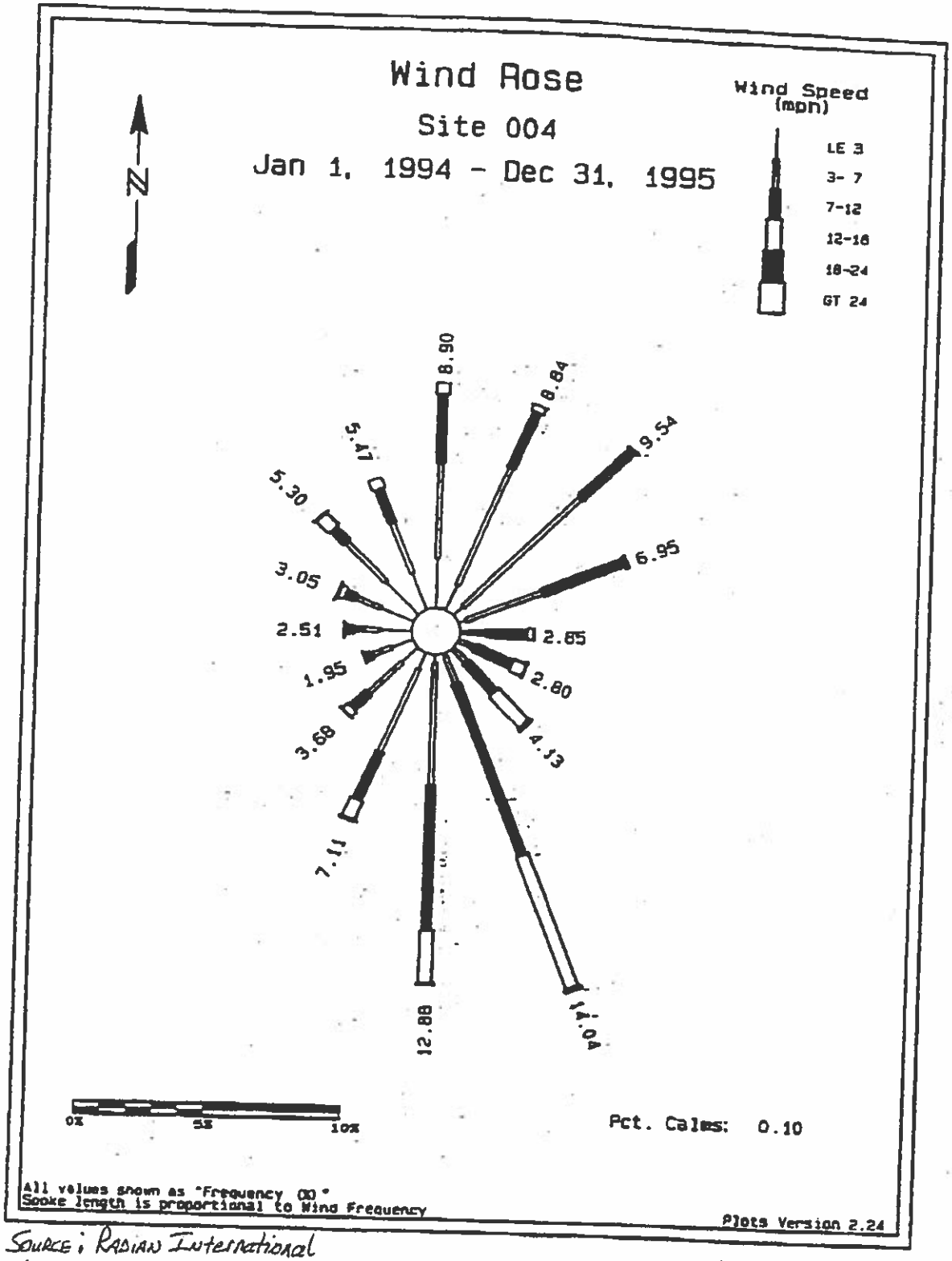
(713) 446-9737

DOUGLASS ENGINEERING SERVICES

ATTACHMENTS V-6 THROUGH V-8

CONTAINER STORAGE AREA DRAWINGS

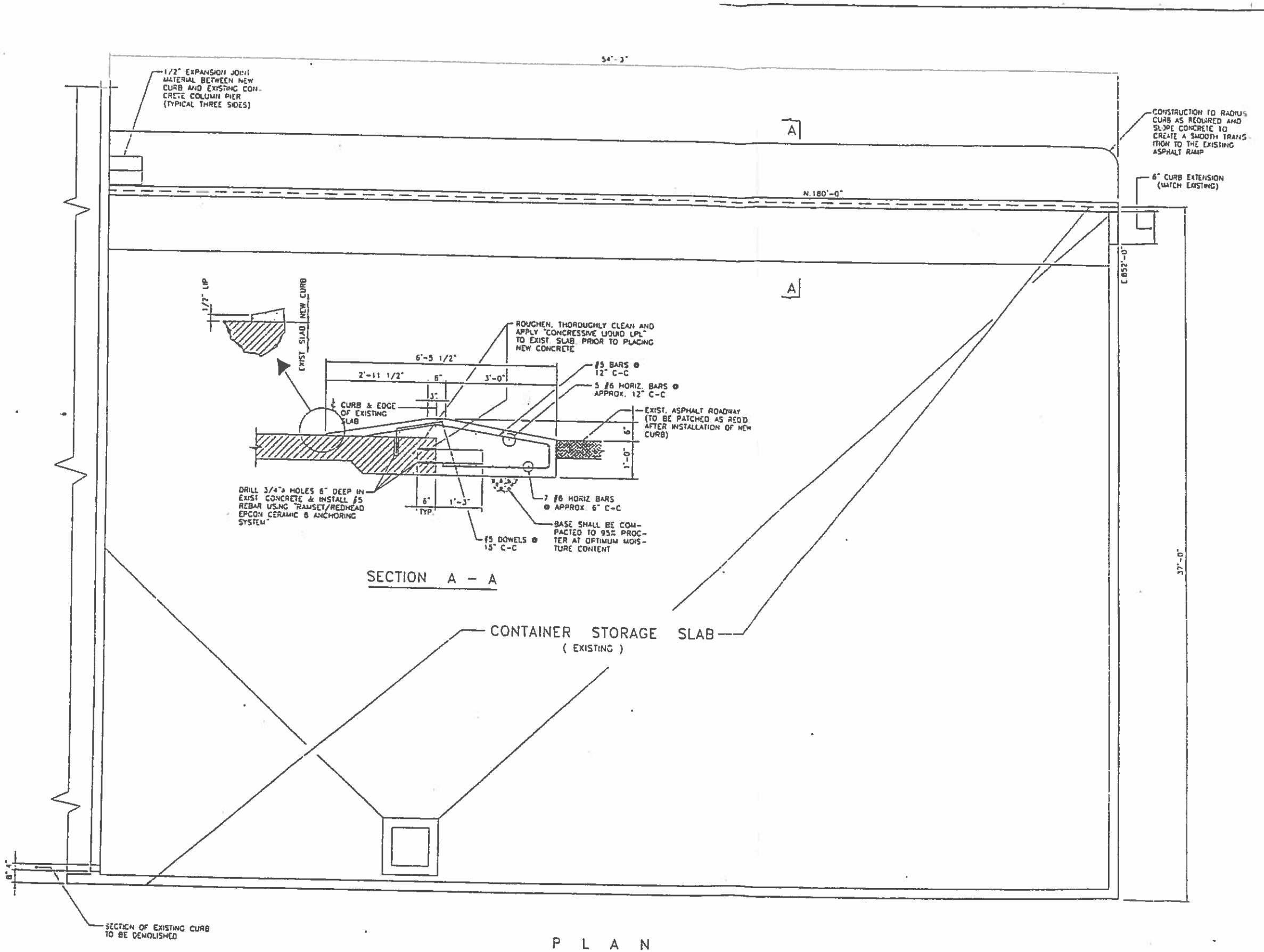
Revised January 1997



Source: Radian International

ATTACHMENT II-4

Container Storage Area Paving Plan



DWG NO	REFERENCE DRAWINGS
"	
"	
"	
"	
"	
"	
"	
"	
"	
E-17-D-039	PAV. & GRAD. SECTIONS CONT. STD. AREA
E-17-D-040	PAVING PLAN-NORTH CONT. AREA STD. FAC.

NOTES

1. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH LYONDELL SPEC. LYO STD 702 AND 706.
2. ALL ASPHALT DEMOLISHED FOR INSTALLATION OF NEW CONCRETE SHALL BE REPLACED AS REQUIRED AFTER NEW CURB IS IN PLACE

STATE OF TEXAS
RAY W. HESTER, JR.
23044
REGISTERED PROFESSIONAL ENGINEER

LYONDELL JOB NO L1'8-7939

JOB NO E-3701

S&B ENGINEERS AND CONSTRUCTORS, LTD. HOUSTON, TEXAS

NO	DATE	REVISIONS	DRN. APP.
1	4/1/97	[illegible]	
2	3/19/97	[illegible]	

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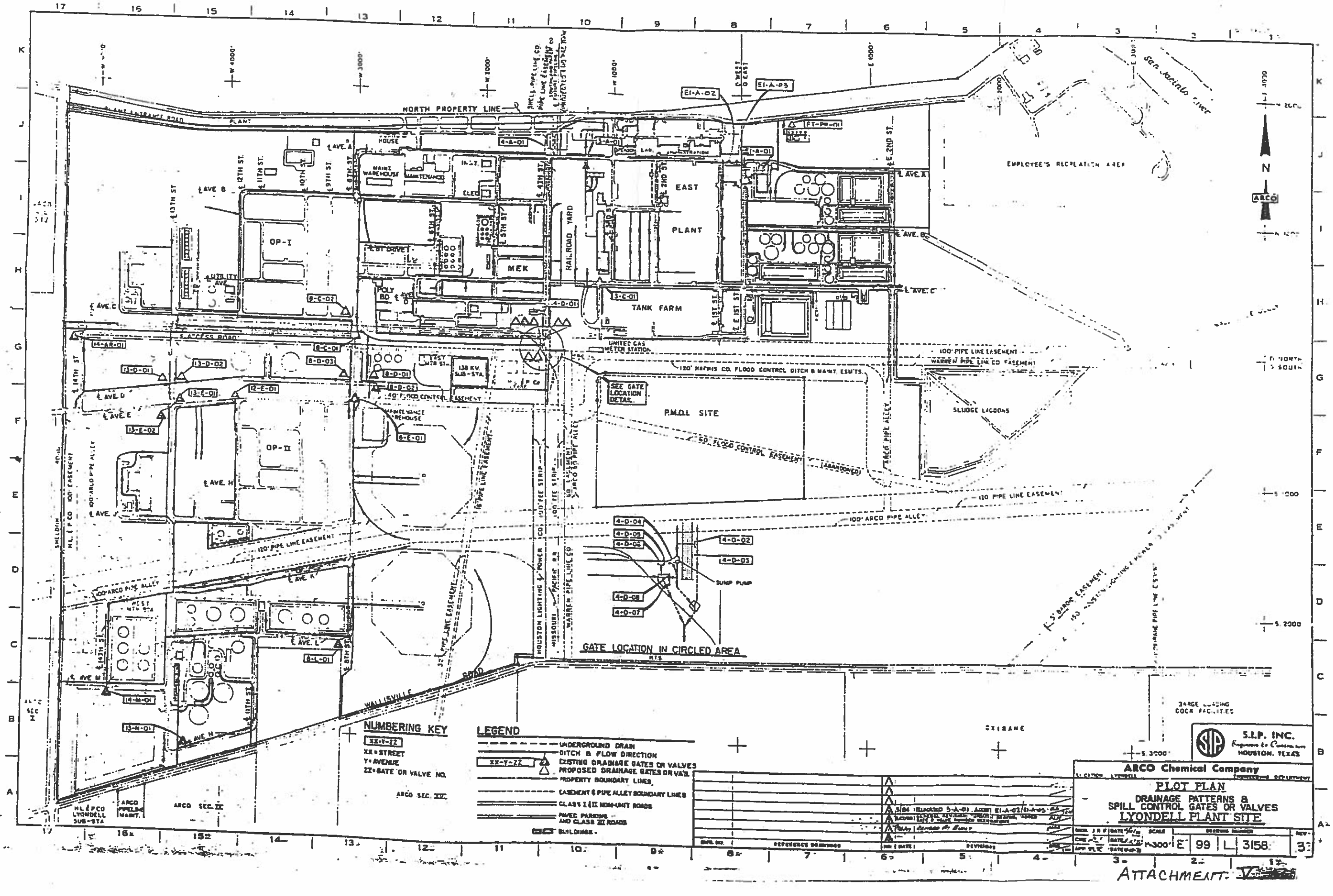
Lyondell

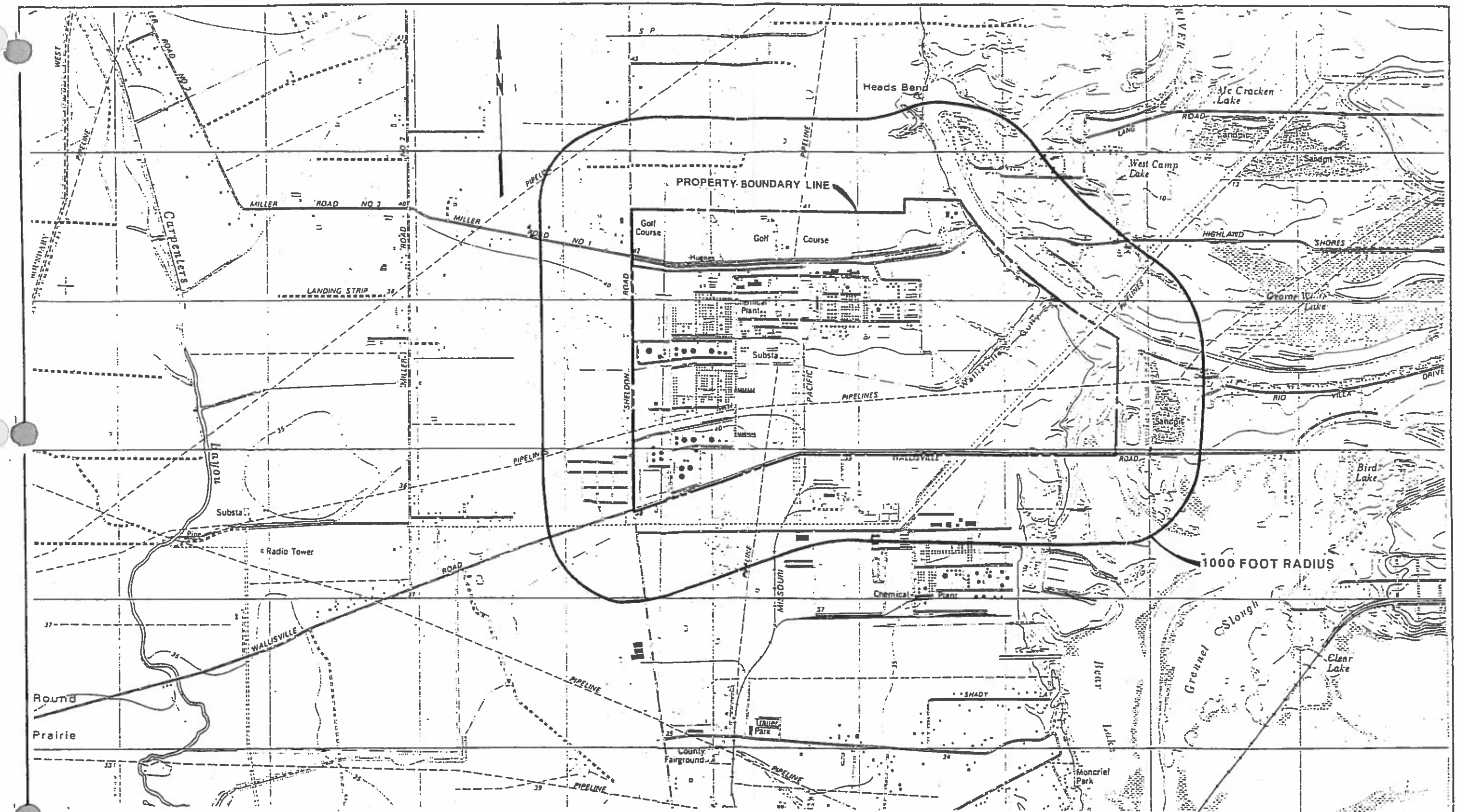
LOCATION: CHANNELVIEW ENGINEERING DEPARTMENT

NORTH CONTAINER STORAGE AREA CURBING PLAN AND DETAILS

DRN. J.A.B.	DATE	SCALE	DRAWING NUMBER				REV.
CHK. B.C.	DATE	1/8"=1'-0"	E	17	D	066	1
APP	DATE						

17 16 15 14 13 12 11 10 9 8 7 6 5


NORTH PROPERTY LINE
PLANT
MAINT. WAREHOUSE
MAINTENANCE
ELEC.
LAB.
EAST PLANT
OP-I
OP-II
MEK
RAILROAD YARD
TANK FARM
POLY BD
UNITED GAS METER STATION
138 KV. SUB-STA.
MAINTENANCE WAREHOUSE
P.M.O.I. SITE
SEE GATE LOCATION DETAIL
120' HARRIS CO. FLOOD CONTROL DITCH & MAINT. ESMTS.
60' FLOOD CONTROL EASEMENT (ABANDONED)
100' PIPE LINE EASEMENT
WARREN PIPE LINE CO. EASEMENT
SLUDGE LAGOONS
EMPLOYEE'S RECREATION AREA
San Jacinto River
120' PIPE LINE EASEMENT
100' ARCO PIPE ALLEY
HOUSTON LIGHTING & POWER 100' FEE STRIP
MISSOURI PACIFIC R.R.
WARREN PIPE LINE CO.
SUMP PUMP
GATE LOCATION IN CIRCLED AREA
NTS
F.S.P. 5' BARGE EASEMENT
WALLISVILLE ROAD
BARGE LOADING DOCK FACILITIES
ORIBAME
ARCO SEC. XX
ARCO SEC. XXI
HL&P CO LYONDELL SUB-STA
ARCO PIPELINE MAINT.
NUMBERING KEY
XX-Y-ZZ
XX = STREET
Y = AVENUE
ZZ = GATE OR VALVE NO.
LEGEND
UNDERGROUND DRAIN
DITCH & FLOW DIRECTION
EXISTING DRAINAGE GATES OR VALVES
PROPOSED DRAINAGE GATES OR VALVES
PROPERTY BOUNDARY LINES
EASEMENT & PIPE ALLEY BOUNDARY LINES
CLASS I & II NON-UNIT ROADS
PAVED PARKING AND CLASS III ROADS
BUILDINGS
S.I.P. INC.
Engineers & Constructors
HOUSTON, TEXAS
ARCO Chemical Company
PLOT PLAN
DRAINAGE PATTERNS & SPILL CONTROL GATES OR VALVES
LYONDELL PLANT SITE
SCALE 1"=300'
E 99 L 3158 3
ATTACHMENT V



REFERENCE: "Highlands and Jacinto City, Texas" Quadrangle Maps by U.S.G.S., 1982.

0 1000 2000
feet scale

Harding Lawson Associates
Engineers, Geologists & Geophysicists

TOPOGRAHPICAL MAP
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW, TEXAS

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ES.	18641,003.12				

8280 Sheldon Road
Post Office Box 777
Channelview Texas 77530
Telephone 713 452 8888

Lyondell Petrochemical Company

April 16, 1997

CERTIFIED MAIL
P 190 820 330

Mr. Dan Pearson
Executive Director
Texas Natural Resource Conservation Commission
12100 Park 35 Circle
Austin, Texas 78753

Attn: Mr. John Clegg - Hazardous Waste Permit Section, MC-130

Subject: **Revisions to Class II Modification of TNRCC Permit No. HW-50117; Solid Waste Registration No. 30030**

Dear Mr. Pearson:

Lyondell Petrochemical Company's Channelview Complex previously submitted a Class II modification for the subject permit on February 6, 1997. We are requesting an amendment to the February 6th submittal to include the following two items which were inadvertently omitted from the original package.

First, although warning signs are already posted around the facility, section 3.0 of the Security Plan has been amended to reflect wording the signs in both English and Spanish.

Second, physical modifications to the uncovered portion of the Container Storage Area will be completed to provide adequate containment. The modifications will include installing approximately 55 feet of six inch high curbing along the northern boundary and removing a section of curbing approximately 4 inches wide along the western curb to provide common containment for both the covered and uncovered areas of the Container Storage Area.

Enclosed are one original and three copies of the following documents:

- Security Plan, located in the Volume I notebook, with the revised wording for the signs;
- Engineering drawing for the containment curb stamped by a registered Professional Engineer;
- Certification statement from a registered Professional Engineer as required by 40 CFR 270.11 for the addition of the containment curb; and,
- Notarized signature pages for the revised Part A and Part B applications.

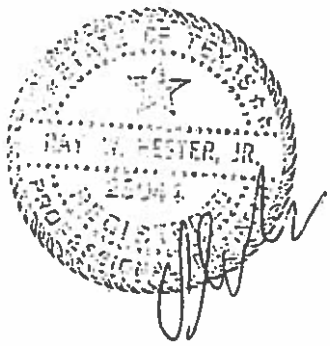
If you need any additional information, or have any questions, please call Todd Marler at (281) 452-8797.

Sincerely,

Kenneth J. Eckroth
Superintendant, Environmental Affairs

cc: (cover letter only)
TNRCC Region 12
Waste Program
5425 Polk St.; Suite H
Houston, TX 77023-1423

I certify under penalty of law that Lyondell drawing E-17-D-066-1 and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



S & B ENGINEERS and CONSTRUCTORS, LTD.
P.O. BOX 26645
HOUSTON, TEXAS 77207-6245
(713)645-4141
FAX 645-6094
7825 PARK PLACE BLVD.
HOUSTON, TEXAS 77087

November 9, 1998

Letter No.: SBLLP-001
Project Title: Storage Area Curb Cert.
Client Job No.:
S&B Job No.: E-4876
File: 601.001

Mr. Todd Marler
Equistar Chemicals, LP
8280 Sheldon Road
Post Office Box 777
Channelview, Texas 77530

Subject: North Container Storage Area Curb

Dear Mr. Marler:

I certify that the North Container Storage Area Curb was constructed in accordance with the attached Lyondell Petrochemical Company drawing E-17-D-066-1. My understanding is that this drawing was submitted as an addendum (April 16, 1997) to a Class II RCRA permit modification dated February 6, 1997 and approved by the TNRCC.

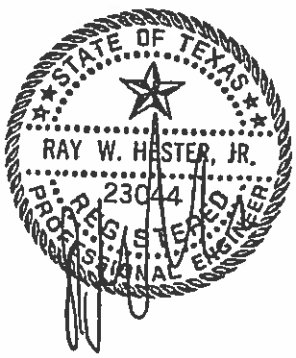
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,

Ray Hester

RH/mss
Attachment

cc: Thad Scott
Janice Seward
Project File



n:\project\e4876\projsec\letters\001

Marler, Todd A.

From: Marler, Todd A.
Sent: Thursday, November 12, 1998 2:43 PM
To: Nemeth, E. C. Chip; Guier, David R.
Cc: Sirgo, A. Sharon; Thompson, J. Doyle; Boullion, Joe T.
Subject: P.E. Certification for Containment Modifications at the RCRA PErmitted Container Storage Area

FYI,

I have received the P.E. certification, with an original stamp, from S&B for the modifications made at the Container Storage Area (CSA) outside slab where bulk containers are stored. The modifications consisted of installing a rollover curb for containment, sealing a few cracks in the existing curb, installing a valve on the low point drain sump and removing a small section (~4 inch wide), creating a notch, in the common curb between the covered portion and outside area to provide enough secondary containment capacity for the bulk containers.

This original drawing will be placed in the February 1997 Class II RCRa permit application submittal file (5 volume notebooks). Doyle a copy of this certification and drawing has been sent to you via interplant mail. Another copy will be placed in the Engineering section of the permit application for the CSA waste management unit report.

S & B ENGINEERS and CONSTRUCTORS, LTD.
P.O. BOX 26645
HOUSTON, TEXAS 77207-6245
(713)645-4141
FAX 645-6094
7825 PARK PLACE BLVD.
HOUSTON, TEXAS 77087

November 9, 1998

Letter No.: SBLLP-001
Project Title: Storage Area Curb Cert.
Client Job No.:
S&B Job No.: E-4876
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Equistar Chemicals, LP
8280 Sheldon Road
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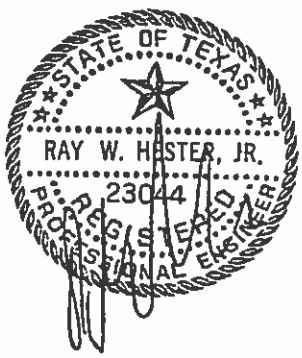
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,

Ray Hester

RH/mss
Attachment

cc: Thad Scott
Janice Seward
Project File



n:\project\e4876\projsec\letters\001

Engineering Report

Tank 3455 & 4455

ITEM NO.	P 3480A/B	TK 3455					P 3432						P 3477A/B		
TITLE	WASTE CAUSTIC SURGE TANK PUMP	WASTE CAUSTIC SURGE TANK											SULFURIC ACID PUMPS		
DESCRIPTION	32 GPM @ 130' Δ Pr 45 PSI H.P.: 5 MATL.: C.S. 1 IS NORMALLY SPARE	40'-6" DIA. x 32'-6" DP: PSIG ID: 7 CAPACITY: 7000 BBL MATL: A-283C OP/FULL H20 + 5" H20					28 GPM Δ Pr 59 PSI H.P.: 1 MATL: NO EQUIPMENT FILE						37.7 GPM Δ Pr 59 PSI H.P.: 1 MATL.: ALLOY 20 1811 TURNDOWN		

DWG. NO.	REFERENCE DRAWINGS
N	
N	
N	
N	
N	
N	
N	
N	
N	
N	
N	

NOTES

1. LEVEL GAGE LIGHTED.
2. FOR ADDITIONAL INFORMATION ON TANK 3455 BLANKETING SYSTEM, SEE INSTRUMENT SPEC. SHEET 34-P-147, 3 OF 3.
3. LEVEL SWITCH IS A 4-20 MA CURRENT SIGNAL.
4. C&F POINT.
5. VENT TO SAFE LOCATION. HIGH POINT OF VENT TO BE ABOVE TOTE.
6. SS FLEX HOSES WILL BE TEFLON LINED.
7. DIAPHRAGM SEAL SHALL BE MONEL WITH A STAINLESS STEEL PRESSURE GAUGE.
8. *INSIDE PAVED CONTAINMENT AREA.
9. **INSIDE RCRA COATED AREA.

NO	DATE	REVISIONS	DRW. APP.
0	05/16/12	INITIAL ISSUE	MP, BS
1	10/26/09	ADDED TANK 3455 BLANKETING SYSTEM	MP, BS
2	01/24/08	REVISED PER AS-BUILT PRINT	MP, BS
3	05/02/06	REVISED PER AS-BUILT & PRE-START MEETING MARK	MP, BS
4	04/28/04	ADDED TK 3455 TANK BLANKETING SYSTEM	MP, BS
5	11/11/03	P&ID'S	MP, BS
6	05/08/02	REVISED PER MARKUP	MP, BS
7	08/13/01	REVISED PER AS-BUILT FIELD MARK-UP	MP, BS
8	03/29/00	UPDATED PER MARKUP	MP, BS
9	08/28/74	APPROVED FOR ISSUE	MP, BS

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Lyondell

LOCATION: CHANNELVIEW ENGINEERING DEPARTMENT

PIPING AND INSTRUMENT DIAGRAM
WASTE CAUSTIC NEUTRALIZATION

DSN. MP	DATE 05/16/12	SCALE	DRAWING NUMBER					REV.
CHK.	DATE	NTS	E	34	M	6JB		34
APP. BS	DATE							

CAD FILE: EXHAUS.REVS\E.DWG

05/16/12

Object name: E-44-M-6JB.tif

rcbuzbee

Revision 3 5/27/2015

ITEM NO.				FLT 44234A/B	LA 44001	D 4452			P 4480A/B	TK 4455			P 4432			
TITLE				WASTE CAUSTIC FILTERS	BRUCK LOADING ARM	WASTE CAUSTIC GASOLINE SEPARATOR			WASTE CAUSTIC SURGE TANK PUMPS	WASTE CAUSTIC SURGE TANK			CAUSTIC PUMP			
DESCRIPTION				MFR: MORSCO SEE EQUIPMENT FILE	SEE EQUIPMENT FILE	3'-6" I.D. x 12'-6" T/T DP: 100 PSID OD: 100 °F CAPACITY: MATL: SA-515-70 DECISIPLEX EQP. FILE			35 GPM Δ P: 45 PSI H.P.: 5 MATL: STEEL	20'-0" DIA. x 22'-6" T/T DP: 40" PWG OT: 170 °F CAPACITY: 7000 MATL: A283-C DECISIPLEX EQP. FILE			Δ P: H.P.: MATL: DECISIPLEX EQP. FILE			

DWG. NO.	REFERENCE DRAWINGS
N	
N	
N	
N	
N	
N	
N	
N	
N	
N	

NOTES

1. DELETED.
2. LOCATE ACID TANKS AND PUMPS IN CURBED AREA & FILL WITH LIME STONE.
3. ALL CL DRAINS IN CAUSTIC NEUTRALIZATION AND CAUSTIC TREATING AREA ROUTED TO WASTE CAUSTIC SUMP TK-4460.
4. E-4484A & B ARE OUT OF SERVICE, PSV-44075.
5. EXISTING SPENT CAUSTIC FILTER BANK WILL NOT BE REMOVED. NO PIPING AROUND TK-4455 SHALL BE REMOVED.
6. STEAM TRAP BOTTOM 1/4 OF TANK SURFACE. TRACER TO BE SUPPORTED FROM TANK METAL SURFACE WITH INSULATING SPACER STRIPS.
7. STEAM TRACING ON ACID OR CAUSTIC LINES SHALL BE INSTALLED IN ACCORDANCE WITH ENGINEERING SPEC. H-105 SECTION 4.12.
8. DELETED.
9. * INSIDE PAVED CONTAINMENT AREA.
   ** INSIDE RCRA COATED AREA.

NO	DATE	REVISIONS	ENGR. APP.
38	05/16/12		
37	03/07/12		
36	04/28/10		
35	01/28/08		
34	04/22/07		
33	12/19/06		
32	03/08/05		
31	02/13/03		
30	12/19/01		
29	03/05/01		

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Lyondell

LOCATION: CHANNELVIEW ENGINEERING DEPARTMENT

PIPING AND INSTRUMENT DIAGRAM
WASTE CAUSTIC NEUTRALIZATION

DES. MS	BASIS ISSUE	SCALE	REVISION NUMBER	REV.
CHK. JC	BASIS ISSUE	NTS	E 44 M 6JB	38
APP. BCL	BASIS ISSUE			

CAD FILE: E-44-M-6JB.dwg

05/16/12

Printed: 08/05/2015 14:02 Version Label: 11.0

LYONDELL PETROCHEMICAL CO.
CHANNELVIEW, TEXAS

TK-4455
HAZARDOUS WASTE TANK ASSESSMENT

for:

Mr. Pat McDaniel

Lyondell Petrochemical Co.
P.O. Box 777
Channelview, TX 77530

The Hendrix Group Report No. H9303

by:

The Hendrix Group, Inc.
15823 N. Barkers Landing
Houston, TX 77079
(713) 556-8774

July 1, 1993

Lyondell Petrochemical
Channelview, Texas

Tank 4455

40 CFR 264.192/193

Hazardous Waste Tank Assessment

1	Preliminary Summary Report Final Report
2	Checklists
3	Mech./Civil Design Review Reports
4	Tank Fabrication Drawings
5	Tank Design Calculations
6	Civil Calculations/Drawings
7	NDT/Test Reports
8	CMTR's
9	Welding Procedures
10	In-Progress Inspection Reports
11	Tank Nameplates
12	
13	
14	
15	

SUMMARY

A design and installation assessment of TK-4455, OP-II Waste Caustic Tank, and its secondary containment, located at Lyondell Petrochemical Co.'s Channelview, TX facility, has been performed. The assessment was performed to address the requirements of 40 CFR 264/265.192 and 264/265.193, relating to the structural integrity and secondary containment of hazardous waste tank storage systems.

The assessment results indicate that the modified outer Tank 4455, and the new, inner Tank 4455 meet the 40 CFR requirements concerning structural integrity and secondary containment of hazardous waste storage tanks.

INTRODUCTION

Tank 4455, OP-II Waste Caustic tank, located at Lyondell Petrochemical Company's Channelview, Texas facility, requires installation of secondary containment in 1993 per the requirements of 40 CFR 264/265.193(a)(3). This report details the results of a design review and installation assessment of a secondary containment system for Tank 4455. The review was conducted based on the requirements of 40 CFR 264/265.192-.193 and the corresponding requirements of 30 TAC 335.112(a)(9).

SCOPE OF ASSESSMENT

The assessment included performing a design review of modifications made to the existing TK-4455 to convert it to secondary containment service, a design review of a new tank and its foundation constructed inside the existing tank to hold the waste, a review of the secondary containment provisions for the new tank, and a field review of the construction.

SYSTEM DESCRIPTION

Overall Tank System Description

Secondary containment for Tank 4455 was provided by modifying the existing tank to convert it to secondary containment service, and installing a new smaller-diameter floating-roof tank on the inside of the existing tank to store the waste. The project included adding a fifth shell course to the existing tank to raise its height from 32' feet to 40', removing the original lap-welded floor plates from the existing tank, pouring a new reinforced concrete-

pad foundation for the inner tank and replacing the original floor plates with new lap-welded plates, adding a second, combination lap-welded/annular-ring false floor, and constructing the new tank inside the existing tank over the false floor. Leak-detection pipes were installed between the two floors and through the shell of the outer tank to detect any spills or leaks.

Outer Tank Description

Tank TK-4455, OP-II Waste Caustic Tank, was originally built in 1976 to API-650, Appendices A and F, as an on-ground, carbon steel tank. It was designed to store a low concentration waste caustic stream (sp. gr. 1.05) originating from the T-4504 Acid Gas Absorber. The existing tank was originally 40′ in diameter by 32′ tall, included an internally supported roof consisting of a center pipe column and radial rafters, and rested on a reinforced concrete ring-wall foundation. It was fabricated from ASTM A-283 Gr. C material with butt-welded shell plates and lap-welded roof and floor plates. The new shell course and bottom floor plates were fabricated from ASTM A 516 Gr. 70 material. Design pressures are 5" water column internal pressure and 1.75" water column external pressure. Design temperatures are 170°F maximum and 12°F minimum. The outer tank contains one 8" Groth pressure/vacuum vents and two 24" emergency vents.

Inner Tank Description

The new inner tank was built to API-650, including Appendices A and H, and includes a individual bulkhead design floating roof. It is approximately 39′ tall by 35′ in diameter and constructed of A 516 Gr. 70 butt-welded shell plates and combination lap-welded and annular ring bottom floor plates. It was designed for a specific gravity of 1.05 and atmospheric pressure. Design temperatures are 170°F maximum and 12° minimum.

ASSESSMENT CONSIDERATIONS

General

Checklists detailing the design, fabrication, and installation attributes reviewed and their dispositions are contained in Exhibit 2 to this report. The results of a mechanical and civil design review conducted by outside consultants under the direction of The Hendrix Group, Inc. are contained in Exhibit 3. Exhibits 4 through 11 contain supporting documentation associated with the design, materials, inspection, and testing of the two tanks and tank foundations.

Design Standards

The design standards employed in the design of the inner and outer tanks and the new concrete foundation are detailed in Exhibits 2, 3 and 6 of this report. In summary, both tanks were designed and built to API 650, 1988 ed. The design of the outer tank included the requirements of Appendix A and F, Optional Design for Small Tanks, and Tanks With Small Internal Pressures, respectively. The inner tank design included the requirements of Appendix A and H, Optional Design for Small Tanks and Internal Floating Roofs, respectively. The new concrete pad foundations was designed to the requirements of ACI 301 and 318. Calculations based on ASME B31.3 were used to design the expansion loops for the nozzles penetrating both tanks (Exhibit 3).

The results of the design review indicated that the design standards used for the inner and outer tanks and the tank foundation are appropriate for the intended application and that the requirements of the design standards were incorporated into the design calculations and fabrication drawings.

Hazardous Characteristics of the Waste

The contained waste is a low-concentration (<5%) aqueous caustic stream originating from the T-4504 Acid Gas Tower. Some naptha hydrocarbons are included in the stream as a rag layer. The primary hazardous characteristics of the waste are reactivity and corrosivity. A complete listing of the chemical components of the waste stream can be found in previous certification reports for Tank 4455.

Corrosion Protection Measures

No particular corrosion protection measures were considered necessary for the tank components exposed to the caustic waste. Thickness measurements taken on the existing outer tank from 1988 to 1992, as part of the certification process for existing hazardous waste tanks, indicated no significant shell wall-thickness loss since the tank initial service in 1977 (see previous certification reports for Tank 4455 on file). In addition, the existing tank shell, floor, and roof interior, and the bottom side of the original floor plates were visually inspected for corrosion during the project. No general or localized corrosion was observed to any components, including the bottom of the floor plates. Corrosion protection of the outer tank exterior is provided by application of a catalyzed epoxy paint. The interior of the outer tank and the exterior of the inner tank are protected from corrosion by a nitrogen purge used to exclude air from the tank annulus. The bottom-side of the false floor will also be purged. No particular corrosion-protection measures were considered necessary for the bottom-side of the floor sitting on the concrete foundation.

Protection of Underground Equipment

There are no underground tank components associated with Tank 4455.

Foundation Review

The original concrete ring-wall foundation for Tank 4455 was modified by adding a reinforced concrete pad to the interior of the ring-wall to support the inner tank. The inner concrete pad was connected to the outer ring-wall through the use of # 8, A 615 Gr. 60 dowels, or reinforcing bars. A civil design review of the foundation addition can be found in Exhibit 3 to this report. The results of the review indicate that, although the original assumptions used by Wyatt to design the concrete pad-dowel-ringwall connection were erroneous, a more rigorous finite-element analysis of the connection, combined with some qualified assumptions concerning load distributions, indicate that the design is capable of carrying all postulated loads.

Ancillary Equipment

No ancillary tank system equipment was included in the scope of this project.

Installation Assessment

An on-site review of the completed tank installation was performed by this writer. The checklist used to perform the review can be found in Exhibit 2. In summary, the results of the installation review indicate that: 1) the subject tank system was fabricated in general conformance with the as-built fabrication drawings, 2) the fabrication workmanship was adequate, and 3) no damage was observed at the time of the inspection.

Secondary Containment Assessment

General

Secondary containment for the inner tank is provided by the existing outer tank.

Materials of Construction

The secondary containment materials of construction are the existing outer tank shell and the false floor, manufactured from A 283 Gr. C carbon steel, except for the A 516 Gr. 70 top-shell course and the false floor. The outer tank materials are structurally able to contain the tank contents up to a maximum height of 31', and the carbon steel material possesses adequate corrosion resistance to the inner tank contents.

Foundation Data

The inner tank foundation is constructed from reinforced 4000 psi concrete, poured over a back-filled sub-grade compacted to 95% maximum density. A discussion of the secondary

containment foundation was covered under the tank "Foundation Review" section of this report.

Leak Detection

Leak detection for the secondary containment system is provided by four, 1" pipes installed around the circumference of the outer tank between the two tank floors and six, 3/4" pipes installed around the circumference of the outer tank just above the false bottom. The pipes are attached to ball valves that are opened daily to check for leaks.

Drainage

The steel grating installed between the two floors is arranged to permit drainage to the perimeter of the tank. In addition, the grating terminates several inches from the perimeter of the outer tank to allow migration of fluid around the tank circumference. No other drainage requirements were considered necessary to meet the secondary containment drainage requirements.

Containment Volume

The maximum fill height of the inner tank is approximately 39.5'. The 40' tall outer tank has sufficient volume to contain the contents of the inner tank in case of a leak, considering that the contents of the inner tank would reach a maximum equilibrium level of about 31' feet, with the waste partially contained by both tanks. No allowance for precipitation was included in the secondary containment volume requirements as the outer tank roof prevents any accumulation of water in the tank annulus.

Drainage

In the event of a leak or spill, the tank contents can be pumped out of the outer tank through one or more of the leak detection pipes.

Vapor Accumulation

Vapor accumulation in the inner tank is prohibited by use of the floating roof. The annulus between the two tanks is purged by nitrogen, preventing any buildup of ignitable vapors.

External Moisture Barrier

An external moisture barrier was not appropriate for the subject tank system design.

ASSESSMENT CONCLUSIONS

Based on the assessment results, the modified existing, and newly built Tank 4455 system, and associated foundation, appear to be adequately designed, and possess sufficient structural strength and compatibility with the hazardous waste to not leak, collapse, or rupture under normal operating conditions. A visual observation of the tank system in the field did not reveal any indications of damage or substandard construction.

The secondary containment for the TK-4455 tank system meets the 40 CFR 265.193 requirements pertaining to containment volume, leak detection, and compatibility with the hazardous waste.

PREPARED BY: D E Hendrix DATE: 7/1/93

President

The Hendrix Group, Inc.

HAZARDOUS WASTE TANK SYSTEM CERTIFICATION
TK-4455, WASTE CAUSTIC STORAGE TANK SYSTEM

Lyondell Petrochemical Co.
Channelview, Texas

July 1, 1993

I have performed and/or supervised the design and integrity assessment of Tank 4455, Waste Caustic storage tank system, as described in the attached summary report, located in the OP-II Olefins Unit at Lyondell Petrochemical Co.'s Channelview, Texas facility.

With regard to this duty, I certify under penalty of law that I have personally examined and am familiar with the information contained in this document, and that, based on my observations, and knowledge of the people responsible for obtaining the information reviewed, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

David E. Hendrix, P.E. D E Hendrix Date: 7-1-93
President
The Hendrix Group, Inc.

15823 North Barkers Landing • Houston, Texas 77079 • (713) 556-8774

THE HENDRIX GROUP, INC.



METALLURGICAL ENGINEERING • CORROSION INVESTIGATIONS • FAILURE ANALYSIS • TESTING

June 30, 1993

Mr. Pat Mc Daniel
Lyondell Petrochemical Co.
P.O. Box 777
Channelview, TX 77530

Re: TK-4455, OP-II Waste Caustic Tank Assessment
The Hendrix Group Project No. H9303

Dear Mr. McDaniel,

Attached is a summary design and installation assessment report for TK-4455, a hazardous waste storage tank located in the OP-II Olefins Unit at Lyondell Petrochemical Co.'s Channelview, TX plant. This assessment was conducted to meet the requirements of 40 CFR 264/265.192 and 264/265.193 for new hazardous waste storage tanks, and secondary containment for existing storage tanks, respectively. The summary report indicates that TK-4455 and its secondary containment meet the applicable EPA requirements for storage of hazardous waste.

A final report will be issued, including all supporting documentation, as soon as all outstanding documents are received. Outstanding items include radiograph reader sheets and the radiograph location map.

I have enjoyed working with you on this project. If you have any questions concerning the contents of the report, please do not hesitate to call.

Sincerely,

David E. Hendrix, P.E.
President

15823 North Barkers Landing • Houston, Texas 77079 • (713) 556-8774

SUMMARY

A design and installation assessment of TK-4455, OP-II Waste Caustic Tank, and its secondary containment, located at Lyondell Petrochemical Co.'s Channelview, TX facility, has been performed. The assessment was performed to address the requirements of 40 CFR 264/265.192 and 264/265.193, relating to the structural integrity and secondary containment of hazardous waste tank storage systems.

The assessment results indicate that the existing, altered exterior Tank 4455 and the new, interior Tank 4455 meet 40 CFR requirements concerning structural integrity and secondary containment of hazardous waste storage tanks. A final report covering Tank 4455, including supporting documentation and details of the assessment findings, will be issued at a later date.

INTRODUCTION

This summary report covers a design and installation assessment of a secondary containment system for Tank 4455, located in the OP II Olefins unit at Lyondell Petrochemical Co.'s Channelview, Texas facility. The assessment included an engineering review of alterations made to the existing TK-4455, a design review of a new tank built inside the existing tank, a review of the secondary containment provisions for the new tank, and a field review of the construction. The purpose of the project was to provide secondary containment for the OP-II Waste Caustic hazardous waste tank, per the requirements of 40 CFR 265.193(a)(3).

SYSTEM DESCRIPTION

Tank TK-4455, OP-II Waste Caustic Tank, was originally built in 1976 to API-650, Appendix F as an on-ground, carbon steel tank. It was designed to handle a low-concentration waste caustic stream from the T-4504 Acid Gas Absorber. Originally constructed, it was 40' in diameter by 32' tall, included an internally supported roof, and rested on a concrete ring-wall foundation. It was fabricated from ASTM A-283 Gr. C material with butt-welded shell plates and lap-welded roof and floor plates.

In 1993, a project was initiated to provide secondary containment for TK-4455 to meet 40 CFR 264/265.193 requirements. The project included constructing a new tank inside the existing tank and modifying the existing tank to provide secondary containment for the newly constructed tank. The new tank was built to API-650, and included a floating roof. Modifications to the existing tank included adding eight feet to the tank height and installing a false bottom with leak detection ports.

ASSESSMENT RESULTS

Based on the assessment results, the modified existing, and newly-built Tank 4455, and its associated foundation, appear to be adequately designed and possess sufficient structural

strength and compatibility with the hazardous waste to not leak, collapse, or rupture under normal operating conditions. Visual observation of the tank system in the field did not reveal any indications of installation damage or substandard construction.

The secondary containment for TK-4455 tank meets 40 CFR 265.193 requirements pertaining to containment volume, leak detection, waste collection, and compatibility with the contained waste.

PREPARED BY: D E Hudson DATE: 6-30-93
President

HAZARDOUS WASTE TANK SYSTEM CERTIFICATION
TK-4455, WASTE CAUSTIC STORAGE TANK SYSTEM

Lyondell Petrochemical Co.
Channelview, Texas

June 30, 1993

I have performed and/or supervised the design and integrity assessment of Tank 4455, Waste Caustic storage tank system, as described in the attached summary report, located in the OP-II Olefins Unit at Lyondell Petrochemical Co.'s Channelview, Texas facility.

With regard to this duty, I certify under penalty of law that I have personally examined and am familiar with the information contained in this document, and that, based on my observations and knowledge of the people responsible for obtaining the information reviewed, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

David E. Hendrix, P.E. D E Hendrix
President

Date: 6-30-93

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THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 0 Date: 10/16/92 Page: 1 of 1

Checklist Title: 40 CFR 264/265.192 Checklist- Tank Systems		**Project No:** 4523
Client: Lyondell Petrochemical		**Location:** Houston TX
Tank System ID: F 4455	**Equipment No:** #4455	**Date:** 2-1-93

	Attribute	Reference	Reviewed by	ACC /REJ
1.	Appropriate Design Standards	40 CFR 264/265.192 (1)	DEH	ACC
2.	Hazardous Characteristics of Waste	40 CFR 264/265.192 (2)	DEH	ACC
3.	Corrosion Protection Measures	40 CFR 264/265.192 (3)	DEH	ACC
4.	Protection of U/G Components	40 CFR 264/265.192 (4)	DEH	N/A
5.	Tank Foundations	40 CFR 264/265.192 (5i)	DEH	ACC
6.	Installation Inspection	40 CFR 264/265.192 (5b)	DEH	ACC
7.	Tightness Test	40 CFR 264/265.192 (5d)	DEH	ACC
8.	Ancillary Equipment	40 CFR 264/265.192 (5c)	DEH	N/A

Remarks:

See Mark Sheet for details.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 0 Date: 10/16/92 Page: 1 of 1

Checklist Title: 40 CFR 264/265.193 Checklist- Secondary Containment		**Project No:** 17932.3
Client: Lyondell Petrochemical Co.		**Location:** Channelview TX
Tank System ID: #4455	**Equipment No:** #4455	**Date:** 7.1.93

	Attribute	Reference(s)	Reviewed by	ACC/ REJ
1.	Constructed of or lined with compatible/impermeable materials	40 CFR 264/265.193 (c1)	DEH	ACC
2.	Sufficient strength	40 CFR 264/265.193 (c1)	DEH	ACC
3.	Foundation design adequate	40 CFR 264/265.193 (c2)	DEH	ACC
4.	Leak detection system	40 CFR 264/265.193 (c3)	DEH	ACC
6.	Waste collection system	40 CFR 264/265.193 (c4)	DEH	ACC
7.	Containment type and capacity	40 CFR 264/265.193 (e2i,ii)	DEH	ACC
	Chemical resistant waterstops	40 CFR 264/265.193 (e2iii)	DEH	N/A
8.	Freedom from vapor buildup	40 CFR 264/265.193 (e2v)	DEH	ACC
9.	Exterior moisture barrier	40 CFR 264/265.193 (e vi)	DEH	N/A
10.	Ancillary equipment	40 CFR 264/265.193 (f)	DEH	N/A

Remarks: See Main report for Nos. 5.

Attachment B

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 3/5/93 Page: 1 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank	Project No: H 9303
Client: Lyondell Petrochemical Company	Location: Channelview
Tank System I.D.: Secondary Containment Project — Equipment No: T-3455/T-4455	Date: 4/8/93

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	**MATERIALS**	API 650, Section 2		
A.	Plates meets API 650 requirements.	API 650, para. 2.2.2 - 2.2.5		
B.	Plates meet toughness requirements.	API 650, para. 2.2.9		
C.	Piping/Forgings meet API 650 req'mts.	API 650, para. 2.5		
D.	Flanges meet API 650 req'mts.	API 650, para. 2.6		
E.	Bolts meet API 650 req'mts.	API 650, para. 2.7		
F.	Welding electrodes meet API 650 req'mts.	API 650, para. 2.8		
2.	**DESIGN**	API 650, Section 3		
A.	Verify tank design requirements	API 650, customer specs	dac	Acc.
B.	Verify tank design stds. appropriate		dac	Acc.
C.	Verify tank calcs./drwgs. to item 2a.		dac	Acc.
D.	Check tank calculations for:	API 650, Vendor calcs.		
i.	. Roof calcs. (if applicable)	API 650, para. 3.10.3	dac	Acc.
ii.	. Allowable stresses used	API 650, para. 3.6.2	dac	Acc.
iii.	. Specific gravity used	Calculations based on SG = 1.05	dac	Acc.
iv.	. Shell course thicknesses	API 650, 3.6.3, 3.6.4	dac	Acc.

Remarks:

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 4/5/93 Page: 2 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank		**Project No:** H 9303
Client: Lyondell Petrochemical Company		**Location:** Channelview
Tank System I.D.: Secondary Containment Project	**Equipment No:** T-3455/T-4455	**Date:** 4/8/93

	Attribute	Reference	Reviewed by	ACC/ REJ
E.	Check drawings for:			
i.	Weld details	API 650, paras. 3.1.2 - 3.1.5		
ii.	Bottom plate thickness	API 650, 3.4.1, Table 3-1	Vac	Acc. (1)
iii.	Min. top-angle size	API 650, para. 3.1.5.9e	Vac	Acc.
iv.	Shell openings	API 650, para. 3.7.1	Vac	Acc.
v.	Reinforcement and welding	API 650, para. 3.7.2	Vac	Acc.
vi.	Spacing of welds	API 650, para. 3.7.3		
vii.	Shell manholes	API 650, para. 3.7.5	Vac	Acc.
viii.	Shell nozzles and flanges	API 650, para. 3.7.6	Vac	Acc.
ix.	Flush connections (if present)	API 650, para. 3.7.7, 3.7.8	N/A	
x.	Roof thickness	API 650, 3.10.2.1, 3.10.2.2	Vac	Acc.
xi.	Supported cone roof	API 650, 3.10.4.2, 3.10.4.5	Vac	Acc.
xii.	Self-supported cone roof	API 650 para. 3.10.5	N/A	
xiii.	Dome and umbrella cone roofs	API 650, 3.10.6	N/A	
xiv.	Overturning stability	API 650, para. 3.11	Vac	Acc.
3.	Check calcs. vs. drwgs. for consistency		Vac	Acc.
4.	Check emergency relief vent size/settings	API 2000		
5.	Check pressure/vacuum vent size/settings	API 2000		

Remarks:

(1) Confirming stress calculations for grating between two bottoms not provided. Assume confirmation available from grating supplier.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 4/5/93 Page: 3 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank | **Project No:** H9303

Client: Lyondell Petrochemical Company | **Location:** Channelview

Tank System I.D.: Secondary Containment Project | **Equipment No:** T-3455/T-4455 | **Date:** 4/8/93

	Attribute	Reference	Reviewed by	ACC/ REJ
6.	Review welding procedures	ASME Section IX		
7.	Review CMTR's vs. spec. requirements	ASTM		
8.	**SPECIAL DESIGN REQUIREMENTS**			
A.	Optional design basis for small tanks	API 650, Appendix A	JAC	Acc.
B.	External floating roofs	API 650, Appendix C	N/A	
C.	Design for small internal pressures	API 650, Appendix F	JAC	Acc.
D.	Internal floating roofs	API 650, Appendix H	JAC	Acc. (1)
E.	External loads on shell openings	API 650, Appendix P	JAC	Acc. (2)

Remarks:

(1) Calculations demonstrating floatation capabilities per API 650 Appendix H not provided. Assume confirmation available from roof supplier.

(2) Loads imposed by external piping systems not checked. Designs for flexibility loops for nozzles passing between both tank shells provided.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 2 Date: 6/22/93 Page: 1 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank		Project No: 4'9363
Client: Lyondell Petrochemical Co.		Location: Channelview, TX
Tank System I.D.: # 4455	Equipment No: # 4455	Date: 7-1-93

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	MATERIALS	API 650, Section 2		
A.	Plates meets API 650 requirements	API 650, para. 2.2.1.1	DEH	ACC
B.	Plates meet toughness requirements	API 650, para. 2.2.9	DEH	ACC
C.	Piping/forgings meet API 650 req'mts	API 650, para. 2.5	DEH	ACC
D.	Flanges meet API 650 req'mts	API 650, para. 2.6	DEH	ACC
E.	Bolts meet API 650 req'mts	API 650, para. 2.7	DEH	ACC
F.	Welding electrodes meet API 650 req'mts	API 650, para. 2.8	DEH	ACC
2.	DESIGN	API 650, Section 3		
A.	Verify tank design requirements	API 650, customer specs		
B.	Verify tank design stds. appropriate			
C.	Verify tank calcs./drwgs. to item 2a			
D.	Check tank calculations for:	API 650, Vendor calcs.		
i.	. Roof calcs. (if applicable)	API 650, para. 3.10.3		
ii.	. Allowable stresses used	API 650, para. 3.6.2		
iii.	. Specific gravity used			
iv.	. Shell course thicknesses	API 650, 3.6.3, 3.6.4		
v.	. Accuracy			

Remarks:

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 2 Date: 6/22/93 Page: 2 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank		**Project No:** 47503
Client: Lyondell Petrochemical Co		**Location:** Houston TX
Tank System I.D.: # 4455	**Equipment No:** #4455	**Date:** 7-1-93

	Attribute	Reference	Reviewed by	ACC/ REJ
E.	Check drawings for:			
i.	Weld details	API 650, paras. 3.1.2 - 3.1.5	DEH	ACC
ii.	Bottom plate thickness	API 650, 3.4.1 Table 3-1	DEH	ACC
iii.	Min. top-angle size	API 650, para. 3.1.5.9c		
iv.	Shell openings	API 650, para. 3.7.1		
v.	Reinforcement and welding	API 650, para. 3.7.2		
vi.	Spacing of welds	API 650, para. 3.7.3		
vii.	Shell manholes	API 650, para. 3.7.5		
viii.	Shell nozzles and flanges	API 650, para. 3.7.6		
ix.	Flush connections (if present)	API 650, para. 3.7.7, 3.7.8		
x.	Roof thickness	API 650, 3.10.2.1, 3.10.2.2		
xi.	Supported cone roof	API 650, 3.10.4.2, 3.10.4.5		
xii.	Self-supported cone roof	API 650 para. 3.10.5		
xiii.	Dome and umbrella cone roofs	API 650, 3.10.6		
xiv.	Overturning stability	API 650, para. 3.11		
3.	Check calcs. vs. drwgs. for consistency			
4.	Check emergency relief vent size/settings	API 2000	DEH	ACC
5.	Check pressure/vacuum vent size/settings	API 2000	DEH	ACC

Remarks: Vent calculations performed for previous API 2000 Rev. See Hendrix Letter Report for #4455, 10/26/92. Settings not verified as vent unavailable during site inspection.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 2 Date: 6/22/93 Page: 3 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank		**Project No:** #5303
Client: Lyondell Petrochemical Co.		**Location:** Channelview, TX
Tank System I.D.: #445	**Equipment No:** #445	**Date:** 7.1.93

	Attribute	Reference	Reviewed by	ACC/ REJ
6.	Review welding procedures	ASME Section IX	NEH	ACC
7.	Review CMTR's vs. spec. requirements	ASTM	NEH	ACC
8.	SPECIAL DESIGN REQUIREMENTS			
A.	Optional design basis for small tanks	API 650, Appendix A		
B.	External floating roofs	API 650, Appendix C		
C.	Design for small internal pressures	API 650, Appendix F		
D.	Internal floating roofs	API 650, Appendix H		
E.	External loads on shell openings	API 650, Appendix P		

Remarks:

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 0 Date: 10/16/92 Page: 1 of 1

Checklist Title: Civil Design Review Checklist- Secondary Containment		**Project No:**
Client: Lyondell Petrochemical		**Location:** Channelview, Texas
Tank System I.D.:	**Equipment No:** T-AA55	**Date:** April 6, 1993

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	Verify civil design requirements	ACI 318	[signature]	
2.	Verify civil calcs./drwgs. to item 1	ACI 318	[signature]	
3.	Verify civil design stds. appropriate	NA	[signature]	
4.	Verify chemical resistant waterstops	NA		
5.	Verify containment volume requirements	NA		
6.	Designed to protect against formation and ignition of vapors	NA		
7.	Designed to collect waste	NA		
8.	Designed to include impermeable lining	NA		
9.	External vapor barrier on below-grade sumps, etc.	NA		

Remarks: None

See Exhibit 3 & details DEM

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 6/21/93 Page: 1 of 1

Checklist Title: API 650 Tank- Inspection and Test Checklist		**Project No:** A9363
Client: Lyondell Petrochemical Co.		**Location:** Channelview, TX
Tank System ID: # 4455	**Equipment No:** A 4455	**Date:** 7-1-93

	Attribute	Reference	Reviewed by	ACC /REJ
1.	MECHANICAL ATTRIBUTES			
1a.	Visual inspection of welds	API 650, para. 6.5	DEH	ACC
1b.	Testing of tank bottom welds	API 650, para. 5.3.4	DEH	ACC
1c.	Testing of reinforcement plate welds	API 650, para. 5.3.5	DEH	ACC
1d.	Shell presure-test results	API 650, 5.3.6, F.4.4, or F.7.6	DEH	ACC
1e.	Roof pressure-test results	API 650, para. 5.3.7	DEH	ACC
1f.	Shell plumbness	API 650, para. 5.5.2	DEH	ACC
1g.	Shell roundness	API 650, para. 5.5.3	DEH	ACC
1h.	Weld-joint radiography	API 650, para. 6.1.2.1 or A.5.3	DEH	ACC
2.	CIVIL ATTRIBUTES			
2a.	Concrete break test results	Project Specifications	DEH	ACC

Remarks: See Exhibits 7.10 in detail.

THE HENDRIX GROUP	API 650 TANK ALTERATION/REPAIR CHECKLIST	Rev. No. 1
		Date: 6/22/93
		Page: 1 of 1

Checklist Title: API 653 Field Alteration and Repair Checklist		Project No: 4363
Client: Lyndell Petrochemical Co.		Location: Channelview TX
Tank System I.D.: #445	Equipment No: #445	Date: 7-1-93

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	MATERIALS			
1a.	Min. thicknes of replacement material (1)		DEH	ACC
2.	FABRICATION			
1a.	Min. replacement shell-plate dimensions	API 653, 7.2.2.1	DEH	ACC
1b.	Distance from existing welds	API 653, 7.2.3.3	DEH	ACC
1c.	New or re-located nozzle insert plates	API 653, 7.7.2	DEH	N/A
1d.	Nozzles near floor welds (2)	API 653, 7.8.2	DEH	ACC (2)
1e.	Welds in critical annular plate zones	API 653, 7.9.1.1	DEH	ACC
2.	INSPECTION			
2a.	UT examination for laminations	API 653, 10.1.2.1	DEH	N/A
2a.	Nozzle neck/repad weld MP inspection	API 653, 10.1.2.3	DEH	ACC
2b.	RT of insert plate butt welds	API 653, 10.1.2.5	DEH	N/A
2c.	RT of shell plates	API 653, 10.2.1	DEH	ACC
2d.	Tank hydro test	API 653, 10.3.1	DEH	ACC
2e.	Tank hydro exemption acceptance	API 653, 10.3.2	DEH	N/A

Remarks: (1) Bot plates and critical annular plates were re-used. All components checked visually for corrosion & UT thickness verified with UT measurements (Exh. 7.

(2) Leak Detection devices do not meet spec. 7.8.2 however outer tank has no liquid hydro stresses.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 6/22/93 Page: 1 of 1

Checklist Title: Field Verification Checklist- Mechanical Systems		**Project No:** H9303
Client: Lyondell Petrochemical Co.		**Location:** Channelview, TX.
Tank System I.D.: # 9455	**Equipment No:** # 9455	**Date:** 6-23-93

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	Random UT verify pressure-containment material thicknesses (1)	Vendor drawings	DEH	ACC
2.	Verify sizing and set points of PSV (2)	Vendor calcs.		
3.	Verify corrosion protection measures		DEH	ACC
4.	Verify nameplate info	Vendor drawings	DEH	ACC
5.	Verify installation w/o damage		DEH	ACC
6.	Check for overall fabrication workmanship quality		DEH	ACC
6.	Verify thermal expansion capabilities		DEH	ACC
7.	Compare vessel with as-built general arrangement drawing		DEH	ACC

Remarks: (1) Bottom course ring checked w. the UT; 0.375" min. plate thickness measured, compared to nominal plate thickness of 0.375 including 1/2" C.A.

(2) Not Available during walk-through; two 24" openings available and designated for emergency relief valves, based on field inspection

THE HENDRIX GROUP	API 650 TANK FIELD FABRICATION SURVEILLANCE CHECKLIST	Rev. No. 0 Date: Page: 1 of 1

Checklist Title: API 650 Field Construction Vendor QA Program Surveillance Checklist		Project No: 2015 Location: Lyondell Petrochemical
Tank System ID:	Equipment No: TK. 4455	Date:

	Attribute	Reviewed by	ACC /REJ
1.	Latest drawing revisions on-site.	JH/AS.	ACC
2.	Heat code map or plate stamping maintained.	JH/A.S.	ACC
3.	Approved weld procedures on-site.	JH/A.S	ACC
4.	Approved NDT procedures on-site.	JH/A.S.	ACC
5.	Radiography weld map maintained.	JH/A.S	ACC
6.	Tank fabrication/dimensions meet drawing requirements.	JH/AS	ACC
7.	Plate marking per API 650, 4.1.4	JH/AS	ACC
8.	Tack welds removed per API 650, 5.2.1.8	JH/AS	ACC
9.	Weld visual quality per API 650, 5.3.2.1	JH/AS	ACC
10.	Low-hydrogen electrodes in working ovens.	JH/AS	ACC
11.	QC inspection checklists in use and maintained.	JH/AS	ACC
12.	Identification of welded joints per API 650, 7.4	JH/AS	ACC
13.	Welder qualification test records/I.D.'s maintained per API 650. 7.3.3.	JH/AS	ACC
14.			
15.			

Remarks:

CARMAGEN
ENGINEERING INC.
7 Waverly Place / Madison, NJ 07940
Phone: (201) 822-3813 / FAX: (201) 822-3118

April 13, 1993

Mr. D.E. Hendrix
The Hendrix Group, Inc.
15823 North Barkers Landing
Houston, TX 77079

RE: The Hendrix Group Project No. H9303
Lyondell Petrochemical Company, Channelview, Texas
T-3455/T-4455 Hazardous Waste Tank Certification

Dear Mr. Hendrix:

Enclosed are three copies of a report documenting our mechanical engineering review of the subject, identical, atmospheric storage tanks. The review was performed at your request for the purpose of hazardous waste tank certification in accordance with the guidelines of 40 CFR 264.192/193.

Confirming our various telephone conversations and preliminary documentation, the mechanical design of these double shell/double bottom tanks is acceptable for the intended service. Additional recommendations were made during the course of this work which would reduce Lyondell's potential future maintenance activity but not have a detrimental impact on tank function. Additional documentation should also be provided to Lyondell from tank component sub-vendors, for the sake of completeness. The enclosed report provides all the necessary details to document our review.

This completes our planned work on this project. Let me know if you have any questions.

Very truly yours,

Vincent A. Carucci

CARMAGEN
ENGINEERING INC.
7 Waverly Place / Madison, NJ 07940
Phone: (201) 822-3813 / FAX: (201) 822-3118

Mechanical Engineering Review
T-3455/T-4455 Caustic Storage Tanks
Lyondell Petrochemical Company, Channelview, Texas

This report provides the results of a mechanical engineering design review made of T-3455/T-4455 Caustic Storage Tanks located at Lyondell Petrochemical Company, Channelview, Texas (LPC). This review was conducted in accordance with the guidelines contained in 40 CFR 264.192/193 governing hazardous waste storage facilities.

Several modifications to the design originally proposed by Wyatt Field Service Company were recommended and ultimately implemented in the final design. Overall, the mechanical design of these tanks is acceptable for the intended service. Several documentation type items are still open, and it is left to LPC to followup on these for record purposes. Other recommendations were made which would reduce LPC's later maintenance activity, but not impact overall tank integrity nor its acceptability for the intended service.

The following provides specific comments and recommendations. Attachment A summarizes the documents that were reviewed in conjunction with this work. Attachment B provides a checklist that was used in performing this evaluation, and summarizes the items that were reviewed and their acceptability.

General

Tanks T-3455/T-4455 are identical, double wall, atmospheric storage tanks consisting of an internal floating roof tank and an external fixed, supported cone roof tank. The tank has two steel bottoms extending under both shells with steel grating between the two bottoms. The objective is for the external shell and bottom to provide secondary containment and leak detection capability should there be a leak from the inner tank. The tank is designed in accordance with API 650 Appendix A, with Appendix F applicable to the external tank and Appendix H applicable to the internal tank.

The following summarizes the tank geometries and design conditions:

Diameter: 40'-0" for external tank
35'-0" for internal tank

Height:	40'-0" for external tank (maximum permitted fill height 31'-0") 39'-6" for internal tank
Corrosion allowance:	0.0625" for shell, roof and bottom of external tank 0.125" for shell and bottom of internal tank
Design pressure:	External tank • Internal 5" W.C. • External 1.75" W.C. Internal tank Atmospheric
Design metal temperature:	12°F to 170°F
Wind load:	110 mph
Seismic:	Zone 0
Stored liquid:	Caustic; Specific Gravity = 1.05

Conclusions and Recommendations

The mechanical design of storage tanks T-3455/T-4455, as described by the documentation listed in Attachment A, is acceptable for the intended service. Several changes were made to the original design proposed by Wyatt based on early review comments provided by Carmagen. The most significant of these were the addition of pipe flexibility loops between the two shells for lower nozzles that pass from the inner shell through the outer shell.

Several other recommendations were made during the course of our review which relate to either maintenance or documentation items. While these do not affect our conclusion that the basic tank mechanical design is acceptable for the intended service, we still recommend that they be followed. It is left for LPC to determine how to handle these items. These recommendations are summarized below:

- At 6" level alarm Nozzle 51, there is concern that cracking of the reinforcing pad fillet weld to the outer shell could be expected with time due to differential thermal expansion. Should such cracking occur, the secondary liquid containment capability of the outer shell would not be breached since liquid cannot reach this level on the outer shell. Should LPC desire to eliminate this potential maintenance problem, LPC could use a flexible metal hose or expansion joint designed for 3/8" compression and 7/16" differential vertical movement, or relocate the nozzle to the roof.

- Garlock Gylon 3510 gaskets are specified for the nozzle flanges. Unless this Teflon type gasket is required for the service fluid, it is preferable to use Grafoil instead. The Gylon 3510 will be prone to damage and result in flange leakage should it become hot due to a fire in the vicinity of the tank.

- The supports for the overflow pipe are all welded to both the pipe and the inner tank shell. Differential thermal expansion between the hot tank shell and the overflow pipe could result in weld cracks and possibly high bending loads on the nozzle. To eliminate this concern:

  - The lower two supports should be changed to guides that permit free vertical thermal expansion, but provide lateral restraint while permitting some "slop" for tank shell radial movement.

  - The top support should be moved higher to minimize the amount of differential vertical movement that must be absorbed. The detail should also be modified to be only a support without any restraint or guiding. One way to do this is by welding lugs to the pipe and have them rest on a support member welded to the tank shell.

- Calculations to demonstrate that the floating roof meets the floatation requirements of API-650, Appendix H, should be provided for LPC's records.

- Calculations to demonstrate the adequacy of the steel grating located between the two bottoms for the weight should be provided for LPC's records.

- The maximum allowable fill height of 31 ft. for the outer tank should be clearly shown on the final tank drawing and in the records. While this fill height cannot be exceeded in the current service, this documentation will help preclude any potential misunderstanding should the tank service be changed in the future.

Vincent A. Carucci
April 12, 1993

Attachment A

THE HENDRIX GROUP	HAZARDOUS WASTE STORAGE TANK ASSESSMENT DOCUMENT REVIEW REVISION MASTER INDEX Lyondell Petrochemical Company Tank T-3155/T-4455	Rev. No. 0 Date: 1/18/93 Page: 1 of 2

Document Name	Document Number	Current Revision	Date Issued
Master Drawing List	W-92-2472A-1	8	2/16/93
General Notes	W-92-2472A-2	A	2/10/93
General Notes #2	W-92-2472A-2A	-	2/10/93
Elevation	W-92-2472A-3	E	2/10/93
Plan of Outer Tank	W-92-2472A-4	B	2/5/93
Plan of Inner Tank	W-92-2472A-5	B	2/5/93
Replacement Bottom Layout	W-92-2472A-6	A	1/20/93
Grating Layout	W-92-2472A-7	A	1/20/93
Detail of Annular Ring	W-92-2472A-8	A	1/20/93
Inner Tank Bottom Layout	W-92-2472A-9	A	1/20/93
Plan of Floating Roof	W-92-2472A-10	B	2/6/93
Deck Layout	W-92-2472A-11	A	1/27/93
Detail FLOAT. Roof Pontoon Assy.	W-92-2472A-12	A	1/27/93
Misc. Float Roof Details	W-92-2472A-13	A	1/27/93
Detail 8" Anti-Rotate Device	W-92-2472A-14	A	1/27/93
Detail Center Column Sleeve	W-92-2472A-15	B	2/10/93
TST Foam Log Seal For 35'-0" Dia. Tank	TST VMF1-0102-92	0	1/25/93
Type "E" Secondary Seal For 35'-0" Dia. Welded Tank	TST SEC-0102-92	0	1/25/93
Schedule of Openings (Shell)	W-92-2472A-18	B	2/11/93
Schedule of Openings (Shell)	W-92-2472A-18A	—	2/3/93
Schedule of Openings (Roof)	W-92-2472A-19	A	2/1/93
Detail of 24" Shell Manway	W-92-2472A-20	B	2/11/93
Misc. Nozzle Details	W-92-2472A-21	C (w/Carmagen changes 3/3c/93)	3/19/93
Detail of Nozzle MK 33 & Skimmer	W-92-2472A-22	A	2/16/93
tail Roof Manway	W-92-2472A-23	A	2/1/93
'll. Automatic Tank Gauge Assembly	W-92-2472A-24	A	2/10/93
Detail of 6"-150# Nozzle MK 52	W-92-2472A-25	A	2/10/93

THE HENDRIX GROUP

HAZARDOUS WASTE STORAGE TANK ASSESSMENT

DOCUMENT REVIEW REVISION MASTER INDEX

Lyondell Petrochemical Company
Tank T-3455 & 4455

Rev. No. 0

Date: 1/18/93

Document Name	Document Number	Current Revision	Date Issued
Detail 36" Shell Manway	W-92-2472A-26	A	2/11/93
Miscellaneous Details	W-92-2472A-27	A	2/10/93
Dt'l. of Center Column & Rafter Clips	W-92-2472A-28	A	2/10/93
Elevation of Stairway	W-92-2472A-29	A	2/10/93
Detail of Nozzle MK-33 @ Low Point	W-92-2472A-30	A	2/16/93
Tank Calculations	—	2	2/4/93
Nozzle Details	W-93-2472A-31	w/Carnagan changes 3/3/93	3/19/93
Expansion Loop For 1½" XXS Temperature Connection Nozzle 40	—	Carnagan sketch	3/3c/93

Attachment B

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 3/5/93 Page: 1 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank	**Project No:** H 9303
Client: Lyondell Petrochemical Company	**Location:** Channelview
Tank System I.D.: Secondary Containment Project **Equipment No:** T-3455/T-4455	**Date:** 4/8/93

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	**MATERIALS**	API 650, Section 2		
A.	Plates meets API 650 requirements.	API 650, para. 2.2.2 - 2.2.5		
B.	Plates meet toughness requirements.	API 650, para. 2.2.9		
C.	Piping/Forgings meet API 650 req'mts.	API 650, para. 2.5		
D.	Flanges meet API 650 req'mts.	API 650, para. 2.6		
E.	Bolts meet API 650 req'mts.	API 650, para. 2.7		
F.	Welding electrodes meet API 650 req'mts.	API 650, para. 2.8		
2.	**DESIGN**	API 650, Section 3		
A.	Verify tank design requirements	API 650, customer specs	vac	Acc.
B.	Verify tank design stds. appropriate		vac	Acc.
C.	Verify tank calcs./drwgs. to item 2a.		vac	Acc.
D.	Check tank calculations for:	API 650, Vendor calcs.		
i.	. Roof calcs. (if applicable)	API 650, para. 3.10.3	vac	Acc.
ii.	. Allowable stresses used	API 650, para. 3.6.2	vac	Acc.
iii.	. Specific gravity used	calculations based on SG = 1.05	vac	Acc.
iv.	. Shell course thicknesses	API 650, 3.6.3, 3.6.4	vac	Acc.

Remarks:

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 4/5/93 Page: 2 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank			**Project No:** H 9303
Client: Lyondell Petrochemical Company			**Location:** Channelview
Tank System I.D.: Secondary Containment Project	**Equipment No:** T-3455/T-4455		**Date:** 4/8/93

	Attribute	Reference	Reviewed by	ACC/ REJ
E.	Check drawings for:			
i.	Weld details	API 650, paras. 3.1.2 - 3.1.5		
ii.	Bottom plate thickness	API 650, 3.4.1, Table 3-1	Vac	Acc. (1)
iii.	Min. top-angle size	API 650, para. 3.1.5.9c	Vac	Acc.
iv.	Shell openings	API 650, para. 3.7.1	Vac	Acc.
v.	Reinforcement and welding	API 650, para. 3.7.2	Vac	Acc.
vi.	Spacing of welds	API 650, para. 3.7.3		
vii.	Shell manholes	API 650, para. 3.7.5	Vac	Acc.
viii.	Shell nozzles and flanges	API 650, para. 3.7.6	Vac	Acc.
ix.	Flush connections (if present)	API 650, para. 3.7.7, 3.7.8	N/A	
x.	Roof thickness	API 650, 3.10.2.1, 3.10.2.2	Vac	Acc.
xi.	Supported cone roof	API 650, 3.10.4.2, 3.10.4.5	Vac	Acc.
xii.	Self-supported cone roof	API 650 para. 3.10.5	N/A	
xiii.	Dome and umbrella cone roofs	API 650, 3.10.6	N/A	
xiv.	Overturning stability	API 650, para. 3.11	Vac	Acc.
3.	Check calcs. vs. drwgs. for consistency		Vac	Acc.
4.	Check emergency relief vent size/settings	API 2000		
5.	Check pressure/vacuum vent size/settings	API 2000		

Remarks:

(1) Confirming stress calculations for grating between two bottoms not provided. Assume confirmation available from grating supplier.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 4/5/93 Page: 3 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank		**Project No:** H9303
Client: Lyondell Petrochemical Company		**Location:** Channelview
Tank System I.D.: Secondary Containment Project	**Equipment No:** T-3455/T-4455	**Date:** 4/8/93

	Attribute	Reference	Reviewed by	ACC/ REJ	
6.	Review welding procedures	ASME Section IX			
7.	Review CMTR's vs. spec. requirements	ASTM			
8.	**SPECIAL DESIGN REQUIREMENTS**				
A.	Optional design basis for small tanks	API 650, Appendix A	QAC	Acc.	
B.	External floating roofs	API 650, Appendix C	N/A		
C.	Design for small internal pressures	API 650, Appendix F	QAC	Acc.	
D.	Internal floating roofs	API 650, Appendix H	QAC	Acc.	(1)
[illegible]	External loads on shell openings	API 650, Appendix P	QAC	Acc.	(2)

Remarks:

(1) Calculations demonstrating floatation capabilities per API 650 Appendix H not provided. Assume confirmation available from roof supplier.

(2) Loads imposed by external piping systems not checked. Designs for flexibility loops for nozzles passing between both tank shells provided.

CARMAGEN
ENGINEERING INC.
7 Waverly Place / Madison, NJ 07940
Phone: (201) 822-3813 / FAX: (201) 822-3118

April 2, 1993

Mr. Patrick J. Mc Daniel
Lyondell Petrochemical Co.
8280 Sheldon Road
Channelview, Tx 77530

LPC Tanks T-3455/T-4455

Dear Pat:

Attached please find copies of Caesar II piping flexibility calculations and API 650 Appendix P nozzle load calculations for the 4" Nozzle 31, 3" Nozzle 17 and the 1.5" Nozzle 40. Please note that while no calculations were made for the 3" Nozzles 33 and 35, we recommend that expansion loops like that shown for the 3" Nozzle 17 be used for these connections also.

Please feel free to call me if you have any questions.

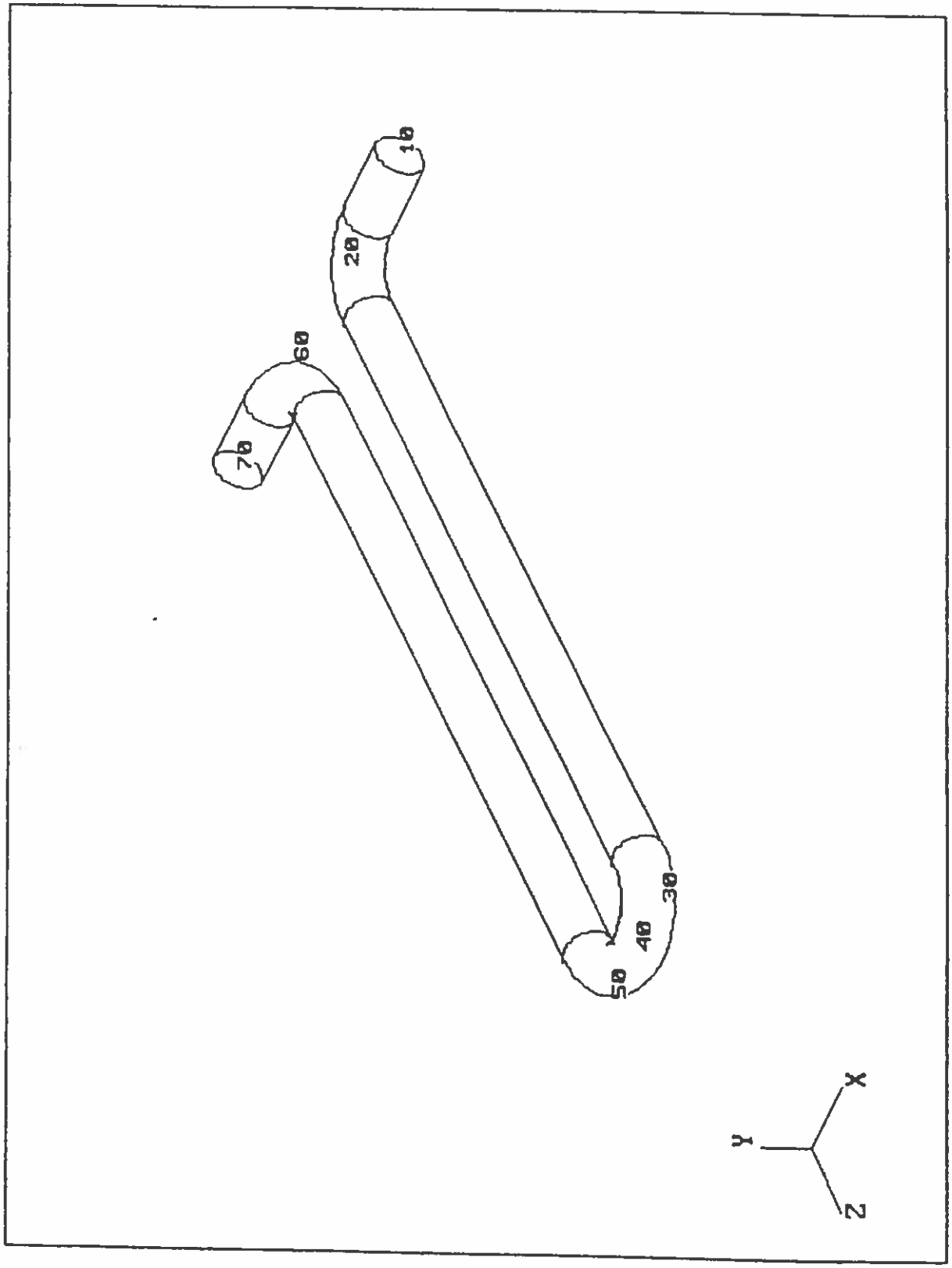
Very truly yours,

Douglas J. Stelling

Douglas J. Stelling

cc: D. E. Hendrix

CAESAR II PIPING FLEXIBILITY AND API 650 APPENDIX P CALCULATIONS
FOR 3" NOZZLE 17



NODE	Translations (in.) DX	DY	DZ	Rotations (deg.) RX	RY	RZ
5	-.1932	.0000	.0000	.0000	.0000	.5329
10	-.1904	.0000	.0000	.0000	.0856	.3567
20	-.1864	-.0590	.0221	-.0571	.1516	.3042
30	-.0489	.0007	.0604	-.0418	.0056	.1672
40	-.0490	.0000	.0605	-.0412	.0045	.1669
50	-.0473	-.0136	.0551	-.0037	-.0926	.1380
60	.0922	.0046	.0104	.0104	-.1060	.0467
70	.0885	.0000	.0000	.0000	-.0931	.0427
75	.0928	.0000	.0000	.0000	.0000	.0000

DE	Forces(lb.) FX	FY	FZ	Moments(ft.lb.) MX	MY	MZ	TYPE
10	230.	0.	0.	0.	0.	0.	Flex X
10	0.	0.	0.	0.	438.	0.	Flex RY
10	0.	0.	0.	0.	0.	-405.	Flex RZ
10	0.	111.	0.	0.	0.	0.	Rigid Y
10	0.	0.	34.	0.	0.	0.	Rigid Z
10	0.	0.	0.	-366.	0.	0.	Rigid RX
40	0.	-85.	0.	0.	0.	0.	Rigid Y
70	0.	0.	-34.	0.	0.	0.	Rigid Z
70	0.	0.	0.	224.	0.	0.	Rigid RX
70	-230.	0.	0.	0.	0.	0.	Flex X
70	0.	0.	0.	0.	-352.	0.	Flex RY
70	0.	0.	0.	0.	0.	75.	Flex RZ
70	0.	-150.	0.	0.	0.	0.	Rigid Y
5	230.	111.	34.	-366.	438.	-405.	Displ. Reactic
75	-230.	-150.	-34.	224.	-352.	75.	Displ. Reactic

*** NO CODE STRESS CHECK PROCESSED

PIPING CODE: B31.3 (1990)

HIGHEST STRESSES: (lb./sq.in.)

OPE STRESS:	6207.	@NODE	30	ALLOWABLE:	0.
BENDING STRESS:	5816.	@NODE	30		
TORSIONAL STRESS:	986.	@NODE	10		
AXIAL STRESS:	76.	@NODE	10		
3D MAXIMUM SHEAR:	6203.	@NODE	30		

STRESS OPTIMIZATION PARAMETERS:

OPE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST OPE STRESS IN THE SYSTEM.

AVG. OPE STRESS 4185.

	/BETWEEN/	/BELOW/
OPE STRESS 90-100%	16.67	83.33
OPE STRESS 80-90 %	8.33	75.00
OPE STRESS 70-80 %	16.67	58.33
OPE STRESS 60-70 %	16.67	41.67
OPE STRESS 50-60 %	16.67	25.00
OPE STRESS 25-50 %	25.00	.00
OPE STRESS 0-25 %	.00	

PIPE ELEMENTS ANALYZED: 6

SAMPLED POINTS: 12

DATA POINT	Forces(lb.) FX	FY	FZ	Moments(ft.lb.) MX	MY	MZ	SIFI	SIFO	(lb./sq.in.) RESULT ALLC
10	-230	-111	-34	365	-438	404	1.00	1.00	3850
20	230	122	34	-320	321	-303	1.38	1.15	3525
20	-230	-122	-34	320	-321	303	1.00	1.00	2957
30	230	173	34	359	-756	-239	1.38	1.15	6206
30	-230	-173	-34	-359	756	239	1.00	1.00	4772
40	230	173	34	359	-757	-235	1.00	1.00	4771
40	-230	-88	-34	-359	757	235	1.38	1.15	6206
50	230	94	34	324	-683	-202	1.38	1.15	5585
50	-230	-94	-34	-324	683	202	1.00	1.00	4235
60	230	145	34	-224	369	-148	1.38	1.15	3213
60	-230	-145	-34	224	-369	148	1.00	1.00	2538
70	230	150	34	-224	351	-74	1.00	1.00	2362

NODE	Translations(in.) DX	DY	DZ	Rotations(deg.) RX	RY	RZ
5	0000	.0000	.0000	0000	.0000	.000(
10	.0000	.0000	.0000	.0000	.0000	.006:
20	.0000	-.0013	.0000	.0014	.0000	.005{
30	.0000	.0000	.0000	-.0049	.0000	-.000{
40	.0000	.0000	.0000	-.0049	.0000	-.000{
50	.0000	-.0003	.0000	-.0044	.0000	-.001:
60	.0000	-.0008	.0000	.0006	.0000	-.007:
70	.0000	.0000	.0000	.0000	.0000	-.007:
75	.0000	.0000	.0000	.0000	.0000	.000(

DATA POINT	Forces (lb.) FX	FY	FZ	Moments (ft.lb.) MX	MY	MZ	SIFI	SIFO	(lb./sq.in.) RESULT	ALLC
10	-230	-111	-34	365	-438	404	1.00	1.00	3850	
20	230	122	34	-320	321	-303	1.38	1.15	3525	
20	-230	-122	-34	320	-321	303	1.00	1.00	2957	
30	230	173	34	359	-756	-239	1.38	1.15	6206	
30	-230	-173	-34	-359	756	239	1.00	1.00	4772	
40	230	173	34	359	-757	-235	1.00	1.00	4771	
40	-230	-88	-34	-359	757	235	1.38	1.15	6206	
50	230	94	34	324	-683	-202	1.38	1.15	5585	
50	-230	-94	-34	-324	683	202	1.00	1.00	4235	
60	230	145	34	-224	369	-148	1.38	1.15	3213	
60	-230	-145	-34	224	-369	148	1.00	1.00	2538	
70	230	150	34	-224	351	-74	1.00	1.00	2362	

NODE	Forces(lb.) FX	FY	FZ	Moments(ft.lb.) MX	MY	MZ	TYPE
10	0.	0.	0.	0.	0.	0.	Flex X
10	0.	0.	0.	0.	0.	0.	Flex RY
10	0.	0.	0.	0.	0.	14.	Flex RZ
10	0.	-37.	0.	0.	0.	0.	Rigid Y
10	0.	0.	0.	0.	0.	0.	Rigid Z
10	0.	0.	0.	15.	0.	0.	Rigid RX
40	0.	-52.	0.	0.	0.	0.	Rigid Y
70	0.	0.	0.	0.	0.	0.	Rigid Z
70	0.	0.	0.	13.	0.	0.	Rigid RX
70	0.	0.	0.	0.	0.	0.	Flex X
70	0.	0.	0.	0.	0.	0.	Flex RY
70	0.	0.	0.	0.	0.	-13.	Flex RZ
70	0.	-36.	0.	0.	0.	0.	Rigid Y
5	0.	-37.	0.	15.	0.	14.	Displ. Reactic
75	0.	-36.	0.	13.	0.	-13.	Displ. Reactic

*** CODE STRESS CHECK PASSED

PIPING CODE: B31.3 (1990)

HIGHEST STRESSES: (lb./sq.in.)

CODE STRESS:	77.	@NODE	10	ALLOWABLE:	20000.
BENDING STRESS:	77.	@NODE	10		
TORSIONAL STRESS:	41.	@NODE	10		
AXIAL STRESS:	0.	@NODE	10		
3D MAXIMUM SHEAR:	112.	@NODE	10		

STRESS OPTIMIZATION PARAMETERS:

CODE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST CODE STRESS IN THE SYSTEM.

AVG. CODE STRESS 37.

	/BETWEEN/	/BELOW/
CODE STRESS 90-100%	16.67	83.33
CODE STRESS 80-90 %	.00	83.33
CODE STRESS 70-80 %	.00	83.33
CODE STRESS 60-70 %	.00	83.33
CODE STRESS 50-60 %	8.33	75.00
CODE STRESS 25-50 %	66.67	8.33
CODE STRESS 0-25 %	8.33	

PIPE ELEMENTS ANALYZED: 6

SAMPLED POINTS: 12

DATA POINT	Forces (lb.) FX	FY	FZ	Moments (ft.lb.) MX	MY	MZ	SIFI	SIFO	(lb./sq.in CODE	ALL
--	0	37	0	-15	0	-14	1.00	1.00	76	200
20	0	-25	0	4	0	-14	1.38	1.15	29	200
20	0	25	0	-4	0	14	1.00	1.00	25	200
30	0	25	0	-1	0	-5	1.38	1.15	33	200
30	0	-25	0	1	0	5	1.00	1.00	29	200
40	0	25	0	-1	0	-4	1.00	1.00	26	200
40	0	26	0	1	0	4	1.38	1.15	30	200
50	0	-20	0	6	0	-13	1.38	1.15	43	200
50	0	20	0	-6	0	13	1.00	1.00	37	200
60	0	30	0	-12	0	-3	1.38	1.15	20	200
60	0	-30	0	12	0	3	1.00	1.00	17	200
70	0	36	0	-12	0	13	1.00	1.00	72	200

NODE	Translations(in.) DX	DY	DZ	Rotations(deg.) RX	RY	RZ
5	-.1932	.0000	.0000	.0000	.0000	.5329
10	-.1904	.0000	.0000	.0000	.0856	.3505
20	-.1864	-.0577	.0221	-.0585	.1516	.2984
30	-.0489	.0007	.0604	-.0369	.0056	.1680
40	-.0490	.0000	.0605	-.0363	.0045	.1677
50	-.0473	-.0134	.0551	.0007	-.0926	.1397
60	.0922	.0054	.0104	.0098	-.1060	.0546
70	.0885	.0000	.0000	.0000	-.0931	.0504
75	.0928	.0000	.0000	.0000	.0000	.0000

NODE	Forces(lb.) FX	FY	FZ	Moments(ft.lb.) MX	MY	MZ	TYPE
10	230.	0.	0.	0.	0.	0.	Flex X
10	0.	0.	0.	0.	438.	0.	Flex RY
10	0.	0.	0.	0.	0.	-419.	Flex RZ
10	0.	148.	0.	0.	0.	0.	Rigid Y
10	0.	0.	34.	0.	0.	0.	Rigid Z
10	0.	0.	0.	-381.	0.	0.	Rigid RX
40	0.	-34.	0.	0.	0.	0.	Rigid Y
70	0.	0.	-34.	0.	0.	0.	Rigid Z
70	0.	0.	0.	211.	0.	0.	Rigid RX
70	-230.	0.	0.	0.	0.	0.	Flex X
70	0.	0.	0.	0.	-352.	0.	Flex RY
70	0.	0.	0.	0.	0.	88.	Flex RZ
70	0.	-114.	0.	0.	0.	0.	Rigid Y
5	230.	148.	34.	-381.	438.	-419.	Displ. Reactic
75	-230.	-114.	-34.	211.	-352.	88.	Displ. Reactic

**** CODE STRESS CHECK PASSED

PING CODE: B31.3 (1990)

HIGHEST STRESSES: (lb./sq.in.)

CODE STRESS:	6125.	@NODE	40	ALLOWABLE:	49969.
BENDING STRESS:	5808.	@NODE	40		
TORSIONAL STRESS:	1027.	@NODE	10		
AXIAL STRESS:	76.	@NODE	10		
3D MAXIMUM SHEAR:	6198.	@NODE	40		

STRESS OPTIMIZATION PARAMETERS:

CODE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST CODE STRESS IN THE SYSTEM.

AVG. CODE STRESS 4120.

	/BETWEEN/	/BELOW/
CODE STRESS 90-100%	25.00	75.00
CODE STRESS 80-90 %	.00	75.00
CODE STRESS 70-80 %	16.67	58.33
CODE STRESS 60-70 %	16.67	41.67
CODE STRESS 50-60 %	16.67	25.00
CODE STRESS 25-50 %	25.00	.00
CODE STRESS 0-25 %	.00	

PIPE ELEMENTS ANALYZED: 6

SAMPLED POINTS: 12

DATA POINT	Forces (lb.) FX	FY	FZ	Moments (ft.lb.) MX	MY	MZ	SIFI	SIFO	(lb./sq.in.) CODE	ALL
10	-230	-148	-34	380	-438	419	1.00	1.00	3861	499
20	230	148	34	-325	321	-289	1.38	1.15	3496	499
20	-230	-148	-34	325	-321	289	1.00	1.00	2919	499
30	230	148	34	360	-756	-233	1.38	1.15	6124	499
30	-230	-148	-34	-360	756	233	1.00	1.00	4691	499
40	230	148	34	360	-757	-231	1.00	1.00	4690	499
40	-230	-114	-34	-360	757	231	1.38	1.15	6125	499
50	230	114	34	317	-683	-188	1.38	1.15	5544	499
50	-230	-114	-34	-317	683	188	1.00	1.00	4189	499
60	230	114	34	-211	369	-145	1.38	1.15	3104	499
60	-230	-114	-34	211	-369	145	1.00	1.00	2423	499
70	230	114	34	-211	351	-88	1.00	1.00	2264	499

PIPE DATA

From 10 To 20 DX= -.875 ft.
PIPE
Dia= 3.500 in. Wall= .300 in. Insul= .000 in.
GENERAL
T1= 170 F Mat= (1)LOW CARBON STEEL E= 29,500,000 lb./sq.in. v = .292
Density= .2899 lb./cu.in.
BEND at "TO" end
Radius= 4.500 in. (LONG) Bend Angle= 90.000
RESTRAINTS
Node 10 X Cnode 5 K= 82,400 lb./in.
Node 10 RY Cnode 5 Kr= 61,435 in.lb./deg
Node 10 RZ Cnode 5 Kr= 27,576 in.lb./deg
Node 10 Y Cnode 5
DISPLACEMENTS
Node 5 DX= -.193 in. DY= .000 in. DZ= .000 in. RX= .000 RY= .00(
RZ= .532
ALLOWABLE STRESSES
B31.3 (1990) Sc= 20,000 lb./sq.in. Sh1= 20,000 lb./sq.in. F1= 1.(

From 20 To 30 DZ= 5.000 ft.
BEND at "TO" end
Radius= 4.500 in. (LONG) Bend Angle= 90.000
RESTRAINTS
Node 10 Z Cnode 5
Node 10 RX Cnode 5

From 30 To 40 DX= -.375 ft.

From 40 To 50 DX= -.375 ft.
BEND at "TO" end
Radius= 4.500 in. (LONG) Bend Angle= 90.000
RESTRAINTS
Node 40 Y

From 50 To 60 DZ= -5.000 ft.
BEND at "TO" end
Radius= 4.500 in. (LONG) Bend Angle= 90.000
RESTRAINTS
Node 70 Z Cnode 75
Node 70 RX Cnode 75

From 60 To 70 DX= -.875 ft.
RESTRAINTS
Node 70 X Cnode 75 K= 53,300 lb./in.
Node 70 RY Cnode 75 Kr= 45,378 in.lb./deg
Node 70 RZ Cnode 75 Kr= 20,943 in.lb./deg
Node 70 Y Cnode 75
DISPLACEMENTS
Node 75 DX= .092 in. DY= .000 in. DZ= .000 in. RX= .000 RY= .000
RZ= .000

MATERIAL Changes:

10	20	Mat= (1)LOW CARBON STEEL	E= 29,500,000 lb./sq.in. v = .292
		Density= .2899 lb./cu.in.	

BEND ELEMENTS

10	20	Radius= 4.500 in. (LONG)	Bend Angle= 90.000
20	30	Radius= 4.500 in. (LONG)	Bend Angle= 90.000
40	50	Radius= 4.500 in. (LONG)	Bend Angle= 90.000
50	60	Radius= 4.500 in. (LONG)	Bend Angle= 90.000

RESTRAINTS

NODE	TYPE	CNODE	STIF1	Len GAP STIF2	MU YIELD FORCE	Dir Vectors		
10	X	5	82400			1.000	.000	.000
10	RY	5	61435			.000	1.000	.000
10	RZ	5	27576			.000	.000	1.000
10	Y	5				.000	1.000	.000
10	Z	5				.000	.000	1.000
10	RX	5				1.000	.000	.000
40	Y					.000	1.000	.000
70	Z	75				.000	.000	1.000
70	RX	75				1.000	.000	.000
70	X	75	53300			1.000	.000	.000
70	RY	75	45378			.000	1.000	.000
70	RZ	75	20943			.000	.000	1.000
70	Y	75				.000	1.000	.000

DISPLACEMENTS

10	20	Node 5	DX= -.193 in.	DY= .000 in.	DZ= .000 in.	RX= .000
		RY= .000	RZ= .532			
60	70	Node 75	DX= .092 in.	DY= .000 in.	DZ= .000 in.	RX= .000
		RY= .000	RZ= .000			

ALLOWABLE STRESS Changes

10	20	B31.3 (1990)	Sc= 20,000 lb./sq.in.	Sh1= 20,000 lb./sq.in.
		F1= 1.00		

HANGER CONTROL AND LOCATION DATA

No. of Hanger Design Load Cases = 1 Actual Cold Load Flag = 0.0
Short Range Spring Flag = 0.0 Default Hanger Table = 1

INPUT UNITS USED...

ITS= ENGLISH NOM/SCH INPUT= ON

LENGTH	inches	x	1.000	=	in.
FORCE	pounds	x	1.000	=	lb.
MASS(dynamics)	pounds	x	1.000	=	lbm
MOMENTS(INPUT)	inch-pounds	x	1.000	=	in.lb.
MOMENTS(OUTPUT)	inch-pounds	x	.083	=	ft.lb.
STRESS	lbs./sq.in.	x	1.000	=	lb./sq.in.
TEMP. SCALE	degrees F.	x	1.000	=	F
PRESSURE	psig	x	1.000	=	lb./sq.in.
ELASTIC MODULUS	lbs./sq.in.	x	1.000	=	lb./sq.in.
PIPE DENSITY	lbs./cu.in.	x	1.000	=	lb./cu.in.
INSULATION DENS.	lbs./cu.in.	x	1.000	=	lb./cu.in.
FLUID DENSITY	lbs./cu.in.	x	1.000	=	lb./cu.in.
TRANSL. STIF	lbs./in.	x	1.000	=	lb./in.
ROTATIONAL STIF	in.lb./deg.	x	1.000	=	in.lb./deg
UNIFORM LOAD	lb./in.	x	1.000	=	lb./in.
G LOAD	g's	x	1.000	=	g's
WIND LOAD	lbs./sq.in.	x	144.000	=	lb./sq.ft.
ELEVATION	inches	x	.083	=	ft.
COMPOUND LENGTH	inches	x	.083	=	ft.
DIAMETER	inches	x	1.000	=	in.
WALL THICKNESS	inches	x	1.000	=	in.

SETUP FILE PARAMETERS

CONNECT_GEOMETRY_THRU_CNODES =	YES
MIN_ALLOWED_BEND_ANGLE =	.5000000E+01
MAX_ALLOWED_BEND_ANGLE =	.9500000E+02
BEND_LENGTH_ATTACHMENT_PERCENT =	.5000000E+01
MIN_ANGLE_TO_ADJACENT_BEND_PT =	.5000000E+01
LOOP_CLOSURE_TOLERANCE =	.1000000E+01
USE_PRESSURE_STIFFENING =	DEFAULT
USE_PD/4T	NO
BASE_HOOP_STRESS_ON_OD	NO
ALPHA_TOLERANCE =	.5000000E-01
RESLD-FORCE =	NO
HGR_DEF_RESWGT_STIF =	.1000000E+13
DECOMP_SNG_TOL =	.1000000E+11
BEND_AXIAL_SHAPE =	NO
FRICT_STIF =	.5000000E+05
FRICT_NORM_FORCE_VAR =	.2500000E+00
FRICT_ANGLE_VAR =	.3000000E+02
FRICT_SLIDE_MULT =	.1000000E+01
ROD_TOLERANCE =	.1000000E+01
ROD_INC =	.2000000E+01
INCORE_NUMERICAL_CHECK =	NO
OUTCORE_NUMERICAL_CHECK =	NO
REDUCED_INTERSECTION =	B31.1(POST1980)
USE_WRC330	NO
NO_REDUCED_SIF_FOR_RFT_AND_WLT	NO
B31.1_REDUCED_Z_FIX =	YES
CLASS_1_BRANCH_FLEX	NO
ALL_STRESS_CASES_CORRODED =	NO
ADD_TORSION_IN_SL_STRESS =	DEFAULT
ADD_F/A_IN_STRESS =	DEFAULT
OCCASIONAL_LOAD_FACTOR =	.0000000E+00
DEFAULT_CODE =	B31.3
B31.3_SUS_CASE_SIF_FACTOR =	.1000000E+01
ALLOW_USERS_BEND_SIF =	NO
USE_SCHNEIDER	NO
PRINTER_TYPE =	DOT_MATRIX
PAGE_LENGTH =	US
PLOTTER_TYPE =	HPGL
STRCT_DBASE=	AISC89.BIN

EXECUTION CONTROL PARAMETERS

Rigid/ExpJt Print Flag	.000
Thermal/Weight Print Flag ..	.000
Bourdon Option	.000
Loop Closure Flag	.000
Liberal Allowable Flag	1.000
Uniform Load Option	.000
Ambient Temperature	70.000 F
Plastic Coefficient	.000
Eqn Optimizer	.000
Node Selection	.000
Eqn Ordering	.000

EXECUTION CONTROL PARAMETERS

Continued...

Collins	.000
Degree Determination	.000
User Eqn Control	.000

COORDINATE REPORT

DE	X (in.)	Y (in.)	Z (in.)
10	.0000	.0000	.0000
20	-10.5000	.0000	.0000
30	-10.5000	.0000	60.0000
40	-15.0000	.0000	60.0000
50	-19.5000	.0000	60.0000
60	-19.5000	.0000	.0000
70	-30.0000	.0000	.0000

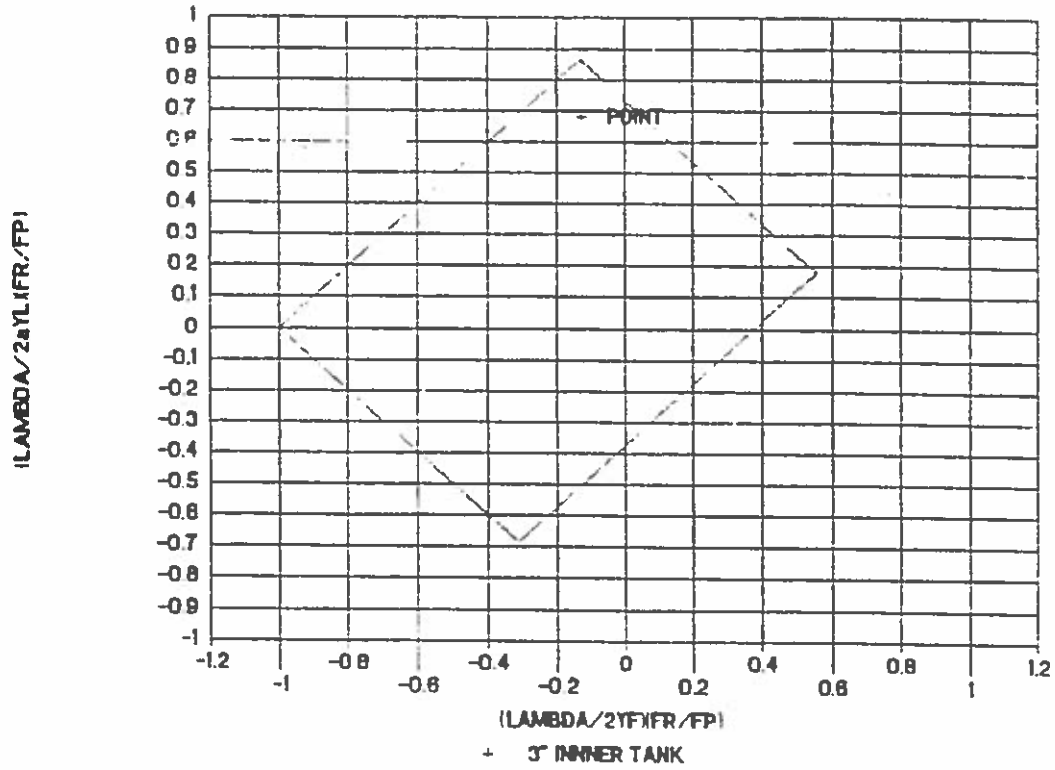
LYONDELL PETROCHEMICAL T-3455 & T-4455

3 INCH NOZZLE - 60 INCH HAIR PIN

(Nomenclature & Equations Per API 650 Appendix P)	INSIDE TANK	OUTSIDE TANK
a=outside radius of opening,inches=	1.75	1.75
E=modulus of elasticity,psi=	2.90E+07	2.90E+07
FR=radial thrust load, lbs=	-230	230
ML=longitudinal moment,in-lbs=	5028	-1056
MC=circumferential moment, in-lbs=	5256	4224
FP=presure thrust load on nozzle, lbs=	127.75	165.27
G=specific gravity of liquid=	1	1
H=maximum allowble filling height, inches=	372	480
L=distance from tank bottom,inches=	4.3125	4.3125
R=nominal radius of tank, inches=	210	240
t=shell thickness at opening,inches=	0.25	0.25
deltaT= design - installation temperature,F=	100	-58
Xa= L + a, inches=	6.0625	6.0625
Xb= L - a, inches=	2.5625	2.5625
Xc= L, inches=	4.3125	4.3125
alpha=thermal expansion coefficient	6.67E-06	6.67E-06
beta=1.285/(Rt)^.5	0.1773	0.1659
betaL=beta*L	0.7648	0.7154
(Rt)^.5=	7.2457	7.7460
L/2a=	1.2321	1.2321
a/R=	0.0083	0.0073
R/t=	840	960
lambda=a/(Rt)^.5	0.2415	0.2259
W=radial growth of the shell ,inches=	0.1932	-0.0928
Theta=rotation of shell, radians=	0.0093	0.0000
SHELL PARAMETERS		
Xa/(Rt)^.5=	0.8367	0.7827
Xb/(Rt)^.5=	0.3537	0.3308
Xc/(Rt)^.5=	0.5952	0.5567
YF (from P-4A)=	1.7	2
YL (from P-4A)=	8	8.5
YC (from P-4B)=	18	23
INTERCEPTS FOR NOMOGRAM		
GREATER OF .1 OR (1-.75Xa/(Rt)^.5)	0.3725	0.4130
GREATER OF .1 OR (1-.75Xb/(Rt)^.5)	0.7348	0.7519
GREATER OF .1 OR (1-.75Xc/(Rt)^.5)	0.5536	0.5824
FR/FRmax	-0.1279	0.0786
ML/MLmax	0.6790	-0.0970
MC/MCmax	0.3155	0.1435
SPRING STIFFNESES		
KR (from charts P-2A & P-2D), lbs/in=	8.24E+04	5.33E+04
KL (from charts P-2B & P-2E), in-lbs/rad=	1.58E+06	1.20E+06
KC (from charts P-2C & P-2F), in-lbs/rad=	3.52E+06	2.60E+06

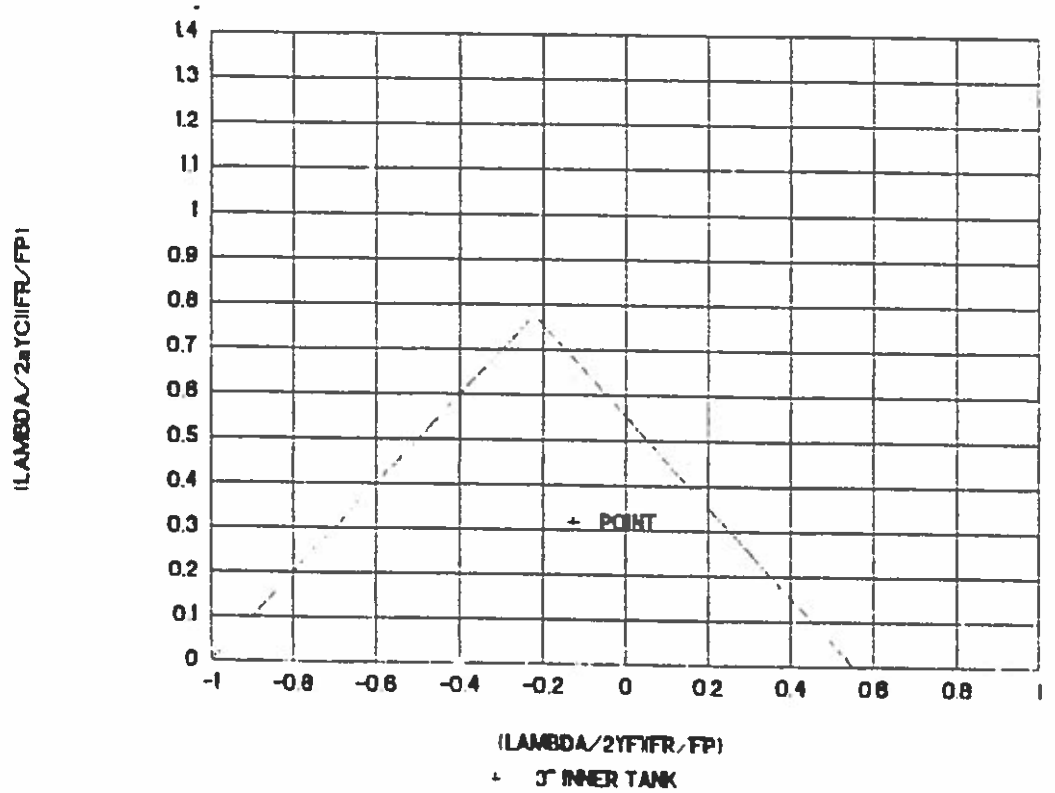
LONGITUDINAL MOMENT vs. AXIAL LOAD

COMPARISON PER API 650 APPENDIX P



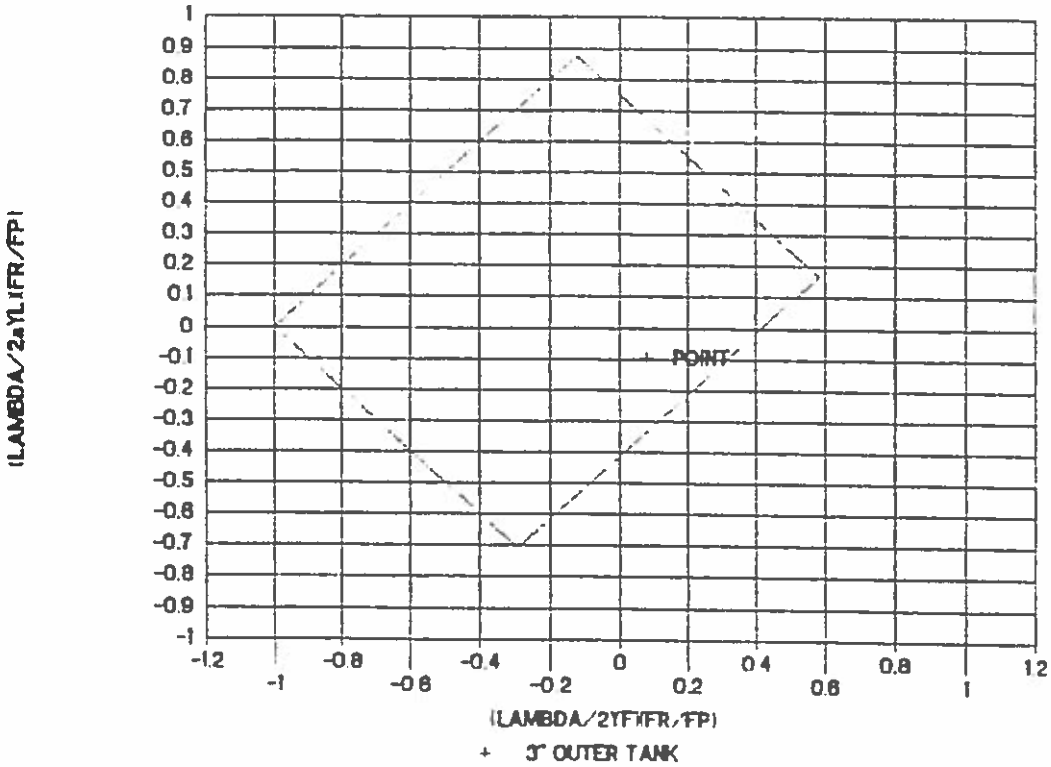
CIRCUMFERENTIAL MOMENT vs. AXIAL LOAD

COMPARISON WITH API 650 APPENDIX P



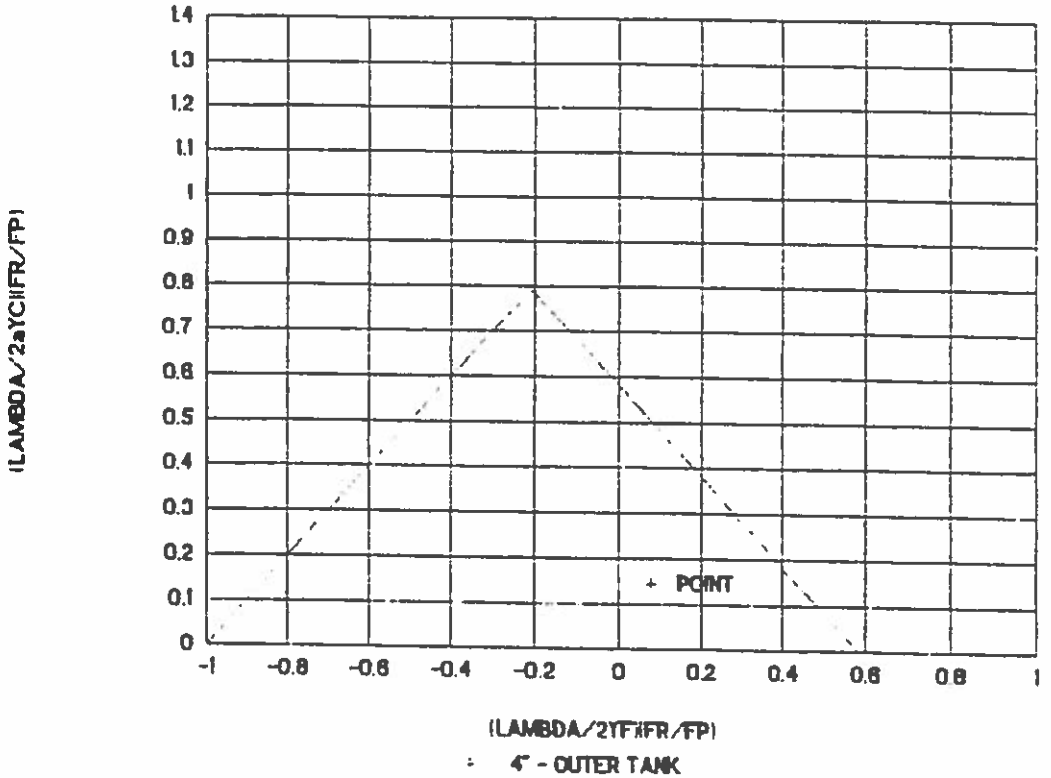
LONGITUDINAL MOMENT vs. AXIAL LOAD

COMPARISON PER API 650 APPENDIX P



CIRCUMFERENTIAL MOMENT vs. AXIAL LOAD

COMPARISON WITH API 650 APPENDIX P



REPORT

on

CIVIL ENGINEERING EVALUATION

of

FOUNDATION DESIGN

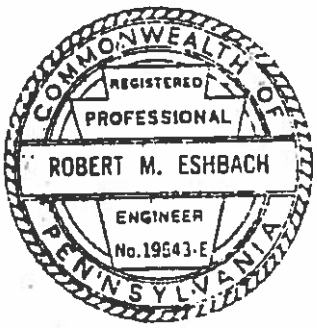
for

TANK T-4455

at

LYONDELL PETROCHEMICAL COMPANY

Channelview, Texas



Submitted To:

David E. Hendrix
President
The Hendrix Group, Inc.
Metallurgical Engineering, Corrosion Testing
P.O. Box 35717
Houston, Texas 77235

INTRODUCTION

Calculations and the related drawings were prepared by Douglass Engineering, Inc. in order to provide secondary containment for Tank T-4455 at the Lyondell Petrochemical Plant in Channelview, Texas. The secondary containment was provided by the existing tank which was modified in order to permit installation of a new inner storage tank which will rest on a new concrete slab. The slab will be attached to the interior of the original ring wall using drilled and grouted dowels.

This report provides the results of a design review of the drawings and calculations representing the new structural design of the slab and its connection to the ring wall. The specific issues evaluated include:

a. Analysis to establish design forces and moments
b. Dowel design
c. Slab design.

DOCUMENTS REVIEWED:

1. Memorandum No. WBD-119-93 of January 19, 1993 from W.B. Douglas of Douglass Engineering, Inc. transmitting:

   a. Lyondell Petrochemical Company (LPC) Drawing E-34-C-127, Rev. 1, "TK-3455 and TK-4455, "Waste Caustic Surge Tank Foundation", January 15, 1993.

   b. Lummus Drawing 7081/ARCO Drawing D-34-C-073-5, "Storage Tank Foundations".

   c. Lummus Drawing 7081/ARCO Drawing D-44-C-073-1, "Storage Tank Foundations".

   d. Engineering sketches SK-1 and SK-2, Foundation for Tank T3455 & T4455, dated 1/11/93.

   e. Calculations for Existing T-3455 Tank Foundation, dated 1/4/93 and 1/14/93, six pages.

2. Selected pages from Wyatt Field Service Company calculations for analysis of tank, dated January 21, 1993.

   a. Sheets 8 and 10 (computer output) for outside tank
   b. Sheets 14 and 15 (computer output) for inside tank
   c. Sheets 18 and 19 for inner and outer tanks

3. TK 3455 Tank Foundation Calculations, prepared by Ken Schiller, dated January 29, 1993, seven pages.

ADDITIONAL REFERENCES:

1. American Petroleun Institute (API) Standard 650, Eighth Edition, November, 1988

   a. Section 3.2, Design Considerations
   b. Section 3.3, Special Consideraitons
   c. Section 3.10.2.1, Minimum Live load
   d. Section 3.11, Wind Load on Tanks
   e. Section 5.5.6, Dimensional Tolerances for Foundations
   f. Appendix B, Recommendations for Construction of Foundations for Vertical Cylindrical Oil Storage Tanks

2. American Concrete Institute (ACI)

   a. ACI 318-89, "Building Code Requirements for Reinforced Concrete", Chapter 10, "Flexure and Axial Loads".

   b. ACI 349-90, "Code Requirements for Nuclear Safety-Related Concrete Structures", Appendix B, "Steel embedments".

3. Brown, Andrew W., "A New Approach to Tank Foundation Design", Hydrocarbon Processing, October, 1974.

4. Dames & Moore, "Report, Foundation Investigation", Proposed Lyondell Plant Expansion, Channelview, Texas

5. ASTM D 1557, "Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort".

DESIGN BASIS:

The material properties and other pertinent data listed below were obtained from the drawings and calculations submitted for review. They form the basis for the design and this evaluation.

1. Concrete:
   28 day Concrete Compressive Strength: 4000 psi

2. Reinforcement:
   ASTM A615, Grade 60
   Yield Strength 60000 psi

3. Subgrade Compaction: 95% of maximum dry density
   In accordance with ASTM D1557.

4.	Coefficient of Active Earth Pressure (K_a):	0.3
5.	Allowable Net Bearing Pressure:	
	Long term loads	3500 psf
	Transient loads	4200 psf
6.	Specific Gravity of Tank Contents:	1.05
7.	Unit Weight of Soil:	120 pcf
8.	Tank design basis:	API 650

ASSUMPTIONS:

1. The adequacy for the design of the tank or its anchorage to the foundation is not within the scope of this review.
2. The design for the Tank T3455 and T4455 foundations, as represented on Jacobs Engineering Group, Inc. Drawing S-1, (dated September 9, 1992) is superceded by the design shown on Lyondell Petrochemical Drawing E-34-C-127, Rev. 1.
3. Inclusion of a roof live load is not appropriate for this design.
4. The tank configuration is consistent with the data in the computer analysis output prepared by Wyatt Field Services and included in the calculations submitted for review.
5. Minimal excavation of the preloaded soil beneath the existing tank is required. Any removed material is replaced with a stable fill material such as sand or soil-cement, and such fill has been compacted to at least 95% of its maximum dry density.

STRUCTURAL FEATURES CHECKED:

1. Design approach.
2. Consideration of all potential loads in the calculations. As a minimum, these would include the effects of dead, live, earth pressure, hydrostatic and wind loads on the supporting structures.
3. Accuracy (freedom from errors) of calculations
4. Bearing pressures within allowable limits.
5. Dimensional accuracy and compatibility with existing features.
6. Appropriate concrete dimensions.
7. Provision of minimum required area of reinforcing steel to satisfy both strength and serviceability requirements.
8. Proper clearances over reinforcing steel.

EVALUATION

GENERAL

The calculations, sketches and drawings submitted for review and identified as Items 1, 2, and 3 of DOCUMENTS REVIEWED were evaluated in detail for accuracy and conformance to applicable industry codes and standards. That evaluation was intended to ensure that the represented design was capable of withstanding all applied loads and, in doing so, satisfy the intent of the design.

The criteria documents providing the basis for the review are:

1. ACI 318-89 which, though not referenced in the calculations, is the governing document for design of reinforced concrete structures.

2. American Petroleun Institute (API) Standard 650, Eighth Edition, November, 1988

3. Dames & Moore, "Report, Foundation Investigation", Proposed Lyondell Plant Expansion, Channelview, Texas

4. ACI 349-90, "Code Requirements for Nuclear Safety-Related Concrete Structures", Appendix B, "Steel embedments".

ANALYSIS

The calculations developed to determine the forces inducing tension in the ring wall were found to be acceptable. These calculations demonstrated the acceptability of the existing ring wall under new loading.

The calculations to determine bearing pressures, however, were somewhat confusing with respect to the distribution of the imposed load between the slab and the ring wall. The calculations for determining hoop tension in the ring wall and also those for determining soil pressure under the main portion of the tank indicate that the entire weight of the tank contents, the floating roof, the grating and the inner tank are transferred directly to the slab. However, the calculation for soil pressure under the ring wall indicates that 50% of the weight of these components is also applied directly to the ring wall. Both distributions, of course, canot be correct.

Presumably, the intent of the calculation was to assume a conservative distribution of load in lieu of conducting a rigorous analysis of a very complex configuration of components at the base of the tanks. Doing so was appropriate, but the assumption should have maximized the differential load between the slab and the ring wall, as would be required to arrive at a suitable estimate of the shear load on the dowels. This could have been accomplished by conservatively assuming that the ring wall carries only the outer tank and that all other loads are applied to the interior area.

The analysis is considered further in subsequent sections of the report.

DOWELS

The calculations generated to design the dowels connecting the new slab to the ring wall were inadequate in a number of respects:

1. The shear to be carried by the dowels was assumed to be the difference between the soil pressure under the ring wall and that under the slab. This is an erroneous simplification of a relatively complex situation.

   In reality, the applied load is shared between the dowels and the soil beneath the slab. The specific proportion of the load being carried by each element is, however, not easily determined since it is a function of the stiffness (or the deformability) of all the elements carrying or transferring load. For instance, if the slab were infinitely stiff (zero bending deformation) none of the applied load would pass to the subgrade, and the dowels would be required to carry the total applied load. They are not capable of doing so. If, on the other hand, the slab had no flexural stiffness (if it were a flexible membrane) the subgrade would carry the entire load, and there would be no load on the dowels. The actual condition is somewhere in between.

   One approach might have been to base the design of the dowels on the assumption that the soil carries none of the load. This would have been conservative but safe. A more rational analysis would attempt to quantify the distributionof load. To do so would require simultaneous consideration of the shear stiffness of the dowels, the flexural stiffness of the ring wall, the flexural stiffness of the slab and the bearing stiffness of the soil beneath both the slab and the ring wall. Only then could one establish (and then only theoretically) how much of the load applied to the surface of the slab is transferred to the subgrade and how much is transferred to the dowels.

   Unfortunately, determination of that proportion is not practical using hand calculations. Rather, a finite element analysis capable of evaluating soil-structure interaction would be much more appropriate.

   Therefore, in order to resolve concerns for the distribution of the applied loads, a number of simplified finite element analyses were carried out using the computer program IMAGES 3D. In these analyses the new slab was conservatively required to support all dead loads except those of the outer tank. Also, the stiffness of the soil, represented by soil springs for which the deformation characteristics were a function of the modulus of subgrade reaction, was varied between 100 pci (a relatively soft soil) and 800 pci (a relatively firm soil). The stiffness of the dowels was constant for all the analyses. This variation of the spring stiffness was of sufficient range to permit an evaluation of the degree to which the shear force on the dowels varies with the stiffness of the soil. The results of these analyses can be summarized very briefly as follows:

K_s	Dowel Shear
100 #/in^3	22.75 kips
400	17.39 kips
800	15.52 kips

It is apparent that the dowel shear varies inversely with the value of K_s. Fortunately, the variation is not linear. The maximum dowel shears is only 47% greater than the minimum over a range in which the corresponding maximum modules value is 800% greater than the minimum. The dowel shear, therefore, can be seen to be relatively insensitive to variations in the stiffness of the soil, but not so much so that the soil stiffness can be disregarded.

Nevertheless, these values are considerably in excess of the values determined in the calculations for dowel shear. They are used in the remainder of this report as the primary basis for the conclusions regarding the adequacy of the design. To reach that conclusion it is necessary to compare the potential dowel load with the load capacity of the dowels and of the concrete supporting those dowels.

Consider first the capacity of the concrete. A shear force acting vertically upward on the dowel will impose a load on the concrete which will tend to break out the top surface of the slab. The capacity to resist that breakout is a function of the strength of the concrete and of the distance of the loading point from the edge of the concrete. In this case that distance is nine inches, and the concrete strength is 4000 psi. It can be determined, using the methodoloy of ACI 349, Appendix B, "Steel Embedments" that the concrete can withstand a dowel shear of up to 27000 pounds. This is greater that the pure shear capacity of the dowel itself which, for a #8 reinforcing bar, is determined to be about 19000 pounds.

The shear capacity of the dowel is, therefore, the more critical element. If its capacity of 19 kips is compared to the dowel shears determined by the finite element analysis for various soil stiffnesses, it can be seen that the dowel would be overloaded if the soil were characterized by a long term K_s value of about 350 ksi or less.

2. In addition to the calculations generated to determine the dowel loads, the calculations performed to design the dowels were not appropriate. This design provides for inserting #8 reinforcing bars into holes drilled into the ring wall every 18 inches and anchoring them in place using epoxy grout. The objections to this calculation are:

   a. The depth of embedment for the steel bar was determined using a procedure appropriate for a headed anchor subject to tensile loading. However, the anchor is not headed (such that the failure cone considered in the calculations cannot develop) and the loading on the dowel will be primarily shear rather than tension. The approach was, therefore, inappropriate, but alternative calculations indicate that it did result in an adequate design for the dowels.

   b. The load on the dowel was apparently identified by "Wyatt" to be 4887 pounds. The "Wyatt" document making that determination was not included in the calculations, however, such that the means for arriving at that load could not be evaluated.

   c. "Brutem 33", the adhesive for anchoring the rebar in the concrete, is no longer being manufactured. It is presumed that an appropriate substitution was made.

3. The stability of the tank under high winds was apparently evaluated by Wyatt and not included in this evaluation.

SLAB

The bending moments in the slab were determined using a paper written by Andrew W. Brown and entitled "A New Approach to Tank Foundation Design", Hydrocarbon Processing, October, 1974. This paper was reviewed and found to provide a rational means for analyzing the slab. Also, the review of the calculations indicated appropriate application of the recommendations of the paper.

CONCLUSIONS

The calculations adequately demonstrated that the imposed loads can be carried by the existing ring wall and by the new slab. The design of the dowels connecting the slab and ring wall were generally inadequate. For that reason, independent finite element analyses were carried out for this evaluation. These analyses lead to the following conclusions:

1. Specific information regarding the actual, long-term value for the subgrade modulus is not available. Definitive conclusions, based on quantitative analysis, regarding the adequacy of the dowel is, therefore, not possible. However, qualitative conclusions can be drawn from the following considerations:

    a. The subgrade for the new inner tank is reported to have been prepared by minimizing excavation of the in-situ soil which was preconsolidated from the load of the previously existing tank. Materials that were removed were replaced with stable backfill material such as layers of soil-cement and sand, which were compacted to 95% of their maximum dry density. While it is not possible to assign a numerical value for K_s, it is reasonable to assume, on the basis of these considerations, that the subgrade prepared as described would have a coefficient of subgrade reaction of at least 300 pci.

    b. The finite element analysis was based on an assumption that the slab carried all loads except the weight of the outer tank. In reality, the facilities provided at the base of the tank, such as the 3" grating subfloor, will influence the distribution of the load so that the ing wall will carry a much greater portion of the imposed load than assumed by this analysis. The dowel load will then be correspondingly less.

    c. The dowel capacity of 19 kips was based on the yield strength of the dowel. If the ultimate strength of the dowel were considered, the capacity would increase about 50% (to 28.5 kips). This is approximately equal to the capacity of the concrete to accept the dowel load.

    These factors suggest that the load imposed on the dowels will not be in excess of their capacity.

2. Maximum soil pressures under the main portion of the tank and under the ring wall are less than the allowable bearing capacities, under both normal and transient conditions, specified in the soils report.

3. The base mat has sufficient depth and sufficient reinforcement to carry the imposed loads.

It is concluded, on the basis of the foregoing rationale, therefore, that the design shown on Lyondell Petrochemical Company Drawing Drawing E-34-C-127 is capable of safely carrying all postulated loads. The attached "Hazardous Tank System Assessment - New Tank System Checklist" summarizes the bases for these conclusions.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 0 Date: 10/16/92 Page: 1 of 1

Checklist Title: Civil Design Review Checklist- Secondary Containment		**Project No:**
Client: Lyondell Petrochemical		**Location:** Channelview, Texas
Tank System I.D.:	**Equipment No:** T-4455	**Date:** April 8, 1993

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	Verify civil design requirements	ACI 318	[signature]	
2.	Verify civil calcs./drwgs. to item 1	ACI 318	[signature]	
3.	Verify civil design stds. appropriate	NA	[signature]	
4.	Verify chemical resistant waterstops	NA		
5.	Verify containment volume requirements	NA		
6.	Designed to protect against formation and ignition of vapors	NA		
7.	Designed to collect waste	NA		
8.	Designed to include impermeable lining	NA		
9.	External vapor barrier on below-grade sumps, etc.	NA		

Remarks: None

DRAWING NO.	REV.	DRAWING DESCRIPTION	LIST REV.	ISSUE STATUS A	C	S	F
W-92-2472B-2	B	GENERAL NOTES (SHT 1 OF 2)	13	X	X	X	X
W-92-2472B-3	H	ELEVATION	14	X	X	X	X
W-92-2472B-4	C	PLAN OF OUTER TANK	13	X	X	X	X
92-2472B-5	C	PLAN OF INNER TANK	14	X	X	X	X
-92-2472B-6	A	REPLACEMENT BOTTOM LAYOUT	1	X	X	X	X
W-92-2472B-7	B	GRATING LAYOUT	9	X	X	X	X
W-92-2472B-8	A	DETAIL OF ANNULAR RING	1	X	X	X	X
W-92-2472B-9	A	INNER TANK BOTTOM LAYOUT	1	X	X	X	X
W-92-2472B-10	B	PLAN OF FLOATING ROOF	7	X	X	X	X
W-92-2472B-11	A	DECK LAYOUT	3	X	X	X	X
W-92-2472B-12	A	DETAIL OF PONTOON ASSEMBLY	3	X	X	X	X
W-92-2472B-13	A	MISC FLOATING ROOF COMPONENTS	3	X	X	X	X
W-92-2472B-14	C	DETAIL 8" ANTI-ROTATION DEVICE	15	X	X	X	X
W-92-2472B-15	D	DETAIL OF CENTER COLUMN SLEEVE	15	X	X	X	X
W-92-2472B-16	A	DETAIL FOAM LOG SEAL	5	X	X	X	X
W-92-2472B-17	A	DETAIL OF SECONDARY SEAL	5	X	X	X	X
W-92-2472B-18	D	SCHEDULE OF OPENINGS (SHELL)	11	X	X	X	X
W-92-2472B-18A	.	SCHEDULE OF OPENINGS (SHELL)	10	X	X	X	X
W-92-2472B-19	A	SCHEDULE OF OPENINGS (ROOF)	5	X	X	X	X
W-92-2472B-20	B	DETAIL 24" SHELL MANWAY	7	X	X	X	X
W-92-2472B-21	D	MISC. NOZZLE DETAILS	11	X	X	X	X
W-92-2472B-22	B	DETAIL OF NOZZLE MK "33" & SLIMMER	11	X	X	X	X
W-92-2472B-23	A	DETAIL 24" ROOF MANWAY	9	X	X	X	X
W-92-2472B-24	A	DETAIL OF VAREC GAUGE	7	X	X	X	X
W-92-2472B-25	C	DETAIL OF NOZZLE MK "52"	13	X	X	X	X
W-92-2472B-26	A	DETAIL OF 36" SHELL MANWAY	7	X	X	X	X
-2-2472B-27	A	MISCELLANEOUS DETAILS	7	X	X	X	X
W-92-2472B-28	B	DETAIL OF CENTER COLUMN & CLIPS	12	X	X	X	X
W-92-2472B-29	A	ELEVATION OF STAIRWAY	7	X	X	X	X
W-92-2472B-30	A	DTL OF NOZZLE MK "33" & LOW POSITION OF ROOF	8	X	X	X	X
W-92-2472B-31	B	NOZZLE DETAILS	12	X	X	X	X
W-92-2472B-32	B	DETAIL OF NOZZLES MK "32" & "40"	13		X	X	X
W-92-2472B-SL1	H	SHIPPING LIST (WYATT USE ONLY)	15	-	-	X	X
W-92-2472B-SL2	A	SHIPPING LIST (WYATT USE ONLY)	5	-	-	X	X
W-92-2472B-SL3	B	SHIPPING LIST (WYATT USE ONLY)	15	-	-	X	X
W-92-2472B-SL4	B	SHIPPING LIST (WYATT USE ONLY)	13	-	-	X	X
W-92-2472B-SL5	C	SHIPPING LIST (WYATT USE ONLY)	12	-	-	X	X
W-92-2472B-SKT1		PLAN OF SUGGESTED FALSEWORK (WYATT USE ONLY)	9	-	-	-	X
W-92-2472B-WM		X-RAY & WELD MAP (WYATT USE ONLY)	5	-	-	X	X

DRAWING NO.	REV.	DRAWING DESCRIPTION	LIST REV.	ISSUE STATUS A	C	S	F
W-92-2472B-2A		GENERAL NOTES (SHT. 2 OF 2)	7	X	X	X	X
W-92-2472B-14A		DETAIL COLUMN SLEEVE	15	X	X	X	
W-92-2472B-14B		MISC DETAILS COLUMN SLEEVE	15	X	X	X	
W-92-2472B-15A		DETAIL COLUMN SLEEVE	15	X	X	X	
W-92-2472B-15B		MISC DETAILS COLUMN SLEEVE	15	X	X	X	

WELDING PROCEDURE LIST

PROC. NO.	REV.	COMMENTS	LIST REV.	ISSUE STATUS A	C	S	F
HW-1.5		SMAW (MANUAL)	3	X	X	X	X

MASTER DRAWING LIST

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/10/94
BY:

NO.	REVISION	DATE	BY	CHK'D
12	REV. AS NOTED	4-6-93	JKH	CC
11	REV. AS NOTED	3-31-93	JKH	CC
10	REV. AS NOTED	3-19-93	JKH	CC
15	REV. AS NOTED	5-28-93	RF	CC
14	REV. AS NOTED	5-11-93	JKH	CC
13	REV. AS NOTED	4-26-93	JKH	CC

P.O.#: CHO-93-0001

S/O 24728 | ITEM: TK-4455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-13-93

CHECKED: CC APPROVED:

NO. W-92-2472B-1 REV. 15

RADIOGRAPHIC STANDARDS

API - 650

10.2 RADIOGRAPHS

10.2.1 NUMBER AND LOCATION OF RADIOGRAPHS

The number and location of radiographs shall be in accordance with API Standard 650 and the following additional requirements:

10.2.1.1 For new or repaired shell vertical joints one radiograph shall be taken in every joint.

10.2.1.2 For new or repaired shell horizontal joints one radiograph shall be taken for each 50 feet of horizontal joint, not including those required at intersections of vertical and horizontal joints.

10.2.1.3 For each new or repaired intersection between shell vertical and horizontal joints one radiograph shall be taken.

10.2.1.4 For reconstructed tanks, each butt-welded annular plate joint shall be radiographed in accordance with API Standard 650.

10.2.1.5 New and replaced shell insert plate and door-sheet welds shall be radiographed. For circular replacement plates, a minimum of one radiograph shall be taken, regardless of thickness. For square or rectangular replacement plates, at least one radiograph shall be taken in a vertical joint and at least one in a horizontal joint, and one in each corner. All junctions between repair and existing welds shall be radiographed. If defects are found, 100% radiography shall be performed on the repaired weld.

10.2.1.6 The minimum diagnostic length of each radiograph shall be 8 inches.

NOTE:

FOR API-650 STANDARDS SEE SHT # 2

RECONSTRUCTED BY

WYATT FIELD SERVICE COMPANY

HOUSTON, TEXAS

A SUBSIDIARY OF HOOKER CORPORATION

REPAIRED/ALTERED TO API 653 EDITION 1ST

DATE COMPLETED	1993	ORIGINAL STANDARD	API-650-73
SERIAL NO	2472A	TANK NO	TK-3455
SHELL COURSE	ALLOW STRESS	MAT'L	TANK DIA 40'-0" HEIGHT 40'-0"
#5		A-516-70	SPECIFIC GRAVITY 1.05
			DESIGN PRESSURE INT. 5"WC EXT. 1.75"WC
			ORIG CONSTR DATE 1975
			YEAR RECONSTRUCTED 1993
			LIQUID LEVEL MAX. 31'-0"
			CAPACITY 1,619 BBLS
			MAX OPERATING TEMP 170°

DETAIL OF CODE NAMEPLATE

NOTES

1) NAME PLATE TO BE INSTALLED ADJACENT TO EXIST. NAME PLATE ON OUTER TANK
2) SEE SHT. #27 FOR DETAIL OF BRACKET

HYDRO-TEST PROCEDURE

1) TANK BOTTOMS (INNER & OUTER) TO BE VACUUM BOX TESTED PER API-650 PARAGRAPH 5.3.3
2) BLANK OFF ALL SHELL NOZZLES FOR INNER TANK
3) FILL INNER TANK WITH POTABLE WATER WITH A MAXIMUM CHLORIDE CONTENT OF % PPM (FURNISHED BY CUSTOMER) TO THE BOTTOM OF OVERFLOW NOZZLE MK. "5Z"
4) THOROUGHLY CHECK THE TANK FOR LEAKS.
5A) DRAIN INNER TANK DOWN TO 31'-0" WATER LEVEL (APPROX. 6'-4" FROM BTM. OF OVERFLOW NOZZ MK. 5Z"
5B) BLANK OFF ALL SHELL OPENINGS FOR OUTER TANK.
6) FILL THE OUTER TANK WITH POTABLE WATER (FURNISHED BY CUSTOMER) TO A MAXIMUM HEIGHT OF 31'-0" (DO NOT DRAIN INNER TANK)
7) IF THE TANK HAS ANCHORAGE, CHECK FOR TIGHTNESS AFTER COMPLETION OF THE FILL OPERATION
8) THOROUGHLY CHECK THE TANK FOR LEAKS.
9) BLANK OFF ALL ROOF OPENINGS. INSTALL THE SPECIAL TEST COVER ON NOZZLE MK. "3" & AIR LINES & MANOMETER INSTALL PRESSURE/VACUUM RELIEF VALVE ON NOZZLE MK. "8"
10) SLOWLY INTRODUCE AIR UNTIL A PRESSURE OF 5" WC IS OBTAINED HOLD THIS PRESSURE FOR 15 MINUTES. REDUCE AIR PRESSURE TO 2½" WC AND VISUALLY CHECK THE TANK FOR TIGHTNESS IN ADDITION, ALL SEAMS ABOVE THE WATER LINE SHALL BE SOAPED FOR THE DETECTION OF LEAKS
11) RELEASE THE INTERNAL PRESSURE BY OPENING THE RELIEF VALVE.
12) REMOVE ONE ROOF TEST COVER TO PROVIDE ADDITIONAL VENTING & DRAIN THE OUTER TANK.
13) AFTER OUTER TANK IS EMPTY, BEGIN DRAINING THE INNER TANK.
14) AFTER COMPLETION OF TEST, REMOVE ALL TEST MATERIAL & RETURN TO WYATT STOCK FOR FUTURE USE

Field Change

CAUTION:

UNLESS EXTREME CARE IS EXERCISED, THE ABOVE TEST CAN CAUSE DAMAGE TO THE TANK. DO NOT PERMIT PRESSURES TO EXCEED THE AMOUNTS STATED IN NOTE #10

PAINT NOTES

SEE SHT. # 2

DESIGN DATA & GENERAL NOTES (OUTER TANK)

DESIGN, FABRICATION, ERECTION & TESTING TO BE IN ACCORDANCE WITH API-653 1ST EDITION, JANUARY 1991 API 650 APP. A & F

CODE NAME R REQ'D YES

DESIGN PRESSURE :
INT: 5" WC
EXT: 1.75" WC

DESIGN TEMPERATURE : 12°F. 170°F

SPECIFIC GRAVITY : 1.05

JOINT EFFICIENCY : 0.85

RADIOGRAPH : SEE STANDARD THIS SHT.

CORROSION ALLOWANCE: 1/16"

MAX. LIQUID LEVEL: 31'-0"

ROOF CONSTRUCTION : LAP WELD SUPPORTED CONE

BOTTOM CONSTRUCTION: LAP WELD

HYDROTEST : SEE PROCEDURE THIS SHT.

WIND LOAD : 110 MPH

EARTHQUAKE ZONE : 0

NOMINAL CAPACITY : 1,619 BBLS

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/12/93
BY:

NO.	REVISION	DATE	BY	CHK'D

P.O.#: CHO-93-0001

S/O 2472 A | ITEM: TK-3444

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'0" Ø x 32'-0" HIGH TANK

GENERAL NOTES #2

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 2-10-93

CHECKED: C.G. APPROVED:

NO. W-92-2472A-2A REV.

RADIOGRAPHIC STANDARDS

API - 653

10.2 RADIOGRAPHS

10.2.1 NUMBER AND LOCATION OF RADIOGRAPHS

The number and location of radiographs shall be in accordance with API Standard 650 and the following additional requirements:

10.2.1.1 For new or repaired shell vertical joints one radiograph shall be taken in every joint.

10.2.1.2 For new or repaired shell horizontal joints one radiograph shall be taken for each 50 feet of horizontal joint, not including those required at intersections of vertical and horizontal joints.

10.2.1.3 For each new or repaired intersection between shell vertical and horizontal joints one radiograph shall be taken.

10.2.1.4 For reconstructed tanks, each butt-welded annular plate joint shall be radiographed in accordance with API Standard 650.

10.2.1.5 New and replaced shell insert plate and door-sheet welds shall be radiographed. For circular replacement plates, a minimum of one radiograph shall be taken, regardless of thickness. For square or rectangular replacement plates, at least one radiograph shall be taken in a vertical joint and at least one in a horizontal joint, and one in each corner. All junctions between repair and existing welds shall be radiographed. If defects are found, 100% radiography shall be performed on the repaired weld.

10.2.1.6 The minimum diagnostic length of each radiograph shall be 8 inches.

NOTE:

FOR API-650 STANDARDS SEE SHT. # 2

HYDRO-TEST PROCEDURE

1) TANK BOTTOMS (INNER & OUTER) TO BE VACUUM BOX TESTED PER API-650 PARAGRAPH 5.3.3
2) BLANK OFF ALL SHELL NOZZLES FOR INNER TANK
3) FILL INNER TANK WITH POTABLE WATER WITH A MAXIMUM CHLORIDE CONTENT OF * PPM (FURNISHED BY CUSTOMER) TO THE BOTTOM OF OVERFLOW NOZZLE MK-"5Z"
4) THOROUGHLY CHECK THE TANK FOR LEAKS.

5A) DRAIN INNER TANK DOWN TO 31'-0" WATER LEVEL (APPROX. 6'-4" FROM BTM. OF OVERFLOW NOZZ. MK-"5Z"

5B) BLANK OFF ALL SHELL OPENINGS FOR OUTER TANK.

6) FILL THE OUTER TANK WITH POTABLE WATER (FURNISHED BY CUSTOMER) TO A MAXIMUM HEIGHT OF 31'-0" (DO NOT DRAIN INNER TANK.)
7) IF THE TANK HAS ANCHORAGE, CHECK FOR TIGHTNESS AFTER COMPLETION OF THE FILL OPERATION.
8) THOROUGHLY CHECK THE TANK FOR LEAKS.
9) BLANK OFF ALL ROOF OPENINGS. INSTALL THE SPECIAL TEST COVER ON NOZZLE MK-"3" W/ AIR LINES & MANOMETER. INSTALL PRESSURE/VACUUM RELIEF VALVE ON NOZZLE MK-"8"
10) SLOWLY INTRODUCE AIR UNTIL A PRESSURE OF 5" WC IS OBTAINED. HOLD THIS PRESSURE FOR 15 MINUTES. REDUCE AIR PRESSURE TO 2½" WC AND VISUALLY CHECK THE TANK FOR TIGHTNESS IN ADDITION, ALL SEAMS ABOVE THE WATER LINE SHALL BE SOAPED FOR THE DETECTION OF LEAKS.
11) RELEASE THE INTERNAL PRESSURE BY OPENING THE RELIEF VALVE.
12) REMOVE ONE ROOF TEST COVER TO PROVIDE ADDITIONAL VENTING & DRAIN THE OUTER TANK.
13) AFTER OUTER TANK IS EMPTY, BEGIN DRAINING THE INNER TANK.
14) AFTER COMPLETION OF TEST, REMOVE ALL TEST MATERIAL & RETURN TO WYATT STOCK FOR FUTURE USE.

CAUTION:

UNLESS EXTREME CARE IS EXERCISED, THE ABOVE TEST CAN CAUSE DAMAGE TO THE TANK. DO NOT PERMIT PRESSURES TO EXCEED THE AMOUNTS STATED IN NOTE #10

PAINT NOTES

SEE SHT. # 2

FIELD CAUTION

DESIGN DATA & GENERAL NOTES (OUTER TANK)

DESIGN, FABRICATION, ERECTION & TESTING TO BE IN ACCORDANCE WITH API-653 1ST EDITION, JANUARY 1991 API 650 APP. A & F

CODE NAME & REQ'D: YES

DESIGN PRESSURE:
INT: 5" WC
EXT: 1.75" WC

DESIGN TEMPERATURE: 12°F - 170°F

SPECIFIC GRAVITY: 1.05

JOINT EFFICIENCY: 0.85

RADIOGRAPH: SEE STANDARD THIS SHT.

CORROSION ALLOWANCE: 1/16"

MAX. LIQUID LEVEL: 31'-0"

ROOF CONSTRUCTION: LAP WELD-SUPPORTED CONE

BOTTOM CONSTRUCTION: LAP WELD

HYDROTEST: SEE PROCEDURE THIS SHT.

WIND LOAD: 110 MPH

EARTHQUAKE ZONE: 0

NOMINAL CAPACITY: 1619 BBLS

RECONSTRUCTED BY
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
A SUBSIDIARY OF HOOKER CORPORATION

REPAIRED/ALTERED TO API 653 EDITION 1ST

DATE COMPLETED 1993 — ORIGINAL STANDARD API-650-73
SERIAL NO 24728 — TANK NO TK-4455
TANK DIA 40'-0" NEW/R 40'-0"
SPECIFIC GRAVITY 1.05
DESIGN PRESSURE INT. 5" WC EXT. 1.75" WC
ORIG. CONSTR. DATE 1975
YEAR RECONSTRUCTED 1993
LIQUID LEVEL MAX. 31'-0"
CAPACITY 1619 BBLS.
MAX. OPERATING TEMP. 170°

SHELL COURSE	ALLOW. STRESS	MAT'L
#5		A-516-70

DETAIL OF CODE NAMEPLATE

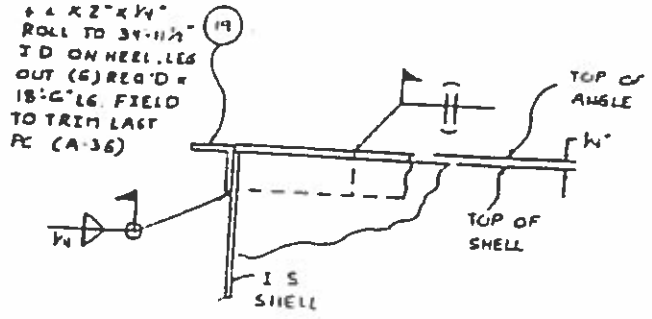
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1) NAME PLATE TO BE INSTALLED ADJACENT TO EXIST. NAME PL ON OUTER TANK
2) SEE SHT. #27 FOR DETAIL OF BRACKET.

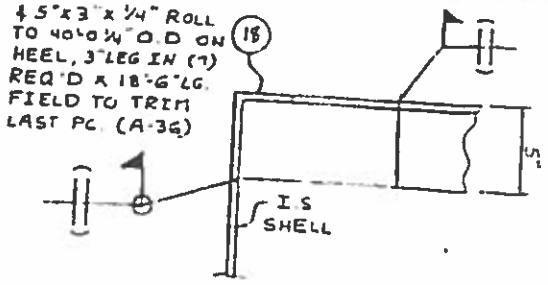
SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/12/93

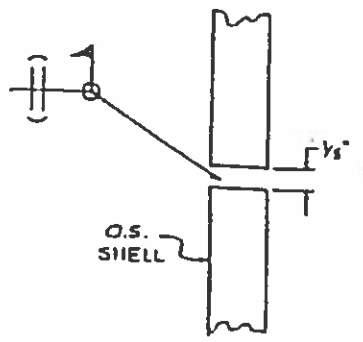
P.O.#: CHO-93-0001
S/O 24728 | ITEM: TK-4444
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK
GENERAL NOTES #2
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: JKH DATE: 2-10-93
CHECKED: C.C. APPROVED:



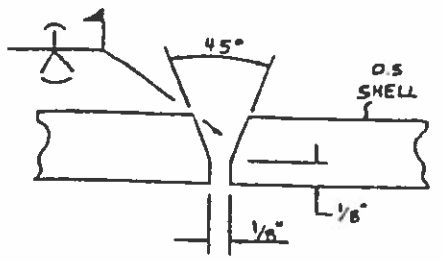
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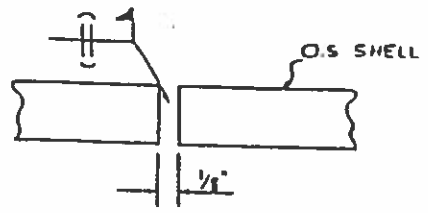
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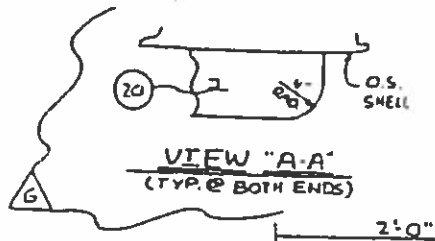
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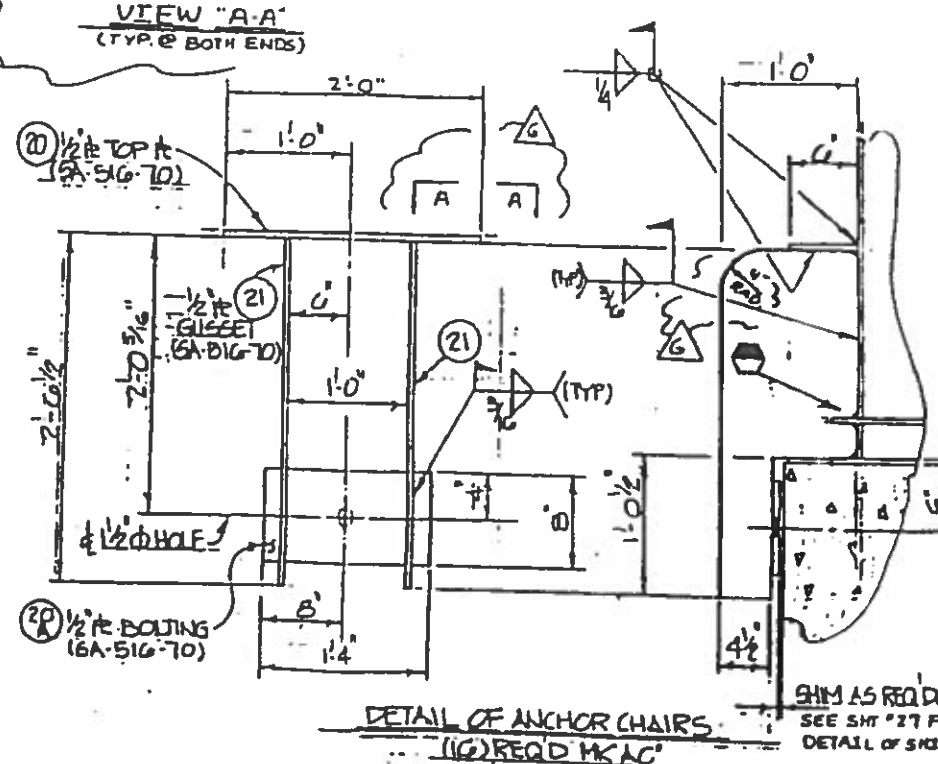
DETAIL "L1"



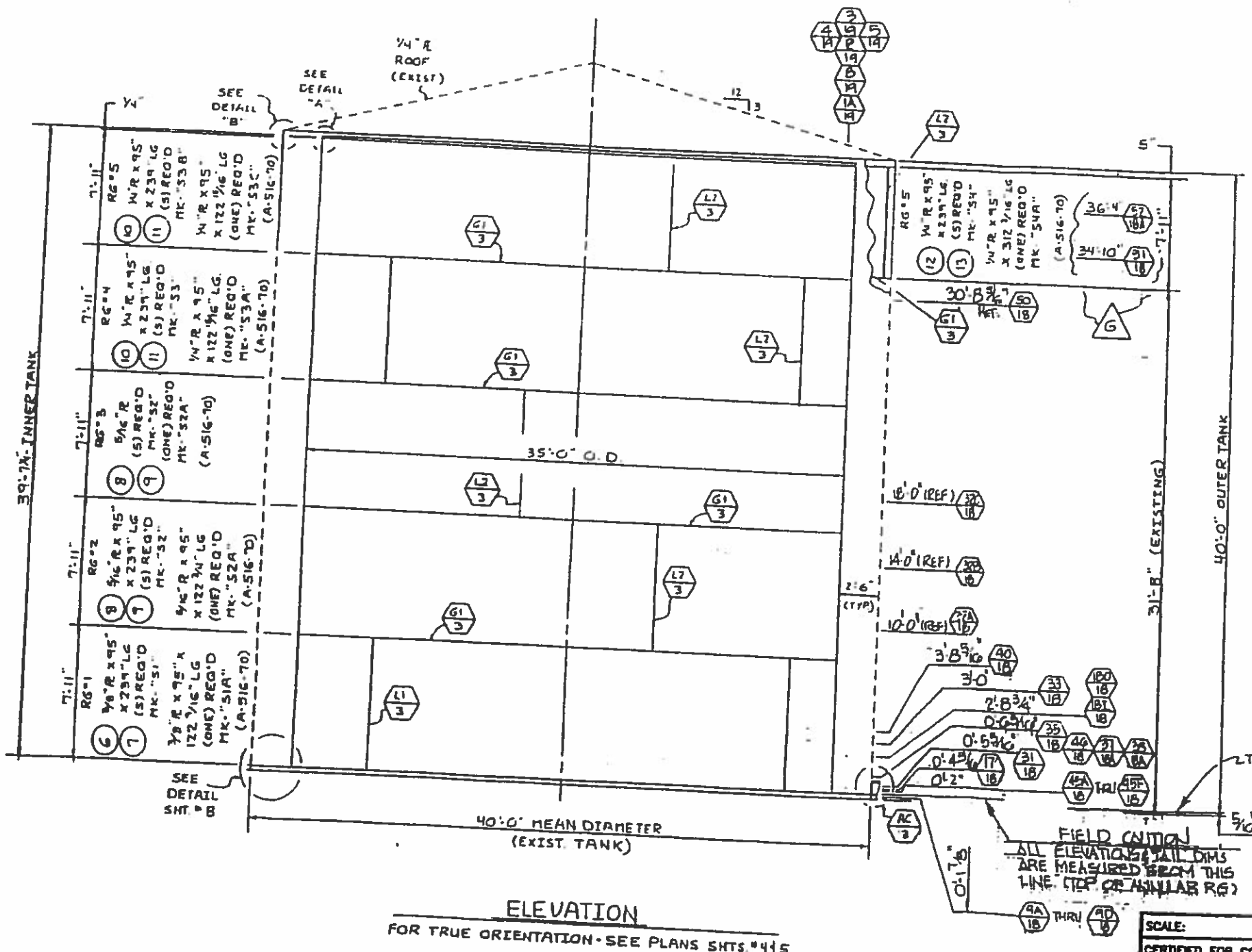
DETAIL "L2"



VIEW "A-A" (TYP. @ BOTH ENDS)



DETAIL OF ANCHOR CHAIRS (16) REQ'D MK AC



ELEVATION

FOR TRUE ORIENTATION - SEE PLANS SHTS #4 & 5

FIELD TO NOTCH GUSSETS AS REQ'D TO CLEAR BOTTOMS & SEAL WELD AFTER INSTALLATION

NO.	REVISION	DATE	BY	CHK'D
E	REV. DIMS @ ANCHOR CHAIR	2-10-93	JKH	C.E.
D	ADD ELEV. OF MK "31" & "32"	2-4-93	JKH	C.E.
C	REV. AS NOTED	2-3-93	CDS	C.E.
G	REV. ELEV. OF MK "31A" & "33" REV. DTL OF ANCHOR CHAIRS	4-28-93	JKH	C.E.
F	REV. HT. OF TANK & DETAIL "A"	3-31-93	JKH	C.E.

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/10/93
BY:

P.O.#: CHO-93-0001

S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK

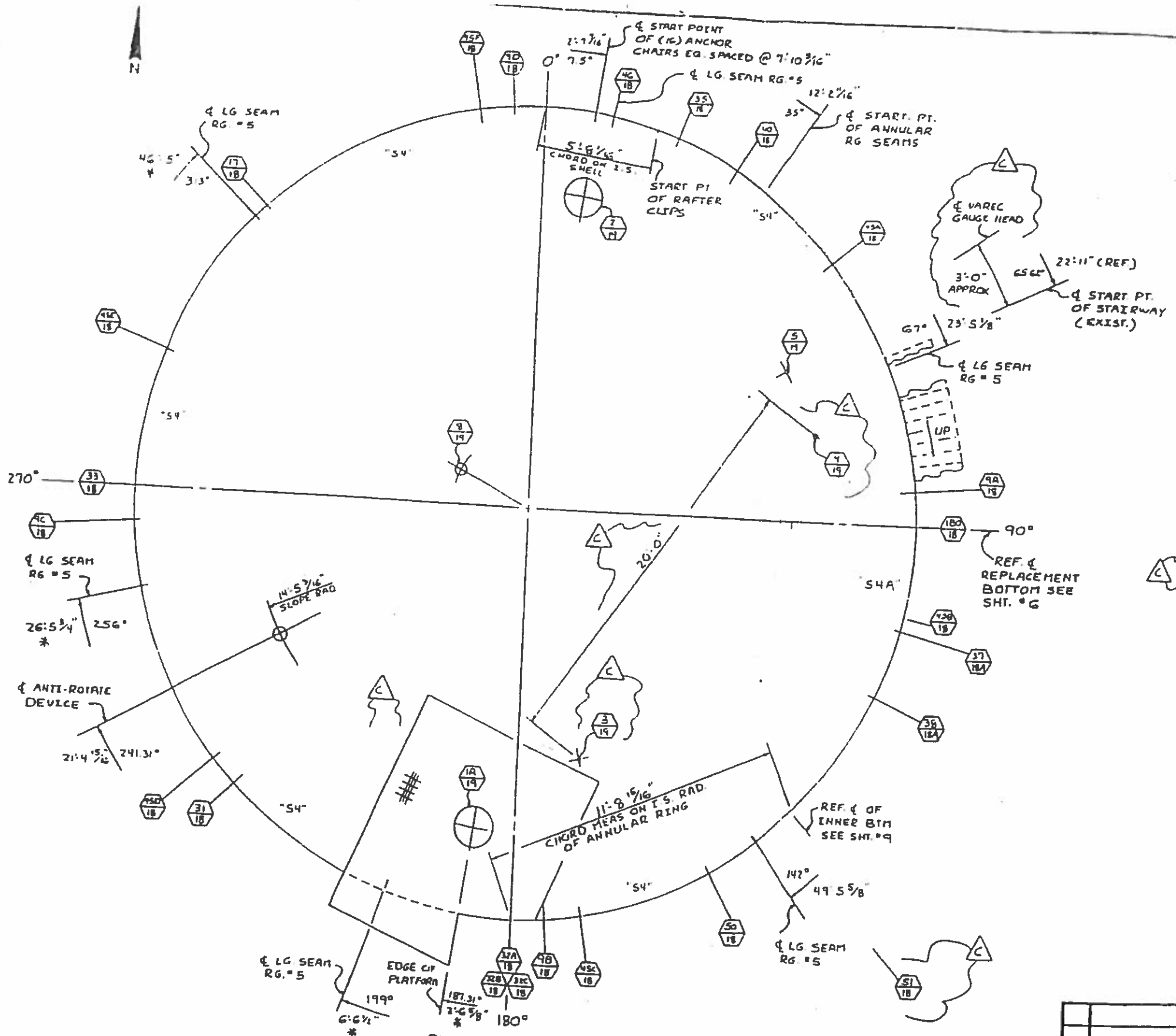
ELEVATION

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH | DATE: 1-12-93

CHECKED: C.E. | APPROVED:

NO. W-92-2472A-3 REV. G



NOZZLE DATA				
NOZZLE MARK	LOCATION	∠	ANGLE "℄ ARC DIVERSION	SLOPE RADIUS
46	SHELL RING "1	10°	3'-5 15/16"	
35	SHELL RING "1	20°	6'-11 9/16"	
40	SHELL RING "1	30°	10'-5 3/4"	
45A	SHELL RING "1	50°	17'-5 9/16"	
9A	SPACER RING BETWEEN BOTTOMS	85°	29'-8 1/4"	
180	SHELL RING "1	90°	31'-5 3/16"	
45B	SHELL RING "1	103°	35'-11 7/16"	
50	SHELL RING "4	150°	52'-4 5/8"	
45C	SHELL RING "1	170°	59'-4 7/16"	
9B	SPACER RING BETWEEN BOTTOMS	175°	61'-1 7/16"	
31	SHELL RING "1	225°	15'-8 9/16" *	
45D	SHELL RING "1	230°	17'-5 7/16" *	
9C	SPACER RING BETWEEN BOTTOMS	265°	29'-8 1/4" *	
33	SHELL RING "1	270°	31'-5 3/16" *	
45E	SHELL RING "1	290°	38'-5" *	
17	SHELL RING "1	315°	47'-1 3/4" *	
45F	SHELL RING "1	350°	59'-4 7/16" *	
9D	SPACER RING BETWEEN BOTTOMS	355°	61'-1 7/16" *	
32A	SHELL RING "1	180°	62'-10 3/8"	
32B	SHELL RING "2	180°	62'-10 3/8"	
32C	SHELL RING "3	180°	62'-10 3/8"	
37	SHELL RING "1	105°	36'-8 9/16"	
38	SHELL RING "1	115°	40'-1 13/16"	
51	SHELL RING "5	138.81°	48'-5 3/4"	
1A	ROOF	187.31°	2'-6 5/8" *	16'-5 5/16"
8	ROOF	292.31°	39'-2 7/16" *	4'-1 1/2"
2	ROOF	7.31°	2'-6 5/8"	16'-5 5/16"
3	ROOF	209°	10'-1 5/16" *	12'-4 7/16"
4	ROOF	165°	57'-7 1/2"	12'-10 3/8"
5	ROOF	60°	20'-11 7/16"	15'-5 1/4"

*-DENOTES ARC MEASURED FROM 180° ℄

NOTE

ALL ARC DIMENSIONS IN PLAN ARE MEASURED ON O.S. CIRCUMFERENCE OF SHELL RG "1 FOR 0° TO 180° & 180° TO 0° CLOCKWISE

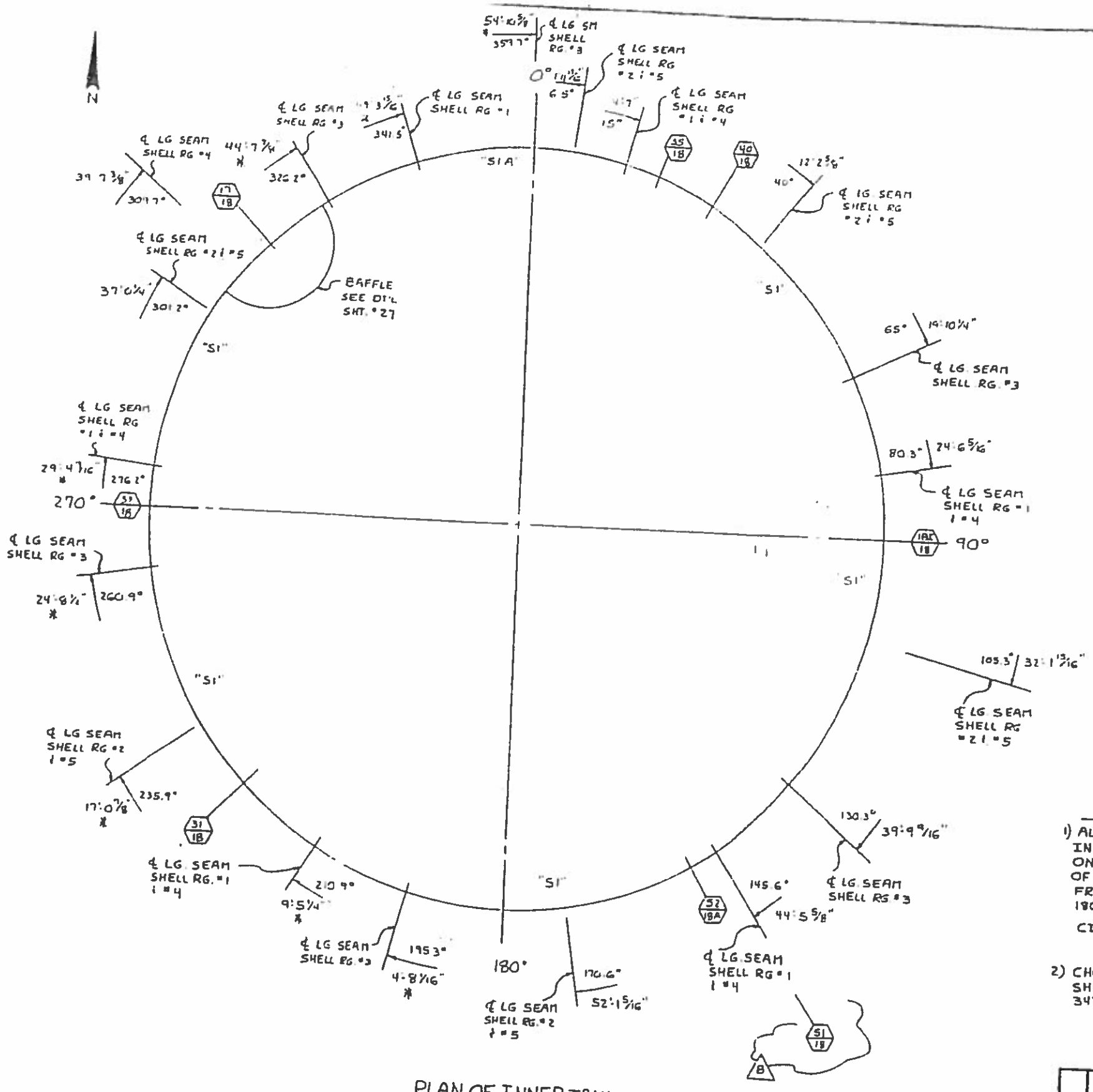
CIRCUMFERENCE = 125'-8 3/4"
1" = 9 3/16" (4.9097")

NO.	REVISION	DATE	BY	CHKD
C	REV. ORIENTATIONS AS NOTED	1-22-93	JKH	CG
B	ADD. ROOF NOZZ. ORIENT.	2-5-93	JKH	CG
A	REV. PER CUST. APPROVAL	2-2-93	JKH	CG

SCALE:

CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 2/03/93
BY: Charles Gilchrist

P.O.#: CHO-93-0001
S/O 2472A | ITEM: TK-3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0" ø x 32'-0" HIGH TANK
PLAN OF OUTER TANK
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: JKH DATE: 1-30-93
CHECKED: C.G. APPROVED:
NO. W-92-2472A-4 REV C



PLAN OF INNER TANK

NOZZLE DATA				
NOZZLE MARK	LOCATION		ANGLE "A" ARC DIMENSION	
1B1	SHELL RING #1	90°	27'-5 3/8"	
52	SHELL RING #5	150°	45'-9 3/4"	

* - DENOTES ARC MEASURED FROM 180° ℄

NOTES

1) ALL ARC DIMENSIONS IN PLAN ARE MEASURED ON O.S. CIRCUMFERENCE OF SHELL CLOCKWISE FROM 0° TO 180° & 180° TO 0°

CIRCUMFERENCE - 109'-11 1/2"
1° = 3 11/16" (3.6659")

2) CHORD DIMENSIONS FOR SHELL PLATES BASED ON 34'-11 1/4" I.D. CIRCLE:

"S1" - 18'-10 5/16"
"S1A" - 10'-0 13/16"

NO.	REVISION	DATE	BY	CHK'D
B	ADD ORIENT. OF MK-"S1"	2-5-93	JKH	CC
A	REV. PER CUST APPROVAL	2-2-93	JKH	CC

SCALE:

CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 2/03/93
BY: Charlie Cox

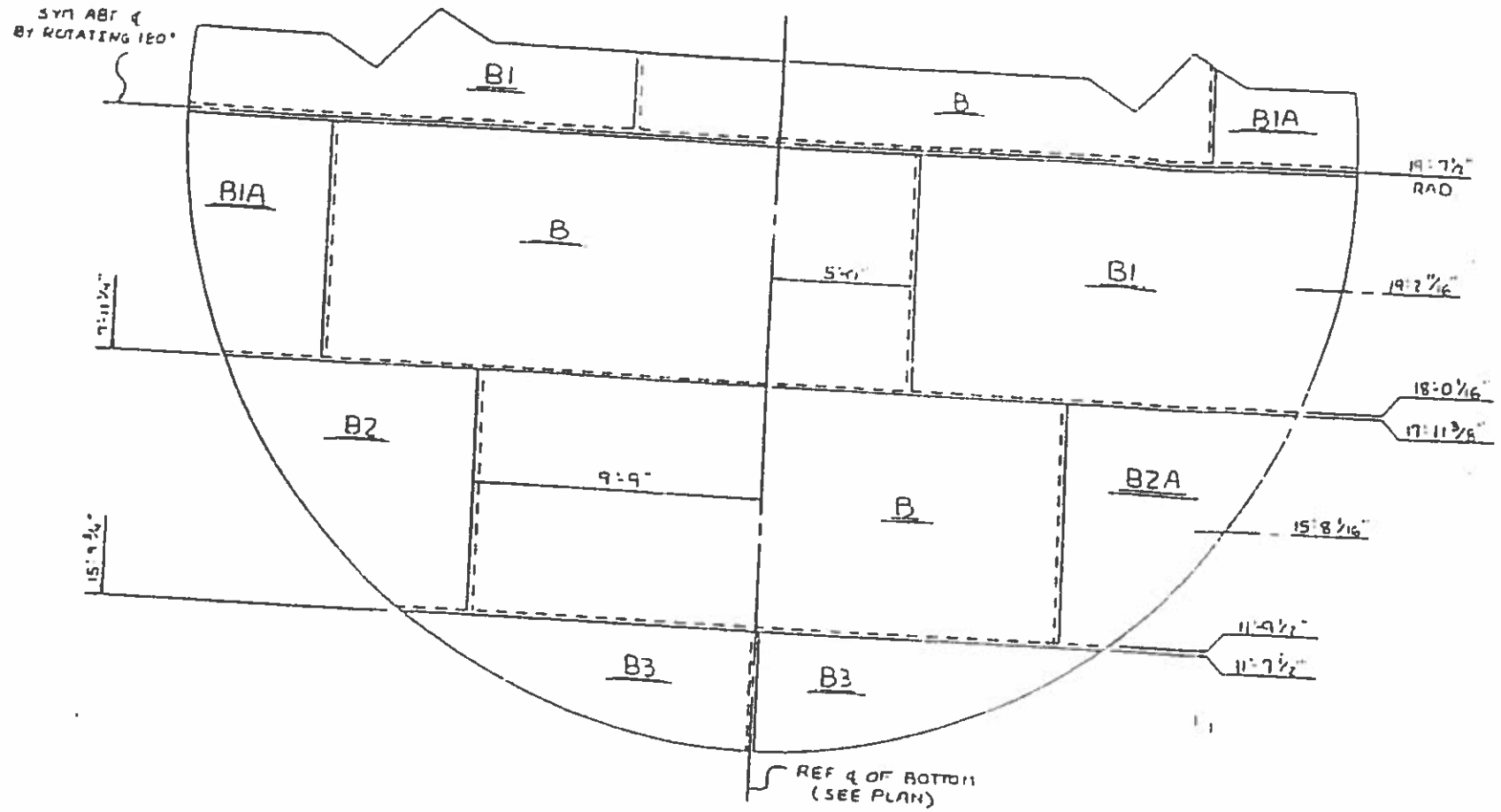
P.O.#: CHO-93-0001
S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

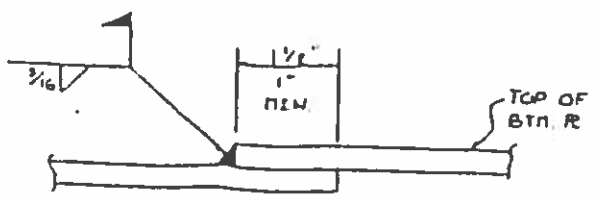
MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø X 32'-0" HIGH TANK

PLAN OF INNER TANK

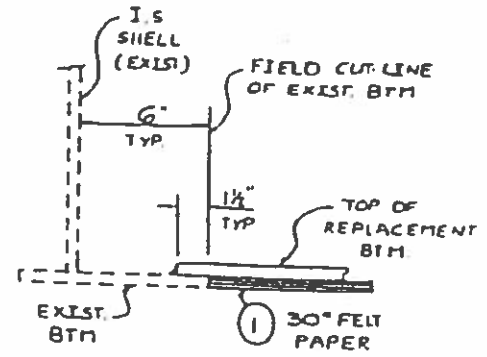
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: JKH | DATE: 1-30-93
CHECKED: CC | APPROVED:
NO. W-92-2472A-5 | REV. B



REPLACEMENT BOTTOM LAYOUT



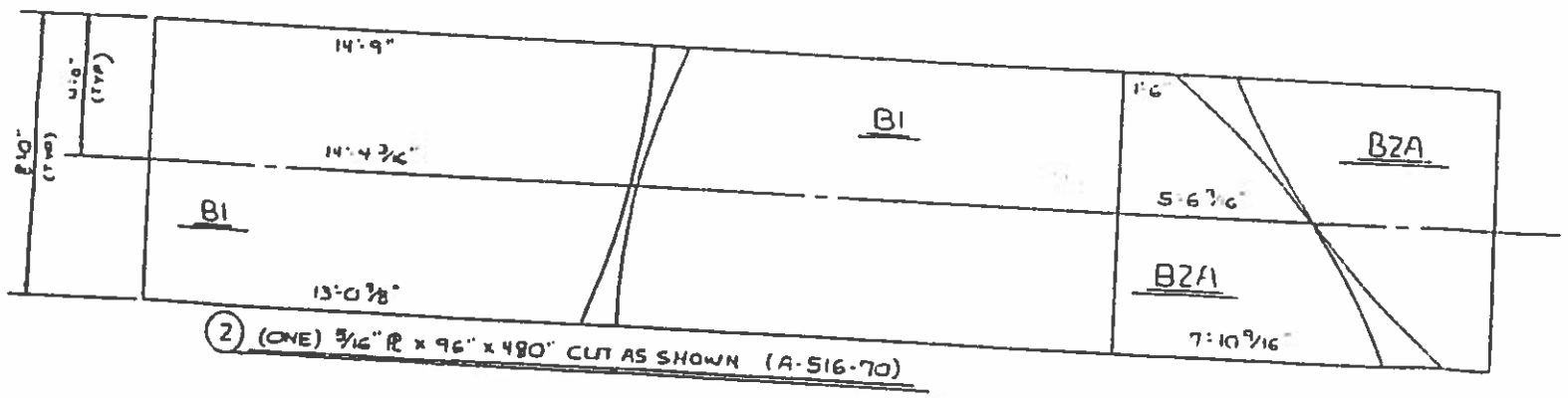
DETAIL OF LAP-WELD SEAM
(TYPICAL)



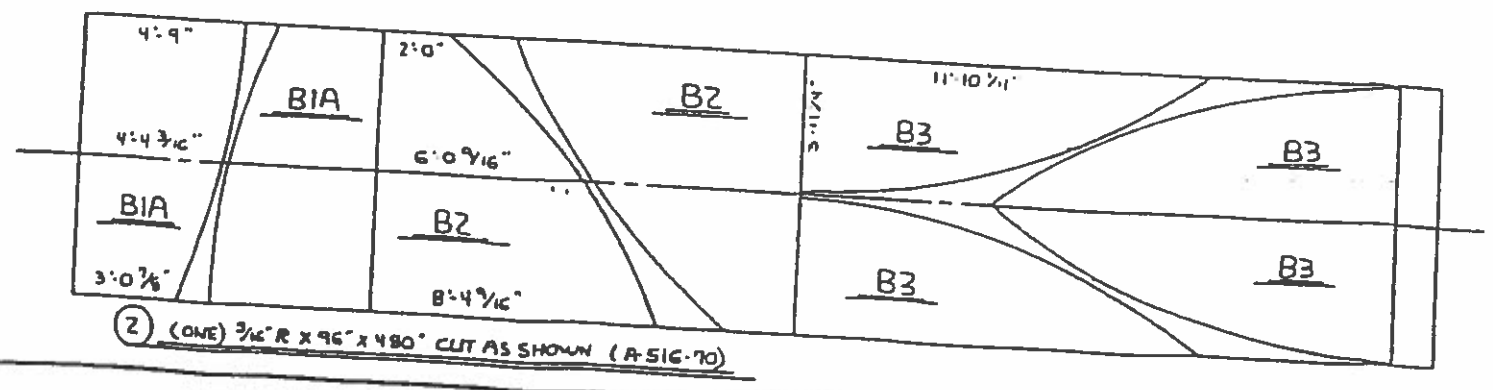
DETAIL OF BTM. REPLACEMENT

FIELD CAUTION

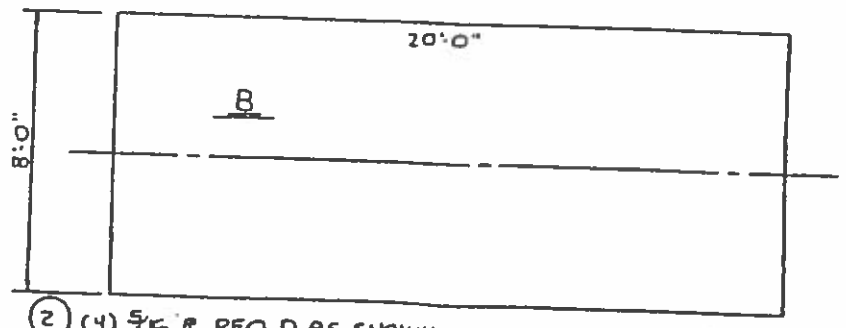
DO NOT INSTALL FELT PAPER & REPLACEMENT BOTTOM UNTIL CUST. HAS COMPLETED ALL WORK ON SAND PAD.



(2) (ONE) 5/16" R x 96" x 480" CUT AS SHOWN (A-516-70)



(2) (ONE) 5/16" R x 96" x 480" CUT AS SHOWN (A-516-70)



(2) (4) 5/16" R REQ'D AS SHOWN CUT FROM (2) PCS. 96" x 480" (A-516-70)

NOTE

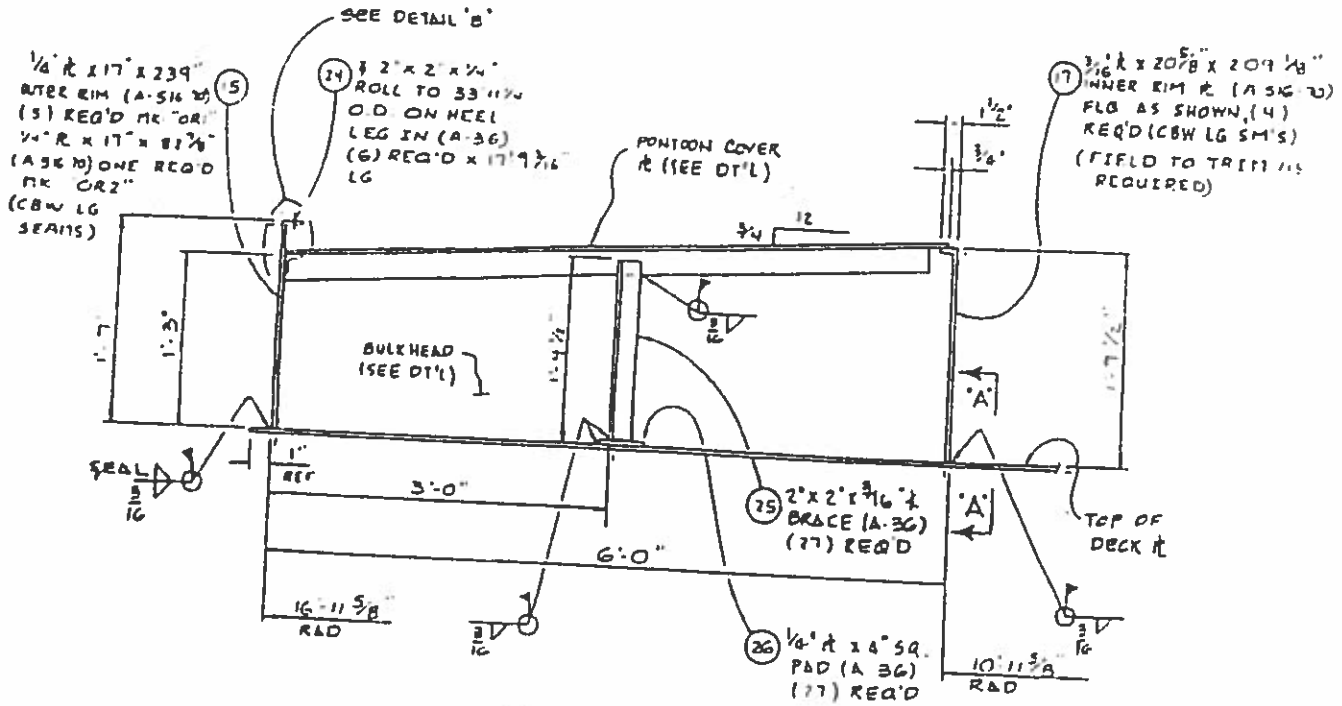
ALL SKETCH PLATES TO BE CUT BY THE SHOP

SCALE:

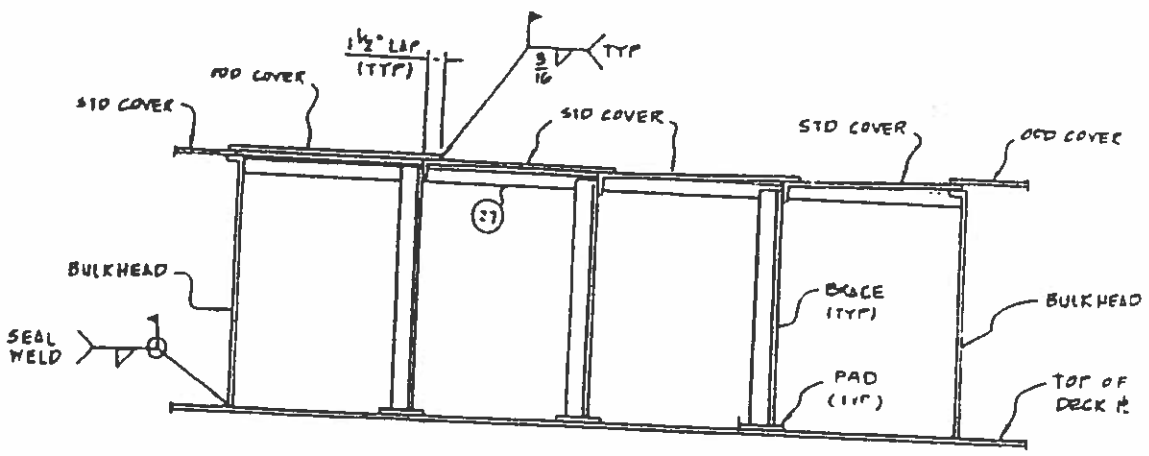
CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/28/99
BY:

NO.	REVISION	DATE	BY	CHKD
A	REV. PER CUST APPROVAL	1-28-99	JKH	C.E.

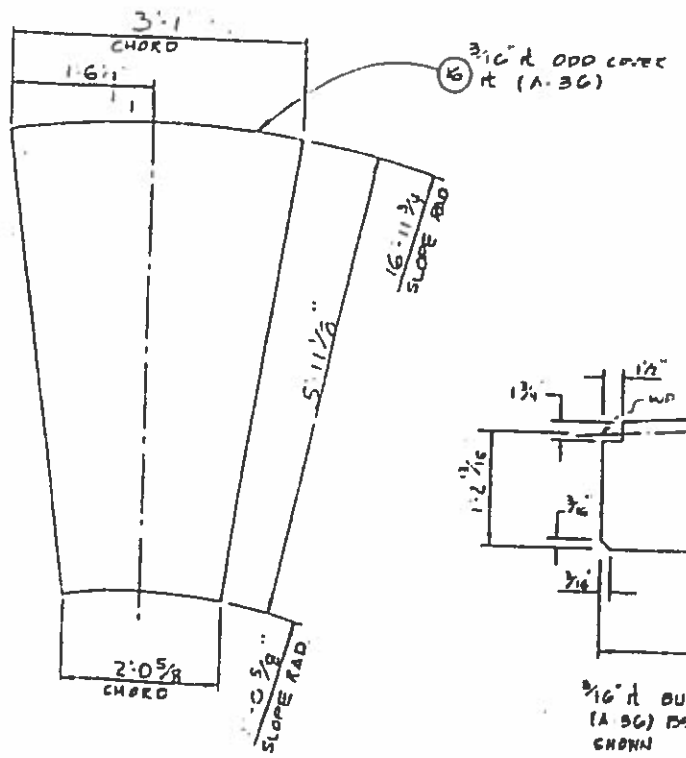
P.O.#: C110-93-0001
S/O 2472A | ITEM: T-3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HDISH TANK
REPLACEMENT BOTTOM LAYOUT
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: JKH DATE: 1-8-99
CHECKED: C.E. APPROVED:
NO. WJ-92-2472A-6 REV. A



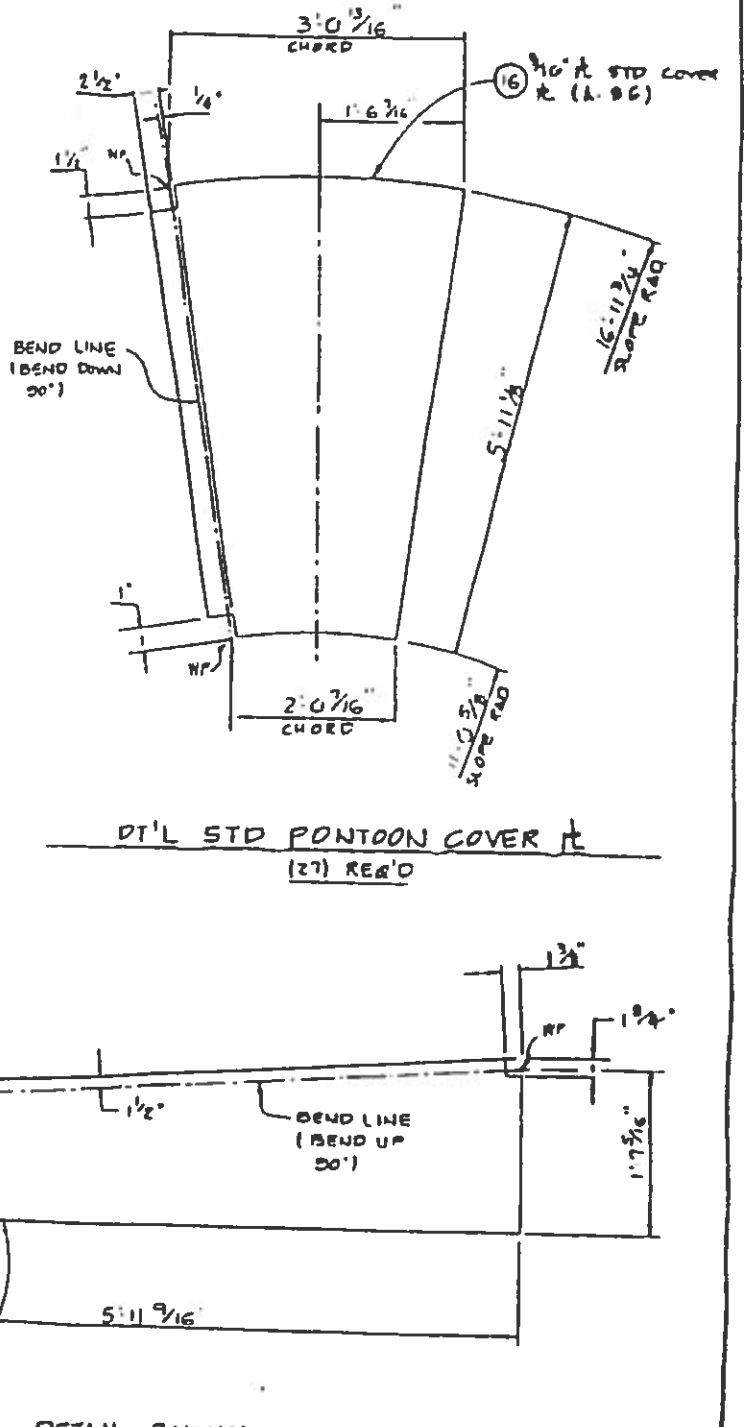
SECTION THRU PONTOON @ BULKHEAD
(TYP (9) PLACES)



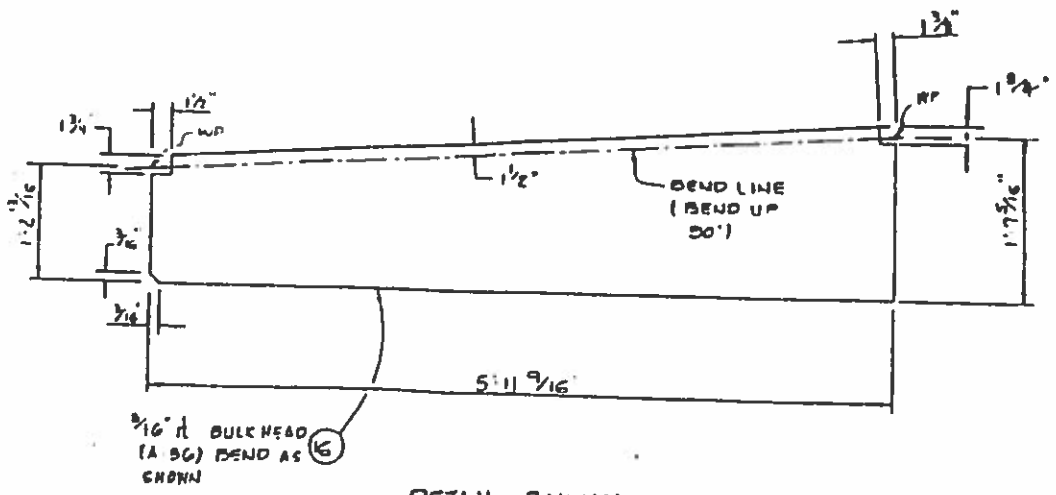
TYP COVER ℄ / BULKHEAD ARRANGEMENT



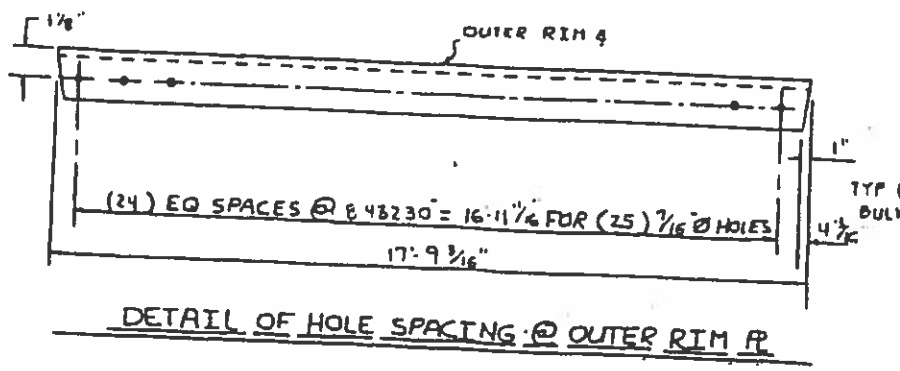
DT'L ODD PONTOON COVER ℄
(9) REQ'D



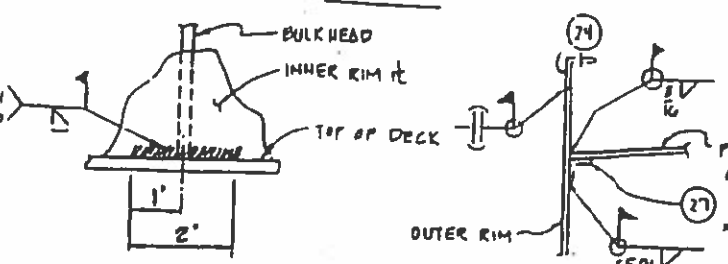
DT'L STD PONTOON COVER ℄
(27) REQ'D



DETAIL BULKHEAD
(9) REQ'D



DETAIL OF HOLE SPACING @ OUTER RIM ℄



SECTION 'A-A'
(TYP WATER STOP @ BULK HEAD)

DETAIL "B"

NOTES

1. BULKHEADS ARE TO BE SEAL WELDED TO INSURE EACH PONTOON COMPARTMENT IS WATER TIGHT.
2. ALL WELDS TO BE 3/16" CONTINUOUS FILLET SEAL WELDS, UNLESS OTHERWISE NOTED.

A	REV PER CUST. APPROVAL	1-27-93	JKH	CL.
	REVISION			

S/O 2472A | TANK NO. TK-3455

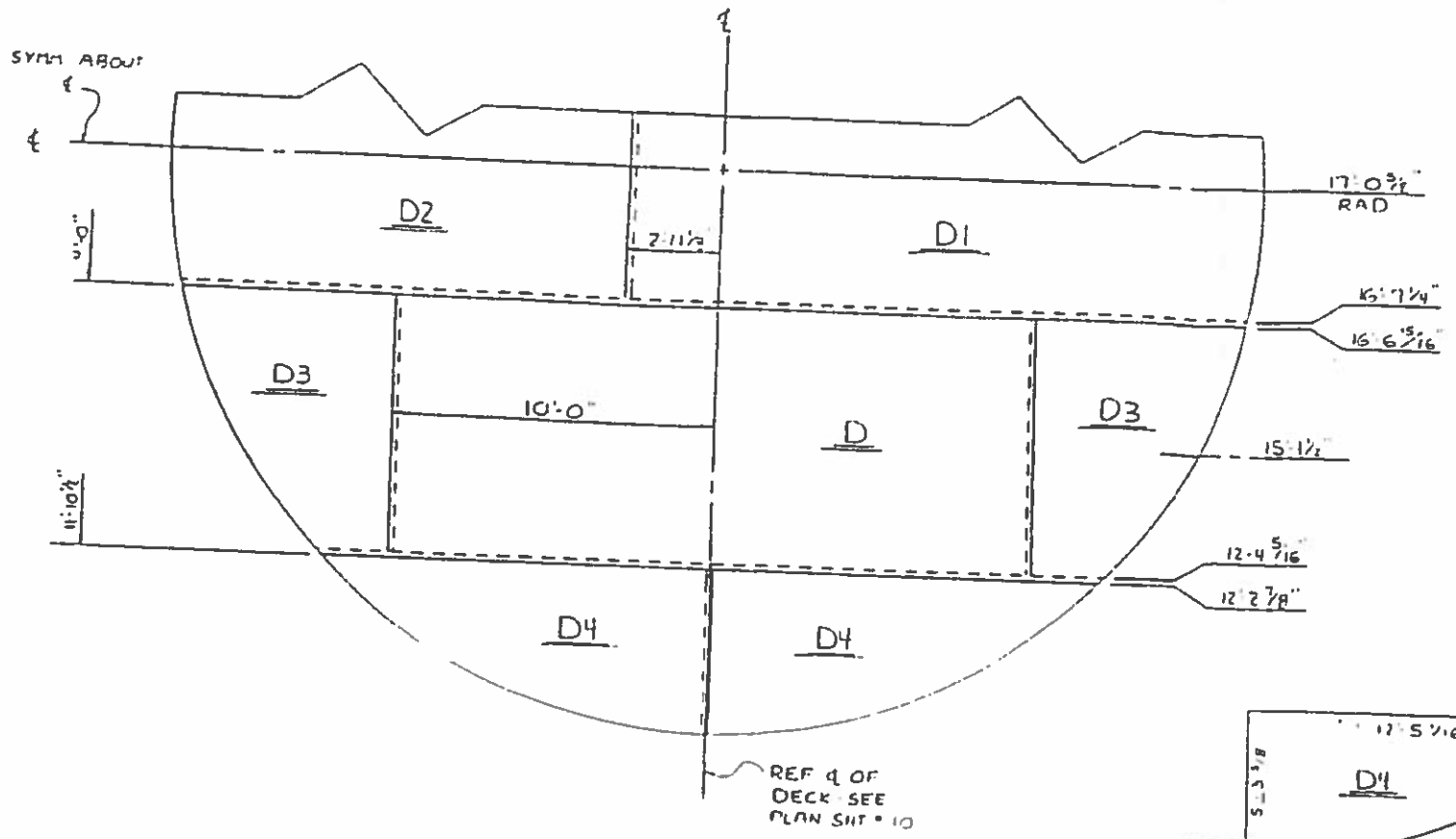
WYATT FIELD SERVICE COMPANY

DETAIL FLOAT. ROOF PONTOON ASS'T

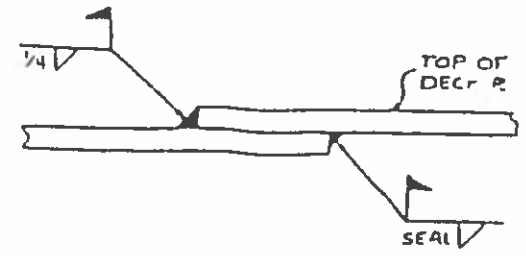
CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-15-93
CHECKED: C.E. APPROVED:

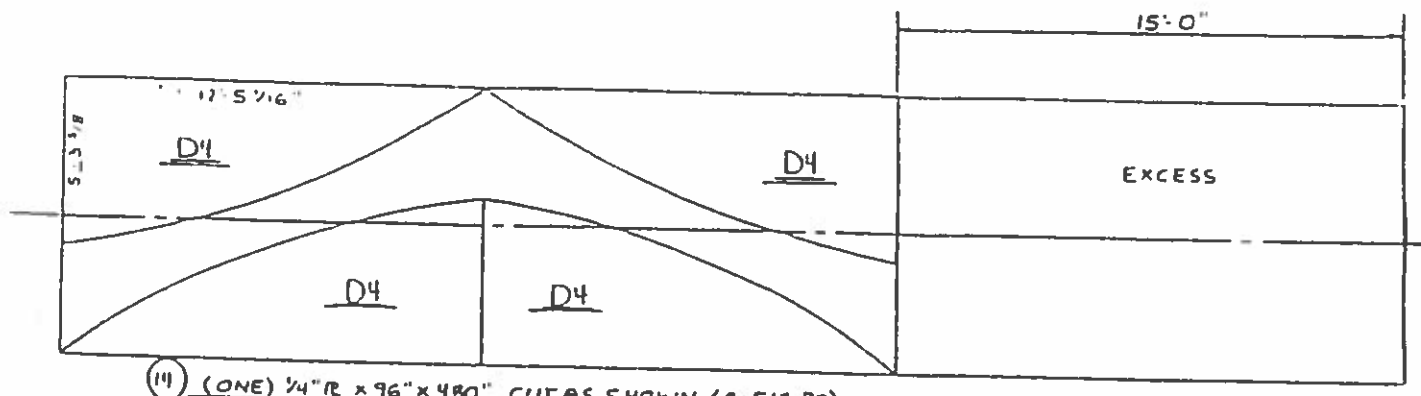
No W-92-2472A-17 REV. A



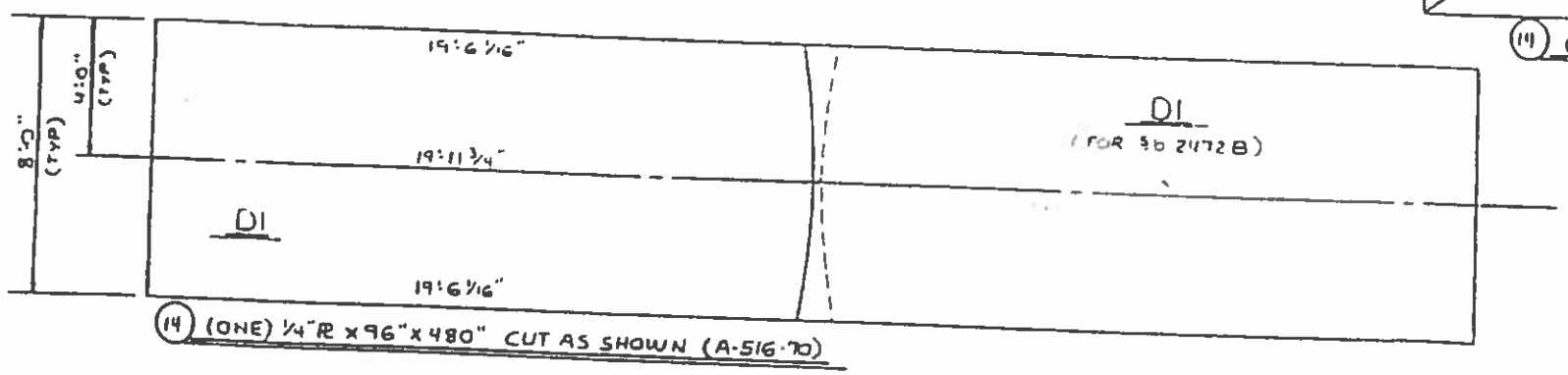
DECK LAYOUT



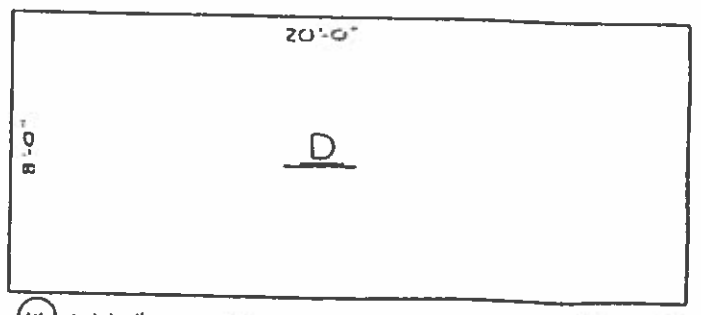
DETAIL DECK LAP WELD SEAM
(TYPICAL)



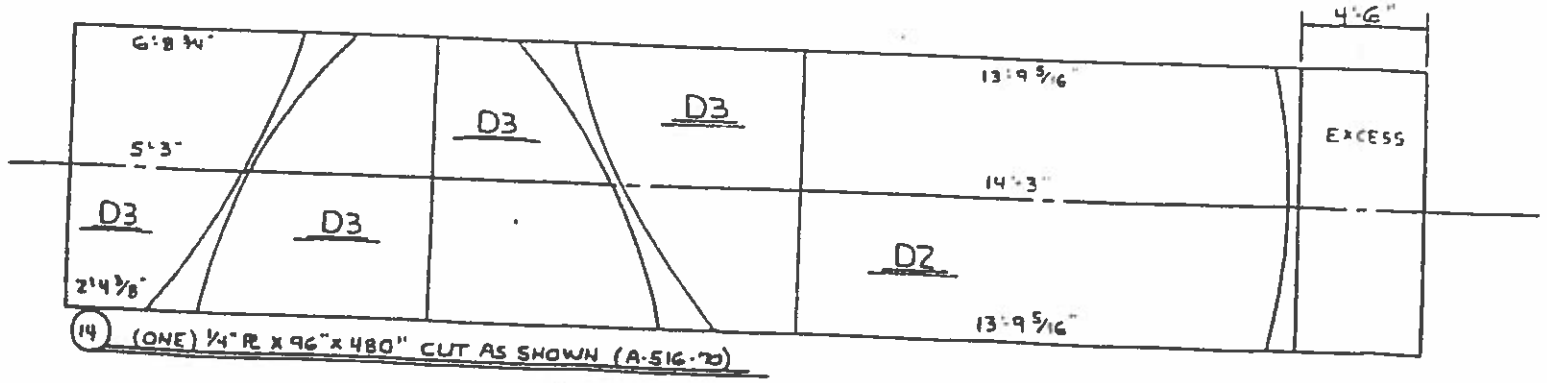
(11) (ONE) 1/4" PL x 96" x 480" CUT AS SHOWN (A-516-70)



(14) (ONE) 1/4" PL x 96" x 480" CUT AS SHOWN (A-516-70)



(14) (2) 1/4" PL REQ'D AS SHOWN CUT FROM PL 96" x 480" (A-516-70)



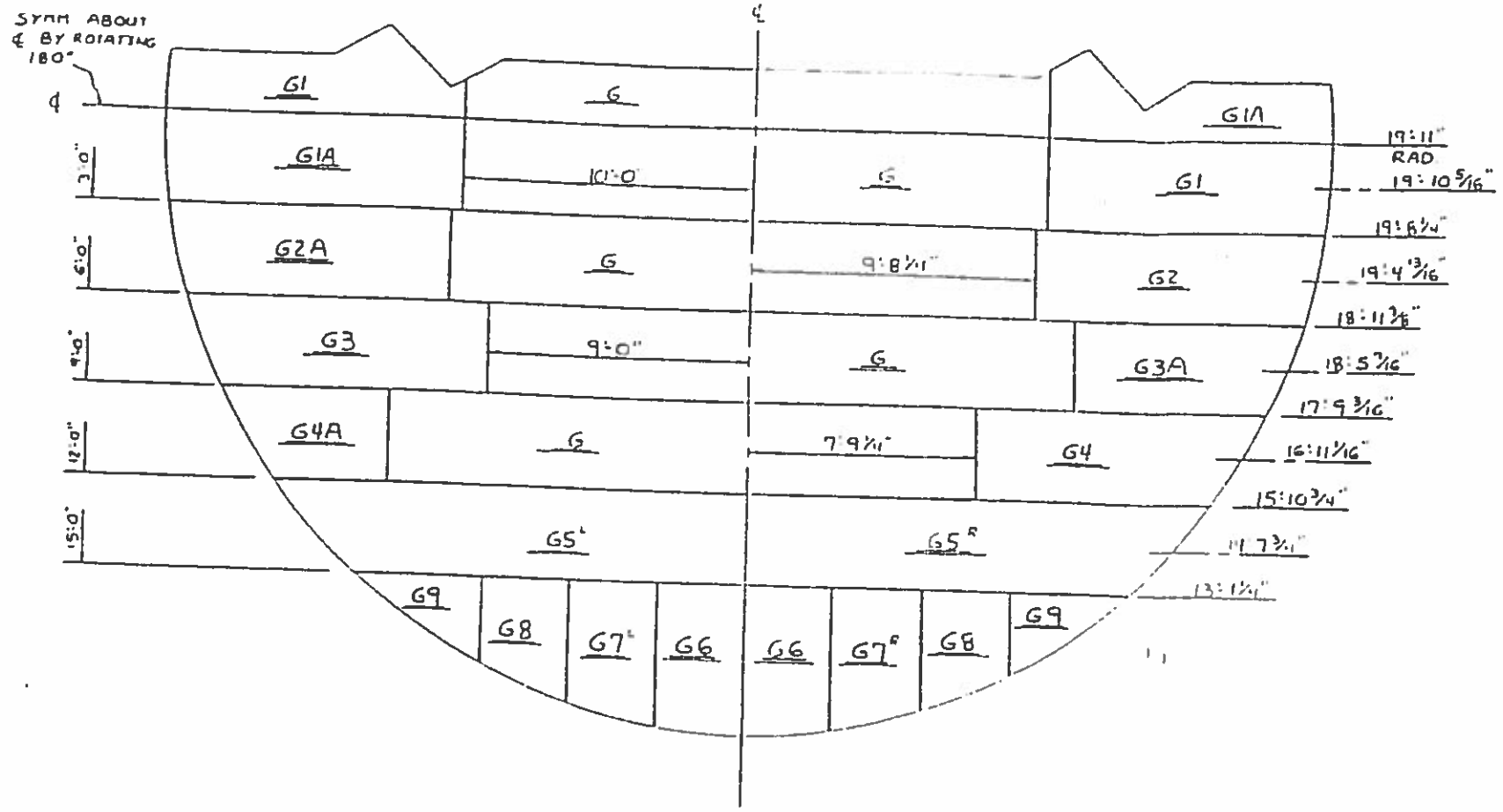
(14) (ONE) 1/4" PL x 96" x 480" CUT AS SHOWN (A-516-70)

NOTE
SHOP TO CUT ALL SKETCH PLATES

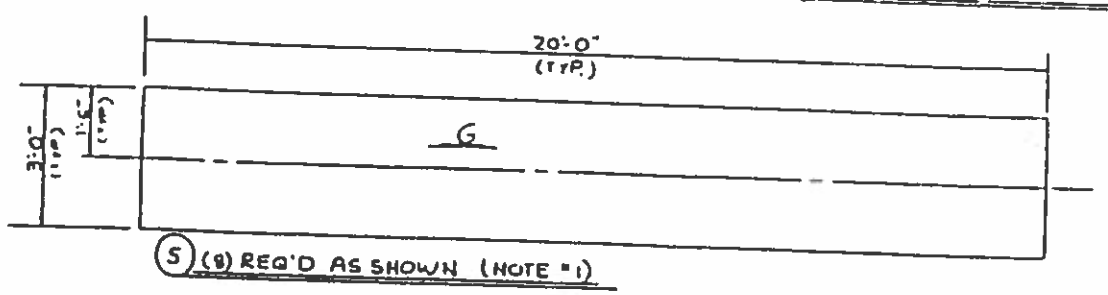
SCALE:
CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/11/93
BY:

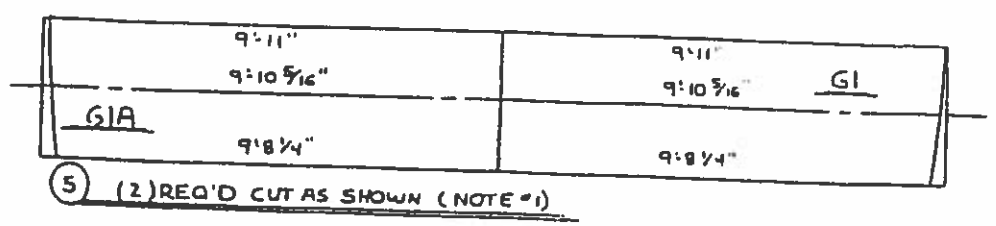
NO	REVISION	DATE	BY	CHK'D
A	REV. PER CUST APPROVAL	1-27-93	JKH	CC

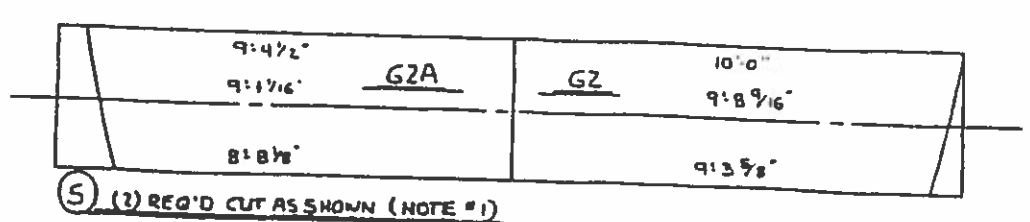
P.O.#: CHU-93-001
S/O 2472A | ITEM: TK 3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS FOR AN EXIST 40'-0" Ø x 32'-0" HIGH TANK
DECK LAYOUT
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: JKH DATE: 1-13-93
CHECKED: C.C. APPROVED:
NO. W-92-2472A-11 REV. A



GRATING LAYOUT

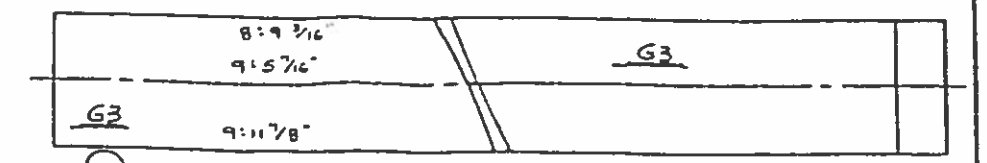


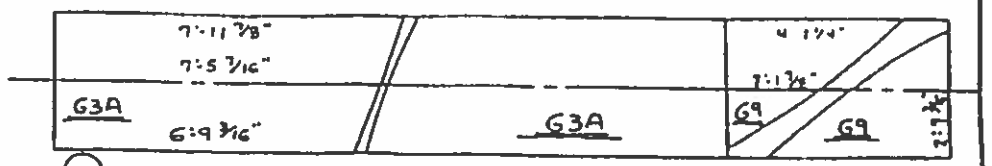


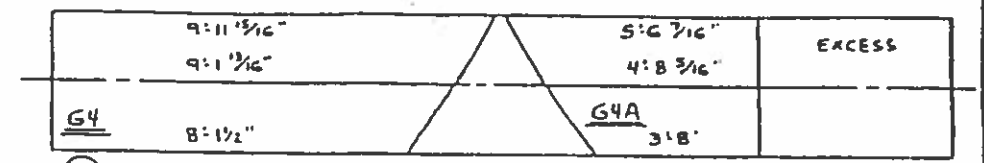


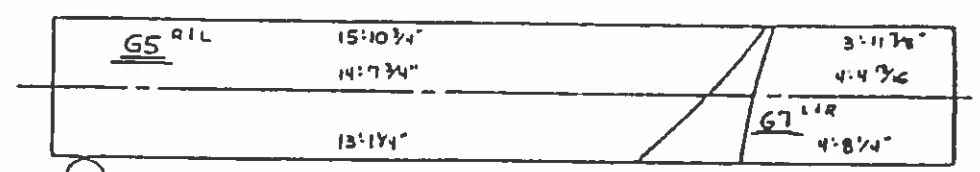
NOTES

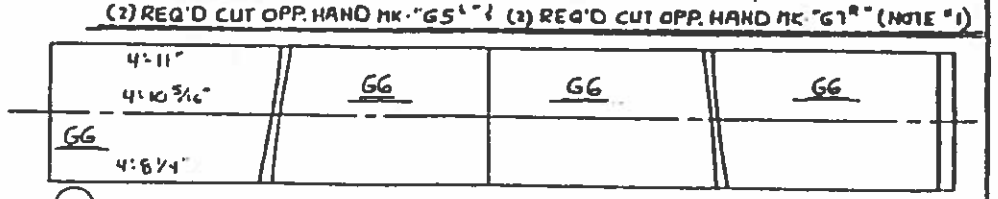
1) ALL SKETCH PLATES TO BE CUT FROM GRATING ⅞" x ¼" x 3" BEARING BARS (W 22 4) PLAIN MILL FINISH 36" x 240" (A 36)
2) ALL SKETCH PLATES TO BE CUT BY THE SHOP
3) ALL SKETCH PLATES ARE TO BE CUT & INSTALLED WITH THE CROSS BARS UP
4) ALL GRATING SKETCH PLATES TO BE HOT DIPPED GALVANIZED AFTER BURNING.

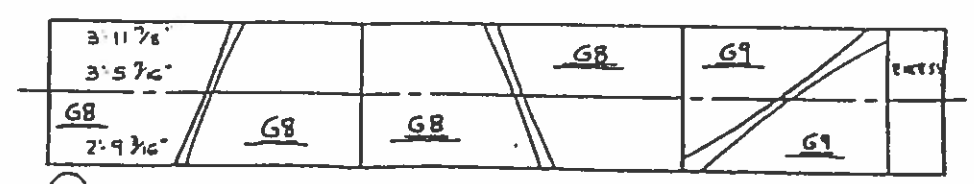












P.O.#: CHO-93-0001

S/O 2472A | ITEM: T-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC MODIFICATIONS TO AN EXIST. 40'-0" ø x 37'-0" HIGH TANK

GRATING LAYOUT

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-7-93

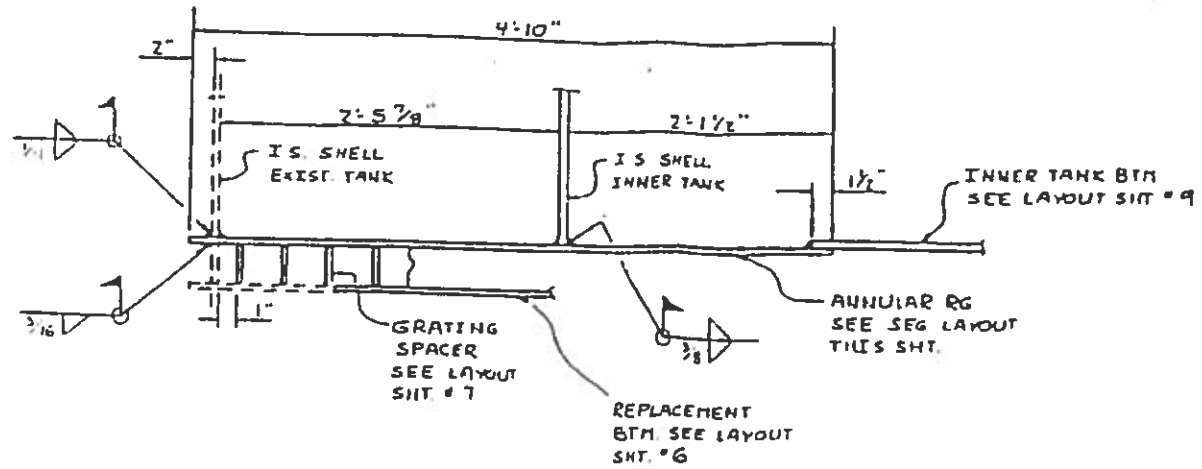
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NO. W-92-2472A-7 REV. A

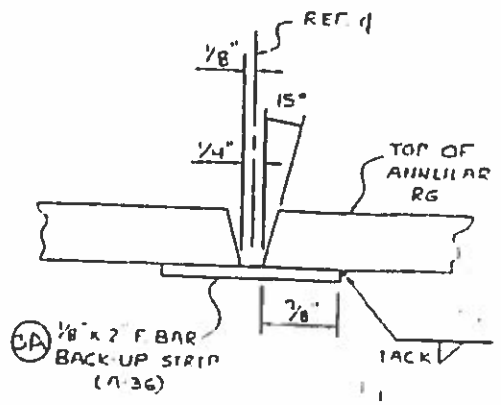
SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/12/93
BY:

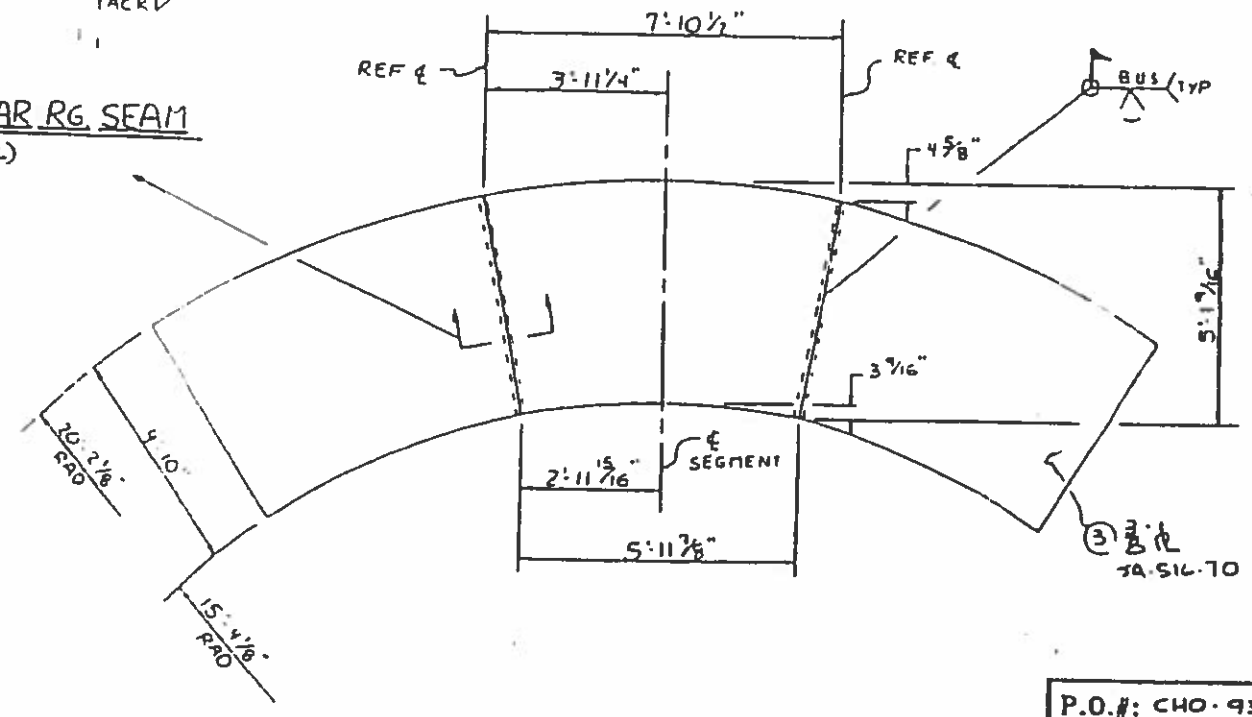
NO.	REVISION	DATE	BY	CHK'D
A	REV. PER CUST. APPROVAL	1-20-93	JKH	CG.



DETAIL DOUBLE BOTTOM ASSEMBLY



DETAIL ANNULAR RG. SEAM
(TYPICAL)



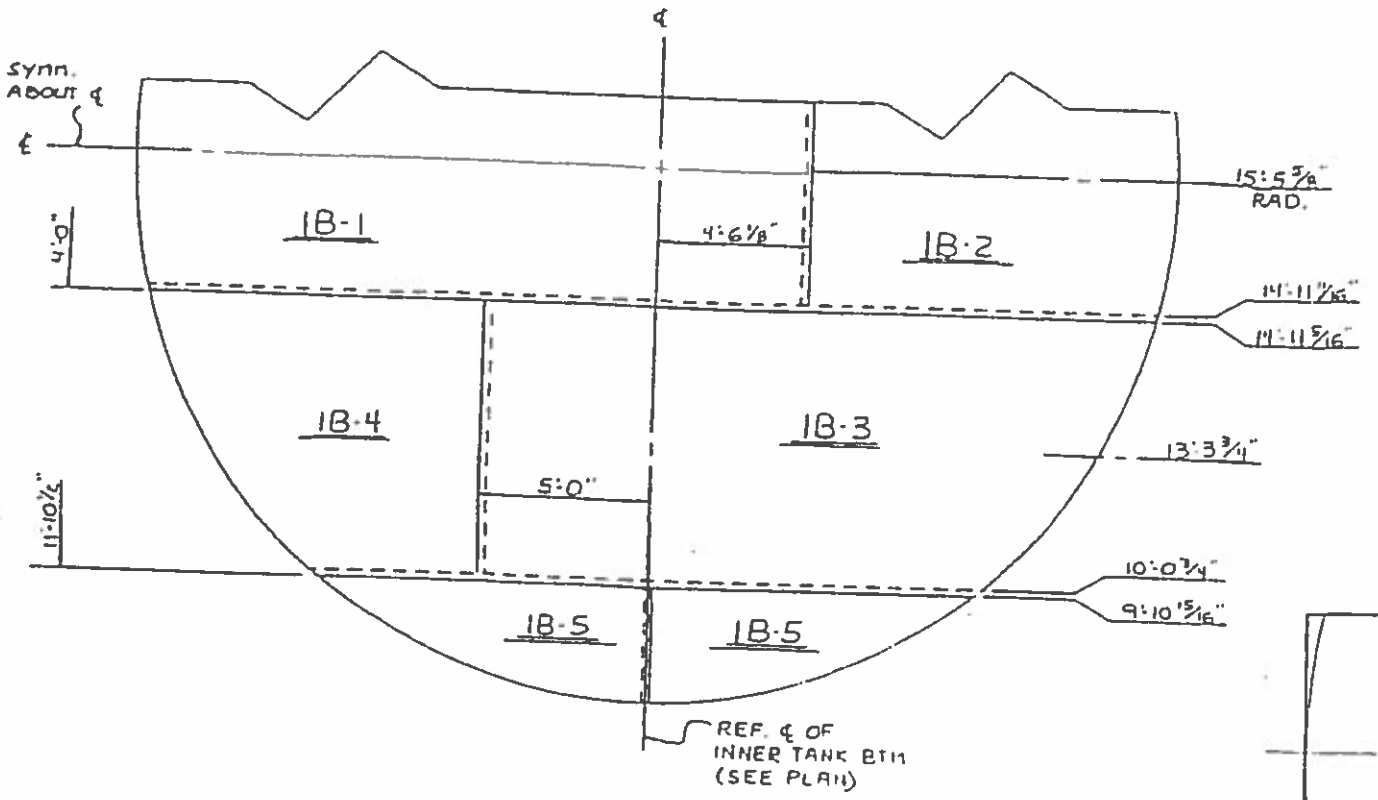
DETAIL OF ANNULAR RG SEGMENT
(16) TOTAL REQUIRED

SCALE:

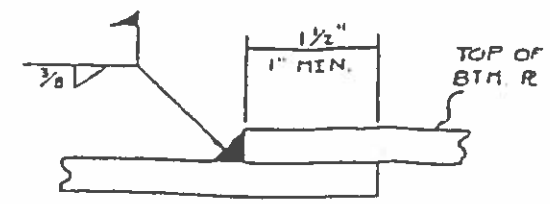
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WYATT FIELD SERVICE COMPANY
DATE: 1/20/93
BY:

NO.	REVISION	DATE	BY	CHKD
A	REV. PER CUST. APPROVAL	1-20-93	JKH	CE

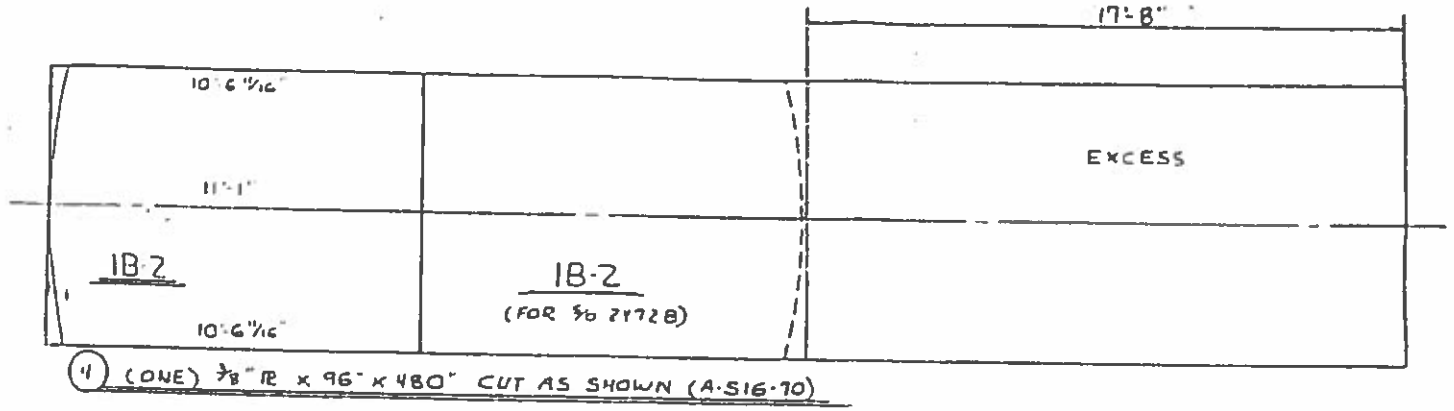
P.O.#: CHO-93-0001
S/O 2472A | ITEM: T-3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK
DETAIL OF ANNULAR RING
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: JKH DATE: 1-7-93
CHECKED: C.E. APPROVED:
NO. W-92-2472A-8 REV. A



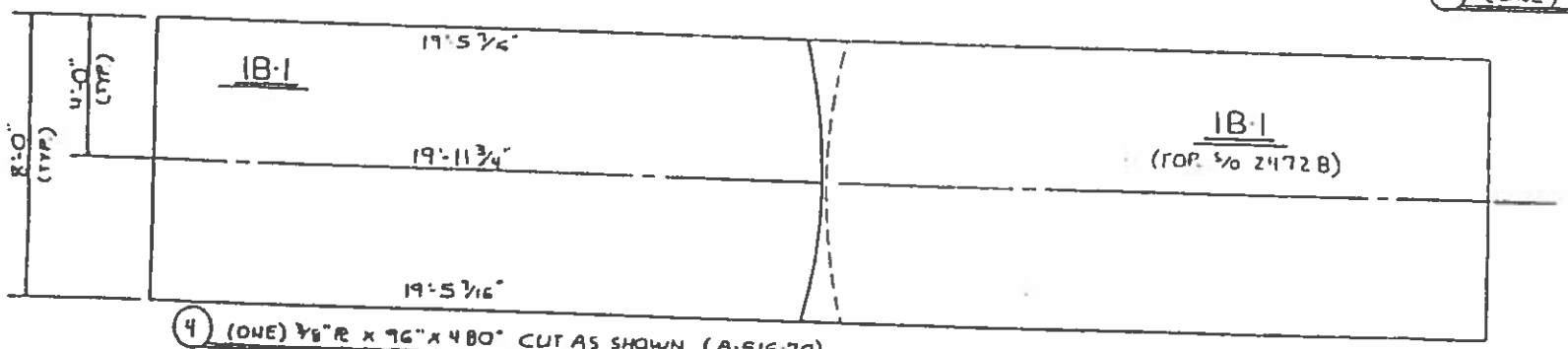
INNER TANK BOTTOM LAYOUT



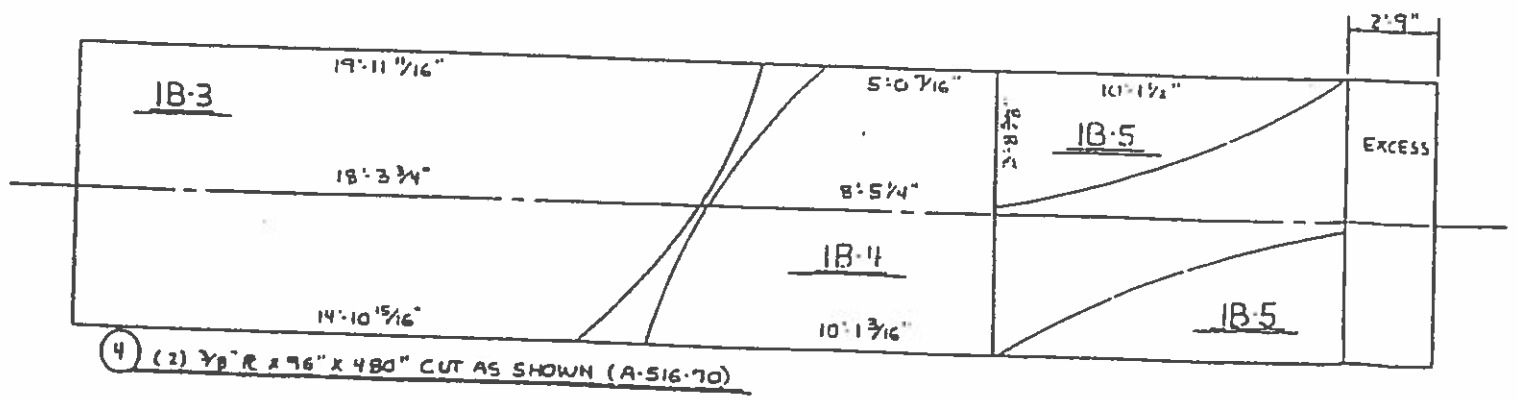
DETAIL LAP WELD BOTTOM SEAM
(TYPICAL)



(4) (ONE) 3/8" R x 96" x 480" CUT AS SHOWN (A-516-70)



(4) (ONE) 3/8" R x 96" x 480" CUT AS SHOWN (A-516-70)



(4) (2) 3/8" R x 96" x 480" CUT AS SHOWN (A-516-70)

NOTE

ALL SKETCH PLATES TO BE CUT BY THE SHOP.

A	REV. PER CUST. APPROVAL	1-20-93	JKH	CHKD
NO.	REVISION	DATE	BY		

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/20/93
BY:

P.O.#: CHO-93-0001

S/O 2472A | ITEM: T-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN = EXIST. 40'0" ⌀ X 32'0" HIGH TANK

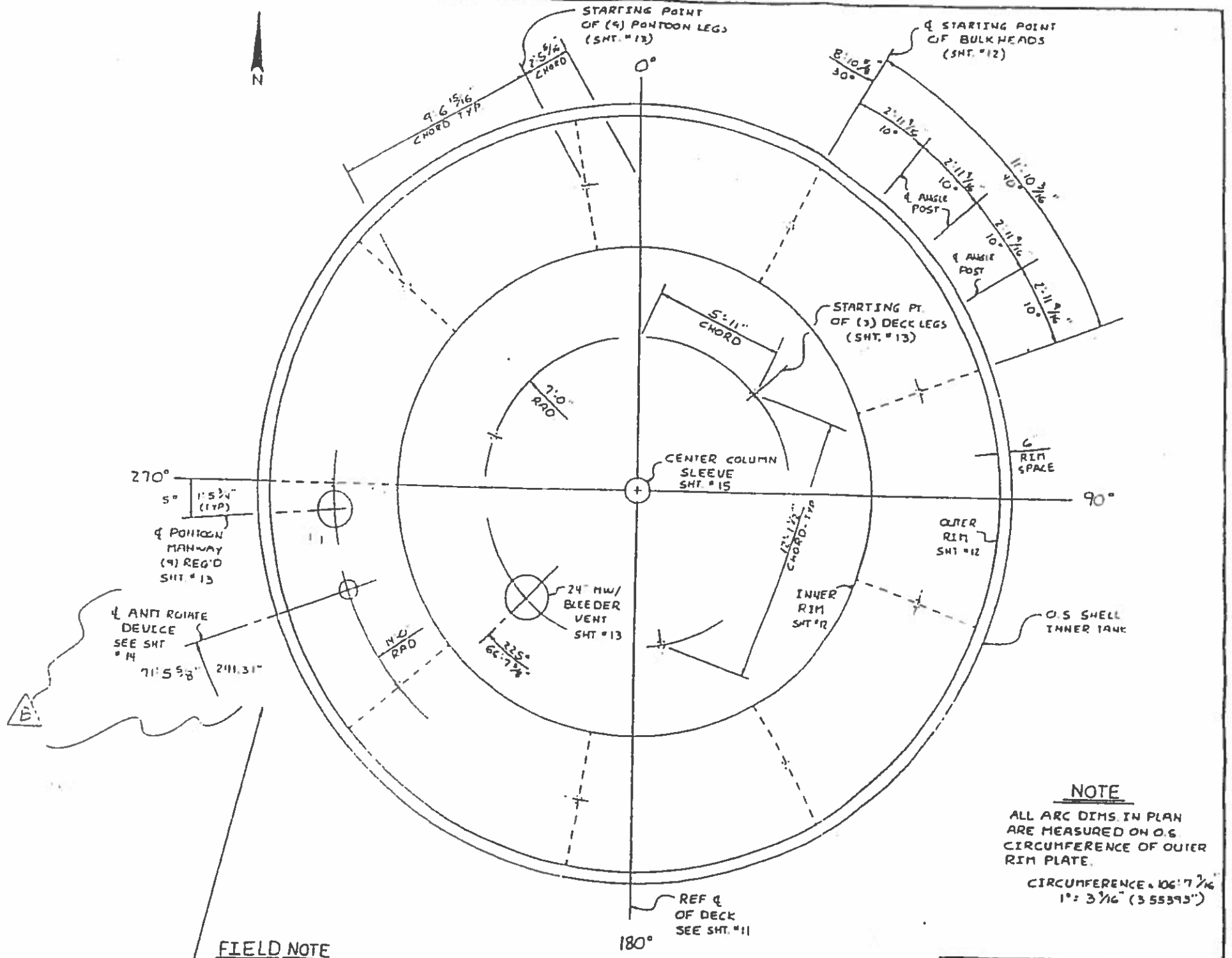
INNER TANK BOTTOM LAYOUT

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-12-93

CHECKED: CG. APPROVED:

NO. W-92-2472A-9 REV. A



FIELD NOTE

OMIT ANGLE POST AT ANTI-ROTATE DEVICE

NOTE

ALL ARC DIMS IN PLAN ARE MEASURED ON O.S CIRCUMFERENCE OF OUTER RIM PLATE.

CIRCUMFERENCE = 106'-7 3/16"
1° = 3 5/16" (3.55395")

PLAN OF FLOATING ROOF

B	REV. ORIENT. OF ANTI-ROTATE	2-6-93	JKH	CC
A	REV. PER CUST. APPROVAL	1-29-93	JKH	CC
NO.	REVISION	DATE	BY	CHKD

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/27/93
BY:

P.O.#: CHO-93-0001

S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS FOR AN EXIST. 40'-0" ⌀ x 32'-0" HIGH TANK

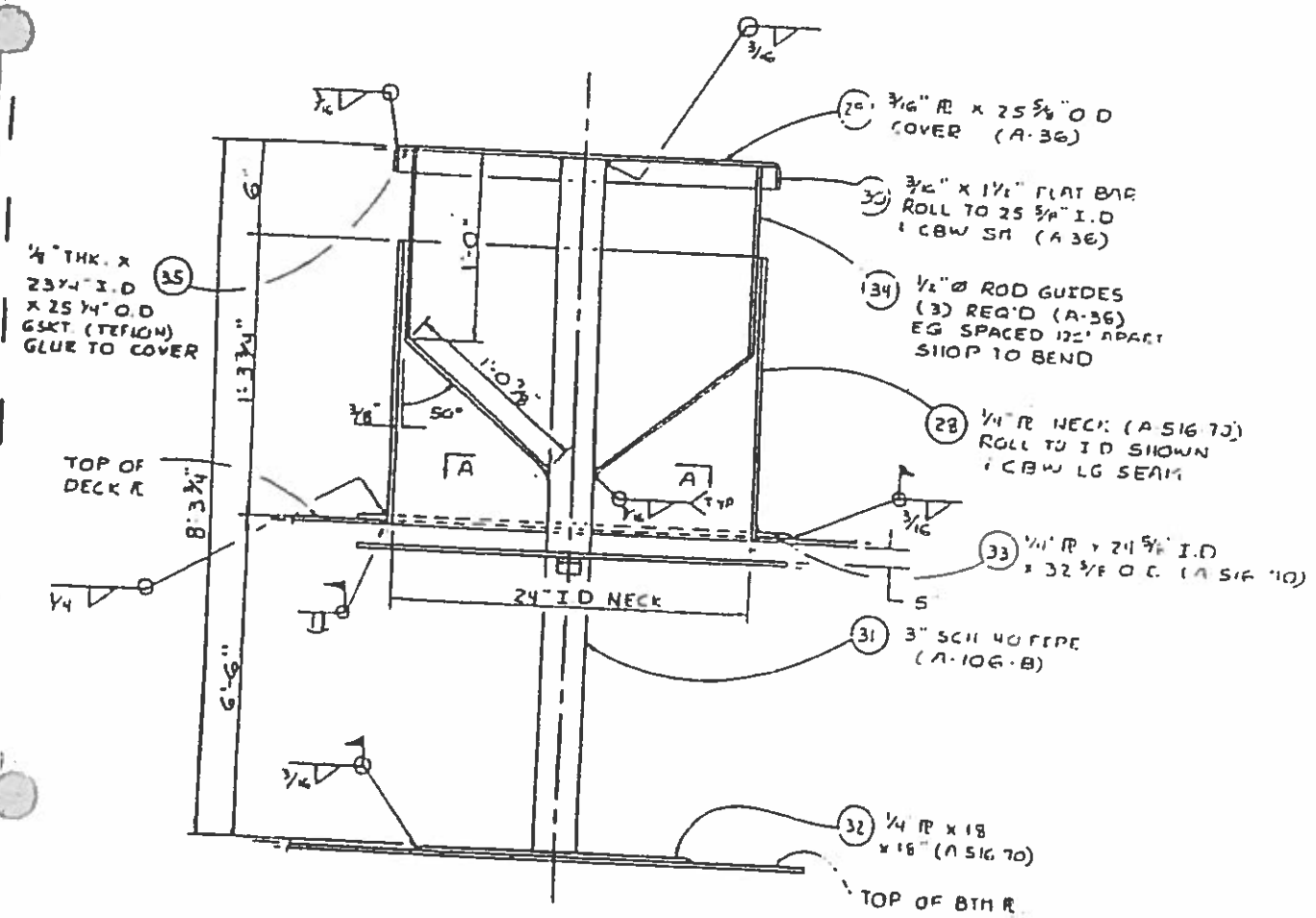
PLAN OF FLOATING ROOF

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-22-93

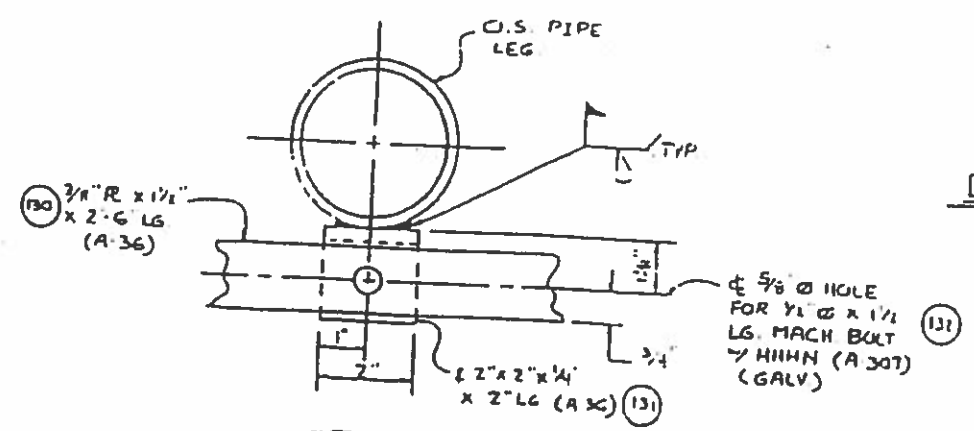
CHECKED: C.C. APPROVED:

NO. W-92-2472A-10 REV. B

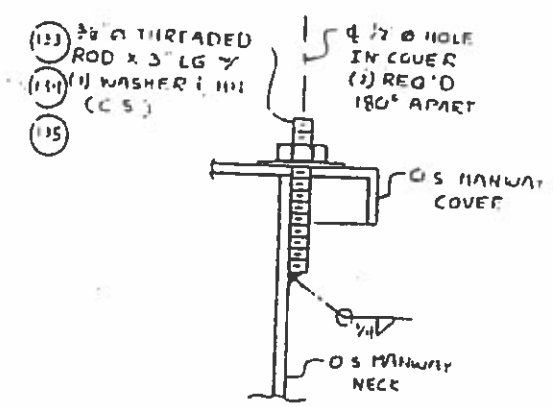


DETAIL 24" MANWAY / BLEEDER VENT

ONE ASSEMBLY REQ'D

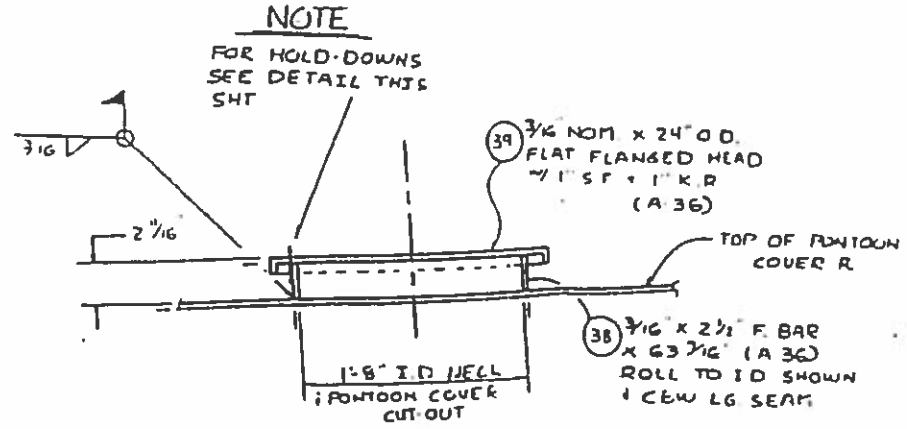


VIEW "A-A"



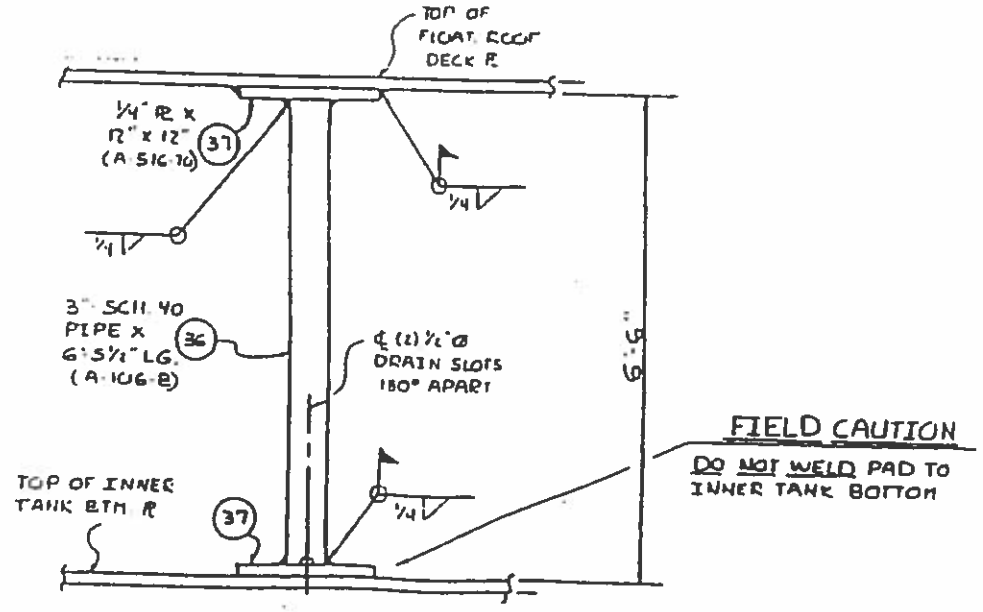
DETAIL HOLD DOWNS @ MANWAY

(1) REQ'D PER PONTOON M.W.



DETAIL PONTOON MANWAY

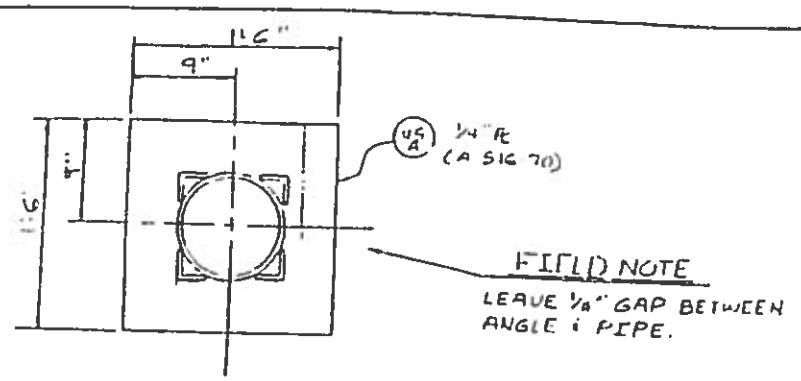
ONE REQ'D PER PONTOON
(9) TOTAL REQUIRED



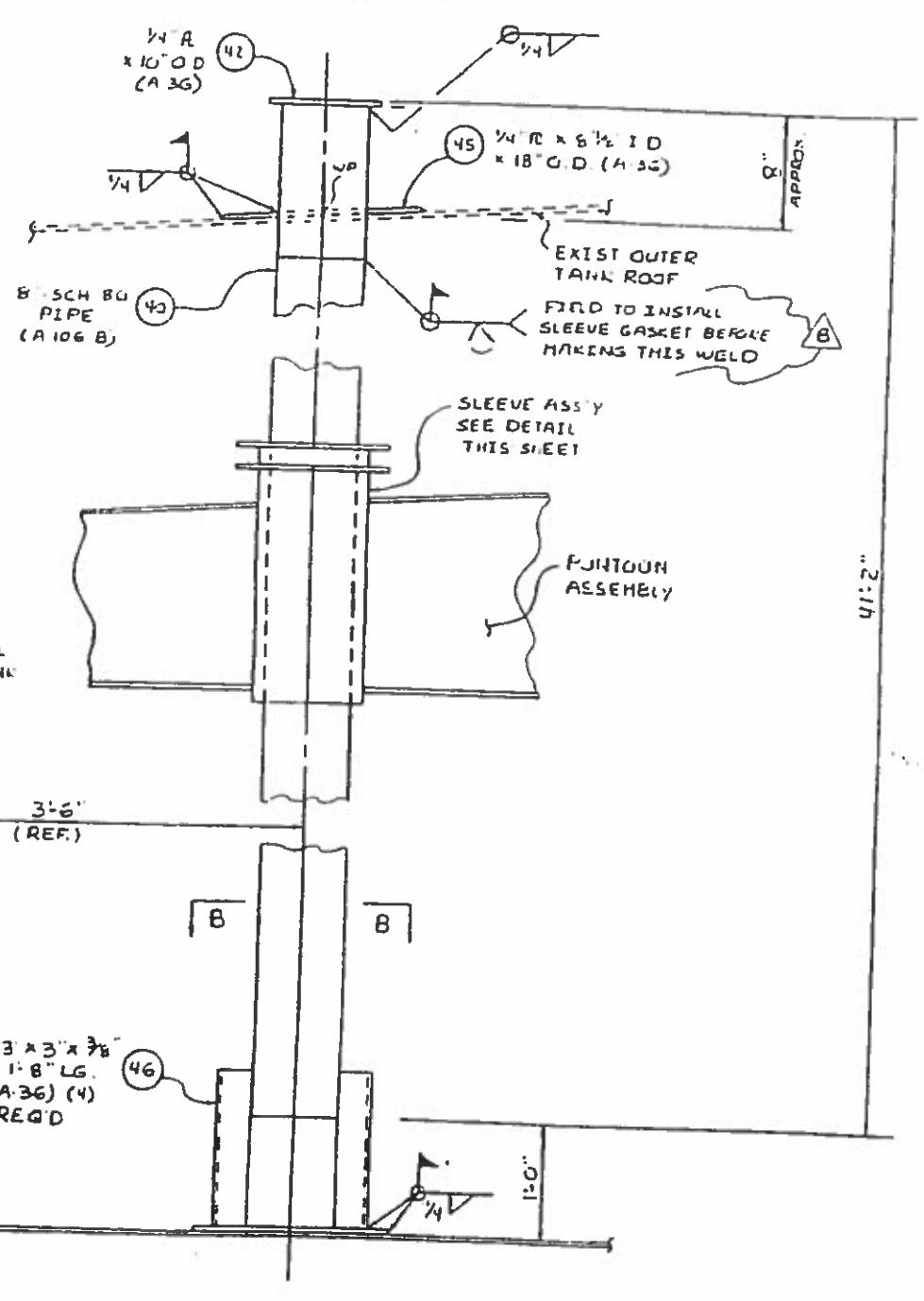
DETAIL DECK SUPPORT LEGS

(12) TOTAL REQ'D

S/O 2472 A	TANK NO. TK-3455			
WYATT FIELD SERVICE COMPANY				
MISC. MODIFICATIONS FOR AN EXIST 40'-0" Ø x 32'-0" HIGH TANK				
MISC. FLOAT ROOF COMPONENTS				
CUSTOMER: LYONDELL PETROCHEMICAL				
DRAWN: JKH	DATE: 1-20-93			
CHECKED: C.C.	APPROVED:			
NO. W-92-2472-A-13				
/1	REV. PER CUST. APPROVAL	1-29-93	JKH	CC.
	REVISION			

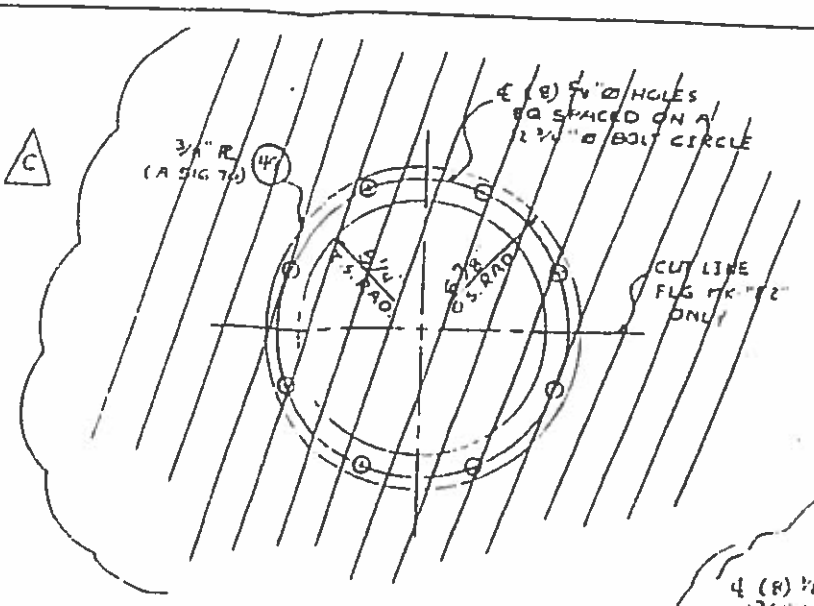


VIEW B-B



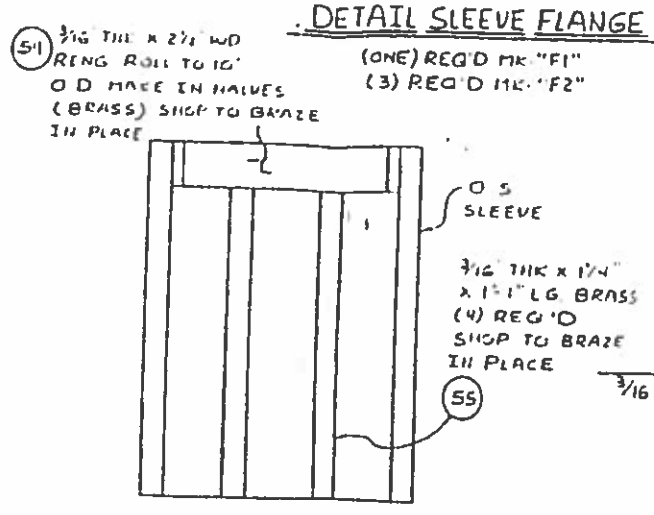
DETAIL 8" ANTI-ROTATION DEVICE

(ONE) ASS'Y REQUIRED

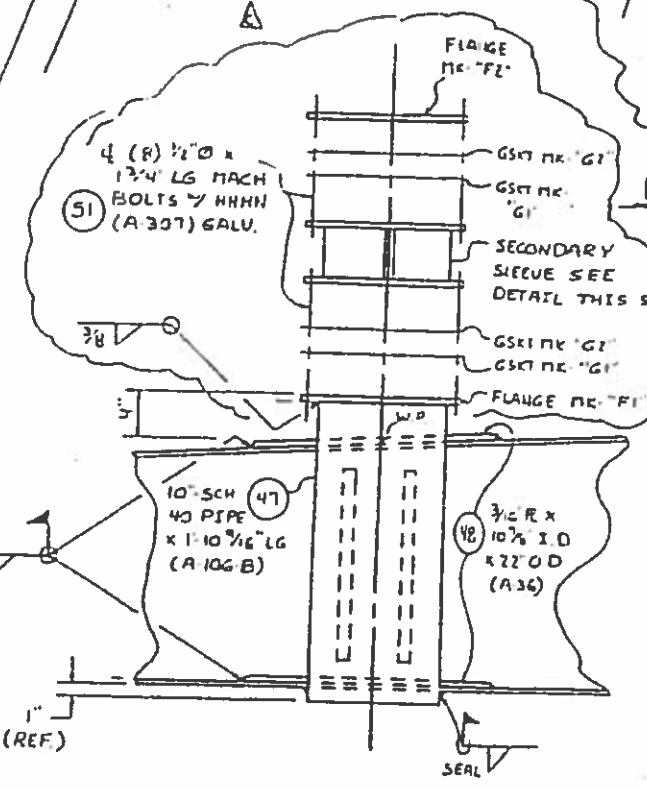


DETAIL SLEEVE FLANGE

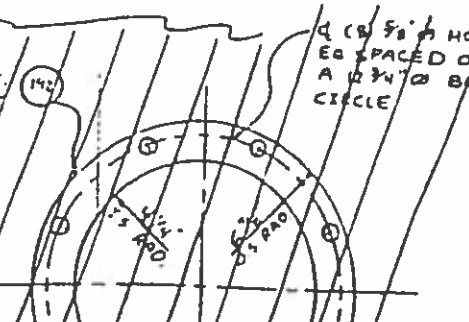
(ONE) REQ'D MK "F1"
(3) REQ'D MK "F2"



DETAIL ANTI-SPARK INSERTS



DETAIL SLEEVE ASSEMBLY

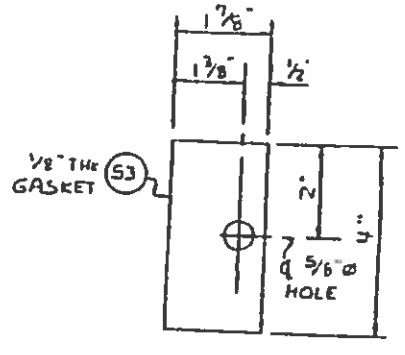


DETAIL SLEEVE GASKET

(1) REQ'D MK "G1"
(1) REQ'D MK "G2"

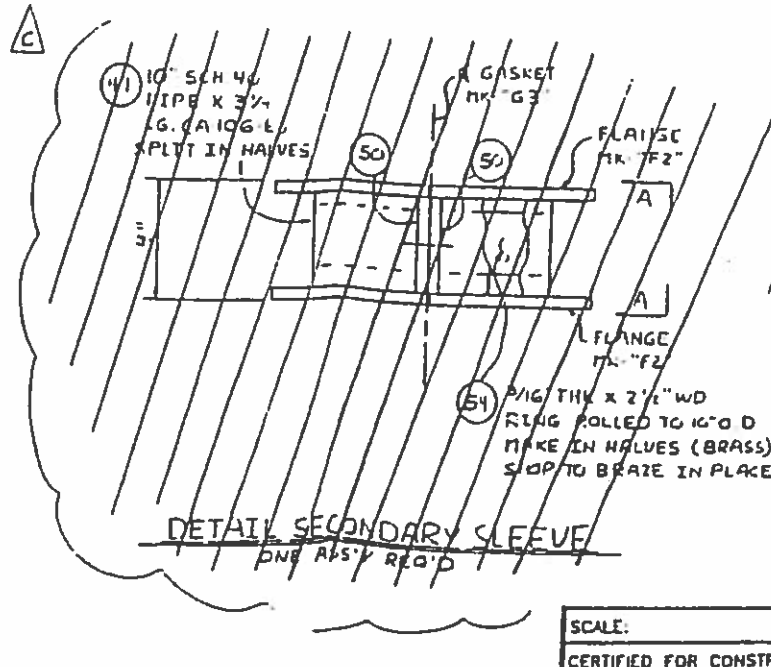
NOTE

MODIFIED COLUMN SLEEVE SEE DETAIL W-92 2472B-14A



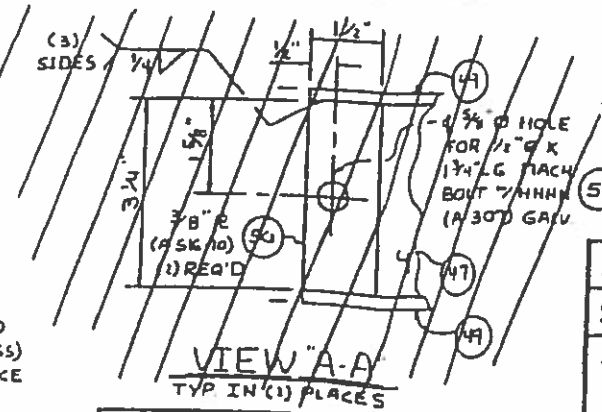
DETAIL SLEEVE GASKET

(2) REQ'D MK "G3"



DETAIL SECONDARY SLEEVE

ONE ASS'Y REQ'D



VIEW A-A

TYP IN (1) PLACES

C	REV. COL. SLEEVE	5-17-93	RF	CG
B	REV. DT'L OF SLEEVE GASKET	4-28-93	JKH	CG
A	REV. PER CUST. APPROVAL	1-29-93	JKH	CG

SCALE:

CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY

DATE: 1/27/93

P.O.#: CHO-93-0001

S/O 2472B | ITEM: TK-4455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC MODIFICATIONS FOR AN EXIST. 40'-0" ⌀ x 32'-0" HIGH TANK

DETAIL 8" ANTI-ROTATE DEVICE

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-21-93

CHECKED: C.G. APPROVED

FIELD NOTE
MODIFIED COLUMN SLEEVE PER DETAIL SHOWN ON DWG W 92-2472B-15A & B

FLANGE MK "F2"
GASKET MK "G2"
GASKET MK "G1"
SECONDARY SLEEVE SEE DETAIL THIS SHT
GASKET MK "G2"
GASKET MK "G1"
FLANGE MK "F1"
(59) ℄ (8) ½" Ø x 1¾" LG MACH BOLTS W HHHN (A 307) GALV
3/16" THK x 2½" WD RING ROLLED TO 12" O.D (BRASS) SHOP TO BRAZE IN PLACE (61)
(56) 12" SCH 40 PIPE x 1'-4¾" LG (A 106 B)
(62) 3/16" THK x 1¼" WD x 10" LG (BRASS) SHOP TO BRAZE IN PLACE (4) REQ'D EQ SPACED
(63) ¼" R x 12⅞" I.D x 24" O.D (A 516 70)
TOP OF DECK R
1:3
1/4
1" REF.

DETAIL SLEEVE FLANGE
(ONE) REQ'D MK "F1"
(3) REQ'D MK "F2"

3/8" R (A 516 70) (57)
℄ (8) 5/8 Ø HOLES EQ SPACED ON A 14 3/4" Ø BOLT CIRCLE
CUT LINE FLG MK "F1" ONLY
22½° TYP 8 PLCS

DETAIL SLEEVE GASKET
(1) REQ'D MK "G1"
(1) REQ'D MK "G2"

1/8" THK GASKET (193)
℄ (8) 5/8 Ø HOLES EQ SPACED ON A 14 3/4" Ø BOLT CIRCLE
22½° TYP 8 PLCS

(D)

DETAIL CENTER COLUMN SLEEVE
(ONE) ASS'Y REQUIRED

(2) SIDES
¼
1½"
½"
℄ 5/8 Ø HOLE FOR ½" Ø 1¼" LG MACH BOLT W HHHN (A 307) GALV (51)
1-5/8"
3¼"
(51)
(52)
(57)
⅜" R (A 516 70) (2) REQ'D (58)

VIEW "A-A"
TYP IN (2) PLACES

(56) 12" SCH 40 PIPE x 3¼" LG (A-106 B) SPLIT IN HALVES
(58)
(56)
℄ GASKET MK "G3"
FLANGE MK "F2"
A
A
FLANGE MK "F2"
(61) 3/16" THK x 2½" WD RING ROLLED TO 12" O.D (BRASS) MAKE IN HALVES SHOP TO BRAZE IN PLACE.

DETAIL SECONDARY SLEEVE
ONE ASS'Y REQ'D

(D)

1⅞"
1⅜"
½"
1/8" THK GASKET (53)
2"
½"
℄ 5/8 Ø HOLE

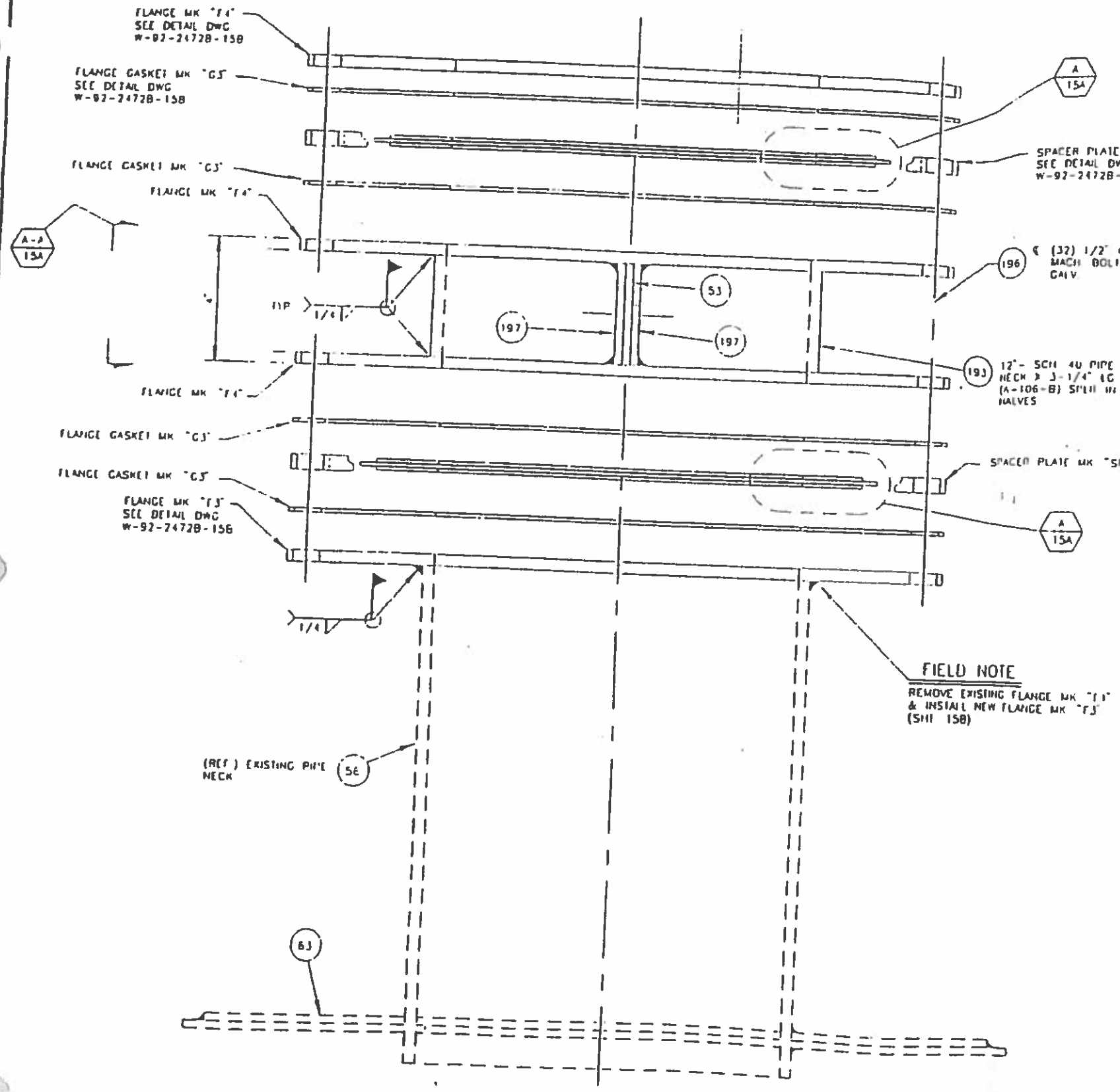
DETAIL SLEEVE GASKET
(2) REQ'D MK "G3"

NO. W-92-2472B-15 REV. D

P.O.#: CHO-93-001
S/O 2472B | ITEM: TK-4455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS FOR AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK
DETAIL CENTER COLUMN SLEEVE
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: JKH DATE 1-22-93

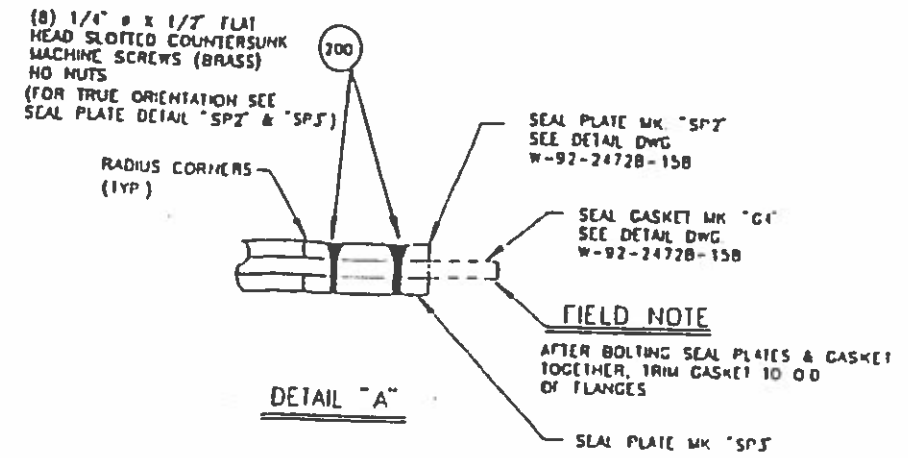
D	REV. CENTER COL. SLEEVE	5-24-93	RF	℄
C	REV. DT'L OF SLEEVE GASKET	4-29-93	JKH	CC
B	REV. I.D. OF GASKET	2-10-93	JKH	CC
A	REV PER CUST.	1-26		

SCALE:
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 4/19/93

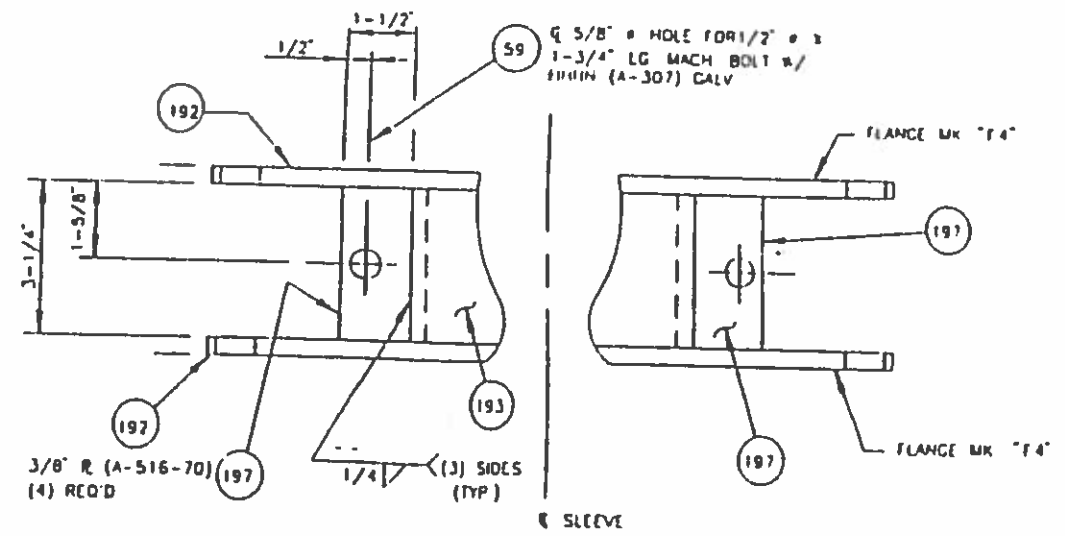


DETAIL CENTER COLUMN SLEEVE

(ONE) ASSEMBLY REQUIRED



DETAIL "A"



VIEW A-A

NO. W-92-2472B-15A REV.

P.O.#: CHO-93-001	
S/O 2472B	ITEM: TK-4455
WYATT FIELD SERVICE COMPANY HOUSTON, TEXAS	
MISC MODIFICATION FOR AN EXISTING 40'-0" ø x 32'-0" HIGH TANK DETAIL CENTER COLUMN SLEEVE	
CUSTOMER LYONDELL PETROCHEMICAL	
DRAWN: RT	DATE: 5-24-93
CHECKED: CE	APPROVED:

SCALE: FULL	
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY	
DATE: 5-27-93	

Wyatt

WYATT FIELD SERVICE COMPANY

P.O. BOX 3052 • HOUSTON, TEXAS 77253-3052 • 713/956-2020

TELECOMMUNICATION – PLEASE DELIVER TO:

NAME: PAT McDANIEL OFFICE: LYONDELL

FAX NUMBER: 452-8825 TOTAL PAGES: 1 DATE: 1-28-93

REFERENCE:

WEIGHT OF TANK W/NO CONTENTS.

OUTER TANK – 86000 #

INNER TANK – 64,000 #

GRATING – 21,600 #

FLOAT ROOF – 28,000 #

201,600 # TOTAL WT. ON FOUNDATION.

EXTERNAL TANK WILL NOT STAND .75" WC EXTERNAL PRESSURE DUE TO RAFTER CORROSION ALLOWANCE OF 1/16" ALL SIDES. WILL STAND 1" WC W/ 1/16" TOTAL CORROSION.

CC:

Henry Dodd
SIGNED

IF YOU DO NOT RECEIVE ALL THE PAGES,
PLEASE CALL BACK AS SOON AS POSSIBLE TO: (713)956-2020 – FAX 682-1558

IU

OUTER

By: M.J.K 2/ 4/93,11:54A Wyatt Field Service Co. Sheet No. 1
Chkd. By: [illegible] Date: 2-6-93 Houston, Texas Job No.: 2472

Company: Lyondell Petrochemical Company
Job Description: Item T-3455, T-4455 File: 2472

1. Summary of Revisions:

Rev.	By	Date	Pages	Description
0	M.J.K.	01/06/93	1 - 22	Tank Calculations
1	M.J.K.	01/22/93	1 - 2	Revised design pressure to 5" W.C.
			4 - 5	Revised anchor bolt chair design
			7 - 13A	Revised maximum liquid height to 31'
			16 - 17	Added normal floating depth of pontoon
2	M.J.K.	02/04/93	1 - 3	Revised external pressure to 1.75" W.C.
			8 - 22	Moved outer rafter supports to inner tank

2. Summary of Calculations:

Revision and Summary Sheet	1
Tank Data Sketches	2 - 7
Outer tank data sheet	
Detail of cone roof supports	
Detail of double tank bottom	
Detail of anchor bolt chairs	
Inner tank data sheet	
Detail of inner tank pontoon	
Outer Tank Calculations	8 - 11
Summary of material and thicknesses	
Minimum shell thickness calculations	
Shell stability for wind	
Tank wind shear and moment	
Tank weights	
Tank anchor bolt calculations	
Anchor bolt chair calculations	12 - 13A
Inner Tank Calculations	14 - 15
Summary of material and thicknesses	
Minimum shell thickness calculations	
Tank weights	
Foundation loading calculations	16 - 19
Tank roof and center column design	20 - 22

WYATT FIELD SERVICE COMPANY

P.O. BOX 3052 • HOUSTON, TEXAS 77253-3052

713/956-2020

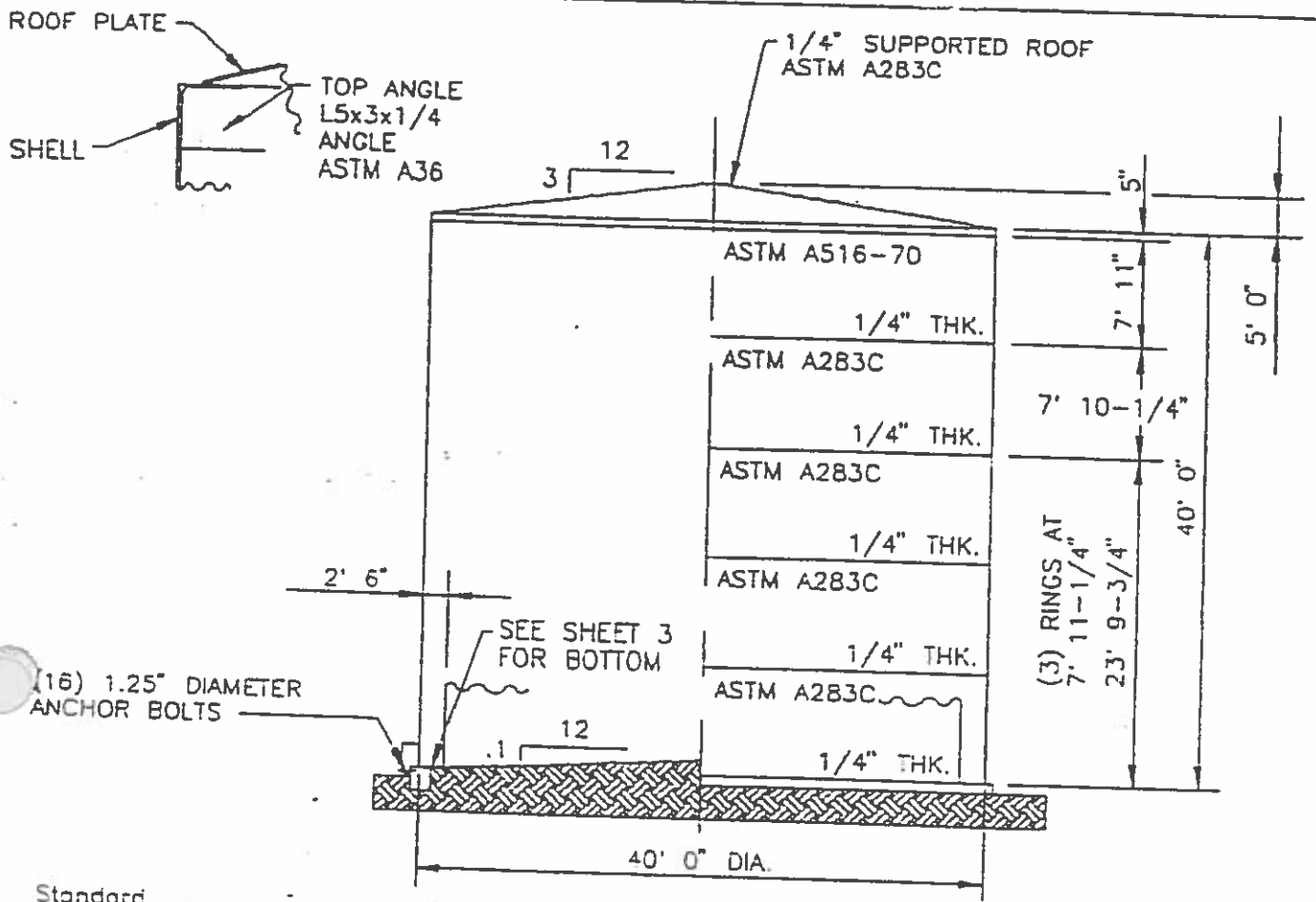
(2)

Prepared by M. KOPECKY Date 02/03/93

Checked by P.V.B. Date 2-F-93

CUSTOMER LYONDELL PETROCHEMICAL COMPANY JOB NO. 2472

REFERENCE ITEM T-3455, T-4455 (EXTERNAL TANK) SHEET 2



Standard	API-650, APPENDIX A, F	Roof Type	SUPPORTED CONE ROOF
Material – Pl	ASTM A283C, A516-70	Floater Type	NONE
– Str	ASTM A36	Bottom Type	DOUBLE SLOPED TO OUTSIDE
Product / S.G.	CAUSTIC / 1.05	Design Pressure Internal	5" W.C.
Allowable Stress	21,000 PSI	External	1.75" W.C. (2)
Joint Efficiency	0.85	Operating	ATMOSPHERIC
Corrosion Allowance		Wind Load	110 MPH
Shell	.0625" ADDED TO DESIGN THK.	Seismic Req.	ZONE 0
Roof	.0625" ADDED TO DESIGN THK.	Design Metal Temp. Low	12 DEG. F.
Bottom	.0625" ADDED TO MIN. THK.	High	170 DEG. F.
Radiography	PER A.S.3.	Anchorage	(16) 1.25" DIAMETER BOLTS
		Hydro-test in accordance with para. F.4.4	
		* MAX. FILL HEIGHT = 31.00 FT.	

SCALE: NONE
FILE: 2472C02

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(2)

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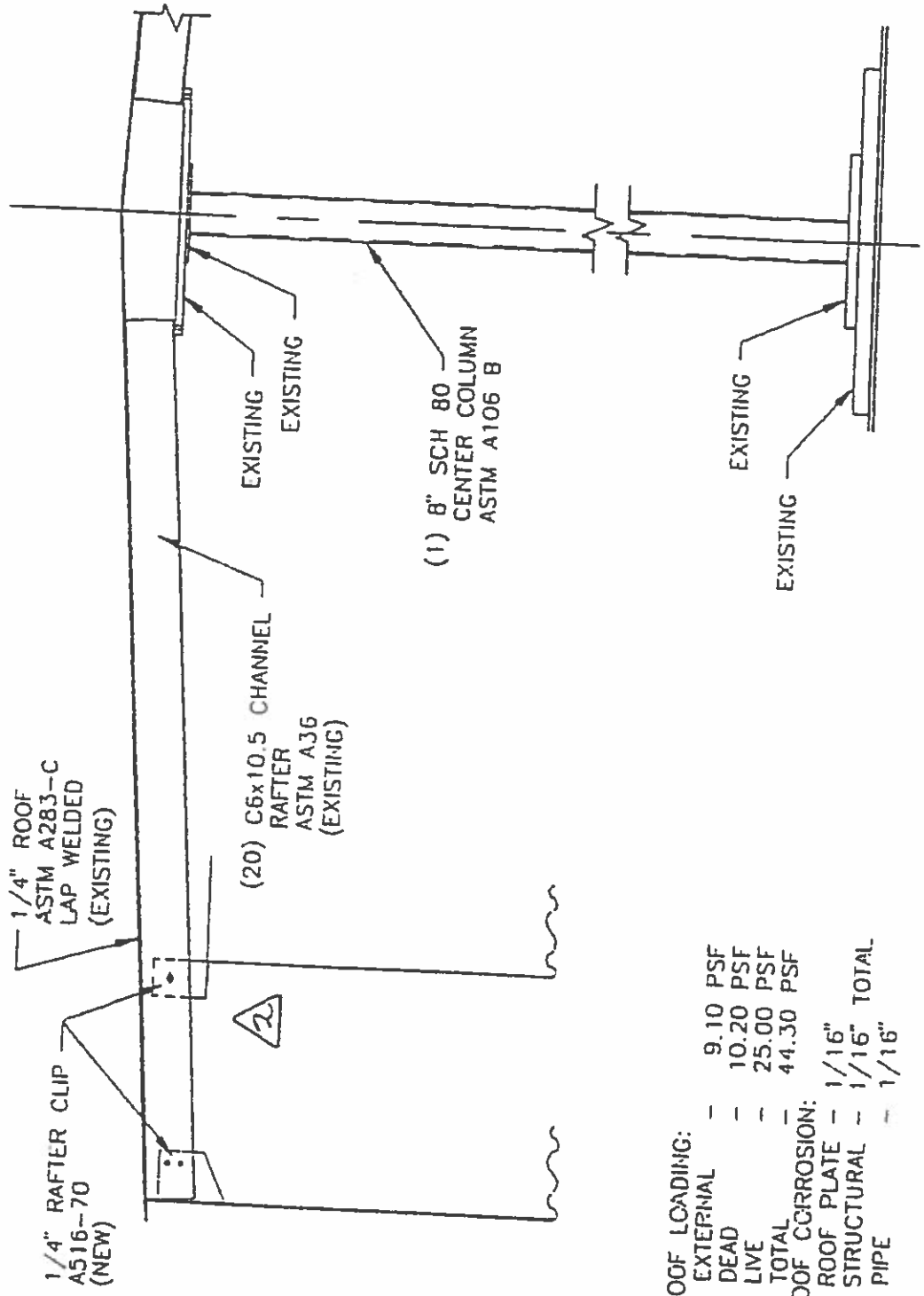
Checked by P.N.B. Date 2-8-93

CUSTOMER LYONDELL PETROCHEMICAL COMPANY

REFERENCE ITEM T-3455, T-4455 JOB NO. 2472

SHEET 3

DETAIL OF CONE ROOF SUPPORTS



ROOF LOADING:
EXTERNAL – 9.10 PSF
DEAD – 10.20 PSF
LIVE – 25.00 PSF
TOTAL – 44.30 PSF
ROOF CORROSION:
ROOF PLATE – 1/16"
STRUCTURAL – 1/16" TOTAL
PIPE – 1/16"

SCALE: NONE
FILE: 2472C02

NOOTER

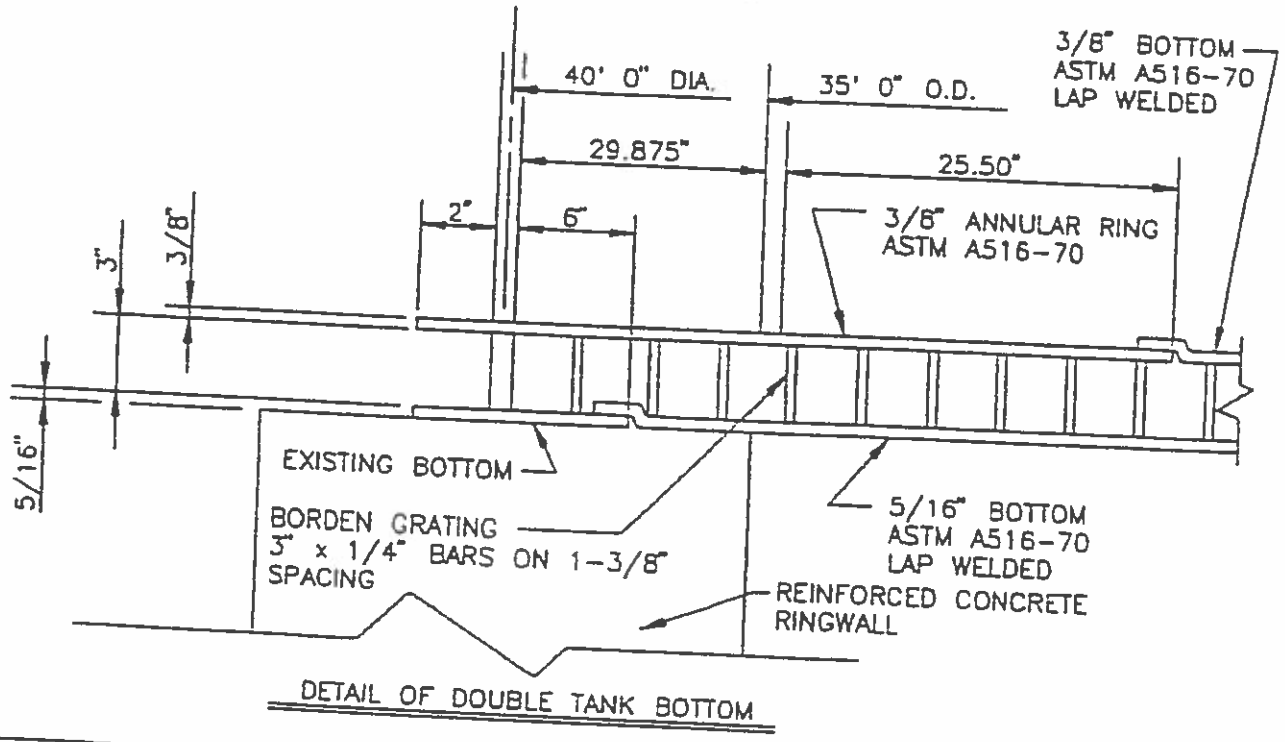
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CUSTOMER LYONDELL PETROCHEMICAL COMPANY
REFERENCE ITEM T-3455, T-4455 (EXTERNAL TANK) JOB NO. 2472
SHEET 4



DETAIL OF DOUBLE TANK BOTTOM

1

SCALE: NONE
FILE: 2472C02

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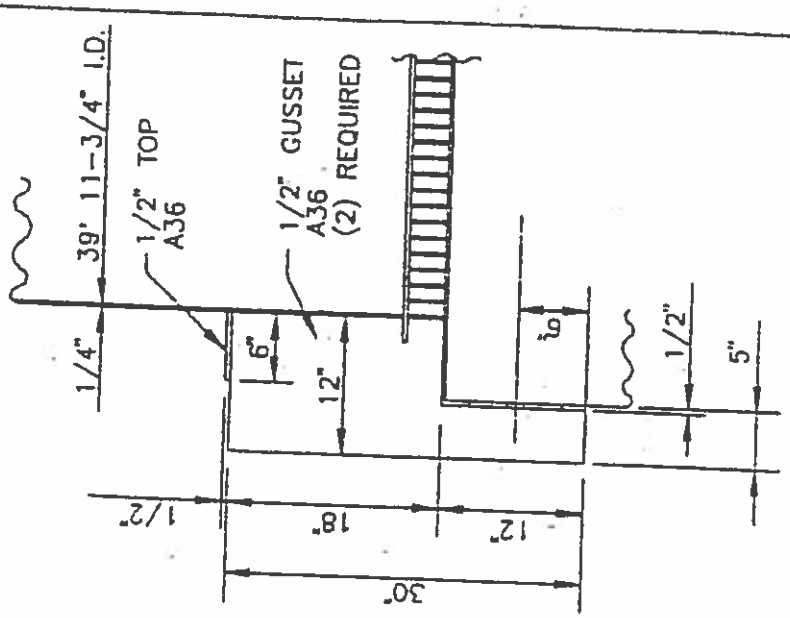
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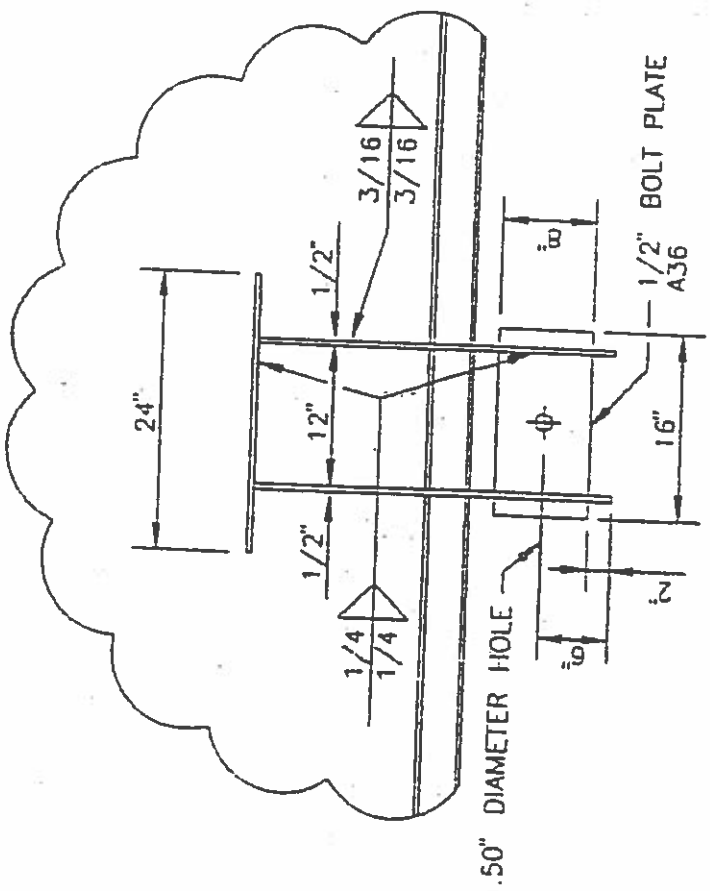
CUSTOMER LYONDELL PETROCHEMICAL COMPANY

REFERENCE ITEM T-3455, T-4455 (EXTERNAL TANK)

JOB NO. 2472

SHEET 4A





DETAIL OF ANCHOR BOLT CHAIRS (16) REQUIRED

SCALE: 3/4" = 1' 0"

FILE: 2472C03

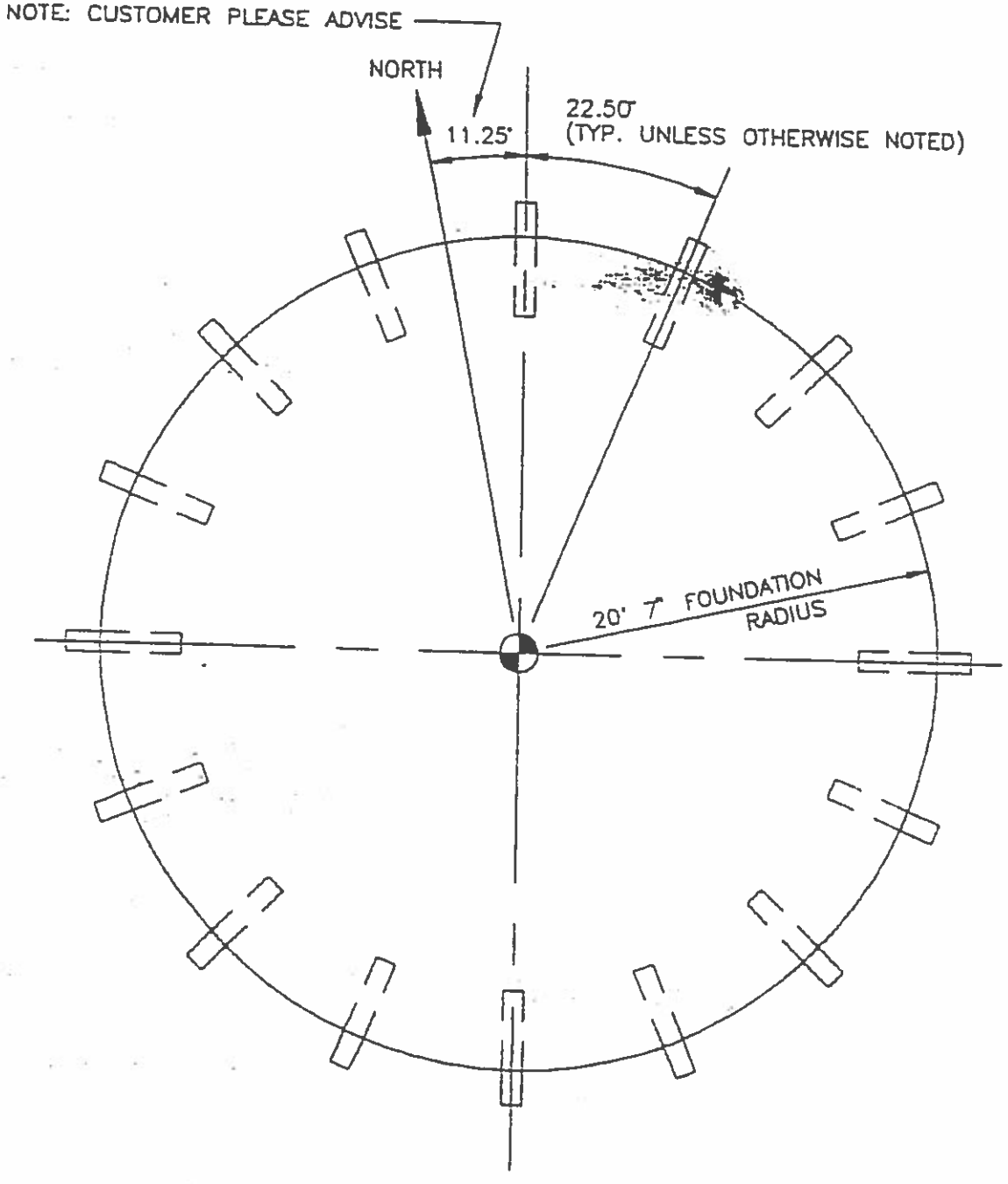
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REFERENCE ITEM T-3455, T-4455 (EXTERNAL TANK) SHEET 5



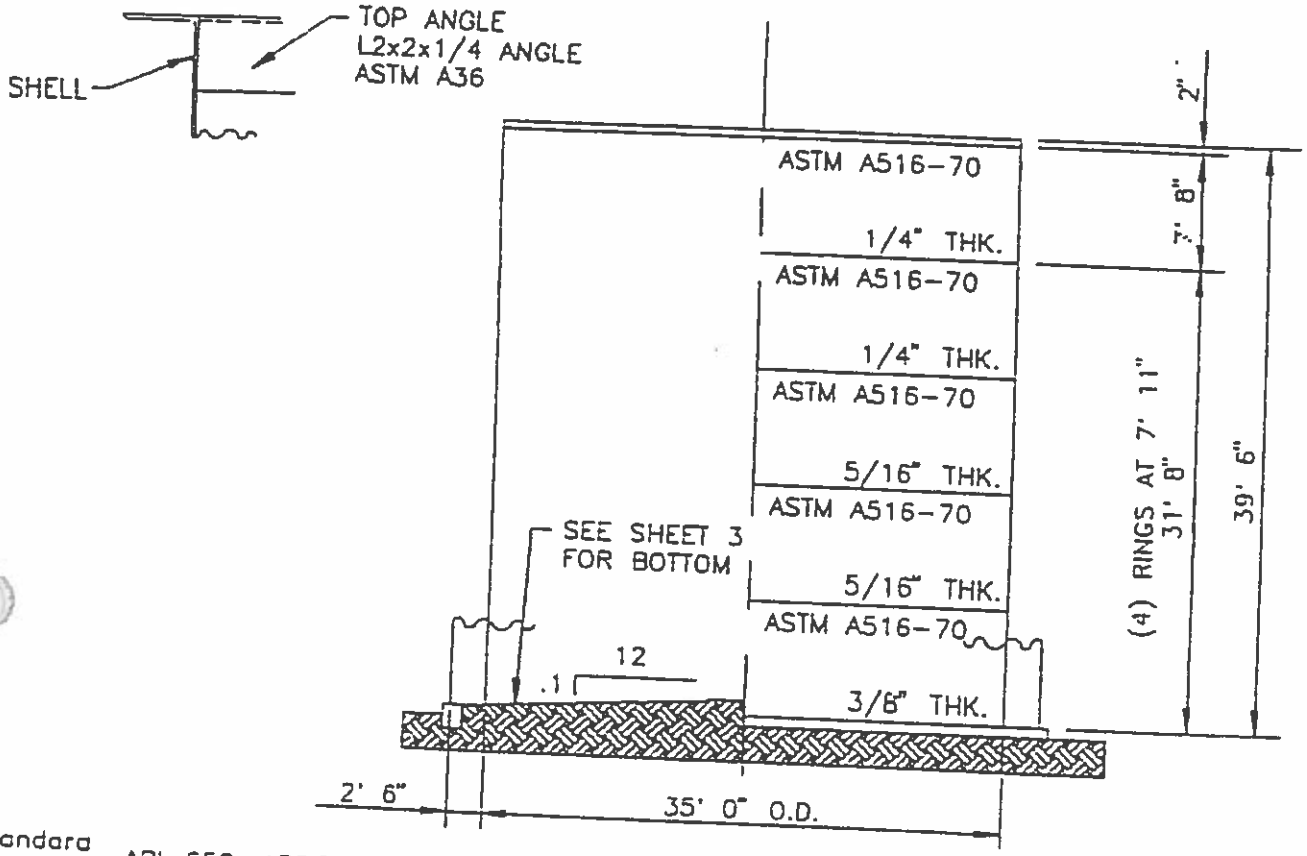
TANK ANCHOR BOLT LAYOUT

SCALE: NONE
FILE: 2472C02

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'ER LYONDELL PETROCHEMICAL COMPANY
...NCE ITEM T-3455, T-4455 (INTERNAL TANK)
JOB NO. 2472
SHEET 6



Standard API-650. APPENDIX A. H
Material – Pl ASTM A516-70
– Str ASTM A36
Product / S.G. CAUSTIC / 1.05
Allowable Stress 21,000 PSI
Joint Efficiency 0.85
Corrosion Allowance
Shell .1250" ADDED TO DESIGN THK.
Roof N/A
Bottom .1250" ADDED TO MIN. THK.
...iography PER A.5.3.

Roof Type NONE
Floater Type PONTOON
Bottom Type DOUBLE SLOPED TO OUTSIDE
Design Pressure
Internal ATMOSPHERIC
External ATMOSPHERIC
Operating ATMOSPHERIC
Wind Load 110 MPH
Seismic Req. ZONE 0
Design Metal Temp. Low 12 DEG. F.
High 170 DEG. F.
Anchorage NONE
Hydro-test in accordance with para. 5.3.6.

SCALE: NONE
FILE: 2472C01

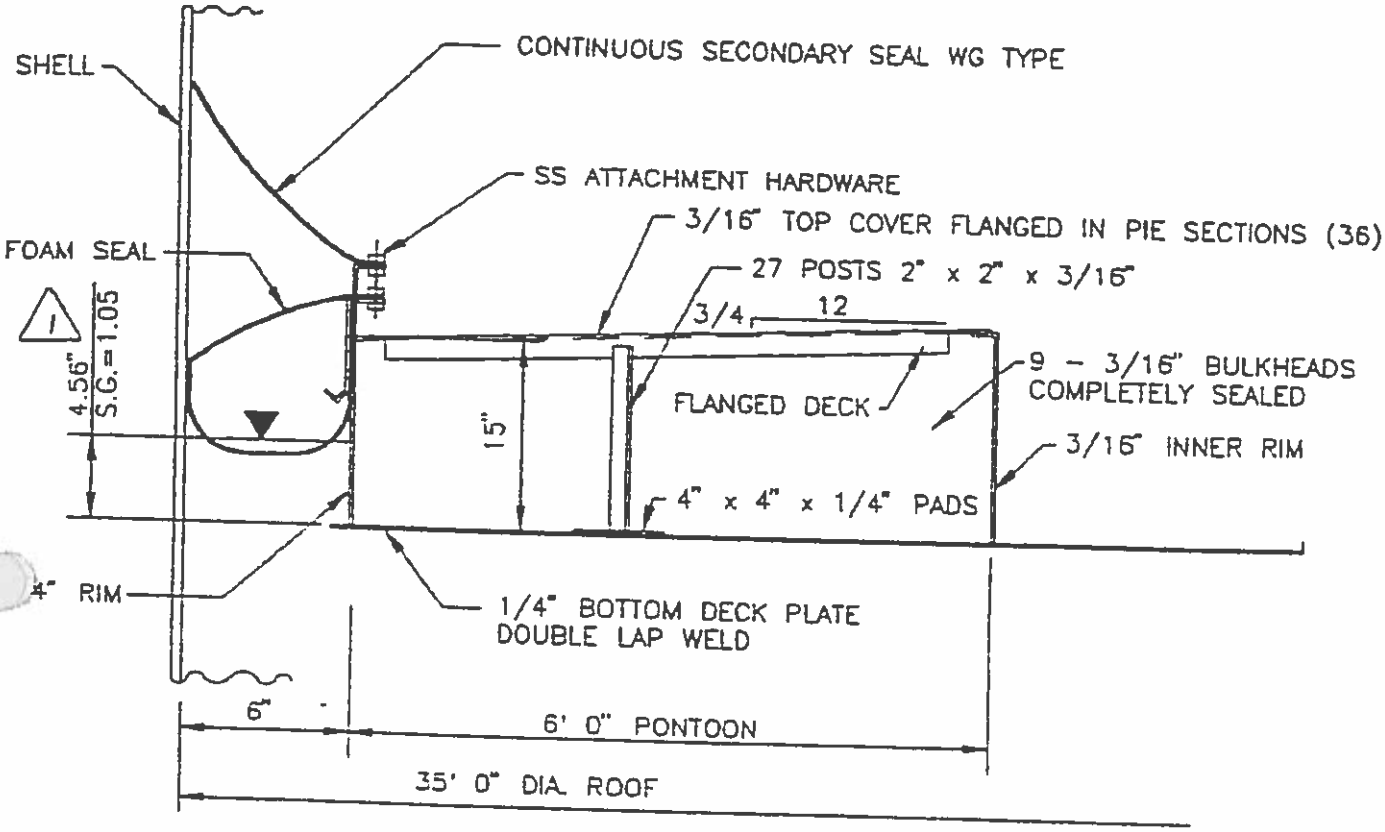
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Checked by [signature] Date 1/22/93

STOMER LYONDELL PETROCHEMICAL COMPANY JOB NO. 2472
FERENCE ITEM T-3455, T-4455 (INTERNAL TANK) SHEET 7

S.G. = 0.7
FOR FLOATATION ONLY



FLOATING ROOF ACCESSORIES:

1. (1) 20" MANHOLE IN SHELL (MINIMUM)
2. (1) 24" COMBINATION MANHOLE/BLEEDER VENT IN PAN DECK
3. (12) FIXED LEGS 2' 6". (9) AT OUTER RIM, (3) AT 20' 0"
4. (1) FOAM SEAL BY TST (OR EQUAL). PRIMARY SEAL FABRIC TO BE 10 MIL TEFLON. HARDWARE TO BE SS.
5. (1) INTERNAL ANTI-ROTATION DEVICE.

SCALE: NONE
FILE: 2472C01

Company: Lyondell Petrochemical Co. File: 2472b
Job Description: Item T-3455, T-4455 (Outside) API-650, Appendix A, F

API650 (1.000) - Calculations of tanks per API 650 Standard

1. Design Data:

Tank height	- Ht	=	40.0000 feet
Tank diameter	- D	=	40.0000 feet
Operating pressure	- Po	=	0.000 inch W.C.
Design pressure - internal	- Pd	=	5.000 inch W.C.
Design pressure - external	- Pe	=	1.750 inch W.C. (2)
Design metal temperature - low		=	12 deg. F.
Design metal temperature - high		=	170 deg. F.
Roof corrosion allowance	- CAr	=	0.0625 inch
Shell corrosion allowance: 0.0000 ft. to 40.0000 ft.	- CAs	=	0.0625 inch
Bottom corrosion allowance	- CAb	=	0.0625 inch
Anchor bolt corrosion on diameter	- CAa	=	0.2500 inch
Product specific gravity	- Gp	=	1.0500
Design specific gravity	- G	=	1.0500
Wind load	- V	=	110 M.P.H.
Wind correction factor (V/100)^2	- Fw	=	1.2100

2. Tank Material Data:

Part	Material	Thickness Group Inch	Sd psi	Corr. Factor for Elast. Fmod	Yield Fyld	
Roof	A283C	0.2500 I	21000	1.000	1.000	
Rg. #6	A36	0.2500 I	21000	1.000	1.000	
Rg. #5	A51670	0.2500 III*	21000	1.000	1.000	*Changed to group III since design stress was reduced per Appendix A
Rg. #4	A283C	0.2500 I	21000	1.000	1.000	
Rg. #3	A283C	0.2500 I	21000	1.000	1.000	
Rg. #2	A283C	0.2500 I	21000	1.000	1.000	
Rg. #1	A283C	0.2500 I	21000	1.000	1.000	
Bottom	A51670	0.3125 III*	21000	1.000	1.000	

3. Minimum Bottom Thickness Per 3.4

Minimum = 0.2500 + CAb = 0.3125 inch
Thickness used = 0.3125 inch

H = (Pe - 8tb) / Gp
= [1.75 - (8 x 0.3125)] / 1.05
= 0.00 inches liquid must remain in tank for ext. pressure

4. Minimum Shell Thickness Using the 1-Foot Method Per Appendix A

Specific gravity per A.4.1 - G = 1.0500
Height to overflow slots = 31.0000 feet

$$td = \frac{2.6 \times D \times (H-1) / G}{E \times Sd \times Fyld} + CAs$$

Shell Top	Elev. feet	Width feet	H feet	E	Sd x Fyld psi	CAs inch	td inch	Use inch
Rg #6	39.5833	0.4167	-8.5833					
Rg #5	31.6667	7.9167	-0.6667	0.85	21000	0.0625	0.0000	0.2500
Rg #4	23.8125	7.8542	7.1875	0.85	21000	0.0625	0.0000	0.2500
Rg #3	15.8750	7.9375	15.1250	0.85	21000	0.0625	0.1004	0.2500
Rg #2	7.9375	7.9375	23.0625	0.85	21000	0.0625	0.1489	0.2500
				0.85	21000	0.0625	0.1975	0.2500

By: MJK 2/ 3/93, 4:04P Wyatt Field Service Co. Sheet No. 9
Chkd. By: P.N.B. Date: 2-5-93 Houston, Texas Job No.: 2472

Company: Lyondell Petrochemical Co. File: 2472b
Job Description: Item T-3455, T-4455 (Outside) API-650, Appendix A, F

API650 (1.000) - Calculations of tanks per API 650 Standard

Rg #1	0.0000	7.9375	31.0000	0.85	21000	0.0625	0.2460	0.2500

5. Maximum Shell External Pressure Design per "Stability of API Standard 650 Tank Shells", Proceedings of the American Petroleum Institute, Section III -- Refining. American Petroleum Institute, New York, 1963, Volume 43, pages 458 - 469. Also methods in "Useful Information on the Design of Plate Structures", Steel Plate Fabricators Association, Inc.

Modulus of Elasticity - E = 28000000 psi
Max. allowable external pressure - Pet = 0.2278 psi

Maximum Allowable External Pressure:

$$Pet = \frac{2.60 \times E \times \left[\frac{tav}{12 \times D}\right]^{2.5} \times Fmod}{\frac{Ls}{D} - 0.45 \times \left[\frac{tav}{12 \times D}\right]^{1/2}}$$

(2)

	Elevation feet	t used Inch	W Feet
Top			
Rg. #6	39.5833	0.1875	0.4167
Rg. #5	31.6667	0.1875	7.9167
Rg. #4	23.8125	0.1875	7.8542
Rg. #3	15.8750	0.1875	7.9375
Rg. #2	7.9375	0.1875	7.9375
Rg. #1	0.0000	0.1875	7.9375
Bottom			

tav = 0.1875 Ls = 48.0000 Pet = 0.2278 psi

Maximum Allowable External Shell Design Pressure:

Pet = Pew + Pe
Pew = (1/3) x 30 x Fw
= (1/3) x 30 x 1.2100
= 12.10 psf = 0.0840 psi
Pe = Pet - Pew
= 0.2278 - 0.0840
= 0.1438 psi = 3.98 " W.C.

6. Shell Stability for Wind Per 3.9.7.1
Maximum unstiffened shell length - Hl = 41.2528 feet
Maximum allowable wind speed - Vmax = 136 M.P.H.

$$Hl = .5 \times 100 \times t \times \left[\frac{100 \times t}{D}\right]^{3/2} \times \frac{1}{Fw} \times Fmod$$

$$Wtr = W \times \left[\frac{t\ uniform}{t\ actual}\right]^{5/2}$$

(2)

Company: Lyondell Petrochemical Co. File: 2472b
Job Description: Item T-3455, T-4455 (Outside) API-650, Appendix A, F

API650 (1.000) - Calculations of tanks per API 650 Standard

$$V_{max} = \left[\frac{(6 \times 10^{6}) \times t}{\Sigma Wtr}\right]^{1/2} \times \left[\frac{100 \times t}{D}\right]^{3/4} \times \left[F_{mod}\right]^{1/2}$$

Top	Elevation feet	t used Inch	W Feet	Wtr Feet	ΣWtr Feet	Vmax MPH
Rg. #6	39.5833	0.2500	0.4167	0.4167	0.4167	1333.71
Rg. #5	31.6667	0.2500	7.9167	7.9167	8.3333	298.23
Rg. #4	23.8125	0.2500	7.8542	7.8542	16.1875	213.98
Rg. #3	15.8750	0.2500	7.9375	7.9375	24.1250	175.28
Rg. #2	7.9375	0.2500	7.9375	7.9375	32.0625	152.04
Rg. #1	0.0000	0.2500	7.9375	7.9375	40.0000	136.12

7. Tank Wind Loads per ASCE 7-88, 1990 Edition:

Wind load - V	=	110 MPH
Tank wind load diameter - Do	=	41.0000 feet
Wind force coefficient - Cf	=	0.6000
Wind velocity exposure	=	C
Wind importance factor - I	=	1.0500
Wind gust factor - Gh	=	1.2267

Elevation feet	Kz	q PSF
0 - 15	0.80	33.51
15 - 20	0.87	36.45
20 - 25	0.93	38.96
25 - 30	0.98	41.05
30 - 40	1.06	44.41
40 - 50	1.13	47.34

Area = Do x Height
Shear = Cf x q x Area
Moment = Shear x Centroid

Elevation feet	Height feet	q lb/ft²	Area ft²	Centroid feet	Shear lbs	Moment ft-lb
41.6700		47.3376	100.00	41.6700	2940	118354
38.0000	10.0000	44.4052	410.00	35.0000	10924	382329
25.0000	5.0000	41.0539	205.00	27.5000	5050	138865
20.0000	5.0000	38.9593	205.00	22.5000	4792	107820
15.0000	5.0000	36.4458	205.00	17.5000	4483	78450
0.0000	15.0000	33.5134	615.00	7.5000	12366	92748
				Total	40455	918565

8. Tank Weights:

Top angle - (π)(40.0000)(6.60)	=	829 lbs.
Top wind girder - (π)(40.0000)(0.00)	=	0 lbs.
Inter. wind girder - (0)(π)(40.0000)(0.00)	=	0 lbs.
Roof plate weight -	=	0 lbs.
Roof framing wt. -	=	0 lbs.
Ring #5 - (π)(40.0000)(7.9167)(0.2500)(40.00)	=	0 lbs.
Ring #4 - (π)(40.0000)(7.8542)(0.2500)(40.00)	=	10147 lbs.
	=	10967 lbs.

(2)

Company: Lyondell Petrochemical Co. File: 2472b
Job Description: Item T-3455, T-4455 (Outside) API-650, Appendix A, F

API650 (1.000) - Calculations of tanks per API 650 Standard

Ring #3 - (π)(40.0000)(7.9375)(0.2500)(40.80)	=	10174 lbs.
Ring #2 - (π)(40.0000)(7.9375)(0.2500)(40.80)	=	10174 lbs.
Ring #1 - (π)(40.0000)(7.9375)(0.2500)(40.80)	=	10174 lbs.
Total for tank shell	=	51566 lbs.
Shell corr. - (π)(40.0000)(40.0000)(0.8625)(40.80)	=	12818 lbs.
Bottom weight - (π/4)(40.0000)²(0.3125)(40.80)(1.03)	=	16583 lbs.
Contents:		
Volume - (π/4)(40.0000)²(40.0000)	=	50265 cu. ft.
- Volume / 5.614583	=	8953 Barrels
- Volume x 7.4805195	=	376012 Gallons
Weight of liquid - Volume x 62.4 x Gp	=	3293394 lbs.
Weight of water - Volume x 62.4	=	3136566 lbs.

9. Tank Anchor Bolt Requirements for Wind:

W = Ws - Wcorr = 51566 - 12818 = 38748 pounds
M = 918565 ft.-lbs.
N = 16 bolts, 1.2500 inch diameter (corr. area = 0.5510 sq. in.)
d = 41.1667 feet anchor bolt circle
P1 = 0.4333 x (Pd/12) x 144 = 26.00 PSF
Pu = (π/4) x D² x P1 = 32670 pounds
(4 x M) / dN = 5578 pounds

Overturning Stability per 3.11

$$Mmax = \frac{2}{3} \times \left[\frac{W \times D}{2} \right] = \frac{2}{3} \times \left[\frac{38748 \times 40.0000}{2} \right]$$

$$= 516645 \text{ ft.-lbs.}$$

Maximum Design Pressure for Unachored Tanks per F.4.2

$$Pmax = \frac{0.245 \times (W - Wr)}{D^2} - (2 \times th)$$

$$= \frac{0.245 \times (38748 - 0)}{(40.0000)^2} + (2 \times 0.2500)$$

$$= 7.93 \text{ " W.C.}$$

Uplift from Design Pressure per 3.11

tB = (4 x M)/dN - W/N
= 0 - (We - Pu)/N
= 0 - (38748 - 32670)/ 16
= -380 pounds
Ab = -380 / 15000 = -0.0253 sq. inch (No bolt load)

Company: Lyondell Petrochemical Co. File: 2472b
Job Description: Item T-3455, T-4455 (Outside) API-650, Appendix A, F

API650 (1.000) - Calculations of tanks per API 650 Standard

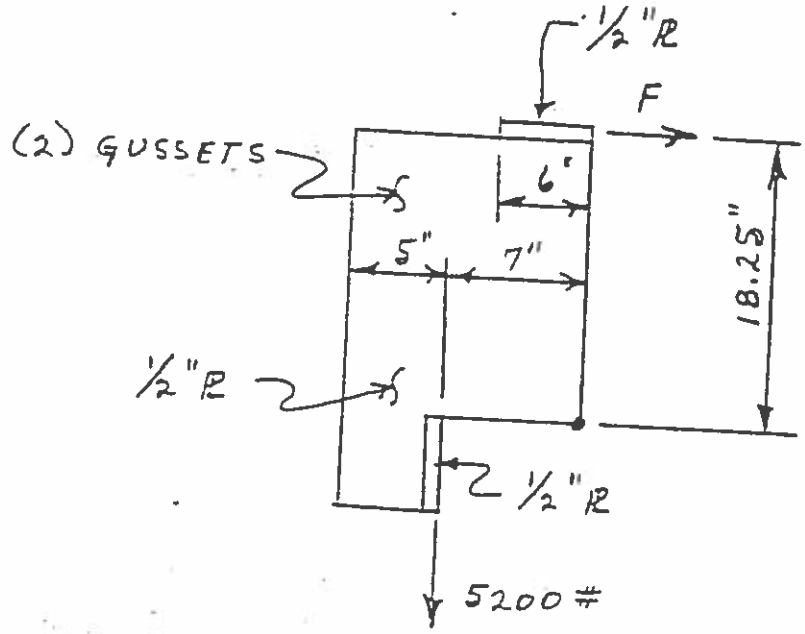
Uplift from Design Pressure + Wind per 3.11

tB = (4 x M)/dN - W/N
= (4 x M)/dN - (We - Pu)/N
= 5578 - (38748 - 32678)/ 16
= 5198 pounds
Ab = 5198 / 20000 = 0.2599 sq. inch

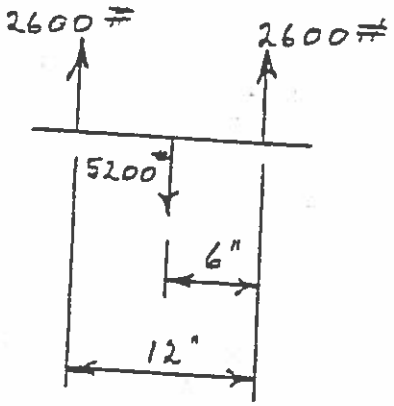
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Prepared by M. KOPECKY Date 1/21/93
Checked by [illegible] Date 1/22/93
CUSTOMER LYONDELL
REFERENCE ITEM T-3455, T-4455
JOB NO. 2472
SHEET 12 OF

ANCHOR BOLT CHAIR CALCULATIONS
LOAD = 5198 LBS. PER SHEET 11
USE 5200 LBS.



STRESS IN BOLT PLATE



13

Prepared by M. KOPECKY Date 1/21/93
Checked by [illegible] Date 1/22/93
CUSTOMER LYONDELL
REFERENCE ITEM T-3455, T-4455 JOB NO 2472
SHEET 13 OF

STRESS IN ANCHOR PLATE

$M = \frac{1}{4} F \ell = \frac{1}{4}(5200)(12) = 15{,}600$ IN·LBS.

$Z = \frac{1}{6} b h^2 = \frac{1}{6}(.500)(8)^2 = 5.33$ IN^3

$S = \frac{M}{Z} = \frac{15{,}600}{5.33} = 2927$ PSI $\leq .6 S_y$

WELD - $S_w = \frac{F}{A} = \frac{\frac{1}{2}(5200)}{2(.707)(.25)(8)}$

$= 919$ PSI $\leq .4 S_y$

STRESS IN GUSSET - $16t = 16(.500) = 8.00$ IN.

IN BOTTOM

$M = (2600)(2.50) = 6500$ IN-LBS.

$Z = \frac{1}{6} b h^2 = \frac{1}{6}(.500)(4.50)^2 = 1.69$ IN^3

$S = \frac{M}{Z} = \frac{6500}{1.69} = 3846$ PSI $\leq .6 S_y$

ABOVE BOTTOM

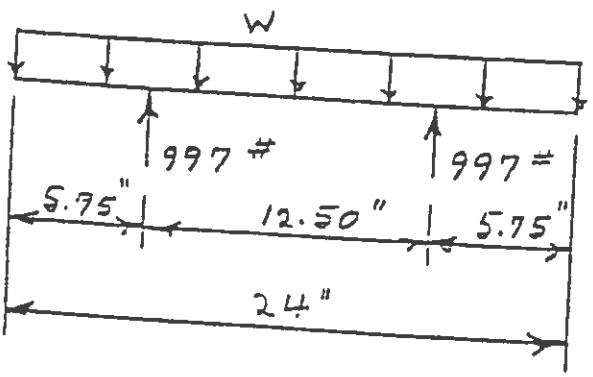
$M = 7(2600) = 18{,}200$ IN·LBS.

$Z = \frac{1}{6} b h^2 = \frac{1}{6}(.500)(8)^2 = 5.33$ IN^3

$S = \frac{M}{Z} = \frac{18{,}200}{5.33} = 3415$ PSI $\leq .6 S_y$

TOP REINFORCING PLATE

$\Sigma M = 7(2600) - 18.25 F = 0 \Rightarrow F = 997$ LBS.



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Prepared by M. KOPECKY Date 1/21/93
Checked by [illegible] Date 1/22/93
CUSTOMER LYONDELL JOB NO. 2472
REFERENCE ITEM T-3455, T-4455 SHEET 13A OF

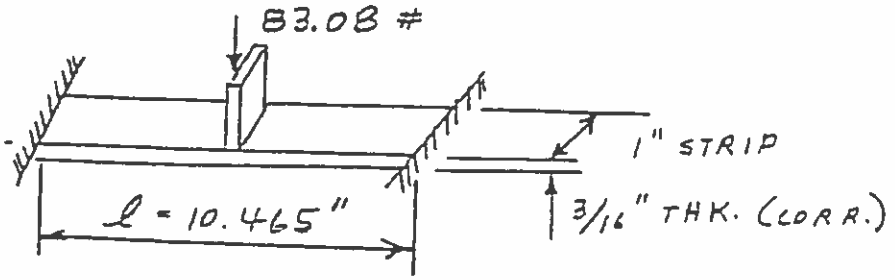
$$W = \frac{2(997)}{24} = 83.08 \text{ LB/IN.}$$

$M_1 = \frac{1}{2}(83.08)(5.75)^2 = 1373$ IN. LBS.
$M_2 = \frac{1}{2}(83.08)(12)^2 - 6.25(997) = -249$ IN. LBS.
$Z = \frac{1}{6}bh^2 = \frac{1}{6}(.50)(6)^2 = 3.00$ IN^3

$$S = \frac{M}{Z} = \frac{1373}{3.00} = 458 \text{ PSI} \leq .6S_y$$

$$\text{WELD} - S_w = \frac{F}{A} = \frac{997}{2(.707)(.25)(6)} = 470 \text{ PSI} \leq .4S_y$$

LOCAL STRESS IN SHELL, 5" W.C. = 0.181 PSI



$$\ell = 1.56\sqrt{Rt} = 1.56\sqrt{(240)(.1875)} = 10.465"$$

$M = \frac{1}{8}w\ell = \frac{1}{8}(83.08)(10.465) = 109$ IN. LBS.
$Z = \frac{1}{6}bh^2 = \frac{1}{6}(1)(.1875)^2 = 0.0058$ IN^3

$$S_B = \frac{M}{Z} = \frac{109}{0.0058} = 18,793 \text{ PSI}$$

$$S_m = \frac{PR}{2t} = \frac{(0.181)(240)}{2(0.1875)} = 116 \text{ PSI}$$

$S_t = S_B + S_m = 18,793 + 116 = 18,909$ PSI $\leq .8S_y$

Company: Lyondell Petrochemical Co. File: 2472a
Job Description: Item T-3455, T-4455 (Inside) API-650, Appendix A, H

API650 (1.000) - Calculations of Tanks per API 650 Standard

1. Design Data:

Tank height	- Ht =	39.5000 feet
Tank diameter	- D =	35.0000 feet
Operating pressure	- Po =	0.000 inch W.C.
Design pressure - internal	- Pd =	0.000 inch W.C.
Design pressure - external	- Pe =	0.000 inch W.C.
Design metal temperature - low	=	12 deg. F.
Design metal temperature - high	=	170 deg. F.
Roof corrosion allowance	- CAr =	0.0000 inch
Shell corrosion allowance: 0.0000 ft. to 39.5000 ft.	- CAs =	0.1250 inch
Bottom corrosion allowance	- CAb =	0.1250 inch
Anchor bolt corrosion on diameter	- CAa =	0.2500 inch
Product specific gravity	- Go =	1.0500
Design specific gravity	- G =	1.0500
Wind load	- V =	0 M.P.H.
Wind correction factor (V/100)^2	- Fw =	0.0000

2. Tank Material Data:

Part	Material	Thickness Group Inch	Sd psi	Corr. Factor for Elast. Fmod	Yield Fyld	
Rg. #6	A36	0.2500 I	21000	1.000	1.000	
Rg. #5	A51670	0.2500 III*	21000	1.000	1.000	*Changed to group III since design stress was reduced per Appendix A
Rg. #4	A51670	0.2500 III*	21000	1.000	1.000	
Rg. #3	A51670	0.3125 III*	21000	1.000	1.000	
Rg. #2	A51670	0.3125 III*	21000	1.000	1.000	
Rg. #1	A51670	0.3750 III*	21000	1.000	1.000	
Bottom	A51670	0.3750 III*	21000	1.000	1.000	

3. Minimum Bottom Thickness Per 5.4

Minimum = 0.2500 + CAb	=	0.3750 inch
Thickness used	=	0.3750 inch

4. Minimum Shell Thickness Using the 1-Foot Method Per Appendix A
Specific gravity per A.4.1 - G = 1.0500

$$td = \frac{2.6 \times D \times (H-1) \times G}{E \times Sd \times Fyld} + CAs$$

Shell Top	Elev. feet	Width feet	H feet	E	Sd x Fyld psi	CAs inch	td inch	Use inch
Rg #6	39.3333	0.1667	0.1667	0.85	21000	0.1250	0.0000	0.2500
Rg #5	31.6667	7.6667	7.8333	0.85	21000	0.1250	0.1616	0.2500
Rg #4	23.7500	7.9167	15.7500	0.85	21000	0.1250	0.2040	0.2500
Rg #3	15.8333	7.9167	23.6667	0.85	21000	0.1250	0.2462	0.3125
Rg #2	7.9167	7.9167	31.5833	0.85	21000	0.1250	0.2887	0.3125
Rg #1	0.0000	7.9167	39.5000	0.85	21000	0.1250	0.3311	0.3750

(2)

By: MJK 2/ 8/93. 2:19P Wyatt Field Service Co. Sheet No. 15
Chkd. By: PNB Date: 2-8-93 Houston, Texas Job No.: 2472

Company: Lyondell Petrochemical Co. File: 2472a
Job Description: Item T-3455, T-4455 (Inside) API-650, Appendix A, H

API650 (1.000) - Calculations of tanks per API 650 Standard

5. Tank Weights:

Top angle	- (π)(35.0000)(3.19)	=	351 lbs.
Top wind girder	- (π)(35.0000)(0.00)	=	0 lbs.
Inter. wind girder	- (0)(π)(35.0000)(0.00)	=	0 lbs.
Roof plate weight	-	=	10940 lbs. (2)
Roof framing wt.	-	=	0 lbs.
Ring #5	- (π)(35.0000)(7.6667)(0.2500)(40.00)	=	8599 lbs.
Ring #4	- (π)(35.0000)(7.9167)(0.2500)(40.00)	=	8879 lbs.
Ring #3	- (π)(35.0000)(7.9167)(0.3125)(40.00)	=	11099 lbs.
Ring #2	- (π)(35.0000)(7.9167)(0.3125)(40.00)	=	11099 lbs.
Ring #1	- (π)(35.0000)(7.9167)(0.3750)(40.00)	=	13318 lbs.
Total for tank shell		=	64284 lbs.
Shell corr.	- (π)(35.0000)(39.5000)(0.1250)(40.00)	=	22151 lbs.
Bottom weight	- (π/4)(35.0000)²(0.3750)(40.00)(1.03)	=	15162 lbs.

Contents:

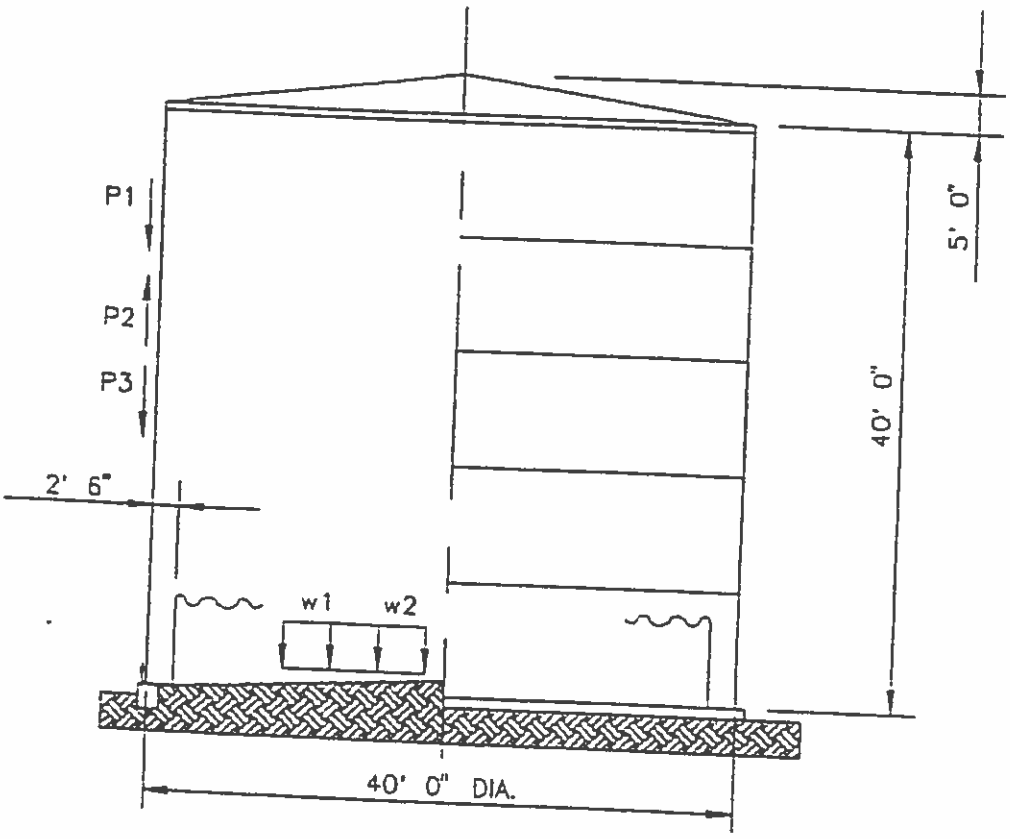
Volume	- (π/4)(35.0000)²(39.5000)	=	38003 cu. ft.
	- Volume x 7.4805195	=	284286 Gallon
Weight of liquid	- Volume x 62.4 x Gp	=	2489986 lbs.
Weight of water	- Volume x 62.4	=	2371416 lbs.

WYATT FIELD SERVICE COMPANY
P.O. BOX 3052 • HOUSTON, TEXAS 77253-3052
713/956-2020

(2)

Prepared by M. KOPECKY Date 02/04/93
Checked by P.V.B. Date 2-8-93

CUSTOMER LYONDELL PETROCHEMICAL COMPANY
REFERENCE ITEM T-3455, T-4455 (EXTERNAL TANK)
JOB NO. 2472
SHEET 16



FOUNDATION DATA:

1. WIND DATA:
   WIND SHEAR = 40455 LBS.
   WIND MOMENT = 918565 FT.-LBS.

2. SOIL BEARING:
   w1 = 18.47 PSI
   w2 = 2659 PSF

3. MAXIMUM TANK COMPRESSION WITH ROOF LIVE LOAD + WIND:
   P1 = 1907 LBS./FT.

4. MAXIMUM TANK UPLIFT:
   P2 = -683 LBS./FT.

5. MAXIMUM TANK COMPRESSION WITH ROOF LIVE LOAD:
   P3 = 1176 LBS./FT.

SCALE: NONE

Company: Lyondell Petrochemical Co. File: 2472b
Job Description: Item T-3455, T-4455 (Outside) API-650, Appendix A, F

API650 (1.000) - Calculations of tanks per API 650 Standard

Tank Foundation Loading Report

1. Tank Dimensions and Loading:

Tank diameter	- D	=	40.0000 feet
Tank height	- H	=	40.0000 inch
Design pressure - internal	- Pd	=	5.000 inch W.C.
Design pressure - external	- Pe	=	1.750 inch W.C.
Liquid specific gravity	- Gp	=	1.0500
Tank bottom thickness	- Tb	=	0.3125

2. Wind Load:

Tank wind shear	- Fw	=	40455 inch
Tank wind moment	- Mw	=	918565 inch
Ww = (4 x M)/(π x D²)		=	731 pounds/foot

3. Soil Bearing:

w1 = {0.4333 x [(Pd / 12) + (H x G)]} + (0.284 x Tb)		=	18.47 PSI
w2 = w1 x 144		=	2659 PSF

4. Roof Loads on Shell:

Area of roof - Ar = 1256.64 sq. ft.

Maximum weight of roof on shell

Portion of roof load on shell	- Wr1	=	0 pounds
External pressure roof load on shell	- Wr2	=	11435 pounds
Roof live load of 25 PSF	- Wr3	=	31416 pounds
Wr1 + Wr2 + Wr3	- Wr4	=	42850 pounds

Minimum roof load on shell

Portion of roof load on shell	- Wr1	=	0 pounds
Internal pressure load on roof	- Wr5	=	32670 pounds
Wr1 - Wr5	- Wr6	=	-32670 pounds

5. Shell Weights:

Maximum weight of shell

Tank total roof and shell weight	- Ws1	=	51566 pounds
Portion of roof load on shell	- Wr1	=	0 pounds
Ws1 - Wr1	- Ws2	=	51566 pounds

Minimum weight of shell

Tank total roof and shell weight	- Ws1	=	51566 pounds
Portion of roof load on shell	- Wr1	=	0 pounds
Shell corrosion weight	- Ws3	=	12818 pounds
Ws1 - Wr1 - Ws3	- Ws4	=	38748 pounds

6. Tank Foundation Loads:

Maximum tank compression with roof live load + wind			
P1 = [(Wr4 + Ws2) / (π x D)] + Ww		=	1482.31 pounds/foot
Maximum tank uplift			
P2 = [(Wr6 + Ws4) / (π x D)] - Ww		=	-682.30 pounds/foot
Maximum tank compression with roof live load			
P3 = [(Wr4 + Ws2) / (π x D)]		=	751.34 pounds/foot

COMBINED INNER AND OUTER TANK WEIGHTS

5. SHELL WEIGHTS

MAXIMUM WEIGHT OF SHELL

OUTER TANK	- W_{s1}	= 51,566 #
INNER TANK AND ROOF	- W_{s1a}	= +64,284
ROOF WT. ON SHELL	- W_{r1}	= -10,940
$W_{s1} + W_{s1a} - W_{r1}$	- W_{s2}	= 104,910 #

MINIMUM WEIGHT OF SHELL (ANCHOR BOLTS)

TANK SHELL	- W_{s1}	= 51,566 #
ROOF WT. ON SHELL	- W_{r1}	= 0
SHELL CORROSION	- W_{s3}	= 12,818
$W_{s1} - W_{r1} - W_{s3}$	- W_{s4}	= 38,748 #

6. TANK FOUNDATION LOADS

MAX. TANK COMPRESSION WITH ROOF LIVE LOAD + WIND

$P_1 = [(W_{r4} + W_{s2}) / \pi D] + W_w$

$= [(42,850 + 104,910) / \pi(40)] + 731$

$= 1176 + 731$

$= 1907$ LB / FT.

MAX. TANK UP LIFT

$P_2 = [(W_{r6} + W_{s4}) / \pi D] - W_w$

$= [(32,670 + 38,748) / \pi(40)] - 731$

$= 48 - 731$

$= -683$ LB / FT.

WYATT FIELD SERVICE COMPANY
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713/956-2020

(2)

Prepared by M. KOPECKY Date 1/6/93
Checked by P.N.B Date 1-14-93

CUSTOMER LYONDELL
REFERENCE ITEM T-3455, T-4455
JOB NO 2472
SHEET 19 OF

MAX. TANK COMPRESSION WITH ROOF LIVE LOAD

$P3 = [(W_{r4} + W_{s2}) / \pi D]$

$= [(42,850 + 104,910) / \pi(40)]$

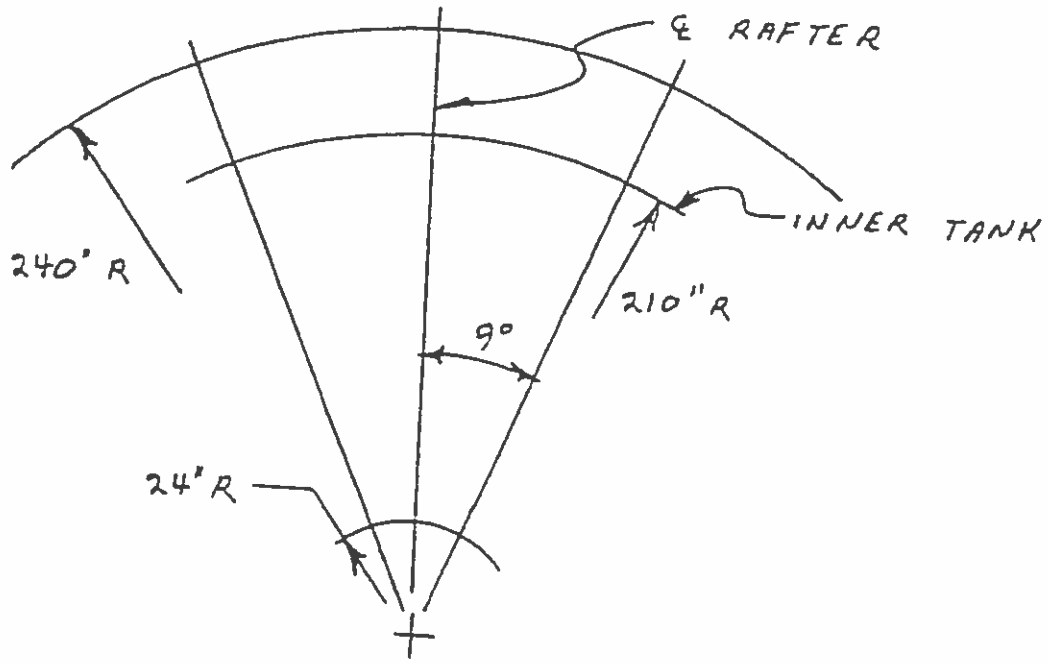
$= 1176$ LB / FT.

WYATT FIELD SERVICE COMPANY
P.O. BOX 3052 • HOUSTON, TEXAS 77253-3052
713/956-2020

(2)

Prepared by M. KOPECKY Date 2/4/93
Checked by P.N.B. Date 2-8-93
CUSTOMER LYONDELL
REFERENCE ITEM T-3455, T-4455 JOB NO 2472
SHEET 20 OF

ROOF SUPPORT CALCULATIONS:



LOAD

EXTERNAL	-	9.10	LB/FT²
DEAD	-	10.20	LB/FT²
LIVE	-	25.00	LB/FT²
TOTAL	-	44.30	LB/FT² = 0.31 LB/IN²

BEAM - 10.50 LB/FT = 0.88 LB/IN.

$W_1 = 2R \sin\theta = 2(24)\sin 9° = 7.51$ IN.
$W_2 = 2R \sin\theta = 2(240)\sin 9° = 75.09$ IN.

BEAM LOADS

$F_1 = (0.31)(7.51) + 0.88 = 3.21$ LB/IN.
$F_2 = (0.31)(75.09) + 0.88 = 24.16$ LB/IN.

Company: Lyondell Petrochemical Co.
Job Description: Item T-3455, T-4455
File: 2472
API-650

SBEAM (1.000) - Calculates the shear, moment, slope and deflection of a simply supported beam under various loading conditions

1. Beam Data:

Modulus of elasticity		- E	=	28800000	psi	
Moment of inertia		- I	=	9.2000	inch^4	
Length of span		- L	=	186.0000	inch	
Reaction at x =	0.0000 inch	- R1	=	802	pounds	
Reaction at x =	186.0000 inch	- R2	=	2154	pounds	
Maximum shear load		- V	=	1434	pounds at	184.1400 inches
Maximum moment load		- M	=	47946	in.-lb. at	188.4400 inches
Maximum deflection		- D	=	0.634148	inches at	94.8600 inches

2. Beam Concentrated Loads:

Load Number	Amount pounds	Location inch
1	0.0000	0.0000
2	0.0000	0.0000
3	0.0000	0.0000
4	0.0000	0.0000
5	0.0000	0.0000
6	0.0000	0.0000
7	0.0000	0.0000
8	0.0000	0.0000
9	0.0000	0.0000

3. Beam Distributed Loads:

Load Number	Starting Amount pounds	Ending Amount pounds	Starting Location inch	Ending Location inch
1	3.2100	24.1600	0.0000	216.0000
2	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000	0.0000

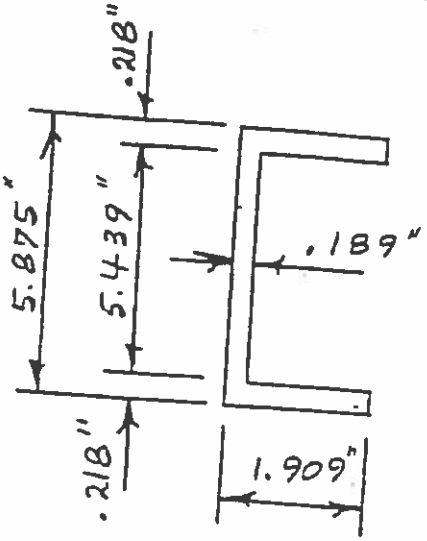
4. Loads in Beam:

	Location inch x	Load pounds F	Shear pounds V	Moment in.-lb. M	Slope S	Deflec. D
COLUMN	0.0000	802	802	0	0.000000	0.000000
	18.6000	-9	725	14251	-0.010036	-0.192943
	37.2000	-13	615	26768	-0.008585	-0.367471
	55.8000	-16	472	36926	-0.006334	-0.507310
	74.4000	-19	294	44101	-0.003471	-0.599265
	93.0000	-23	84	47669	-0.000227	-0.634038
	111.6000	-26	-161	47006	0.003122	-0.607039
	130.2000	-29	-438	41487	0.006258	-0.519203
	148.8000	-33	-750	30489	0.008818	-0.377804
	167.4000	-36	-1095	13388	0.010396	-0.197273
TOP	186.0000	2115	681	-10441	0.010540	-0.000000

12

Prepared by M. KOPECKY Date 1/6/93
Checked by P.N.B Date 1-14-93
CUSTOMER LYONDELL
REFERENCE ITEM T-3455, T-4455 JOB NO 2472
SHEET 21 OF

PROPERTIES OF C6x10.50 WITH 1/16" CORROSION ON EACH SURFACE



$A = 1.86 \text{ IN}^2$
$I = 9.20 \text{ IN}^4$
$Z = 3.13 \text{ IN}^3$

$$S = \frac{M}{Z} = \frac{47,946}{3.13} = 15,318 \leq 20,000 \text{ PSI}$$

CHECK CENTER COLUMN PER API-650, 3.10.3.3
8" X-STG PIPE WITH 1/16" CORROSION

$R_o = 4.25 \text{ IN.}$
$R_i = 3.8125 \text{ IN.}$
$t = 0.4375 \text{ IN.}$

$$I = \pi/4 (R_o^4 - R_i^4) = \pi/4 [(4.25)^4 - (3.8125)^4] = 90.31 \text{ IN}^4$$

$$A = \pi (R_o^2 - R_i^2) = \pi [(4.25)^2 - (3.8125)^2] = 11.08 \text{ IN}^4$$

$$r = \sqrt{\frac{I}{A}} = \sqrt{\frac{90.31}{11.08}} = 2.85 \text{ IN.}$$

$$\frac{t}{R_o} = \frac{.4375}{4.25} = 0.1029, \quad Y = 1.00$$

SHELL ROOF BOTTOM

$$L = 40(12) + \frac{3}{12}\left(\frac{40}{2}\right)(12) - \frac{.1}{12}\left(\frac{40}{2}\right)(12)$$
$$= 480 + 60 - 2$$
$$= 538 \text{ INCH}$$

$$\frac{L}{r} = \frac{538}{2.85} = 189$$

$$Cm_c = \frac{149{,}000{,}000\ Y}{(L/r)^2[1.6 - (L/200r)]}$$
$$= \frac{149{,}000{,}000\ (1.00)}{(189)^2[1.6 - (189/200)]}$$
$$= 6369 \text{ PSI}$$

$F = \pi(24)^2(0.31) + 20(802) = 16{,}601$ LBS.

ROOF MAX. LOAD -	16,601 LBS.
PIPE & MISC. WT. -	2500
TOTAL	19,101 LBS.

$$S_c = \frac{F}{A} = \frac{19{,}101}{11.08} = 1724 \leq 6369 \text{ PSI}$$

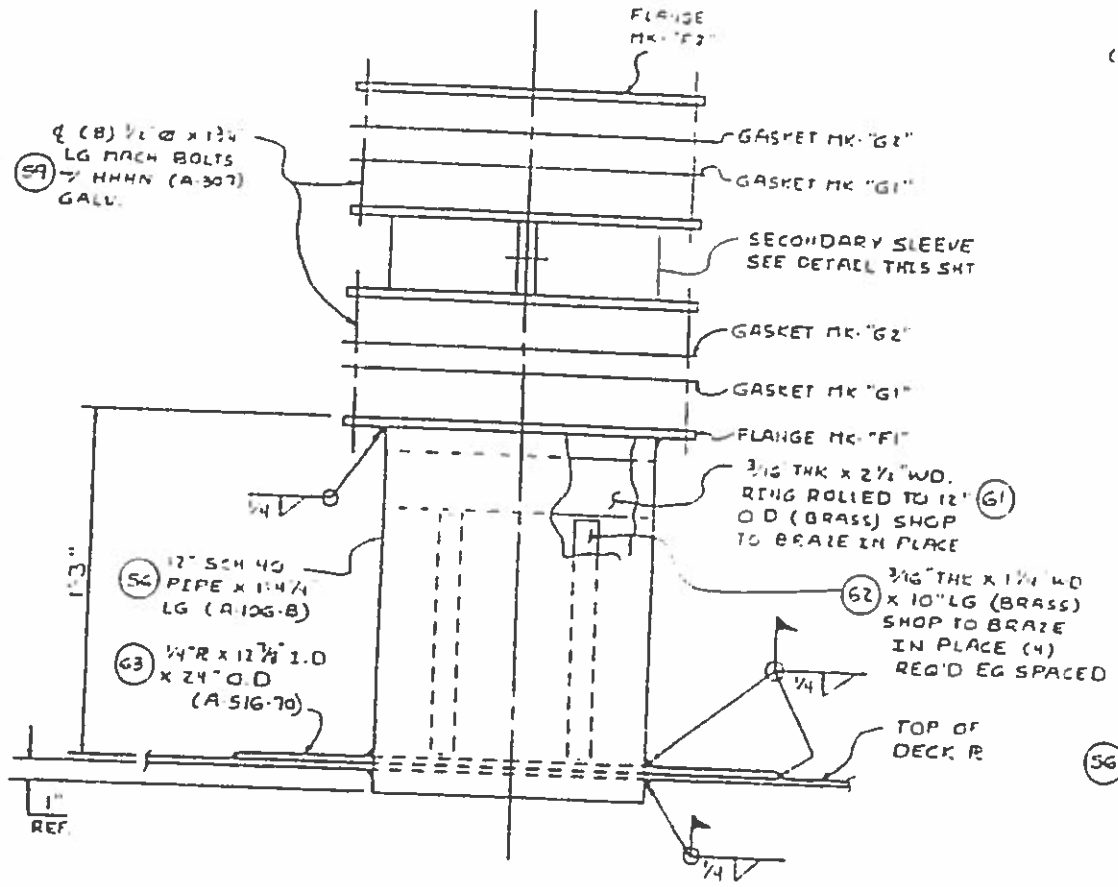
LOAD ON SHELL (MINIMUM)

LOAD = 10.20 LB/FT^2 = 0.07 LB/IN^2

$F_2 = (0.07)(75.09) + 0.88 = 6.14$ LB/IN

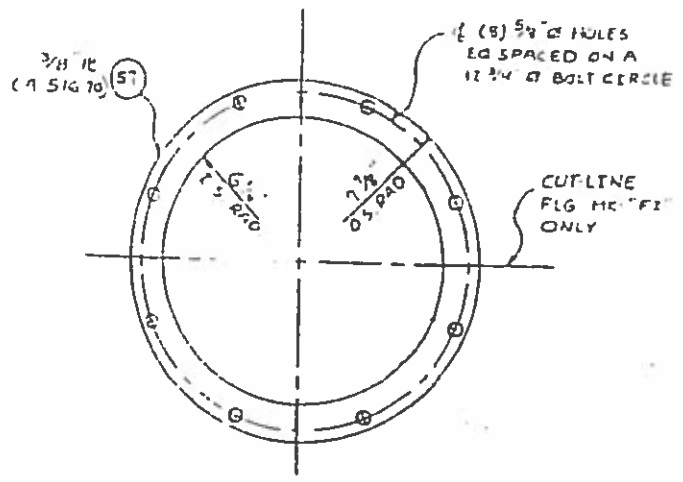
$$R = \left(\frac{6.14}{24.16}\right)(2154) = 547 \text{ LBS.}$$

WT = 20(547) = 10,940 LBS. (ON INNER TANK)



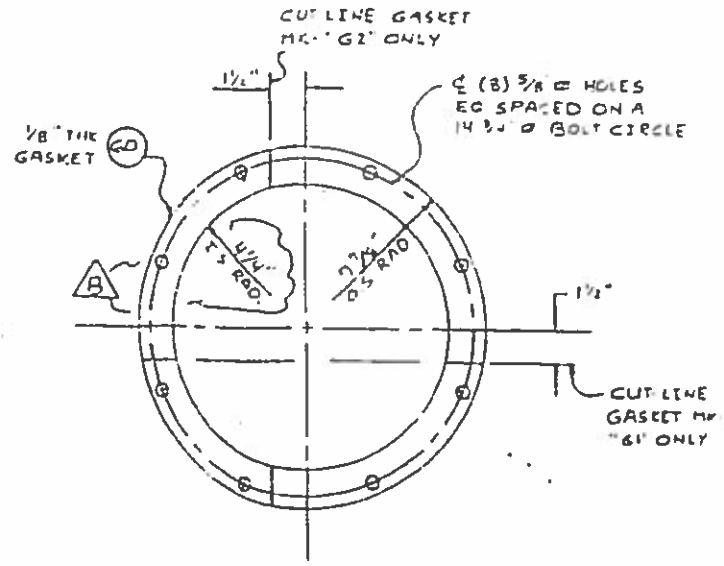
DETAIL CENTER COLUMN SLEEVE

(ONE) ASS'Y REQUIRED



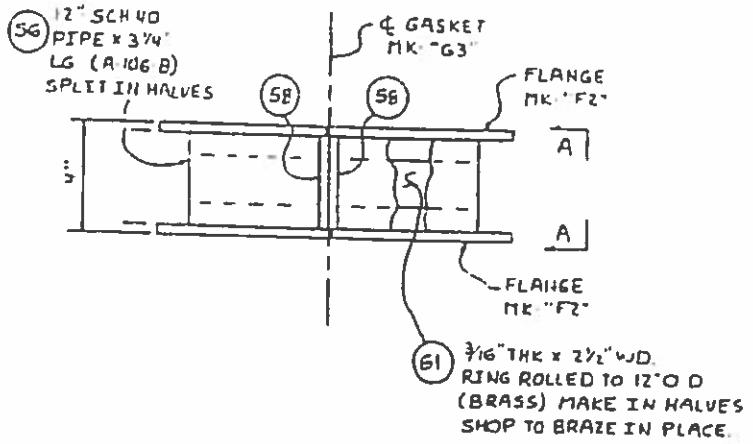
DETAIL SLEEVE FLANGE

(ONE) REQ'D MK "F1"
(3) REQ'D MK "F2"



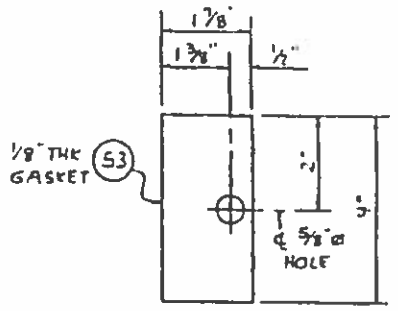
DETAIL SLEEVE GASKET

(1) REQ'D MK "G1"
(2) REQ'D MK "G2"



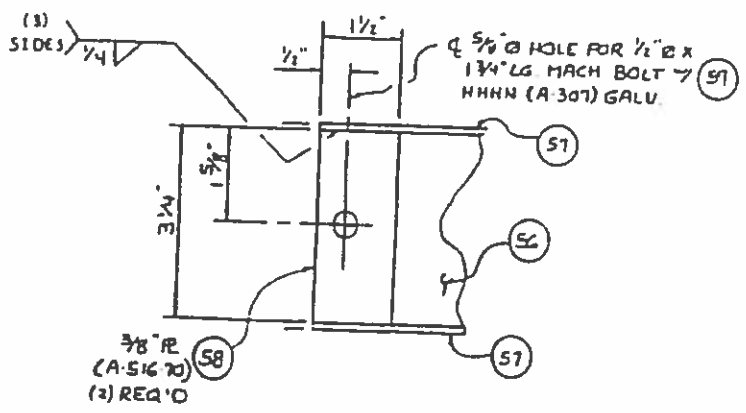
DETAIL SECONDARY SLEEVE

ONE ASS'Y REQ'D



DETAIL SLEEVE GASKET

(2) REQ'D MK "G3"



VIEW "A-A"

TYP. IN (2) PLACES

P.O.#: CHO-93-001

S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC MODIFICATIONS FOR AN EXIST. 40'-0"ø x 32'-0" HIGH TANK

DETAIL CENTER COLUMN SLEEVE

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-22-93

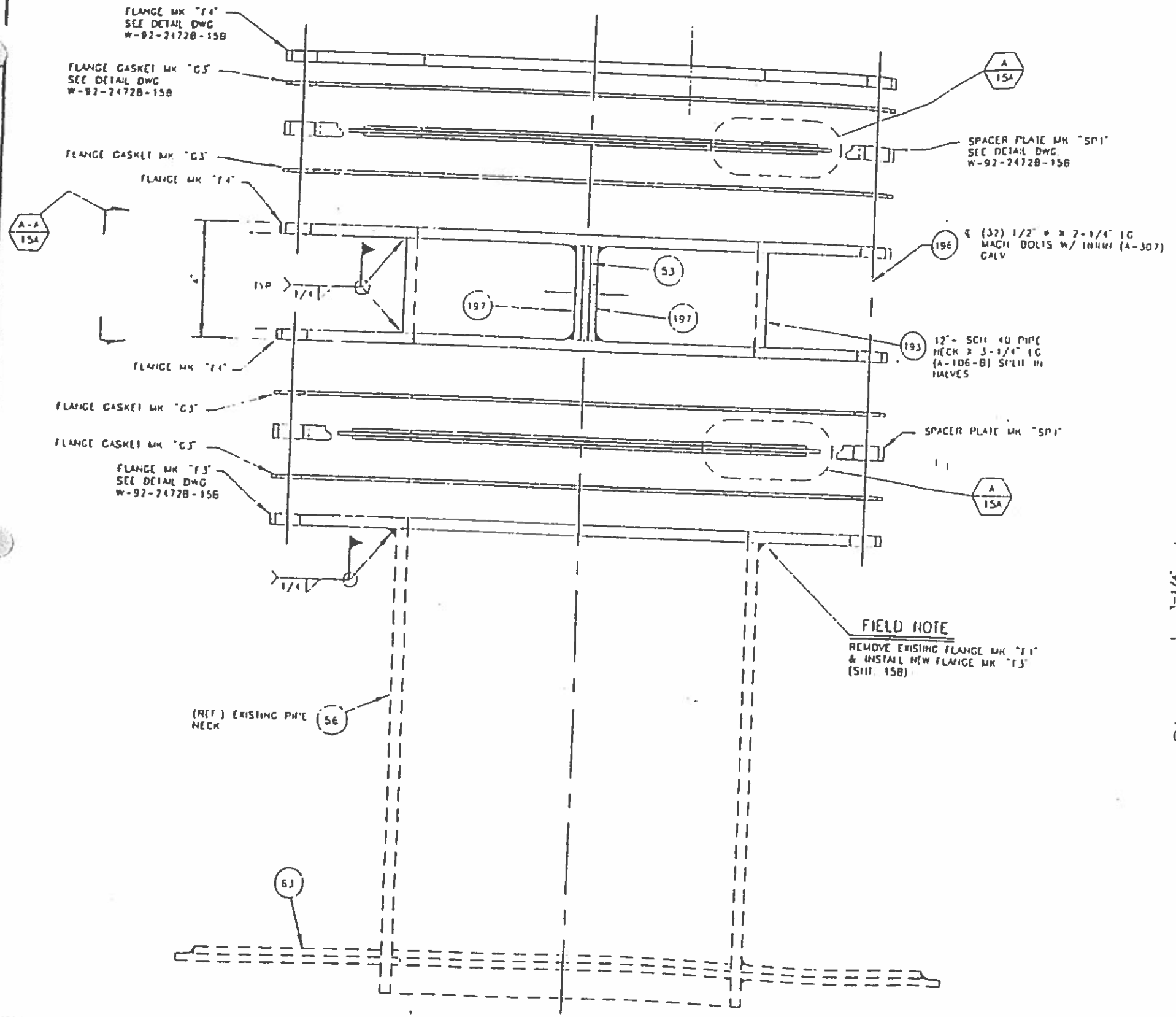
CHECKED: C.C APPROVED:

NO. W-92-2472A-15 REV. B

SCALE:

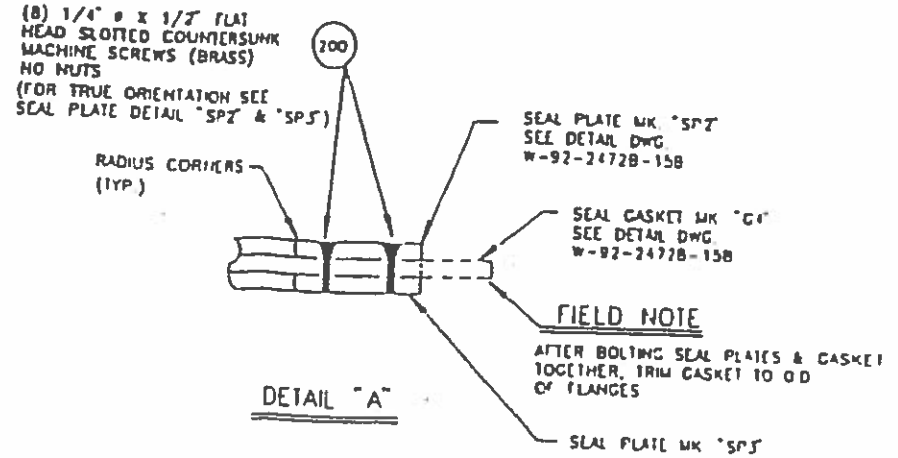
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 1/27/93
BY: [signature]

NO.	REVISION	DATE	BY	CK'D
B	REV. I.D. OF GASKET	2-10-93	JKH	C.C.
A	REV. PER CUST. APPROVAL	1-29-93	JKH	C.C.

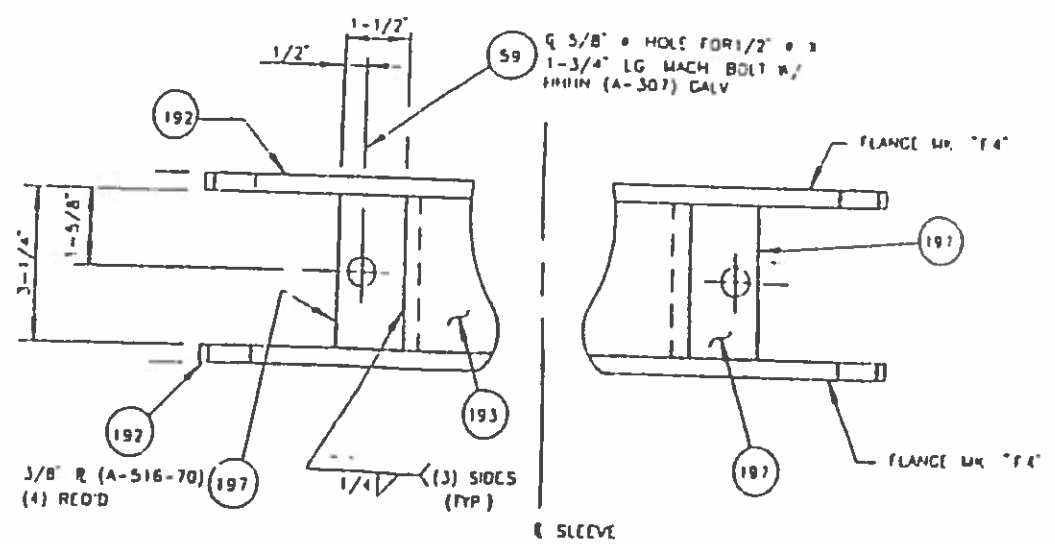


DETAIL CENTER COLUMN SLEEVE

(ONE) ASSEMBLY REQUIRED



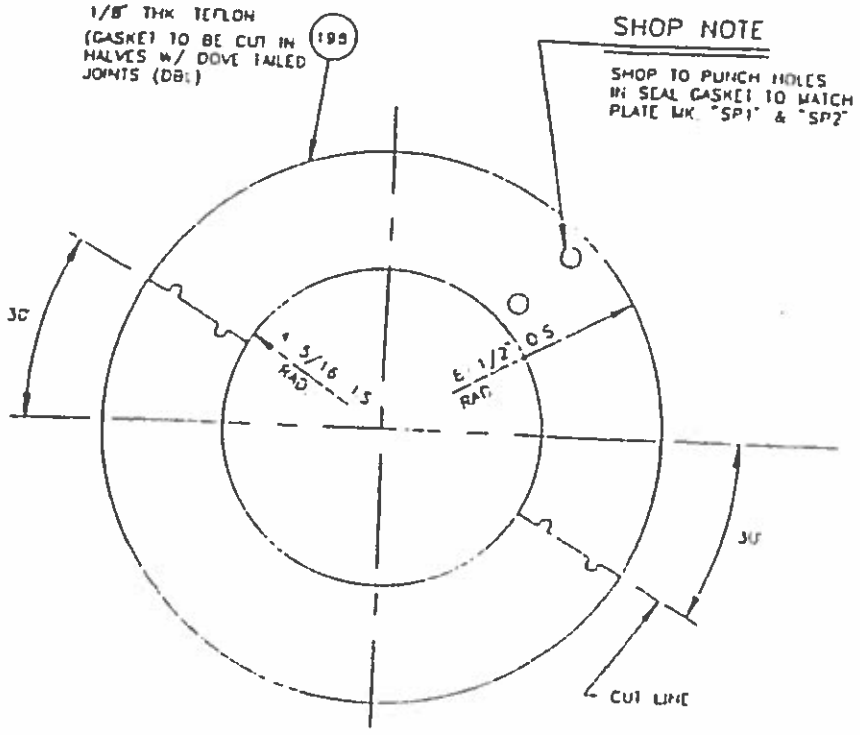
DETAIL "A"



VIEW A-A

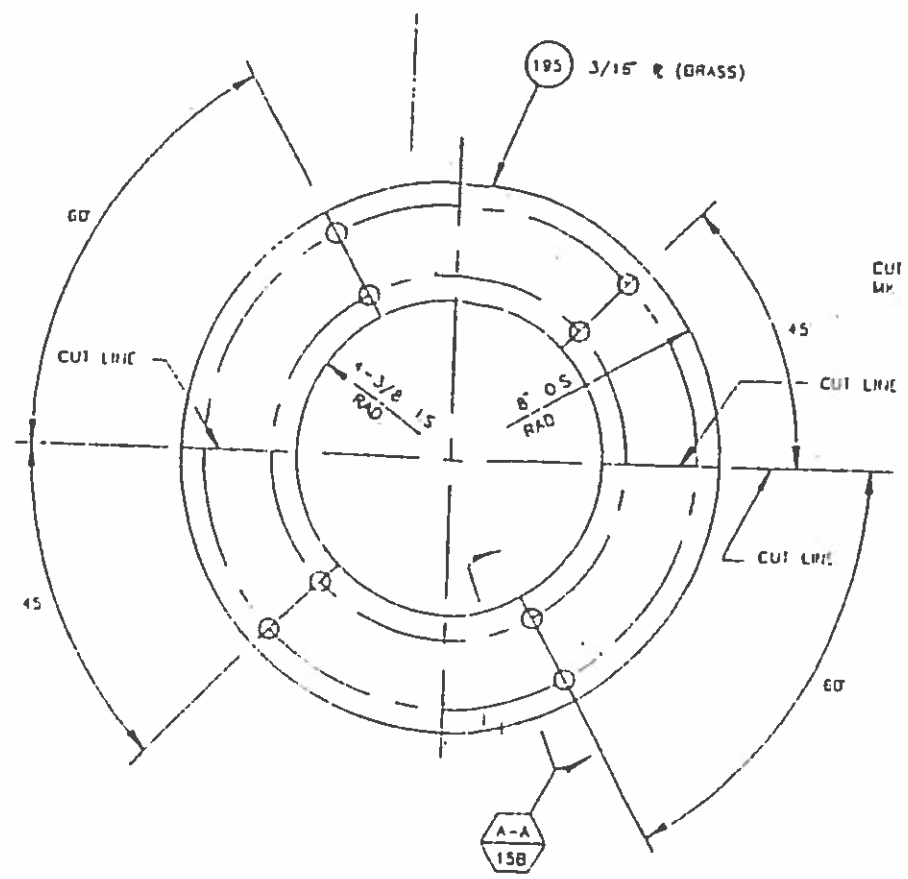
NO. W-92-2472B-15A REV.

P.O.#: CHO-93-001	
S/O 2472B	ITEM: TK-4455
WYATT FIELD SERVICE COMPANY HOUSTON, TEXAS	
MISC MODIFICATION FOR AN EXISTING 40'-0" ø X 32'-0" HIGH TANK DETAIL CENTER COLUMN SLEEVE	
SCALE: FULL	CUSTOMER: LYONDELL PETROCHEMICAL
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY DATE: 5-27-93	DRAWN: RF DATE: 5-24-93



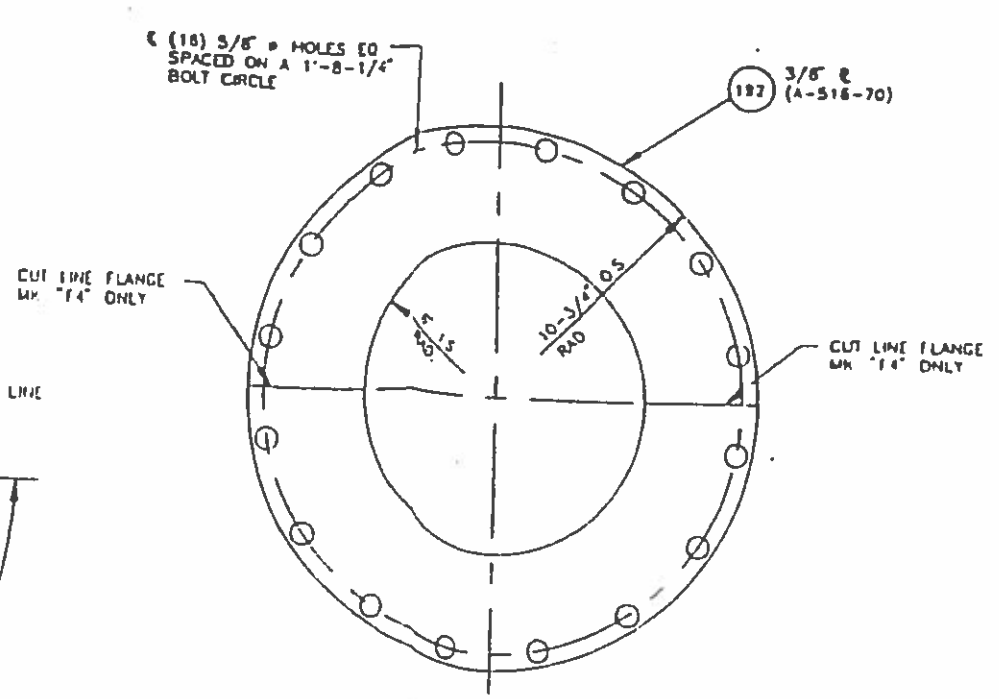
DETAIL SEAL GASKET

(2) REQ'D MK "G4"



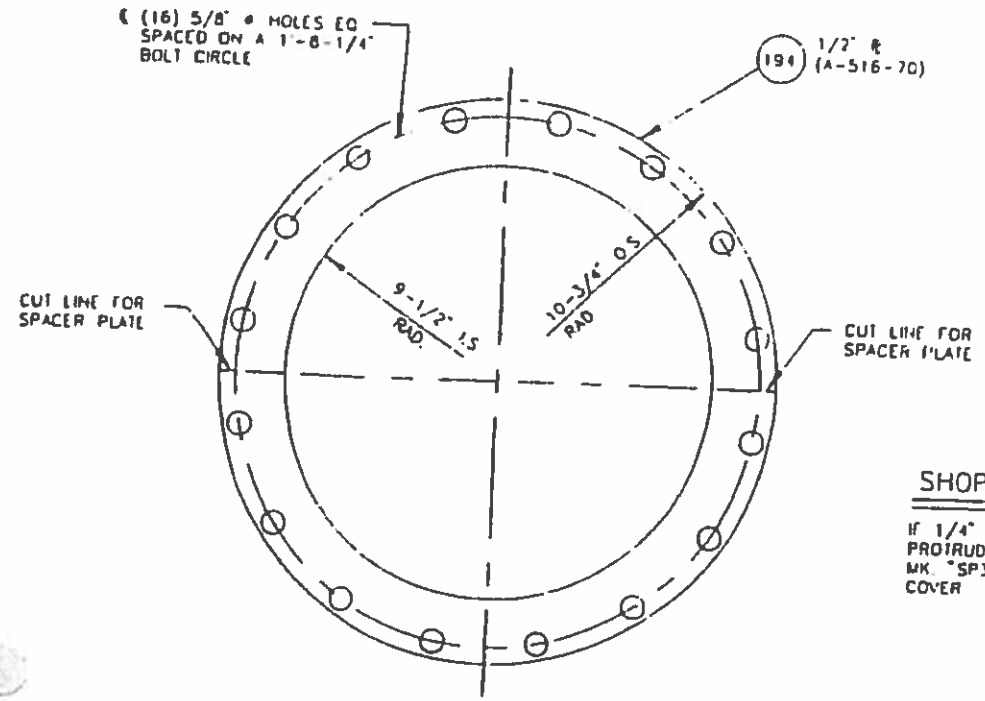
DETAIL SEAL PLATE

(2) REQ'D MK "SP2"
(2) REQ'D MK "SP3"



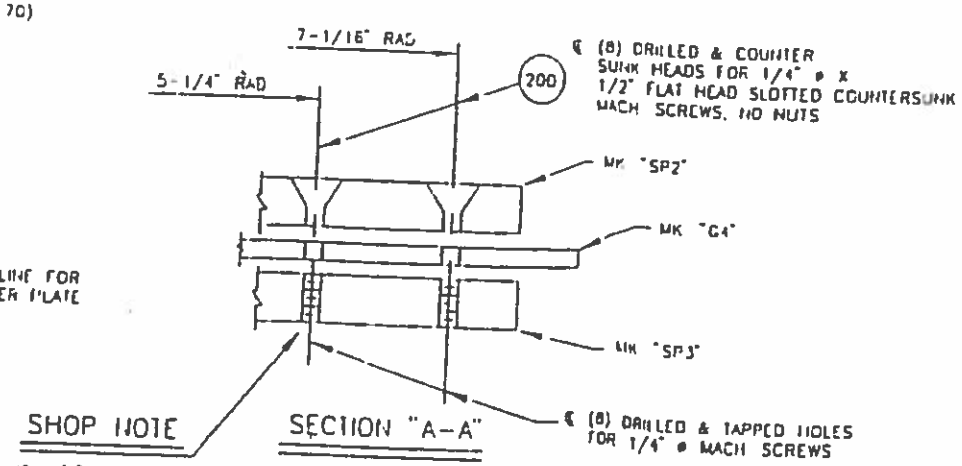
DETAIL SLEEVE FLANGE

(ONE) REQ'D MK "F5"
(3) REQ'D MK "F4"



DETAIL SPACER PLATE

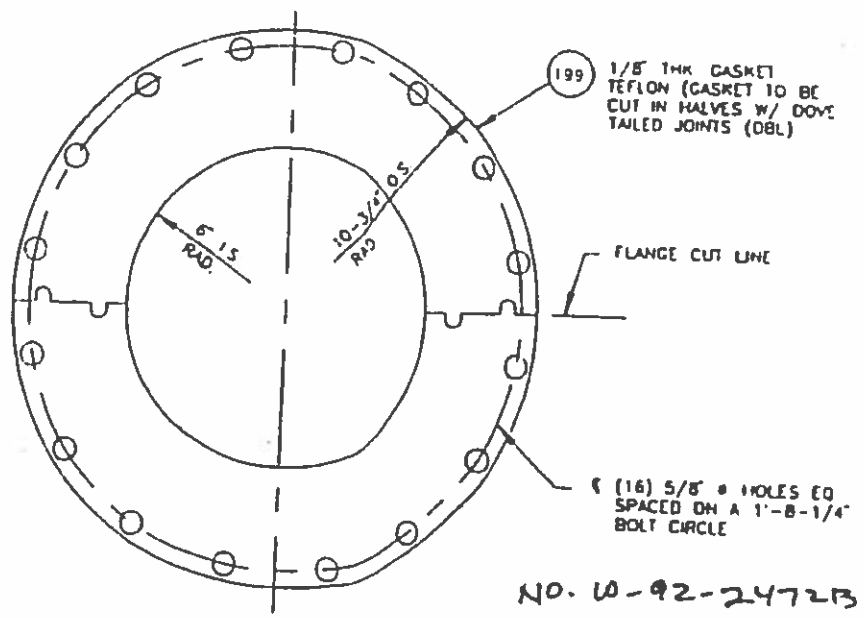
(2) REQ'D MK "SP1"



SHOP NOTE

IF 1/4" ø SCREW ENDS PROTRUDE BELOW SEAL PLATES MK "SP3" GRIND FLUSH W/ COVER

SECTION "A-A"



DETAIL FLANGE GASKET

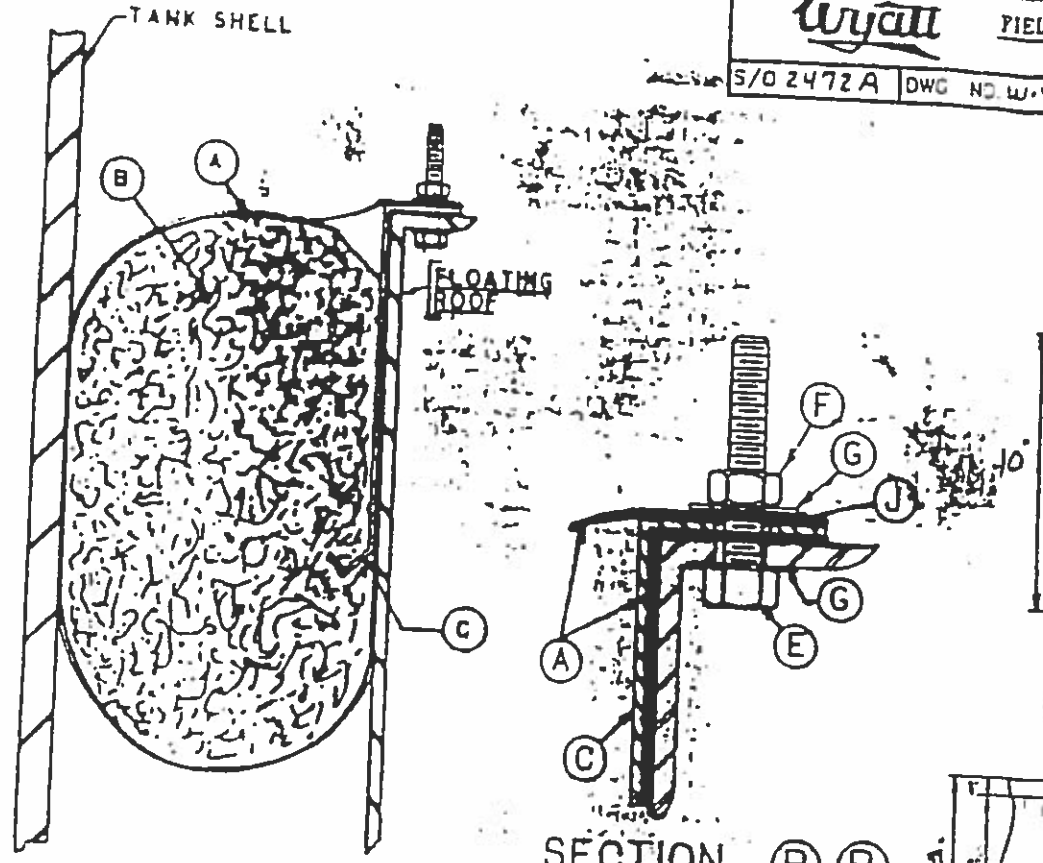
(4) REQ'D MK "G3"

NO. 0-92-24728-15B REV.

P.O.#:	CHO-93-001
S/O 24728	ITEM: TK-4455
WYATT FIELD SERVICE COMPANY HOUSTON, TEXAS	
MISC MODIFICATION FOR AN EXISTING 40'-0" ø X 32'-0" HIGH TANK MISC DETAILS CENTER COLUMN SLEEVE	
CUSTOMER	LYONDELL PETROCHEMICAL
DRAWN: RF	DATE 5-24-93
CHECKED: CE	

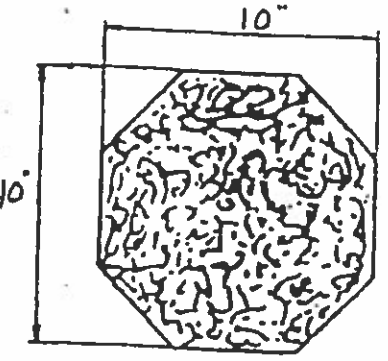
SCALE:	FULL
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY	
DATE:	5-27-93

Wyatt FIELD SERVICE COMPANY HOUSTON, TEXAS		
S/O 2472A	DWG NO. W-92-2472A-16	REV A



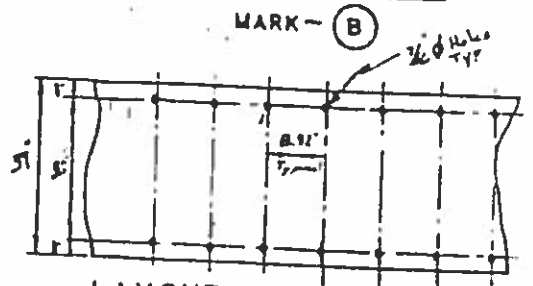
SECTION (A)-(A)

SECTION (B)-(B)

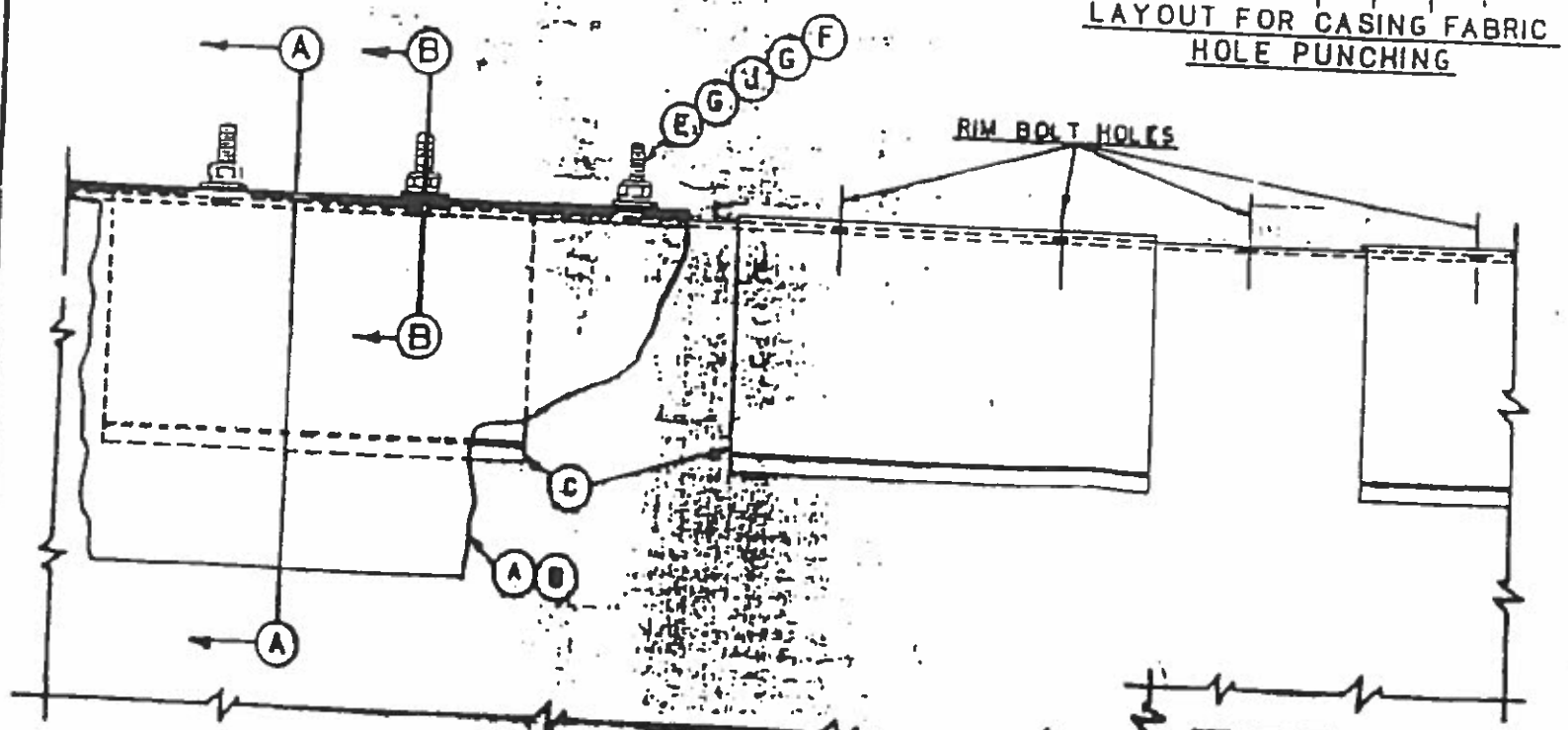


FOAM LOG

MARK – (B)



LAYOUT FOR CASING FABRIC HOLE PUNCHING



ELEVATION

BILL OF MATERIALS

MARK	DESCRIPTION	MATERIAL	QUAN REQD	QUAN SHPD	SHIPPING WEIGHT
A	SEAL FABRIC- GOTON	30mil Teflon coated fiberglass	115 ft	115 ft	64
B	OCTAGONAL FOAM-10"	URETHANE 10" LG	115.5'	120'	56
C	HOLD DOWN PLATES	18 GA. Galvanize	51	53	166
D	CLAMP CHANNEL	GALVANIZE x 8 LG	Stock	Stock	2040 LBS
E	3/8 x 2" HEX HD. TAP	Stainless Steel	151	175	13
F	3/8 HEX NUT	Stainless Steel	181	175	3
G	3/8 STANDARD WASHER	Stainless Steel	302	350	4
H	FABRIC SPLICE KIT	.002x1" FEP Teflon Tape	6.5'	7'	1
I					
J	FINERMAN CLIPS	COATED S.S.	151	175	1

GENERAL NOTES

1. ALL STEEL PARTS COMING IN CONTACT WITH THE SEAL FABRIC MUST BE FREE OF BURRS AND SHARP EDGES.
2. SEAL FABRIC SPECIFICATIONS
   A. CASING FABRIC: Meet GOTO SEAL Teflon Coated Fiberglass
   B. SPLICE WITH FEP Teflon Tape by use of Heat Iron
3. FOAM LOG SPECIFICATIONS:
   PRIME QUALITY POLYETHER TYPE URETHANE FOAM WITH THE FOLLOWING VALUES:
   A. COMPRESSION SET NOT TO EXCEED 10% @ 75% DEFLECTION
   B. INDENTATION LOAD DEFLECTION --RMS VALUE 15-35 AT 25% DEFLECTION.
   C. DENSITY---1.0 TO 1.2 LBS./CU. FT.
   D. TENSILE STRENGTH---10# PER SQ. IN.
   E. ELONGATION---180% MIN.
   F. TEMPERATURE---20°F TO 200°F.
4. FIELD NOTES:
   A. EXTRA LENGTH SEAL FABRIC HAS BEEN SUPPLIED. CUT OFF EXCESS. MAKE LAP IN SPLICE 4" WIDE.
   B. EXTRA FOAM HAS BEEN SUPPLIED. CUT OFF ANY EXCESS. FOAM IS TO BE INSTALLED IN SEAL FABRIC WITHOUT SPLICING AND EACH 10'-0" SECTION SHALL BE COMPRESSED IN LENGTH APPROX. 6".
   C. SEE DRILLING HOLES PER HOLE DOWN PLATE. SEE ELEVATION

Extra Hole Report

ANNULUS: 6"

RIM HOLE SPACING: 8½" Centers

ANTI ROTATION DEVICE: Gauge Pole

PRODUCT LEVEL FROM TOP OF RIM: 14.44"

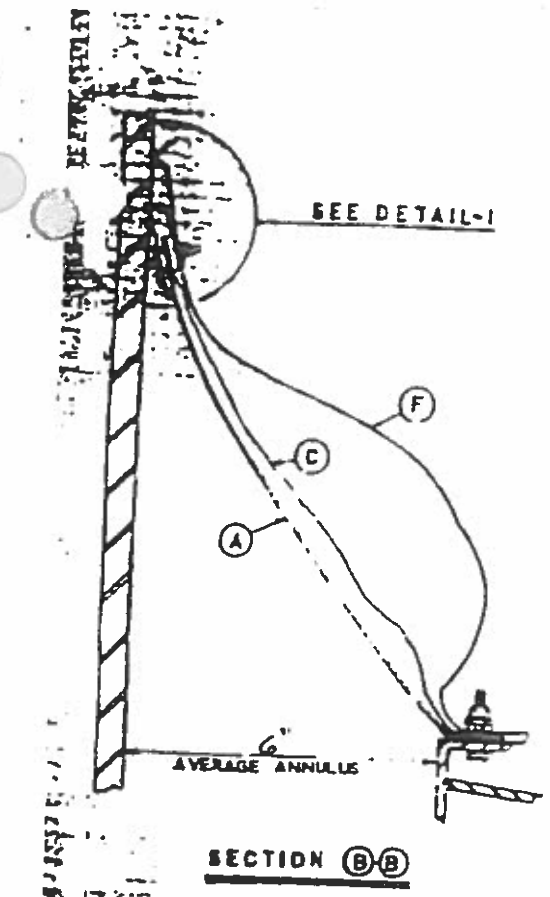
VAPOR MOUNTED

NO	DATE	BY	REVISION DESCRIPTION

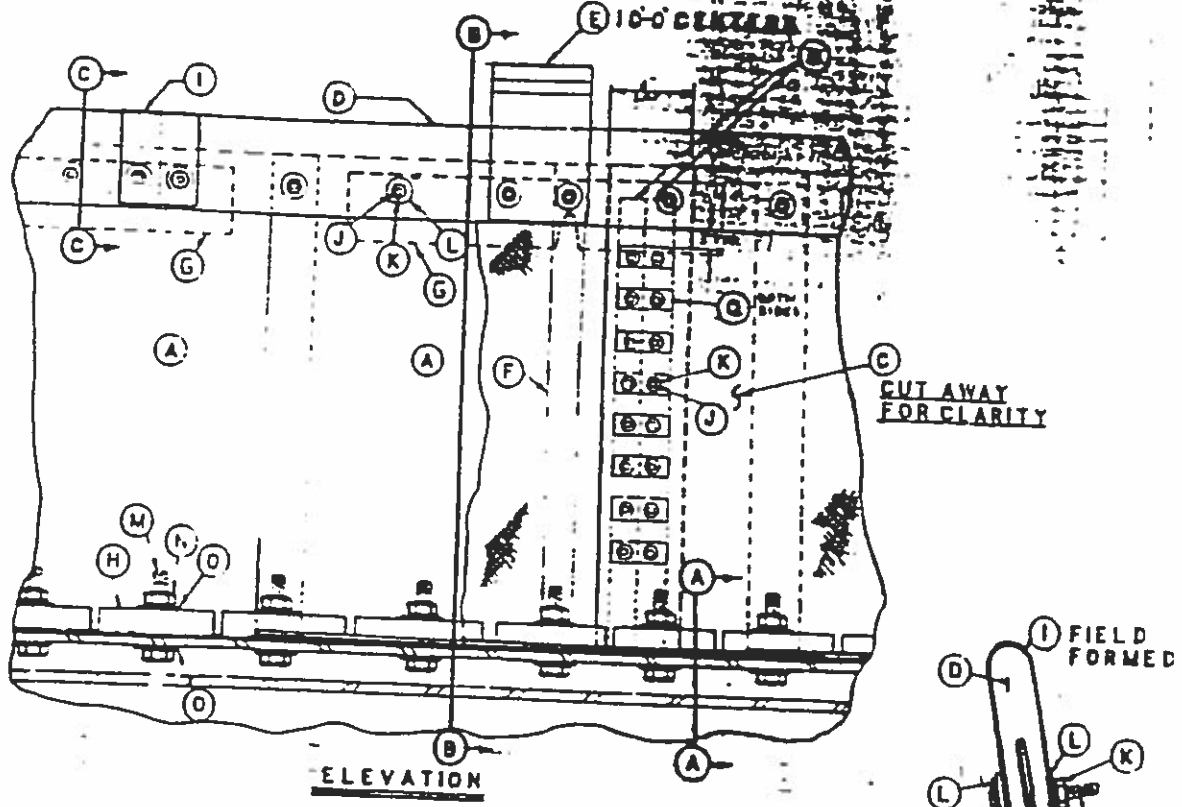
CUSTOMER INFORMATION	
TANK NO. TK-3455	Wyatt Field Service Company Lyndell Petrochemical Channelview, TX
ORDER NO. W-5748C/2472	JOB NO. 92-102

TST FOAM LOG SEAL FOR 35'-0" DIA. TANK

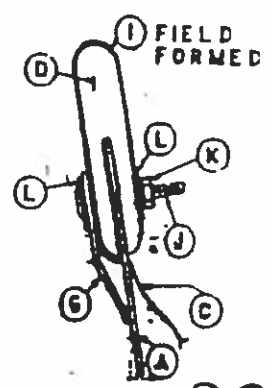
Drafted by	Checked	Approved	SCALE	DATE
VL		cl	NONE	1-25-93
SHEET NO. 1 of 2		DRAWING NO. TST-VMFL-0102-92		REV. 0



SECTION (B)(B)

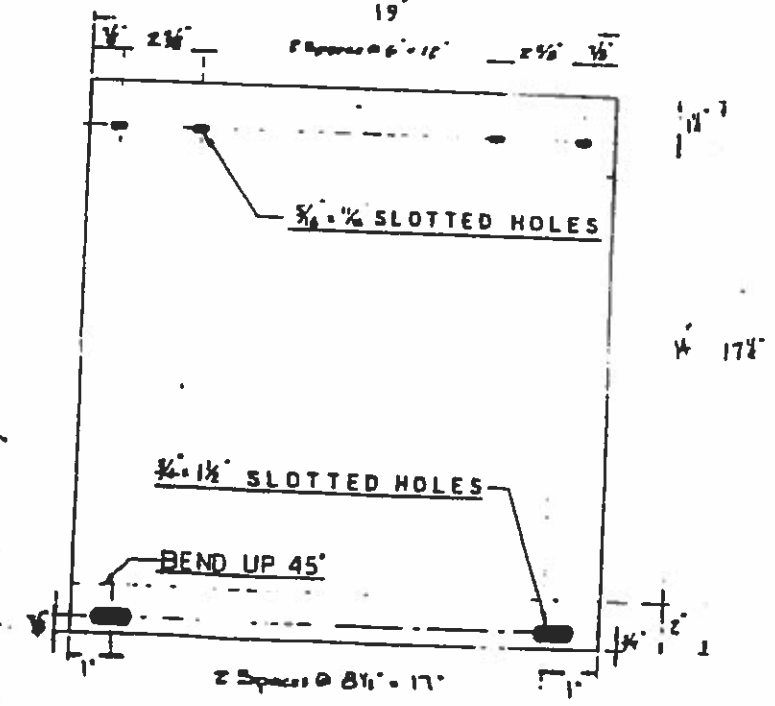


ELEVATION

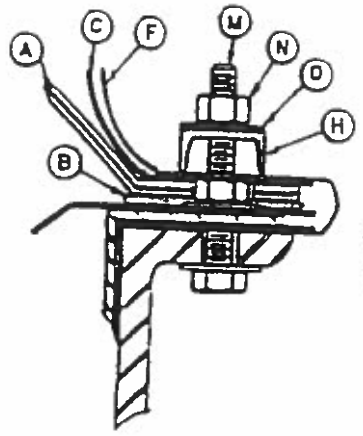


SECTION (C)(C)

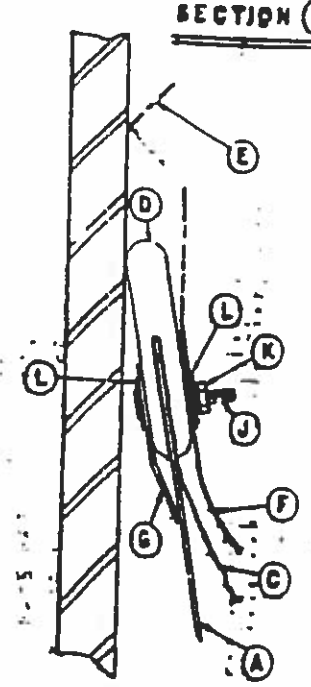
MARK	DESCRIPTION	MATERIALS	GRAMS REQ'D	GRAMS CUTOUT	SHIPG. WT. LBS.	PART
A	SECONDARY SEAL PLATES	Hot Galvanized	78	78	1003	
B	GASKET	Polyethylene Foam	111	135	24	
C	VAPOR BARRIER FABRIC	Polyethylene Ft wrap	111	135	30	
D	SEAL TIP	Neoprene/EPDM Blend	248	112	148	
E	GROUND SHUNT	Stainless Steel	11	12	2	
F	GROUND STRIP	Stainless Steel	11	12	2	
G	ANTI-HANGUP	Hot Galvanized	96	98	65	
H	CLAMP CHANNEL	Galvanized Steel	131	165	91	
I	SEAL SPLICE PLATE	Stainless Steel	.3	.3		
J	¼" x 1 1/4" PAN HD MACH SCREW	Stainless Steel	344	400	2	
K	¼" HEX NUT	Stainless Steel	344	400	1	
L	¼ x 1 1/2 WASHER	Stainless Steel	344	400	1	
M	⅜ x 1" HEX HD TAP BOLT	Stainless Steel	455	780	9	
N	⅜ HEX NUT	Stainless Steel	See	Sheet	1 of 2	PART "F"
O	⅜" WASHER	Stainless Steel	151	173	3	
P	⅜" TINNERMAN CLIP	Coated Carbon Steel	151	173	2	
Q	VAPOR BARRIER SPLICE	Hot Stainless Steel	18	20	1	



STANDARD SEAL PLATE MARK-A



SECTION (A)(A)



DETAIL-1

Wyatt FIELD SERVICE COMPANY HOUSTON, TEXAS

S/O 2472A | DWG. NO. W-92-2472A-17 | REV. A

CONTRACTOR'S DESIGNATION

TEX-SEAL | Wyatt Field Service Co.

JOB NO. 92-108 | ORDER NO. P-8396/Rev

TYPE "F" SECONDARY SEAL FOR 32'-0" I.D. WELDED TANK

SCALE: NONE

P-5164 Units:

1. [illegible] to accommodate to flatness to a minimum amount of ½" to a maximum amount of 1½" and tensioning down into place.

Dim. attachment C Bar on Angle 1 inch at center ± ½" of vertical and horizontal position.

Field Holes:

1. To prevent binding of the Vapor Barrier Fabric & Bars C drill a field hole with a pointed object before attempting to pull bolts into holes.

Vapor Barrier Fabric is to be installed with approximately ½" in slack.

Attachments C Bars D & Anti to be placed in the center of each seal plate. Do not install across the seal plates lap joints.

Lap seal plates in a clockwise pattern.

Vapor Barrier Splice Fab to be placed as shown on Fabrication sketch with a nut at top and bottom.

Tank Data Sheet:

Material	6"
Bolt Hole Spacing	8¼" Centers
Type of Pin Connection	Horizontal
Anti-Rotation Device	Gauge Pole
Existing Primary Seal Height above Pin	0"

Operation Note:
Do not operate tank when Secondary Seal System projects above the bottom edge of Guide Poles or Damage any other parts Secondary Seal System.

SCHEDULE OF OPENINGS

DETAIL OF OPENINGS

MARK NO.	NO. REQ'D.	SIZE	FLANGE RATING	FACING	NOZZLE SERVICE	FLANGE TYPE	NECK TYPE	NECK O.D.	REINFORCING PAD	BLIND FLANGE	FLANGE BOLTING	GASKETS	NOZZLE PROJ. (SEE NOTE 6)	ATTACHMENTS: TYPE	O.S. FILLET "A"	I.S. FILLET "B"	PAD FILLET "C"	REMARKS
180	ONE	36"	API 650	FF	MANWAY OUTER TANK				SEE DETAIL ON SHT. # 26									
181	ONE	24"	API 650	FF	MANWAY INNER TANK				SEE DETAIL ON SHT. # 20									
* 17	ONE	3"	150#	RF	OUTLET				SEE DETAIL ON SHT. # 31									
* 31	ONE	4"	150#	RF	DRAIN				SEE DETAIL ON SHT. # 21									
32A THRU 32C	ONE EA	3"	150#	RF	SKIMMING NOZZLE					(104) 3"-150# BLIND FLG 1/16" RF (A-105)	(105) (4) 5/8"Ø x 3 3/4" LG STUDS W/ (2) HHHN EA (A-193-B7) (A-194-2H)	(106) 1/16" THK GSKT FOR 3"-150# RF FLG. GARLOCK GYLON 3510 (OFF WHITE)						
* 35	ONE	3"	150#	RF	UTILITY CONN.				SEE DETAIL ON SHT. # 31									FIELD TO BLIND OFF EXIST. NOZZLES
46	ONE	1½	150#	RF	EXT. LEVEL CONN.	(115) 1½"-150# LONG WELD NECK x 9"LG. 1/16" RF (A-105)		2 5/8"										
50	ONE	6"	150#	RF	OVERFLOW					(150) 6"-150# BLIND FLG 1/16" RF (A-105)	(151) (8) 3/4"Ø x 4" LG. STUDS W/ (2) HHHN EA. (A-193-B7) (A-194-2H)	(152) 1/16" THK GSKT FOR 6"-150# RF FLG. GARLOCK GYLON 3510 (OFF WHITE)	6"	III	1/4	1/4	—	
69	ONE	1½	150#	RF	TEMP. GAUGE				SEE DETAIL ON SHT. # 32									FIELD TO BLIND OFF EXIST. NOZZLE
45A THRU 45F	ONE EA	¾	150#	RF	COND. INDICATOR	(111) ¾"-150# LONG WELD x 9"LG. 1/16" RF (A-105)		1 5/8"		(112) ¾"-150# BLIND FLG. 1/16" RF (A-105)	(113) (4) ½"Ø x 2½" LG STUDS W/ (2) HHHN EA (A-193-B7) (A-194-2H)	(114) 1/16" THK GSKT. FOR ¾"-150# RF FLG. GARLOCK GYLON 3510 (OFF WHITE)	6"	VI	1/4	1/4	—	
9A THRU 9D	ONE EA.	1"	150#	RF	NITROGEN PURGE	(107) 1"-150# LONG WELD NECK x 9"LG. 1/16" RF (A-105)		2"		(108) 1"-150# BLIND FLG. 1/16" RF (A-105)	(109) (4) ½"Ø x 2¾" LG. STUDS W/ (2) HHHN EA. (A-193-B7) (A-194-2H)	(110) 1/16" THK GSKT FOR 1"-150# RF FLG. GARLOCK GYLON 3510 (OFF WHITE)	8½"	VI	1/4	1/4	—	
33	ONE	3"	150#	RF	SKIMMING NOZZLE				SEE DETAIL ON SHT. # 22									
51	ONE	6"	150#	RF	HIGH LEVEL CONN.	(76) 6"-150# SLIP-ON FLG 1/16" RF (A-105)	(77) 6"-SCH. 80 PIPE x 3'-3"LG. (A-106-B)	6 5/8"	(78) ¼" R x 6 ¾" I.D. x 15 ¾" O.D. (A-516-70) (2) REQ'D				10"	VII / I	1/4	1/4	1/4	SEE DETAIL OF SPACER ON SHT. # 26

WELD NECK FLANGE ATTACHMENT DETAIL

SLIP-ON FLANGE ATTACHMENT DETAIL

TYPE I — I.S. INNER SHELL

TYPE II — I.S. OUTER SHELL

TYPE III — I.S. OUTER SHELL

TYPE IV — I.S. INNER SHELL

TYPE V

TYPE VII — I.S. OUTER SHELL

Field Note
Do Not Weld This Side

TYPE VI — I.S.

NOTES

1. ALL NOZZLE AND MANWAY FLANGE BOLT HOLES IN TANK SHELL ARE TO STRADDLE THE VERTICAL CENTERLINES (UNLESS OTHERWISE NOTED).
2. ALL NOZZLE AND MANWAY FLANGE BOLT HOLES IN TANK ROOF ARE TO STRADDLE THE NORTH/SOUTH CENTERLINES (UNLESS OTHERWISE NOTED).
3. NOZZLE PROJECTIONS ARE MEASURED FROM FACE OF FLANGE TO OUTSIDE OF OUTER SHELL AT NOZZLE CENTERLINE (UNLESS OTHERWISE NOTED).
4. ALL REINFORCEMENT PADS OR EACH SECTION (IF MADE IN SECTIONS) SHALL HAVE ONE (1) 1/4" NPT, TELL TALE HOLE AND SHALL BE TESTED WITH 15 PSIG AIR AND SOAP SUDS. EXCEPT NOZZ. MK-"31" OUTER TANK PAD
5. [MT] SEE SHT. # 2 FOR MAG PART NOTE
6. DENOTES NOZZLES THAT PENETRATE BOTH SHELLS
7. ALL PAD TEST HOLES ON INNER TANK TO BE PLUGGED W/ ¼" PIPE PLUGS (REMOVED AFTER HYDROTEST OF OUTER TANK

D	MOVED NOZZ. MK-"40" TO SHT. "32"	11-09-93	JKH	CE
C	MOVED NOZZLES MK-"1" & "35" TO SHT. # 31 ADD PAD	9-15-93	JKH	CE
B	ADD GASKETS, TYPE VII, NOTE 6 REV. NOTE # 4	7-11-93	JKH	CE
A	REV. PER CUST. ACCEPTANCE	2-3-93	JKH	CE

FILE NAME: SPEEDDRAFT

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/03/12

NO. 10-92-2472-B-18 REV. D

P.O.#: CHO-93-0001

S/O 2472B | ITEM: TK-4455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST 40'-0"Ø X 32'-0" HIGH TANK

SCHEDULE OF OPENINGS (SHELL)

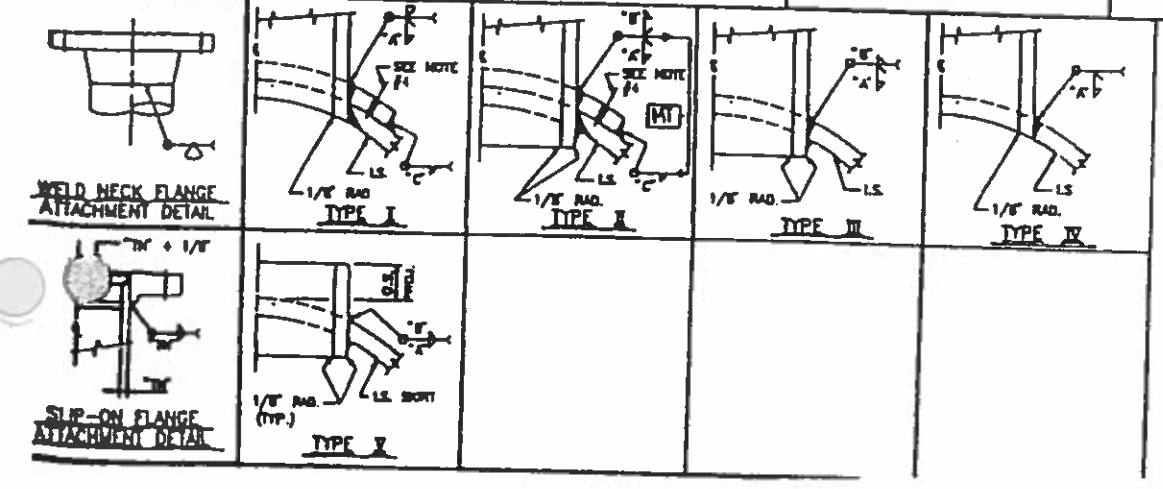
CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH | DATE: 1-23-93

SCHEDULE OF OPENINGS

DETAIL OF OPENINGS

MARK NO.	NO. REQ'D	SIZE	FLANGE RATING	FACING	NOZZLE SERVICE	FLANGE TYPE	NECK TYPE	NECK O.D.	REINFORCING PAD	BLIND FLANGE	FLANGE BOLTING	GASKETS	NOZZLE PROJ (SEE NOTE 5)	ATTACHMENTS: TYPE	ATTACHMENTS: O.S. FILLET "A"	ATTACHMENTS: I.S. FILLET "B"	ATTACHMENTS: PAD FILLET "C"	REMARKS
37	ONE	3"	150#	RF		(82) 3"-150# SLIP ON FLG. ½" RF (A-105)	(89) 3" SCH 160 PIPE x 8" LG (A-106-B)	3½"	(153) ¼" PL x 3⅝" ID x 10½" OD PAD (A 36)				6"	II	¼	¼	¼	SEE SHT #21 FOR DTL OF BAFFLE
38	ONE	3"	150#	RF		(82) 3"-150# SLIP ON FLG. ½" RF (A-105)	(89) 3" SCH 160 PIPE x 8" LG (A-106-B)	3½"	(153) ¼" PL x 3⅝" ID x 10½" OD PAD (A 36)				6"	II	¼	¼	¼	SEE SHT #21 FOR DTL OF BAFFLE
52	ONE	6"	150#	RF	OVERFLOW				SEE DETAIL ON DWG # 91 92 2472 - 25									



NOTES

1. ALL NOZZLE AND MANWAY FLANGE BOLT HOLES IN VESSEL SHELL ARE TO STRADDLE THE VERTICAL CENTERLINES (UNLESS OTHERWISE NOTED).
2. ALL NOZZLE AND MANWAY FLANGE BOLT HOLES IN VESSEL HEADS ARE TO STRADDLE THE NORTH/SOUTH CENTERLINES (UNLESS OTHERWISE NOTED).
3. NOZZLE PROJECTIONS ARE MEASURED FROM FACE OF FLANGE TO OUTSIDE OF SHELL AT THE NOZZLE CENTERLINE (UNLESS OTHERWISE NOTED).
4. ALL REINFORCEMENT PADS OR EACH SECTION (IF MADE IN SECTIONS) SHALL HAVE ONE (1) 1/4" NPT, TELL TALE HOLE AND SHALL BE TESTED WITH 15 PSIG AIR AND SOAP SUDS.
5. [MT] SEE SHT #2 FOR MAG. PART NOTE

FILE NAME: SPEEDSHT

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/03/93

P.O.#: CHO-93-0001

S/O 2472B | ITEM: TK-4455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'-0"ø x 32'-0" HIGH TANK

SCHEDULE OF OPENINGS (SHELL)

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: OOG DATE: 2-3-93

CHECKED: CG. APPROVED:

SCHEDULE OF OPENINGS

DETAIL OF OPENINGS

MARK NO	NO. REQ'D	SIZE	FLANGE RATING	FACING	NOZZLE SERVICE	FLANGE TYPE	NECK TYPE	NECK O.D.	REINFORCING PAD	BLIND FLANGE	FLANGE BOLTING	GASKETS	NOZZLE PROJ. (SEE NOTE 3)	ATTACHMENTS TYPE	O.S. FILLET "A"	I.S. FILLET "B"	PAD FILLET "C"	REMARKS
1A	ONE	24"	API 650	FF	MANWAY				REUSE EXIST MANWAY									
8	ONE	8"	150#	RF	VENT				REUSE EXIST NOZZLE									
2	ONE	24"	API 650	FF	MANWAY				SEE DETAIL ON SHT #23									
3	ONE	1½"	150#	RF		(115) 1½" 150# LONG WELD NECK x 9" LG ⅛" RF (A-105)		2⅝"										
4	ONE	1"	150#	RF		(107) 1" 150# LONG WELD NECK x 9" LG ⅛" RF (A-105)		2"					6"	III	¼	¼	—	
													6"	III	¼	¼	—	
5	ONE	1½"	3000#	—	VAREC GAUGE				SEE DETAIL ON SHT #24									

WELD NECK FLANGE ATTACHMENT DETAIL

TYPE I

TYPE II

TYPE III

TYPE IV

SLIP-ON FLANGE ATTACHMENT DETAIL

TYPE V

NOTES

1. ALL NOZZLE AND MANWAY FLANGE BOLT HOLES IN TANK SHELL ARE TO STRADDLE THE VERTICAL CENTERLINES (UNLESS OTHERWISE NOTED).
2. ALL NOZZLE AND MANWAY FLANGE BOLT HOLES IN TANK ROOF ARE TO STRADDLE THE NORTH/SOUTH CENTERLINES (UNLESS OTHERWISE NOTED).
3. NOZZLE PROJECTIONS ARE MEASURED FROM FACE OF FLANGE TO OUTSIDE OF ROOF AT THE NOZZLE CENTERLINE (UNLESS OTHERWISE NOTED).
4. ALL REINFORCEMENT PADS OR EACH SECTION (IF MADE IN SECTIONS) SHALL HAVE ONE (1) 1/4" NPT, TELL TALE HOLE AND SHALL BE TESTED WITH 15 PSIG AIR AND SOAP SUDS.

FILE NAME: SPEEDSHT

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/03/93

A	REV PER CUST. APPROVAL	2-2-93	JKH	C.E.

P.O.#: CHO-93-0001

S/O 2472B | ITEM: TK-4455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK

SCHEDULE OF OPENINGS (ROOF)

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-25-93

CHECKED: C.E. APPROVED:

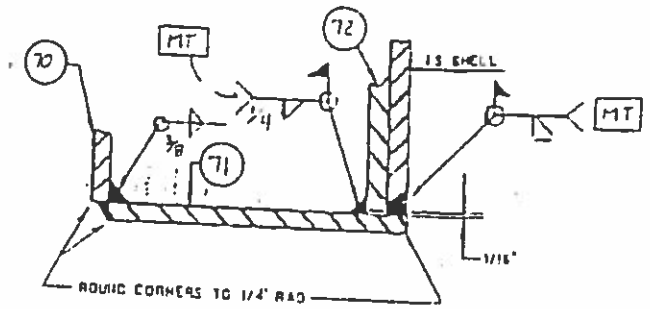
SHEET NO.

ORDER NO.

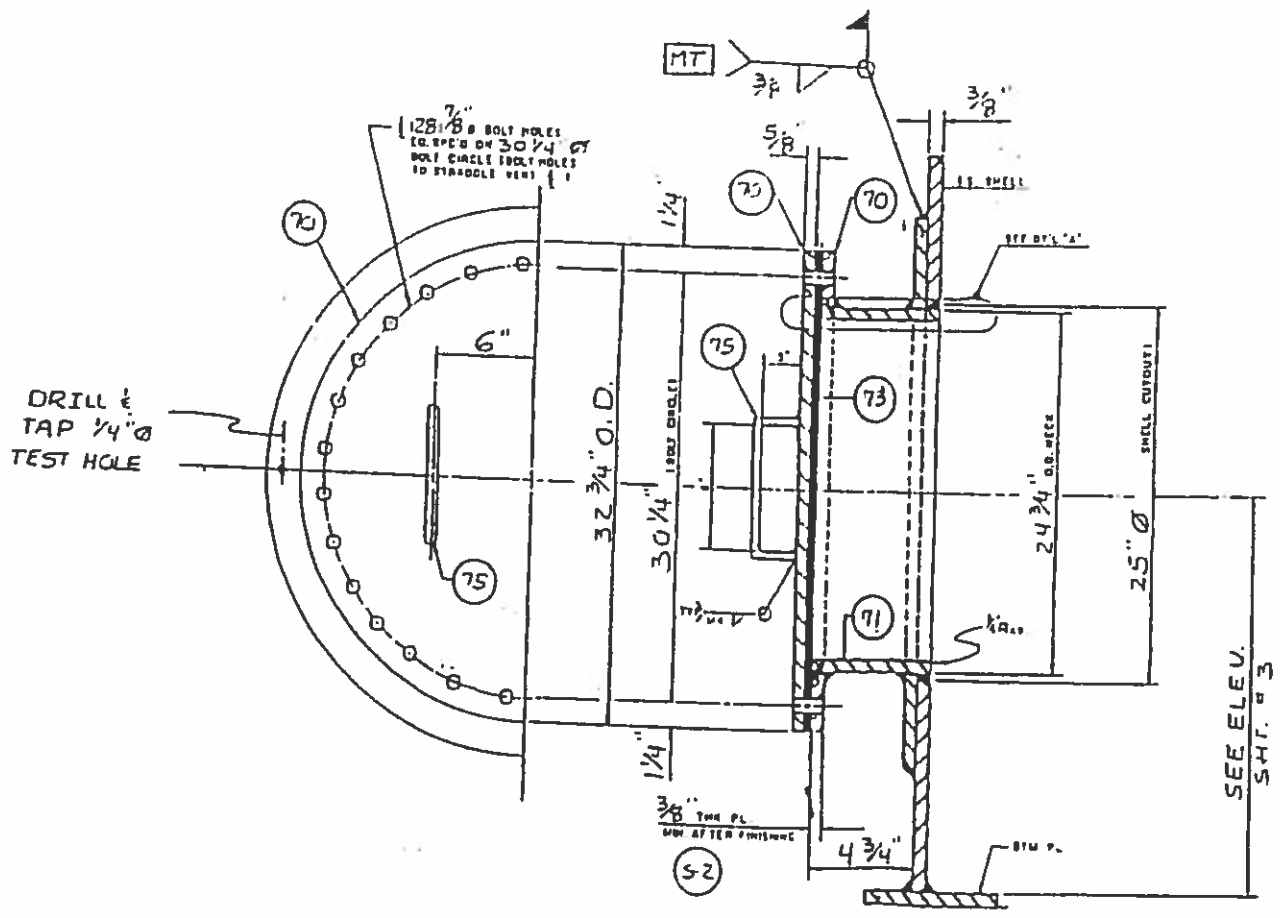
DWG. NO.

ITEM	QUAN.	DESCRIPTION & SIZE	WEIGHT
	ONE	24"Ø SHELL MANWAY	
70	ONE	5/8" R x 24 3/4" I.D. x 32 3/4" O.D.	
-	-	FLANGE A-516-70	
71	ONE	3/8" R x 8" x 76 9/16" LG. ROLL TO	
-	-	24" I.D. ± CBW LG. SEAM. A-516-70	
72	ONE	3/8" R x 24 7/8" I.D. x 53 1/2" O.D.	
		A-516-70	
70	ONE	5/8" R x 32 3/4" O.D. COVER A-516-70	
75	2	5/8" Ø ROD x 1'-1" LG. HANDLES A-36	
73	ONE	1/8" THK GASKET x 24 3/4" I.D. x 29 3/8"	
-	-	O.D. GARLOCK GYLON 3510 (OFF WHITE)	
74	28	3/4"Ø x 3 1/2" LG. STUDS W/ (2) HN EA	
-	-	A-193-B7 A-194-2H	

8



DETAIL "A"



24 "Ø A.P.I. 650 SHELL MANWAY

ONE REQ'D MK- "1BI"

NOTES

1) MT SEE SHT # 2 FOR MAG PART. NOTE

2) SEE SHT # 2 FOR TESTING OF MANWAY REINF. PAD.

B	ADD GASKET MATERIAL	2-11 93	JKH	CC.	
A	REV. PER CUST. APPROVAL	2-2 93	JKH	CC.	
NO.	REVISION	DATE	BY	CHK'D	

S/O 24728 | TANK NO. TK-4455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'-0"Ø x 32'-0" HIGH TANK

DETAIL 24" SHELL MANWAY

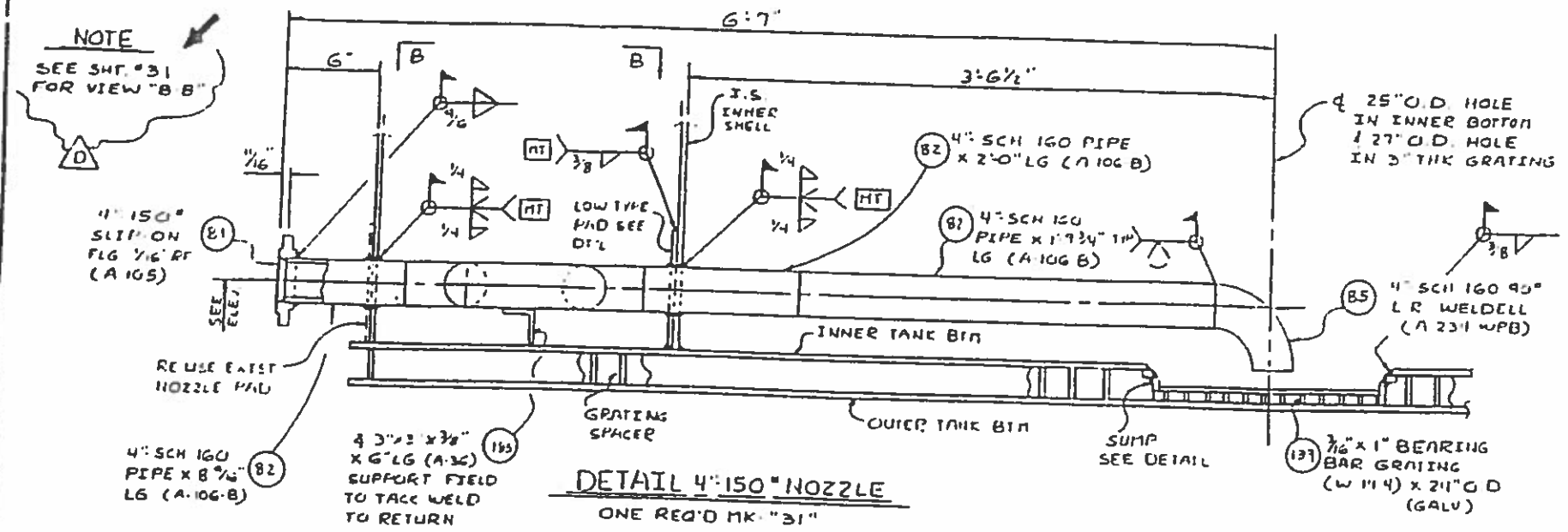
CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-23-93

CHECKED: C.C. APPROVED:

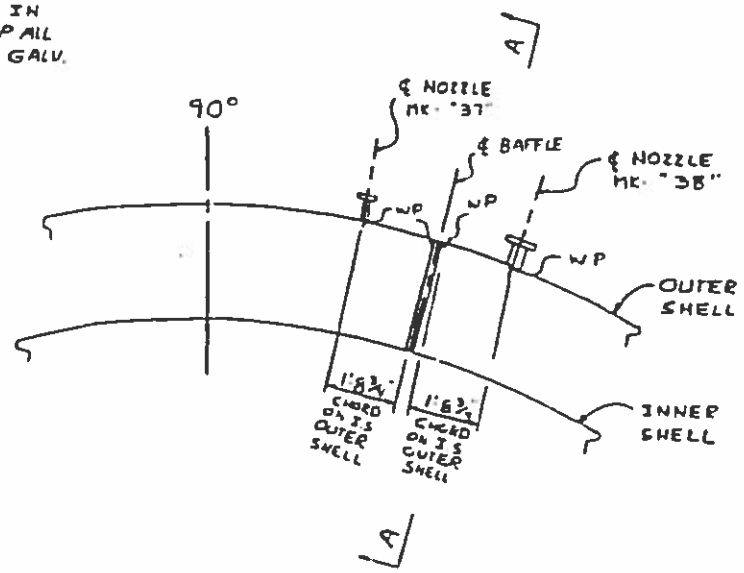
No. W-92-24728-70 REV B

NOTE
SEE SHT. #31 FOR VIEW "B-B"

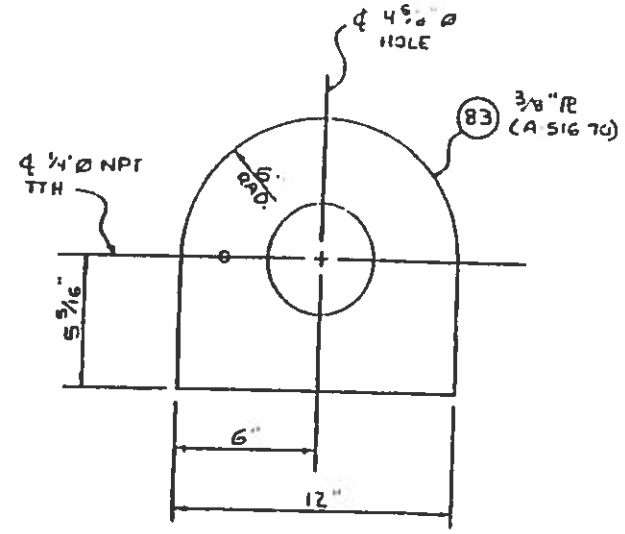


DETAIL 4" 150# NOZZLE
ONE REQ'D MK. "31"

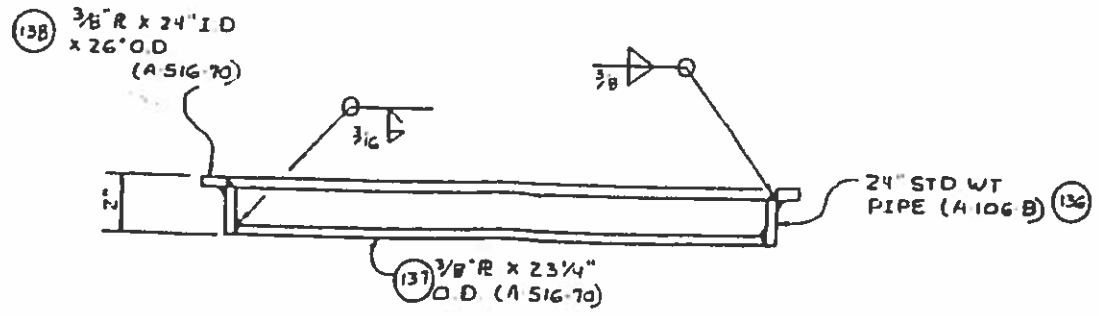
FIELD NOTE
AFTER CUTTING HOLE IN 3" GRATING TOUCH-UP ALL DAMAGED AREAS OF GALV. WITH ZRC



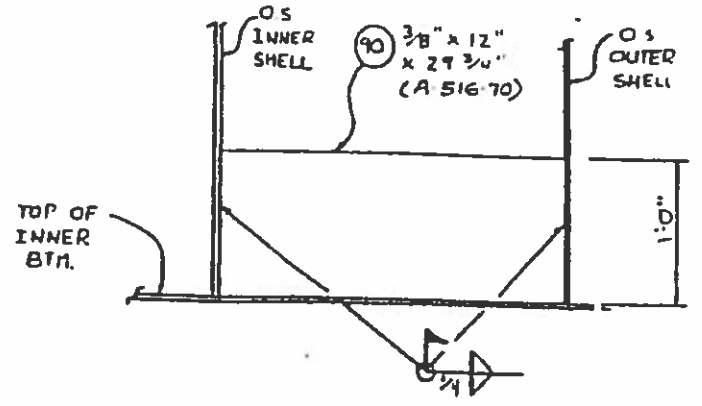
PLAN VIEW OF BAFFLE



DETAIL LOW TYPE PAD
ONE REQ'D MK. "31"



DETAIL OF SUMP
(ONE) REQUIRED



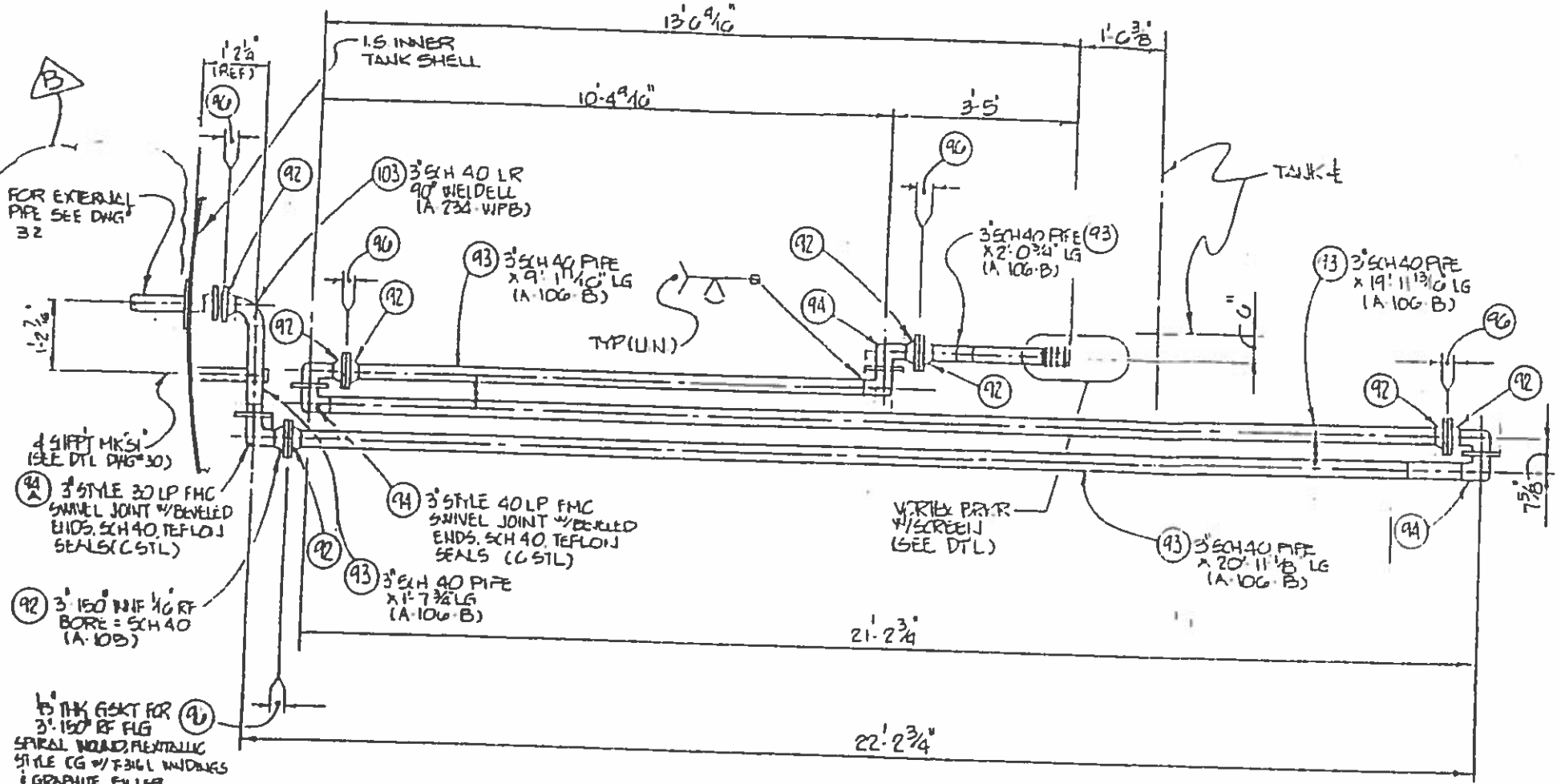
VIEW "A-A"

NOTES
1) HT SEE SHT. #2 FOR MAG PARTICLE NOTE
2) SEE SHT. #2 FOR TESTING OF NOZZLE RE-PAD.

D	MOVED VIEW "B-B" TO SHT. #31 & REMOVE DTL "C"	3-31-93	JKH	CC
C	REV NOZZLE MK. "31" & ADD VIEW "B-B" & DETAIL "C"	3-9-93	JKH	CC
B	ADDED FIELD NOTE	2-6-93	JKH	CC
A	REV. PER CUST. APPROVAL	2-2-93	JKH	CC
NO	REVISION			

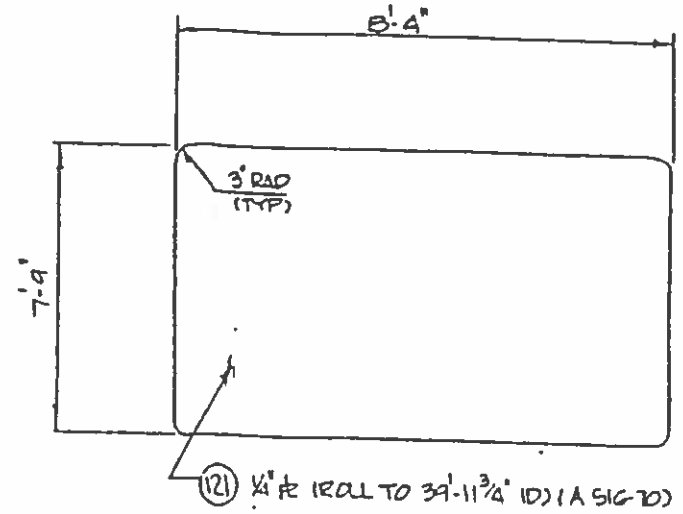
SCALE:
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 2/02/93
BY:

P.O.#: CHO-93-0001
S/O 2472 B | ITEM: TK-4456
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK
MISC. NOZZLE DETAILS
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: JKH DATE: 1-28-93
CHECKED: CC APPROVED:

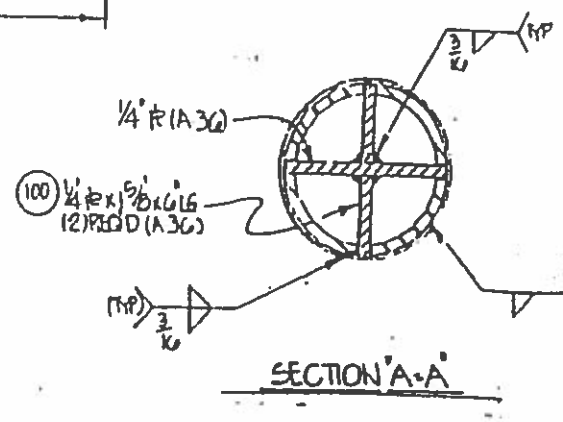


DETAIL OF 3"-150# NOZZLE MK "33"
ONE (1) ASSY REQ'D

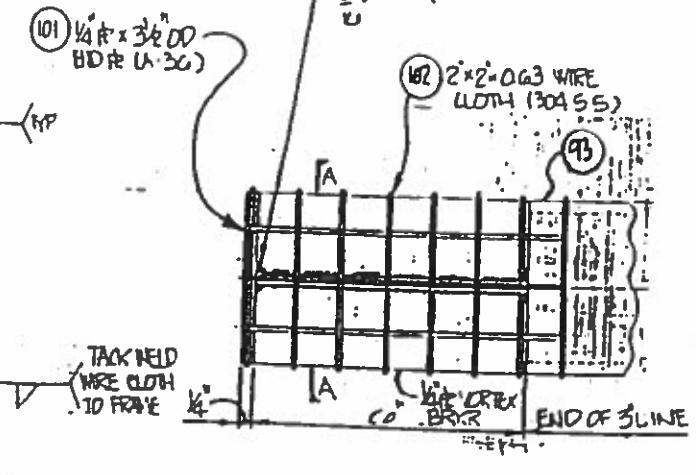
(95) — (20) 5/8"ϕ x 3 3/4" LG STUDS W/2 NUTS EA
TOTAL REQ'D (A 193 B7) (A 194 2H)



DETAIL OF DOOR PLATE
ONE (1) REQ'D



SECTION "A-A"

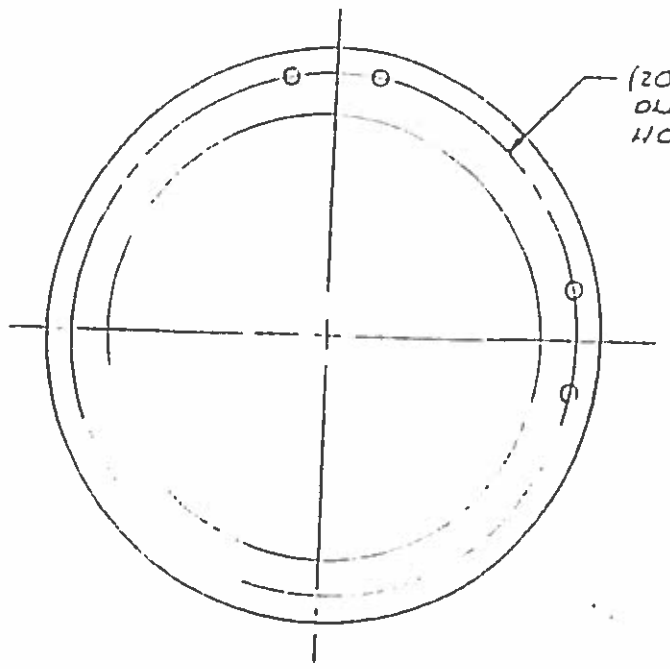


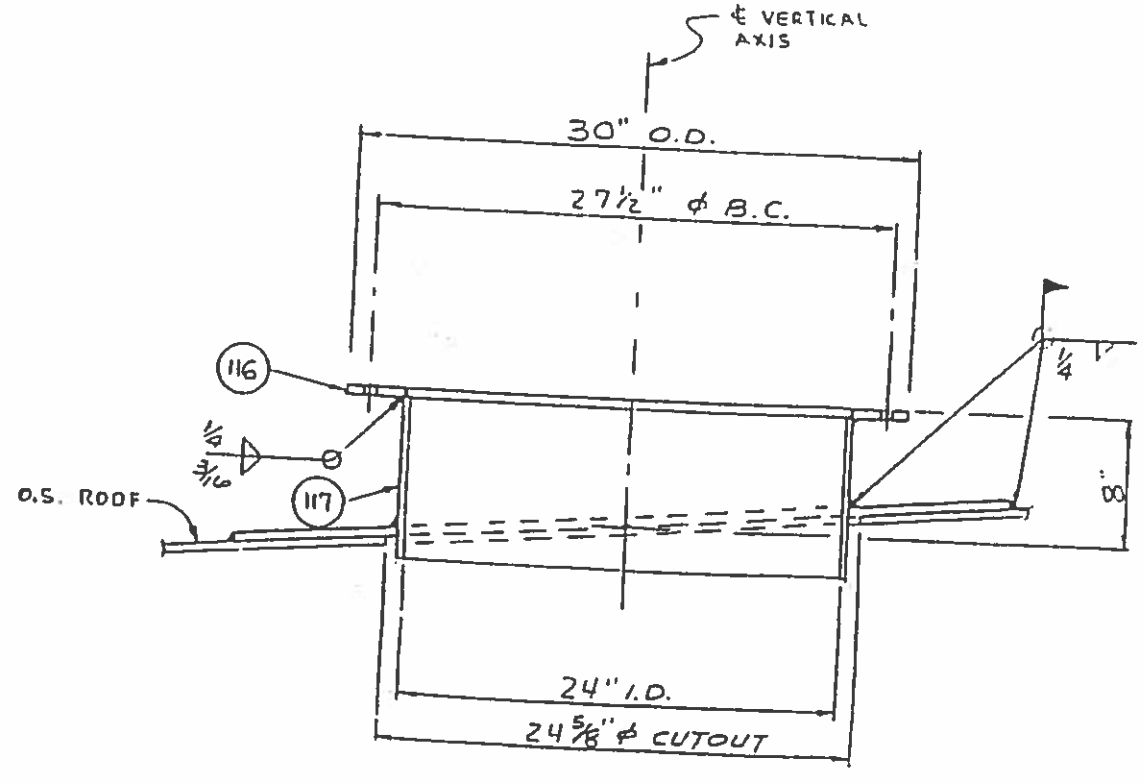
DETAIL: VORTEX BREAKER W/SCREEN

B	REV. AS NOTED	3-30-93	ODG	C.E.	
A	REV. PER CUST. APPROVAL	2-16-93	ODG	C.E.	
NO	REVISION				

SCALE:
CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/17/93
BY:

P.O.#: CHO-93-0001
S/O 2472B | ITEM: TK-4455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN
=EXIST. 40'-0"ϕ x 32'-0" HIGH TANK=
DETAIL OF NOZZLE MK'33' & SKIMMER
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: ODG DATE: 2-6-93
CHECKED: C.E. APPROVED:





DETAIL 24" ROOF MANWAY
ONE REQD MK "2"

ORDER No.		Dwg. No.	
ITEM	QUAN.	DESCRIPTION & SIZE	WEIGHT
116	1	1/4" R X 24 1/2" I.D. X 30" O.D. A-36	
117	1	1/4" R X 12" X 76 3/16" (A-36) ROLL TO	
–	–	24" I.D. ℄ CBW LG. SEAM	
118	1	1/4" R X 24 5/8" I.D. X 46" O.D. A-36	

A	REV. PER CUST APPROVAL	2 2 93	JKH	C.E.

S/O 2472B | TANK NO. TK-4455

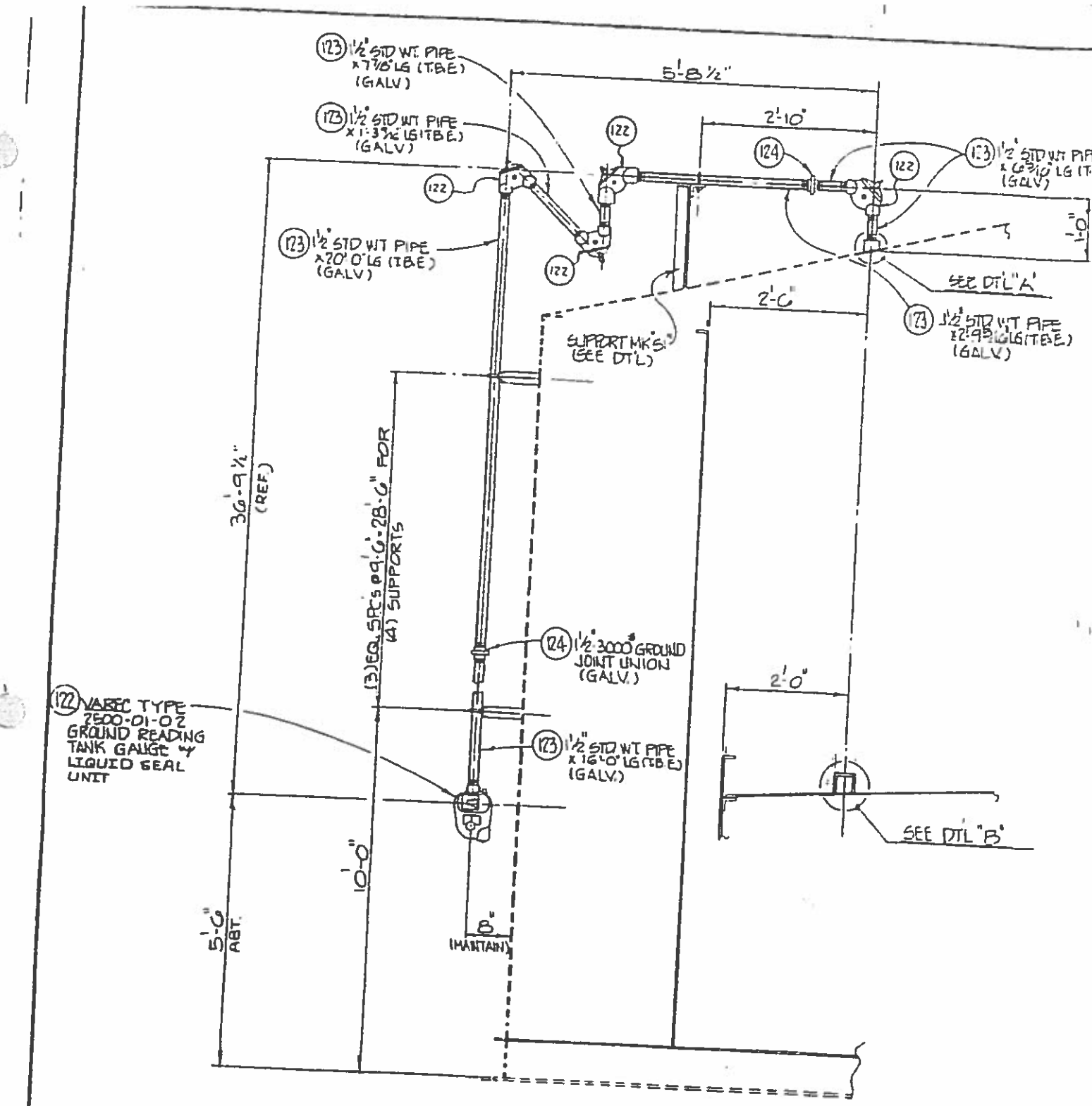
Wyatt WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'-0" X 32'-0" HIGH TANK

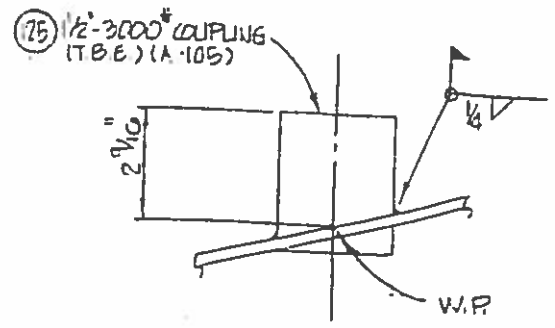
DETAIL ROOF MANWAY

CUSTOMER: LYONDELL PETROCHEMICAL

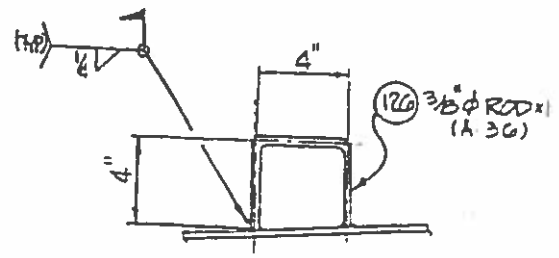
DRAWN: JKH DATE: 1-27-93
CHECKED: C.E. APPROVED:



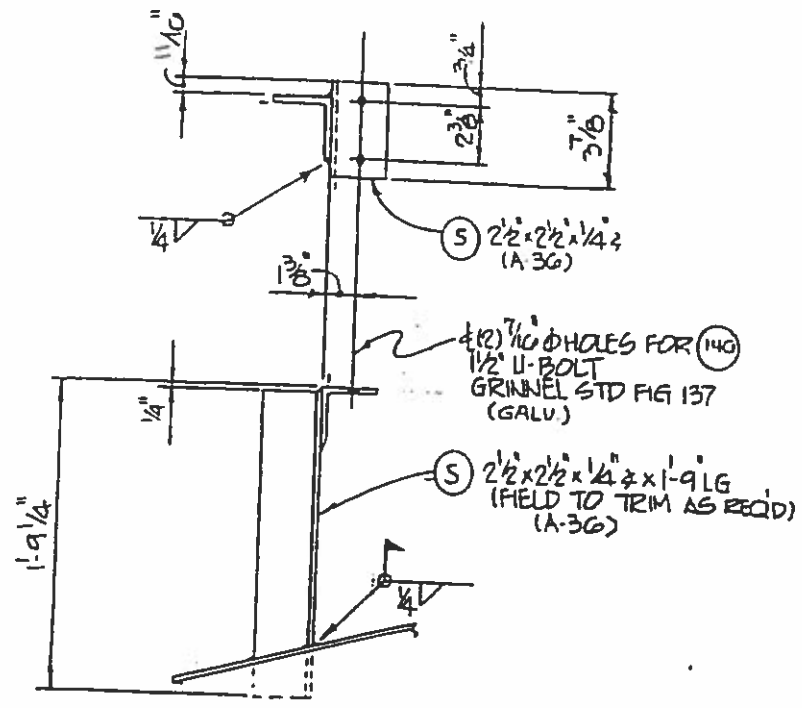
DETAIL AUTOMATIC TANK GAUGE ASS'Y



DETAIL 'A'



DETAIL 'B'

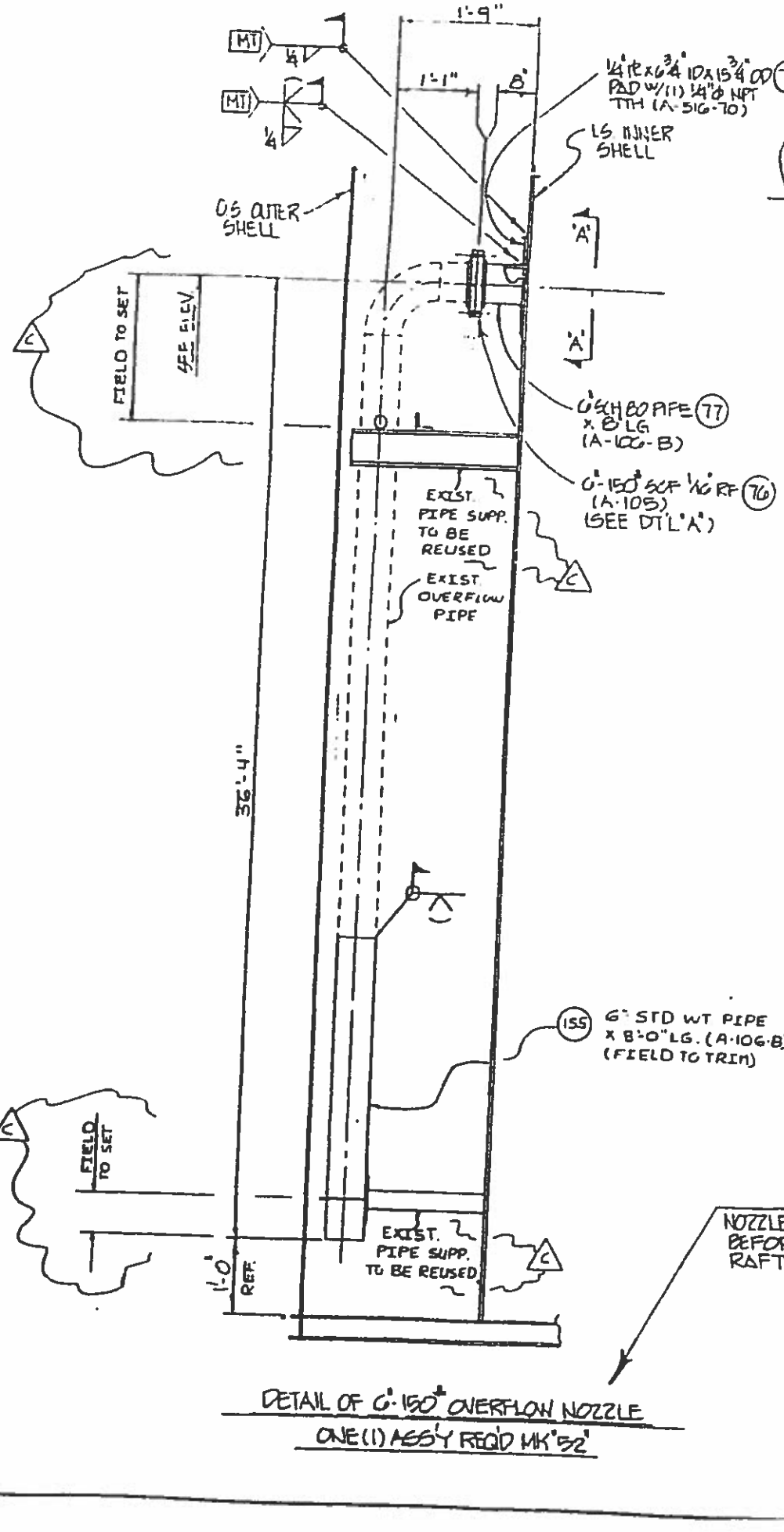


DETAIL OF SUPPORT
ONE (1) REQ'D MK "S1"

NO. W-92-2472B-24
REV. A

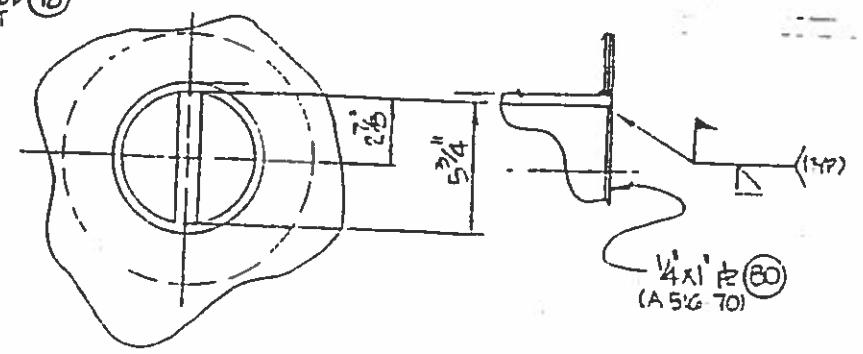
P.O.#: CHO-93-0001	
S/O 2472 B	ITEM: TK 4455
WYATT FIELD SERVICE COMPANY HOUSTON, TEXAS	
MISC. MODIFICATIONS TO AN EXIST. 40'-0" ϕ x 32'-0" HIGH TANK	
DTL AUTOMATIC TANK GAUGE ASS'Y	
CUSTOMER: LYONDELL PETROCHEMICAL	
DRAWN: ODG	DATE: 1-30-93

SCALE:				
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY DATE: 2/12/93	A	REV. PER CUST APPROVAL	2-10	

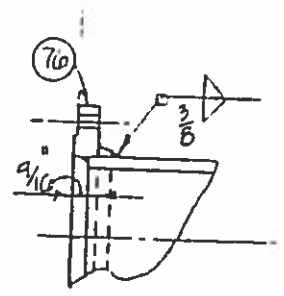


DETAIL OF 6"-150# OVERFLOW NOZZLE
ONE (1) ASS'Y REQ'D MK '52'

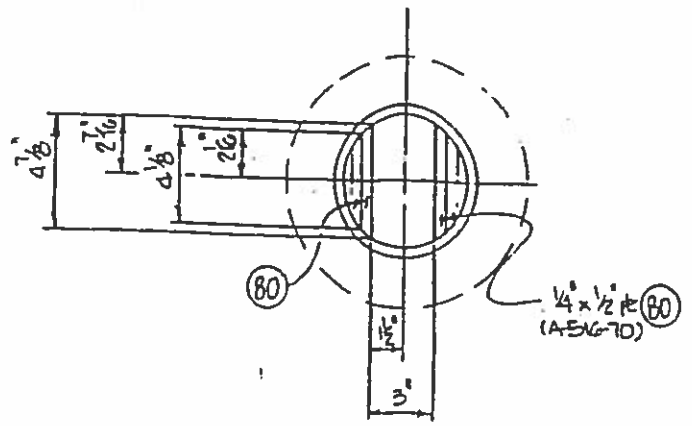
FIELD CAUTION
NOZZLE MK '52' TO BE INSTALLED BEFORE INSTALLATION OF RAFTERS & ROOF PL'S



VIEW 'A-A'



DTL 'A'



DETAIL OF SPACERS @ NOZZLE MK '51'

C

C

NO. W-92-2472 B-25
REV. C

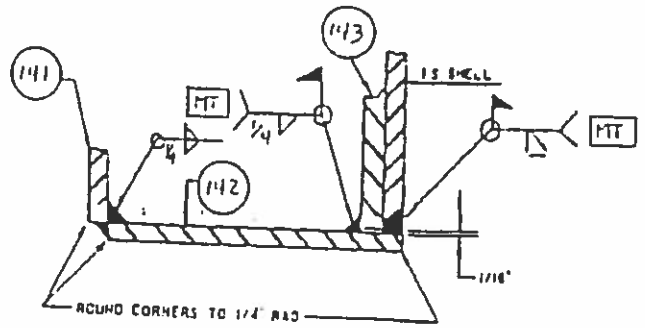
C	REV. PIPE SUPPORTS	4-27-93	JKH	CC
B	REV. NUMBER OF SUPPORTS & ADDED VIEW "B-B"	3-31-93	JKH	CC
A	REV. PER CUST. APPROVAL	2-10-93	JKH	CC

SCALE:
CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/2/93

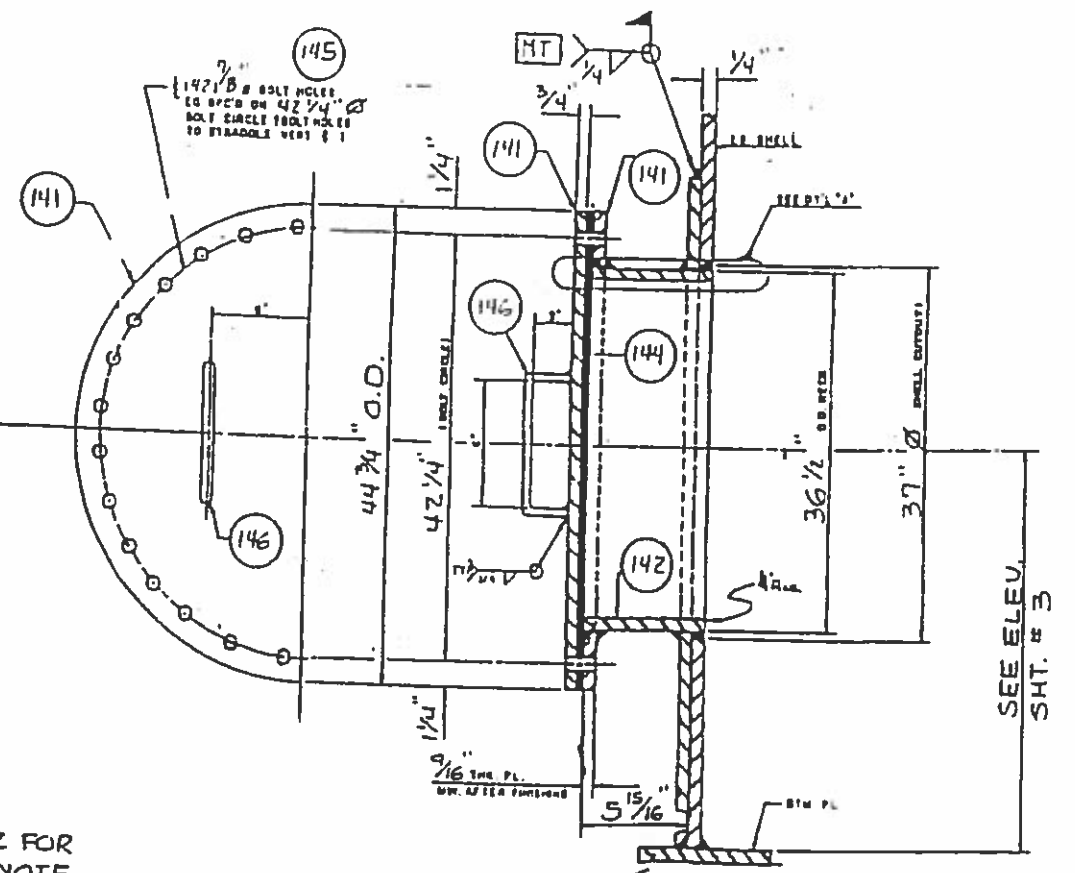
P.O.#: CHO-93-0001
S/O 2472B ITEM: T-4455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST 40'-0"ø x 32'-0" HIGH TANK
DETAIL OF 6"-150# NOZZLE MK '52'
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: ODG DATE: 2-4-93
CHECKED: C.C. APPROVED:

ORDER No. | SHEET NO.

ITEM	QUAN.	Dwg. No. DESCRIPTION & SIZE	WEIGHT
	ONE	36" API-650 MANWAY	
141	ONE	3/4"R x 36 1/2" I.D. x 44 3/4" O.D. FLANGE A-516-70 N	
142	ONE	1/4"R x 7 1/2" X 113 3/8" LG. ROLL TO 36" I.D. ; CBW LG SEAM. A-516-70	
143	ONE	3/8"R LOW TYPE PAD - SEE DETAIL A-36	
141	ONE	3/4"R x 44 3/4" O.D. COVER A-516-70 N	
146	2	5/8"Ø ROD X 1'-1" LG. HANDLES A-36	
144	ONE	1/8" THK X 36 1/2" I.D. X 41 3/8" O.D. GSKT GARLOCK GYLON 3510 OFF-WHITE	
145	42	3/4"Ø X 3 1/2" LG. STUDS W/ (2) HHHN EA. A-193-B7 A-194-2H	
-	-		



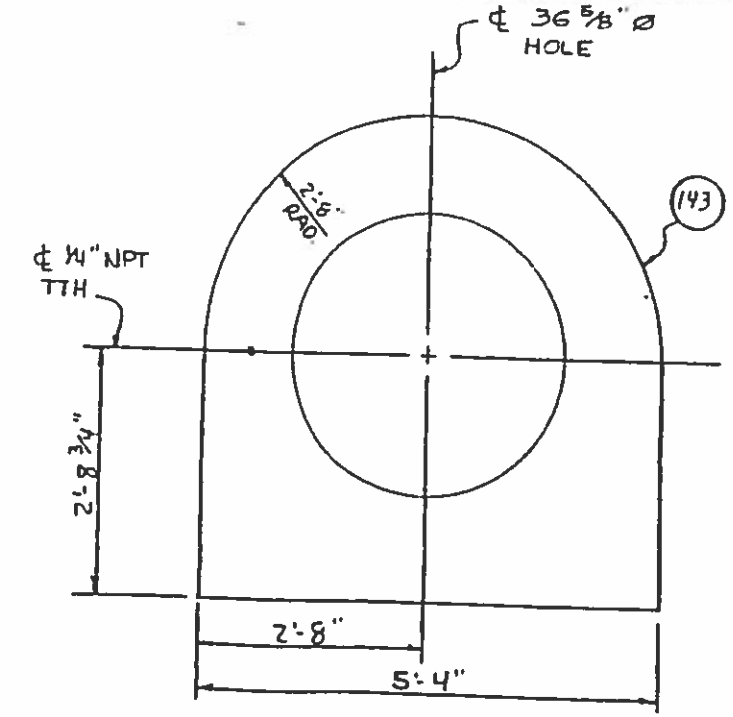
DETAIL "A"



36"Ø A.P.I. 650 SHELL MANWAY
ONE REQ'D MK. "1B0"

NOTES

1) MT SEE SHT. # 2 FOR MAG. PART. NOTE
2) SEE SHT. # 2 FOR TESTING OF MANWAY REINF. PAD.



DETAIL LOW-TYPE PAD

A	ADD GASKET MATERIAL	2-11-93	JKH	CG.
#	REVISION	DATE	BY	CHK'D

S/O 2472B | TANK NO. TK-4455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

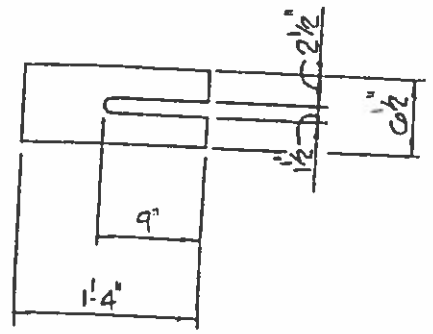
MISC. MODIFICATIONS FOR AN EXIST. 40'-0"Ø x 32'-0" HIGH TANK

DETAIL 36" SHELL MANWAY

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH | DATE: 2-4-93
CHECKED: CG. | APPROVED:

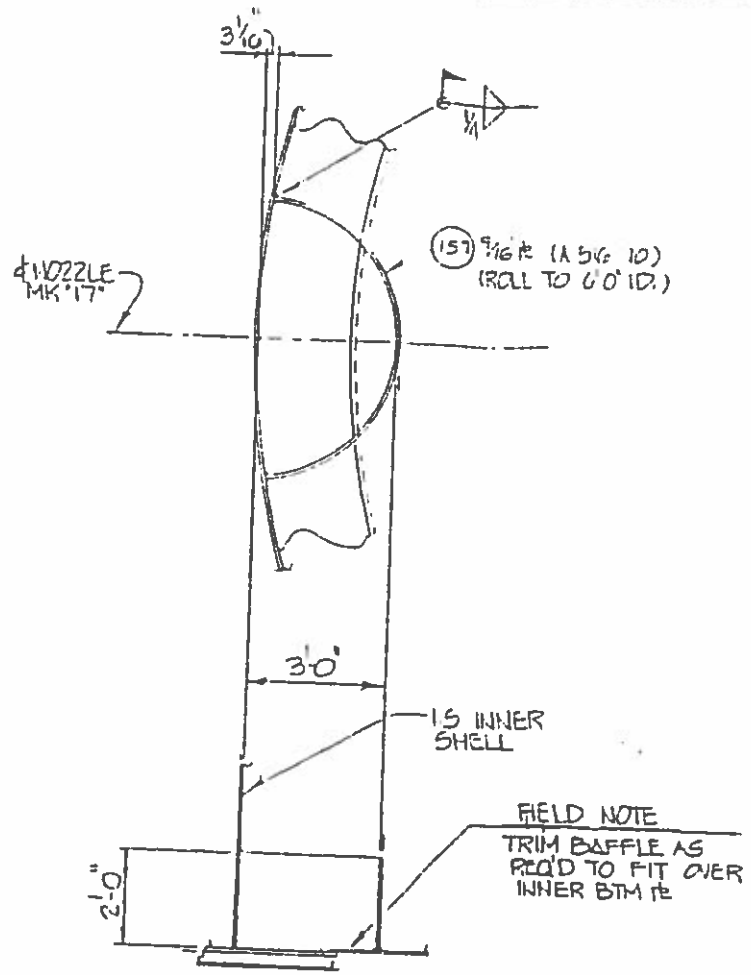
No. W-93-2472B-1



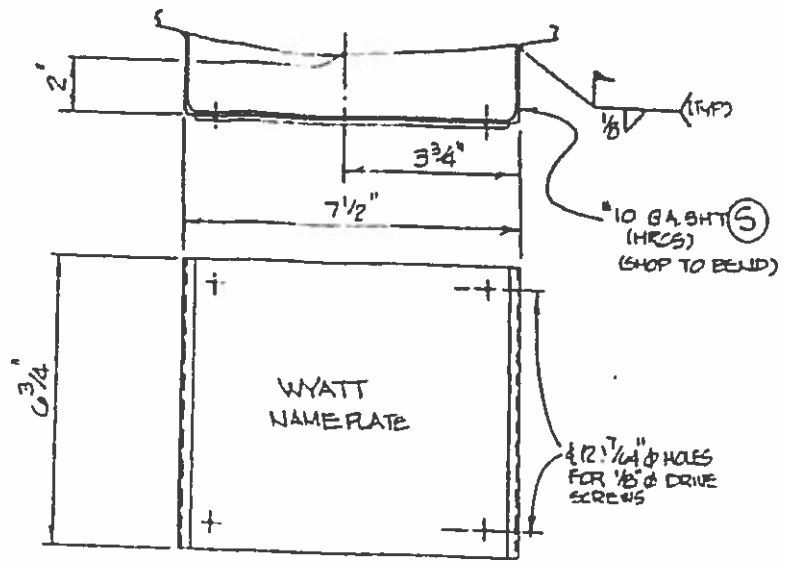
DETAIL OF ANCHOR CHAIR SHIMS

(5) — (30) REQ'D 9/16" PL (C. ST'L)
(5) — (24) REQ'D 1/4" PL (C. ST'L)
(5) — (24) REQ'D #10GA SHT (HRCS)
(154) — (16) REQ'D #16GA SHT (HRCS)

(94) TOTAL REQ'D



DETAIL OF BAFFLE & NOZZLE MK "17"
ONE (1) REQ'D



DETAIL OF NAMEPLATE BRACKET
TWO (2) REQ'D

NO. W-92-2472 B-27
REV. A

P.O.#: CHO-93-0001
S/O 2472 B | ITEM: TK-4455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK
MISCELLANEOUS DETAILS
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: ODG DATE: 2-5-92
CHECKED: C.E. APPROVED:

SCALE:
CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/12/93

A	REV. PER CUST. APPROVAL	2-12-93	JCH	CC

18'-7 1/8" (REF)

18'-2 1/8" (FIELD HOLD)

RAFTER CLIP MK "RC" (SEE DT'L)

RAFTER CLIP MK "RC1" (SEE DT'L)

SEE DT'L 'A'

FIELD CAUTION

ECCENTRIC LOADS ON RAFTER SUPPORT PLATE AND COLUMN WILL CAUSE BENDING AND EXCESSIVE STRESS IN COLUMN AND SUPPORT PLATE BOLTS. SEVERAL RAFTERS SHOULD BE INSTALLED AT 120° INTERVALS IN ORDER TO BALANCE THE LOAD DURING RAFTER ERECTION.

23'-6 5/16"

8'-0"

OMIT WELD @ DRAIN HOLE.

1/8 x 7.5 (S)

(23) 8" SCH 80 PIPE (A-53)

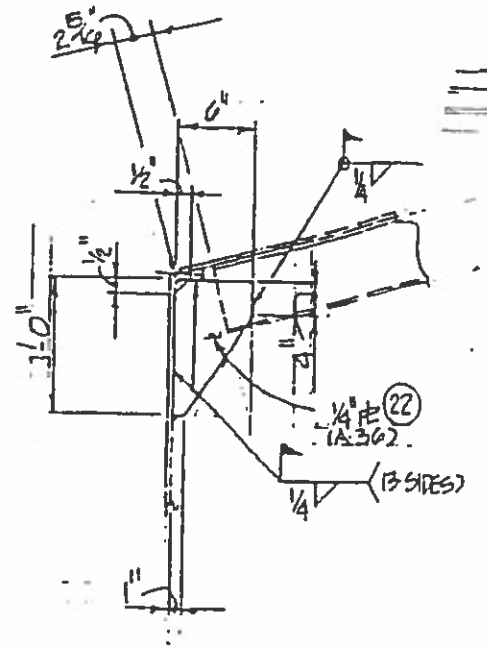
FIELD CAUTION
DO NOT WELD BASE PL TO BOTTOM PL

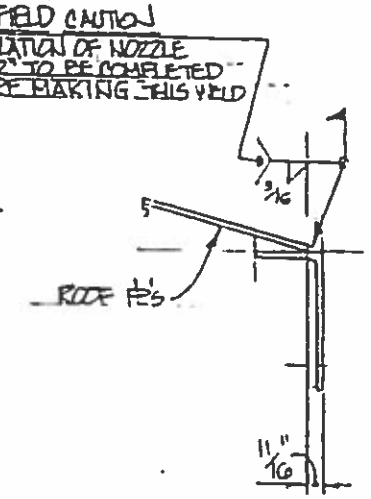
1/4

DO NOT WELD ANGLE TO BASE PL

3"x3"x1/2"x0'-0" LG (19) REQ'D EQ SPCD (S) (A-36)

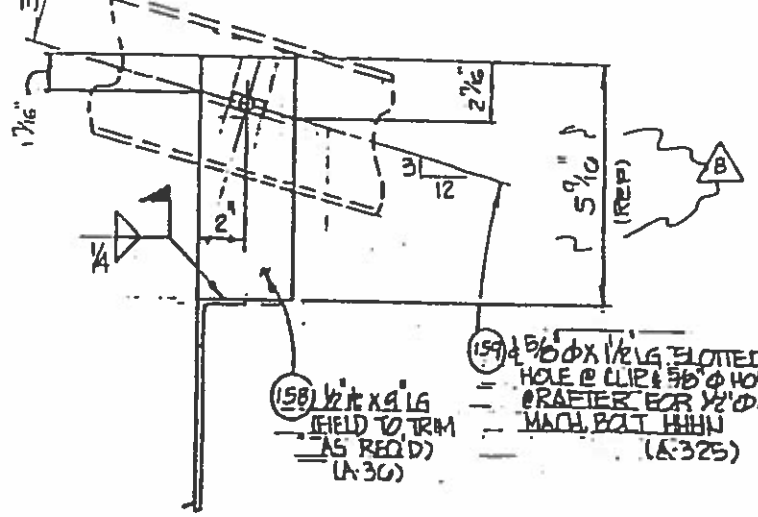
SECTION THRU SHELL





DETAIL 'A'

DETAIL OF RAFTER CLIPS MK 'RC'
(20) TOTAL REQ'D



DETAIL OF RAFTER CLIP MK 'RC1'
(20) TOTAL REQ'D

P.O.#: CHO-93-0001

S/O 2472B | ITEM: TK-4455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø & 32'-0" HIGH TANK

DT'L OF CENTER COLUMN & RAFTER CLIPS

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: DLG DATE: 2-1-93

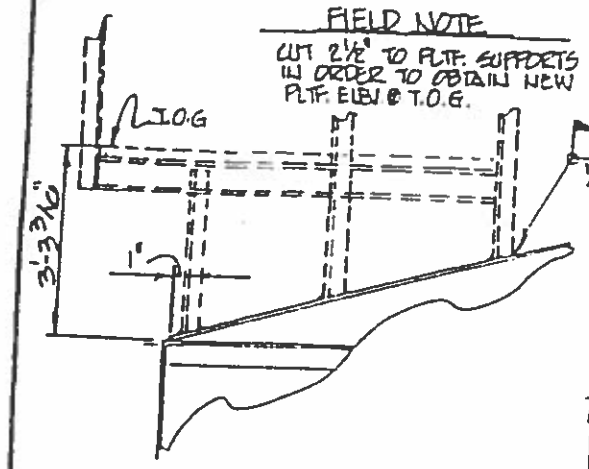
CHECKED: CL APPROVED:

SCALE:

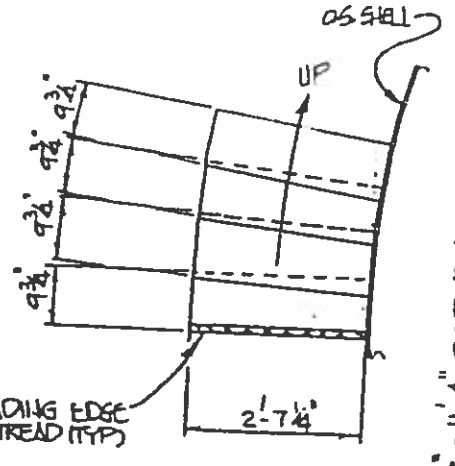
CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/12/93
BY: [signature]

NO.	REVISION	DATE		
B	REV. DIM. @ RAFTER CLIP	4-6 93	JKH	CL
A	REV. PER CUST. APPROVAL	2-10 93	JKH	CL

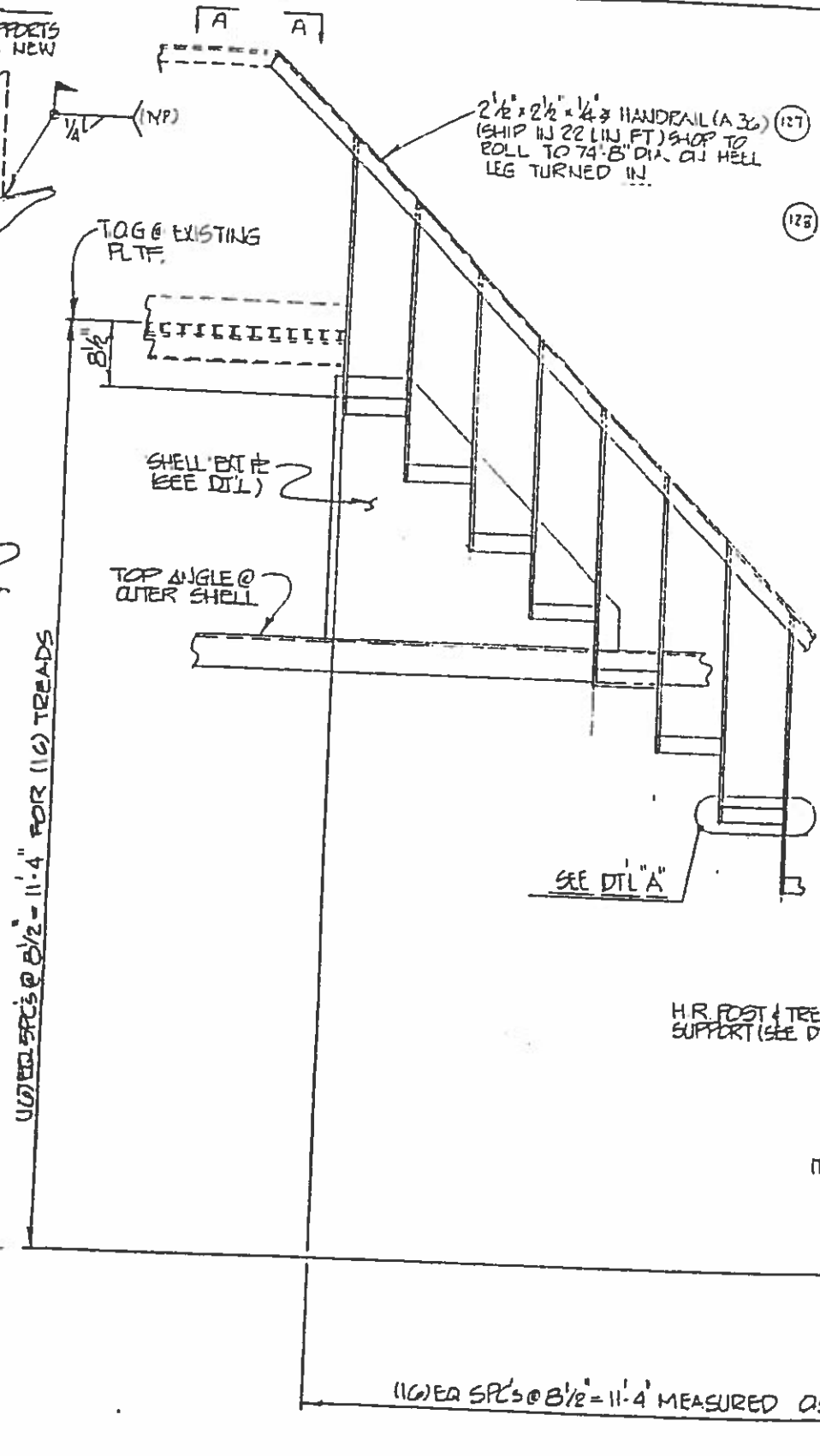
FIELD NOTE
CUT 2½" TO PLTF. SUPPORTS IN ORDER TO OBTAIN NEW PLTF. ELEV @ T.O.G.



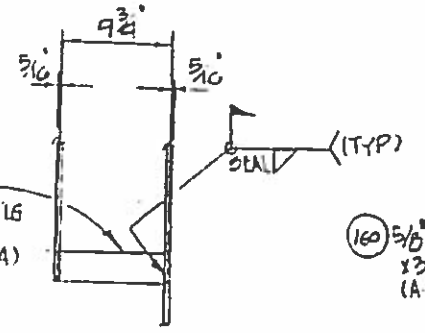
SECTION THRU PLATFORM



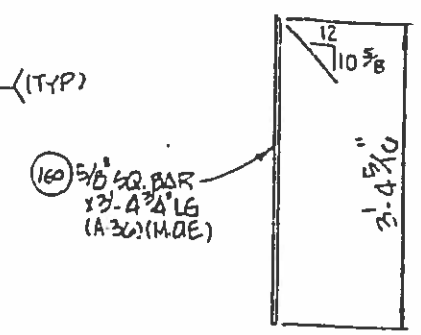
TYPICAL PLAN OF TREAD



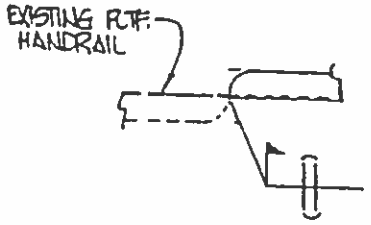
ELEVATION OF STAIRWAY



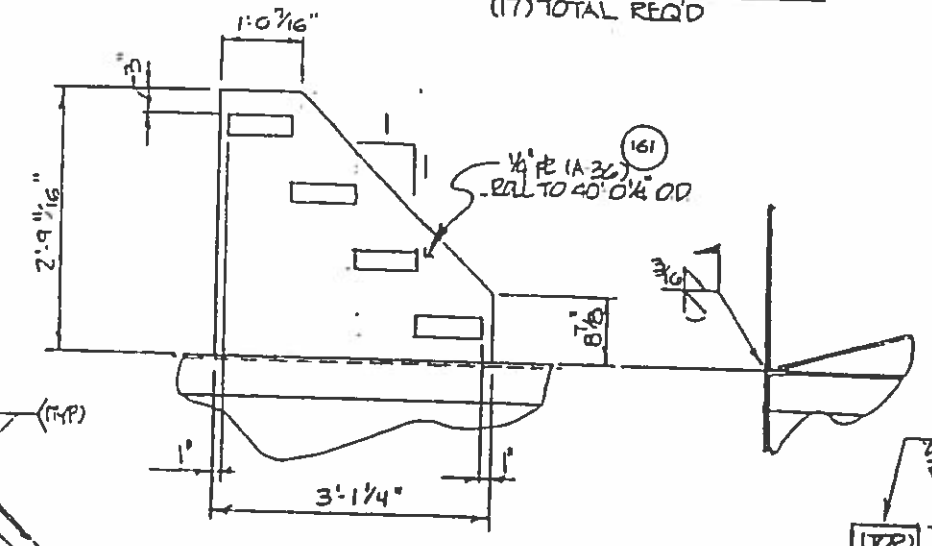
DETAIL "A"



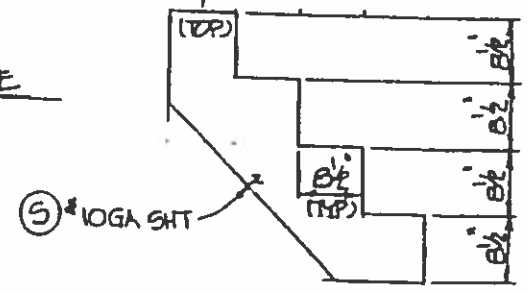
DETAIL OF HR POST & TREAD SUPPT
(17) TOTAL REQ'D



VIEW "A-A"



DETAIL OF SHELL EXT. PLATE



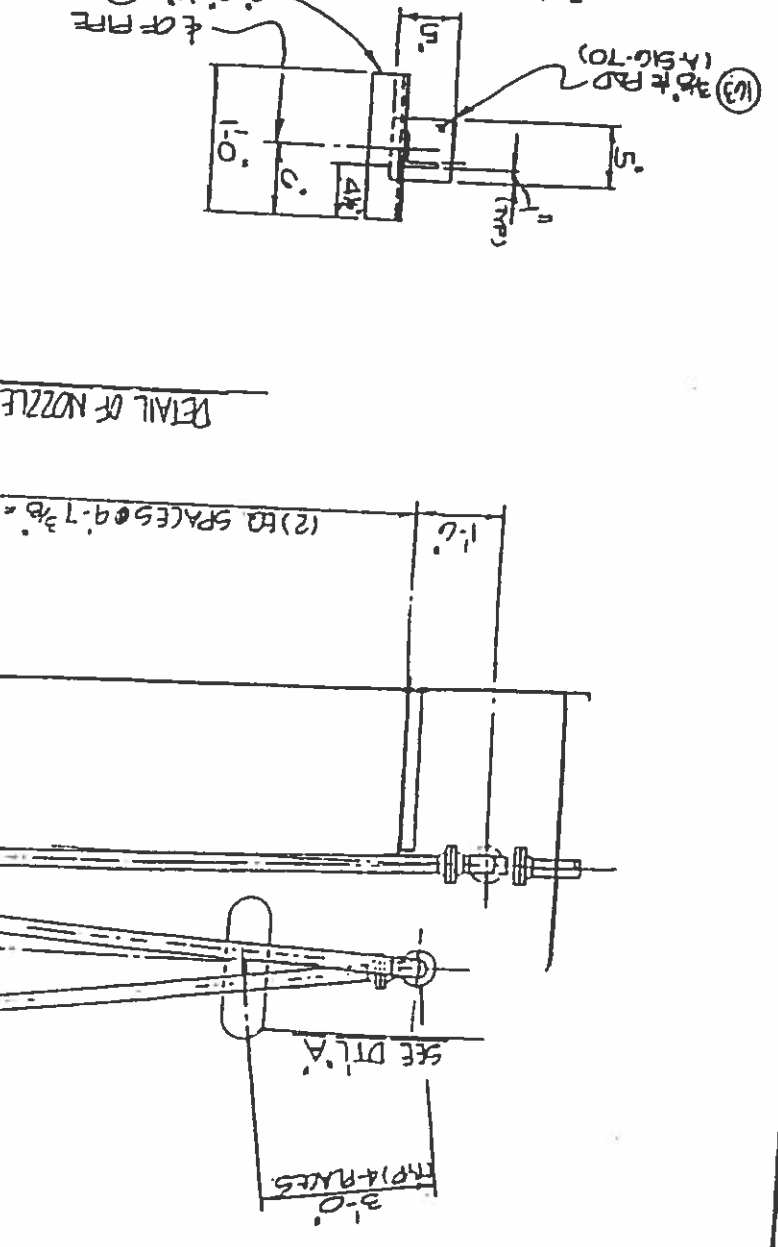
STAIRWAY TEMPLATE

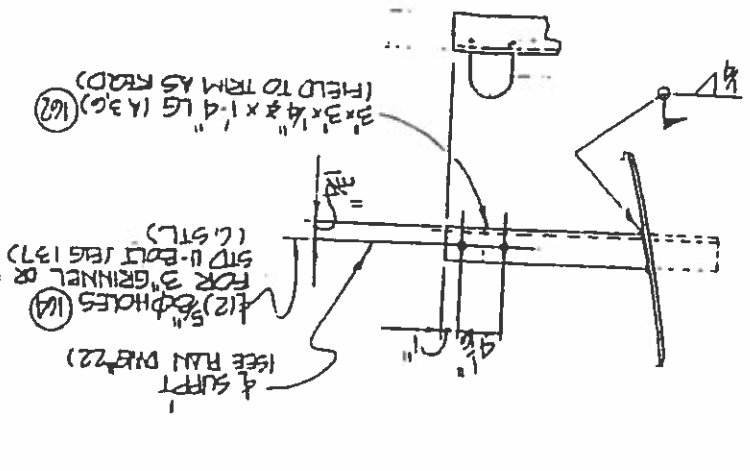
NOTES
1. ALL WELDS TO BE CONTINUOUS FILLET/SEAL WELD UNLESS NOTED OTHERWISE
2. GALVANIZE PER ASTM A-123, A-143 & A-385 COVERAGE 2.0 TO 2.3 OZ PER SQ FT.
3. ALL SHARP EDGES, BURRS, WELD SPATTER, GREASE, OIL & DIRT TO BE REMOVED PRIOR TO GALV
4. AFTER INSTALLATION, FIELD TO TOUCH-UP ANY DAMAGED GALV. SURFACES BY CLEANING PER SSPC-SP-3 & COATING WITH ZRC

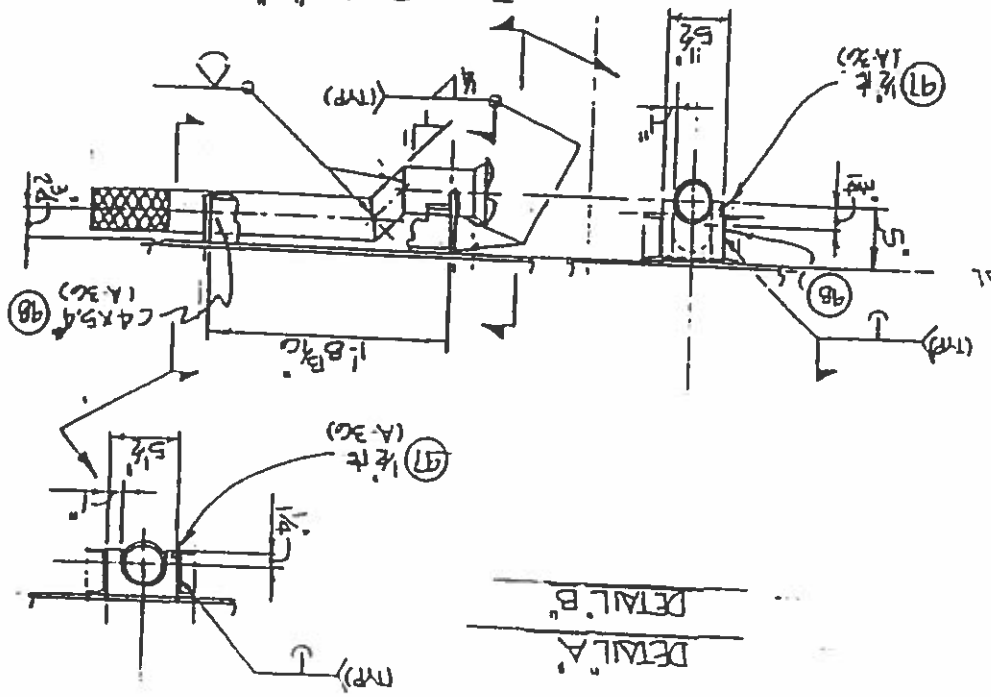
NO W-92-2472B-29 REV.A

P.O.#: CHO-93-0001
S/O 2472B | ITEM: T-4455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC MODIFICATIONS TO AN EXIST 40'-0" ϕ x 32'-0" HIGH TANK
ELEVATION OF STAIRWAY
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: ODG DATE: 2-3-93

SCALE:
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 2/12/93







P.O.#: CHO-93-00021	REV: A
S/O 2472B	ITEM: TK-445S

Utility WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. NOTIFICATIONS TO AN
≡FLOAT 40'-0"ø x 32'-0" HIGH TANK≡
DETAIL OF NOZZLE MK'33e LOW PROFILE

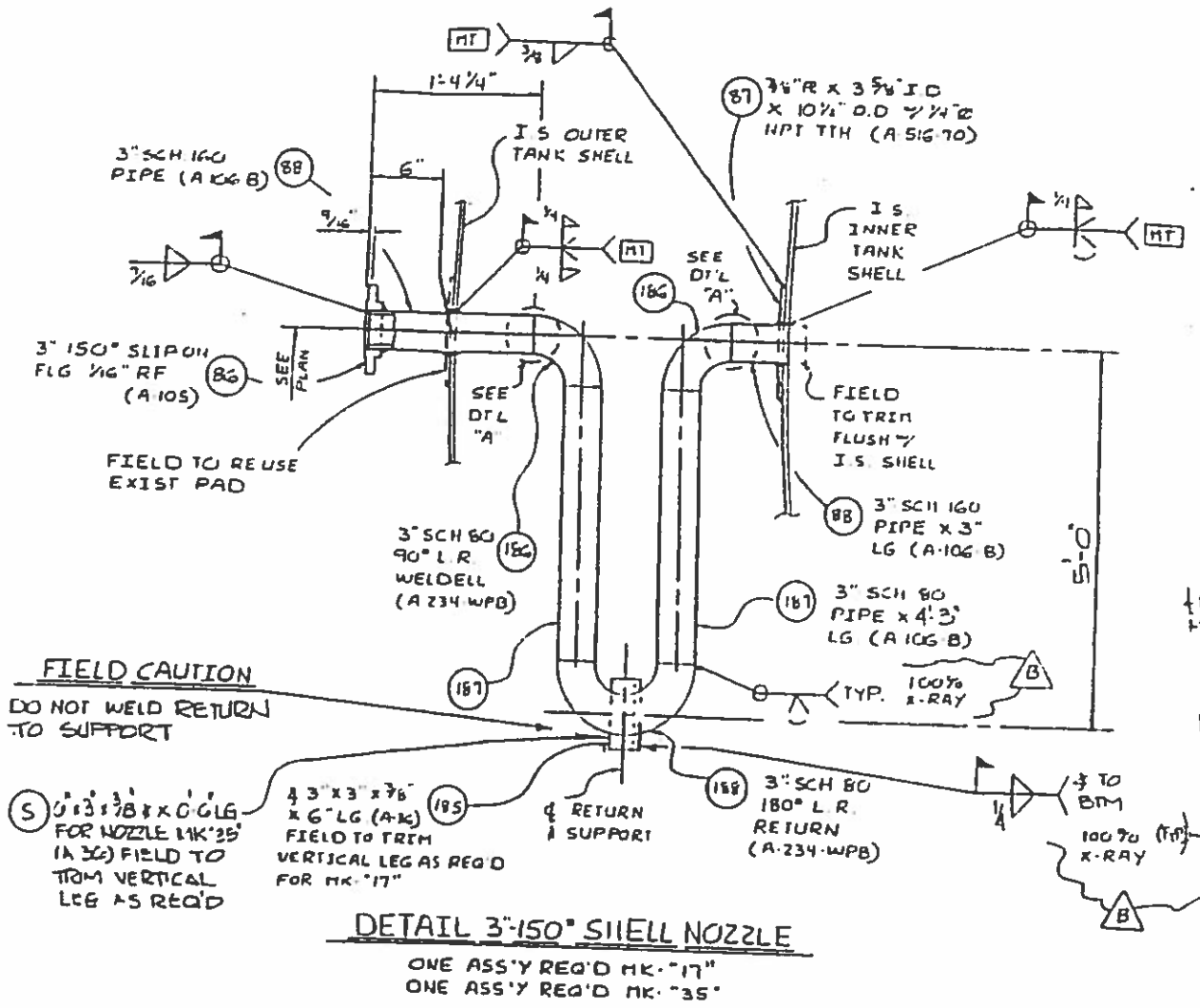
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: COG DATE: 2-10-93
CHECKED: C.G. APPROVED:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/11/13

SCALE:

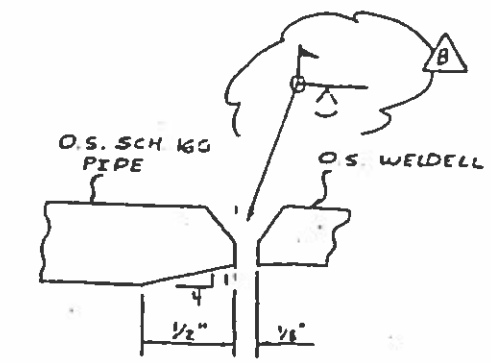
A	REV. PER CUST. AFTRQUAL	2-10-93			

NO. W-92-2472-B-30

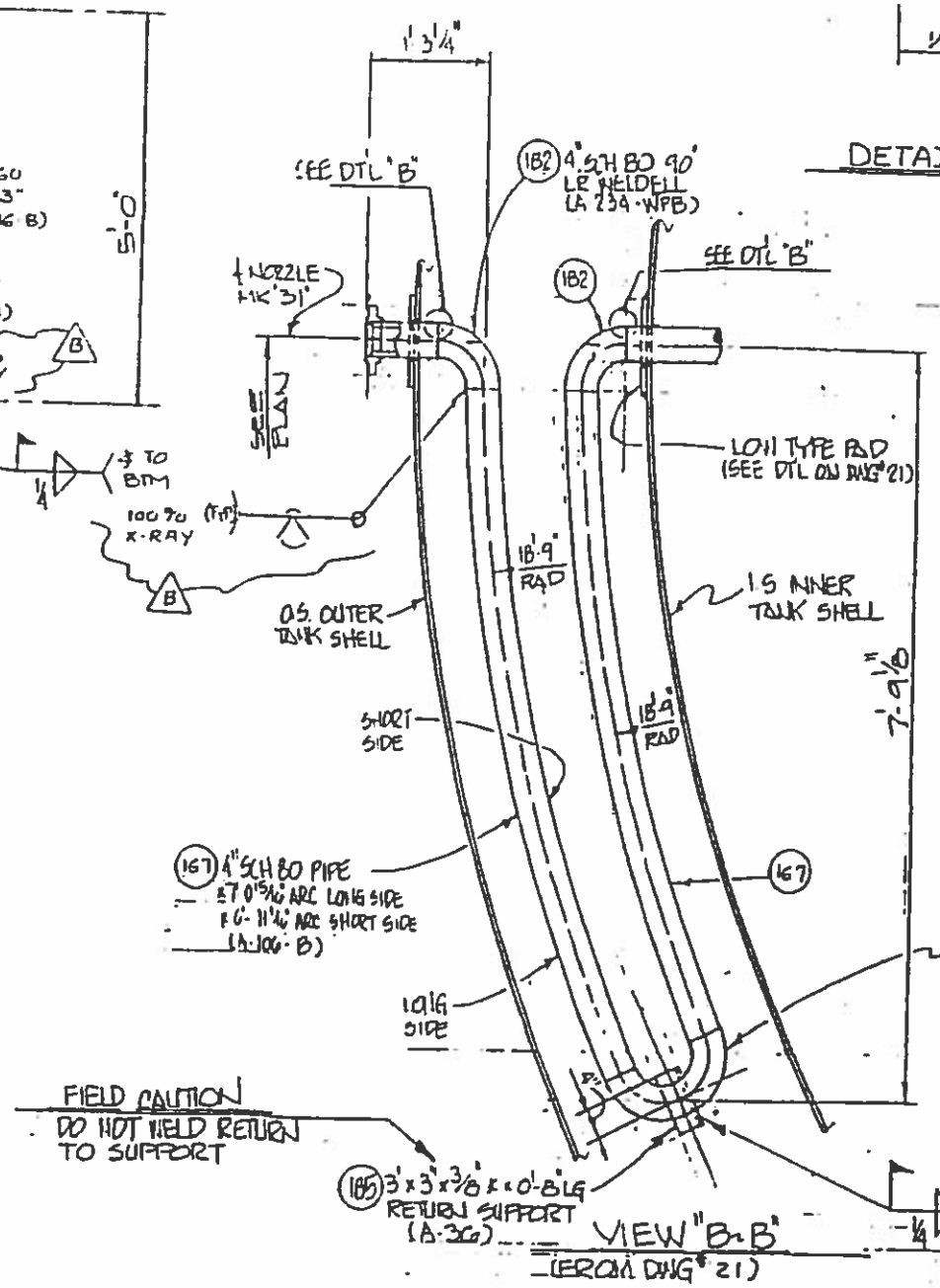


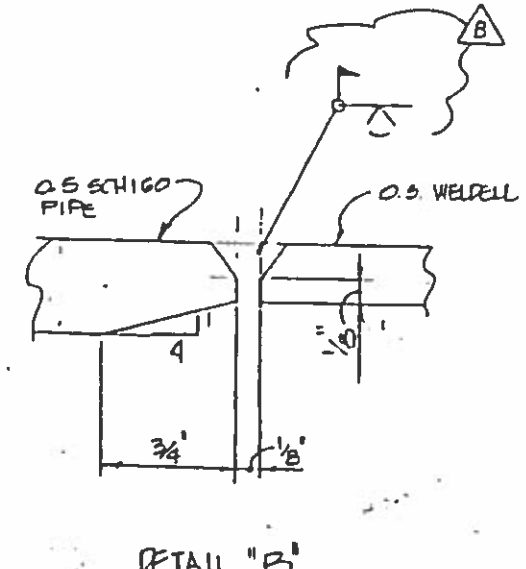
DETAIL 3"-150# SHELL NOZZLE

ONE ASS'Y REQ'D MK-"17"
ONE ASS'Y REQ'D MK-"35"



DETAIL "A"





DETAIL "B"

NOTES

1) MT SEE SHT # 2 FOR MAG PART NOTE
2) SEE SHT # 2 FOR TESTING OF NOZZLE REINF. PAD.

B	REV. WELD SYMBOLS	4-6-93	JKH	CE
A	REV PER CUST APPROVAL	3-24-93	ODS	CE

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 3/30/93

P.O.#: CHO-93-001

S/O 2472B | ITEM: TK-4456

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

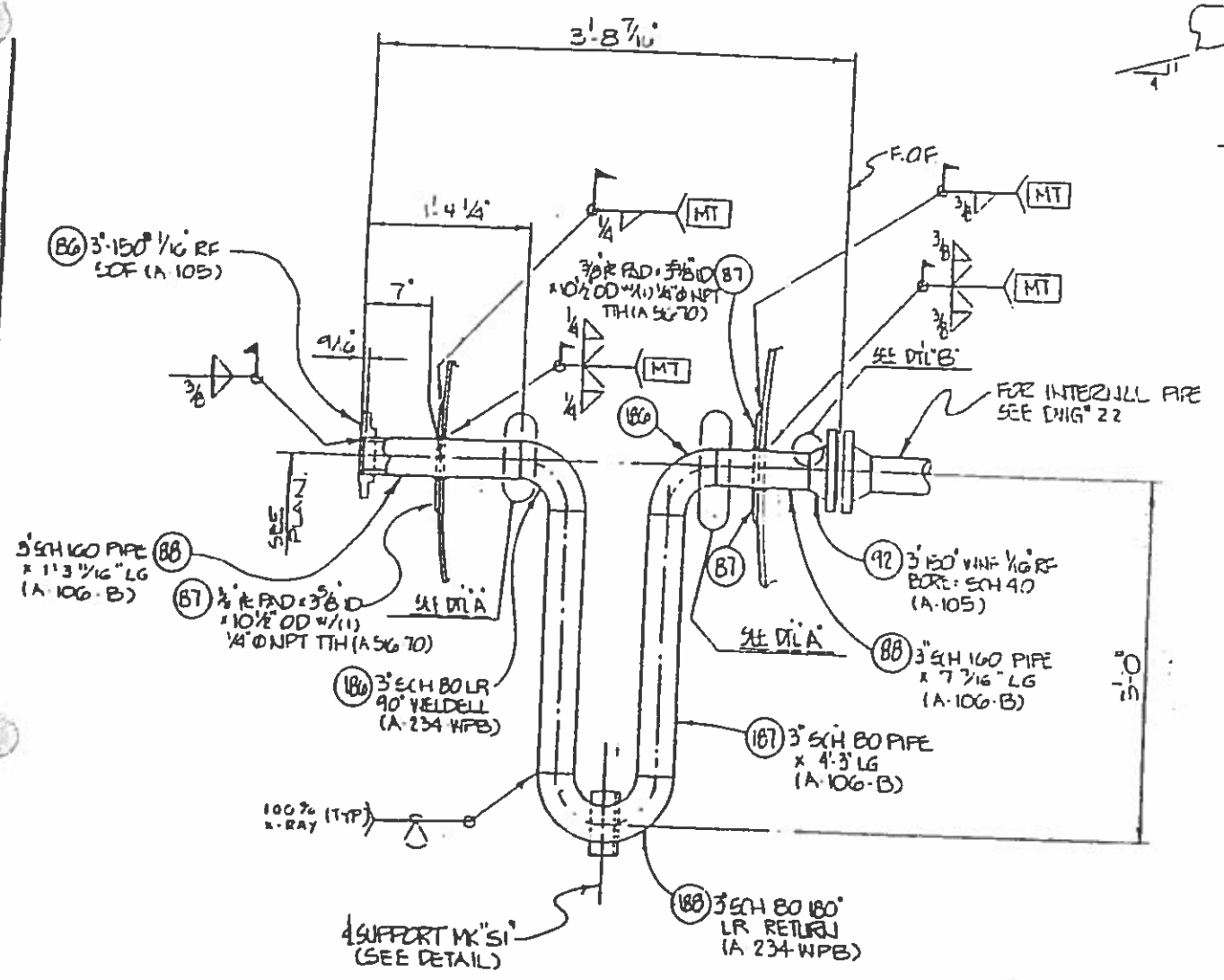
MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK

NOZZLE DETAILS

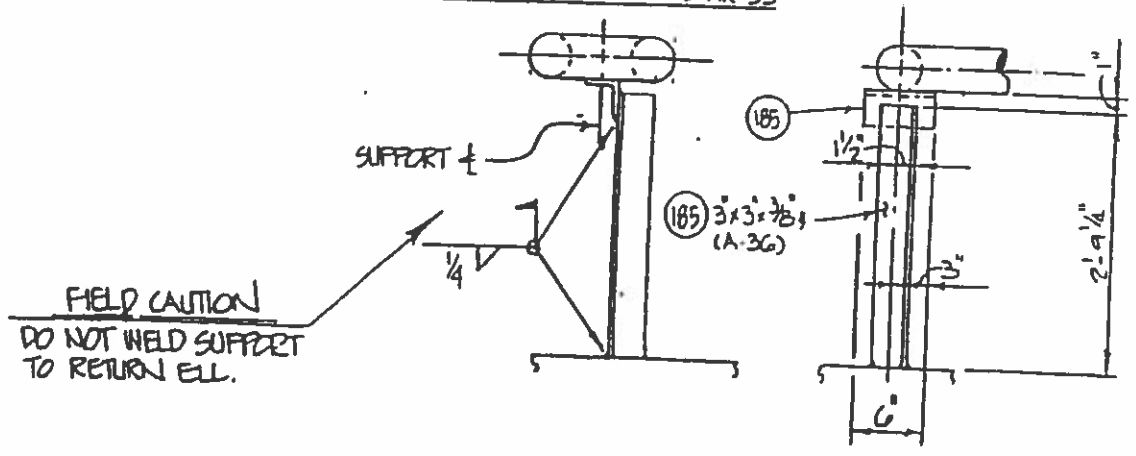
CUSTOMER: LYONDELL PETROCHEM

DRAWN: JKH | DATE: 3-19-93

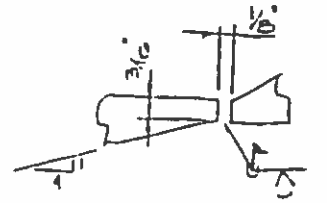
CHECKED: CE | APPROVED:

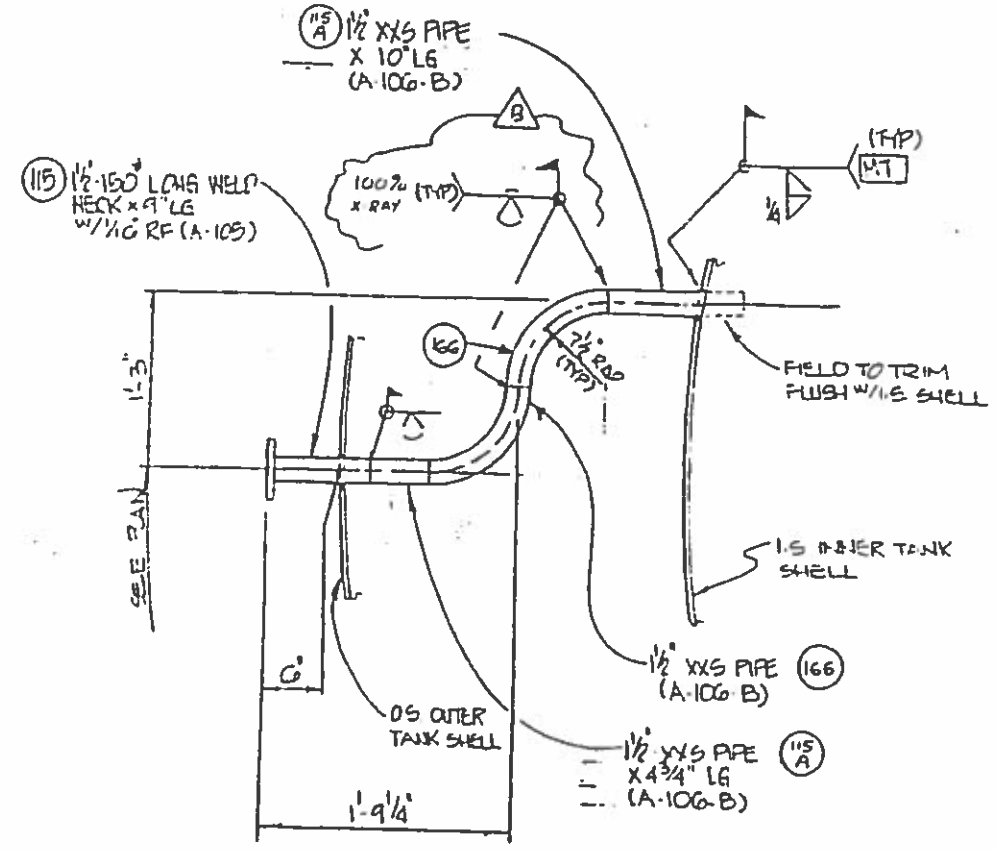


DETAIL OF 3"-150# SHELL NOZZLE
ONE (1) ASSY REQ'D MK "33"

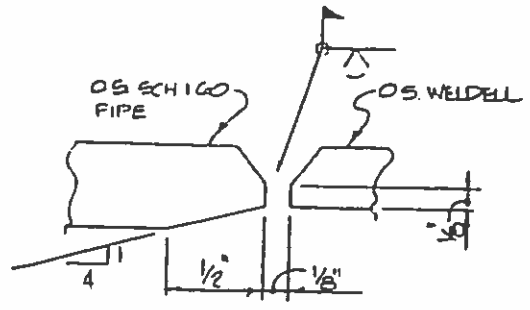


DETAIL OF SUPPORT
ONE (1) REQ'D MK "S1"





DETAIL OF 1 1/2"-150# SHELL NOZZLE
ONE (1) ASSY REQ'D MK "40"

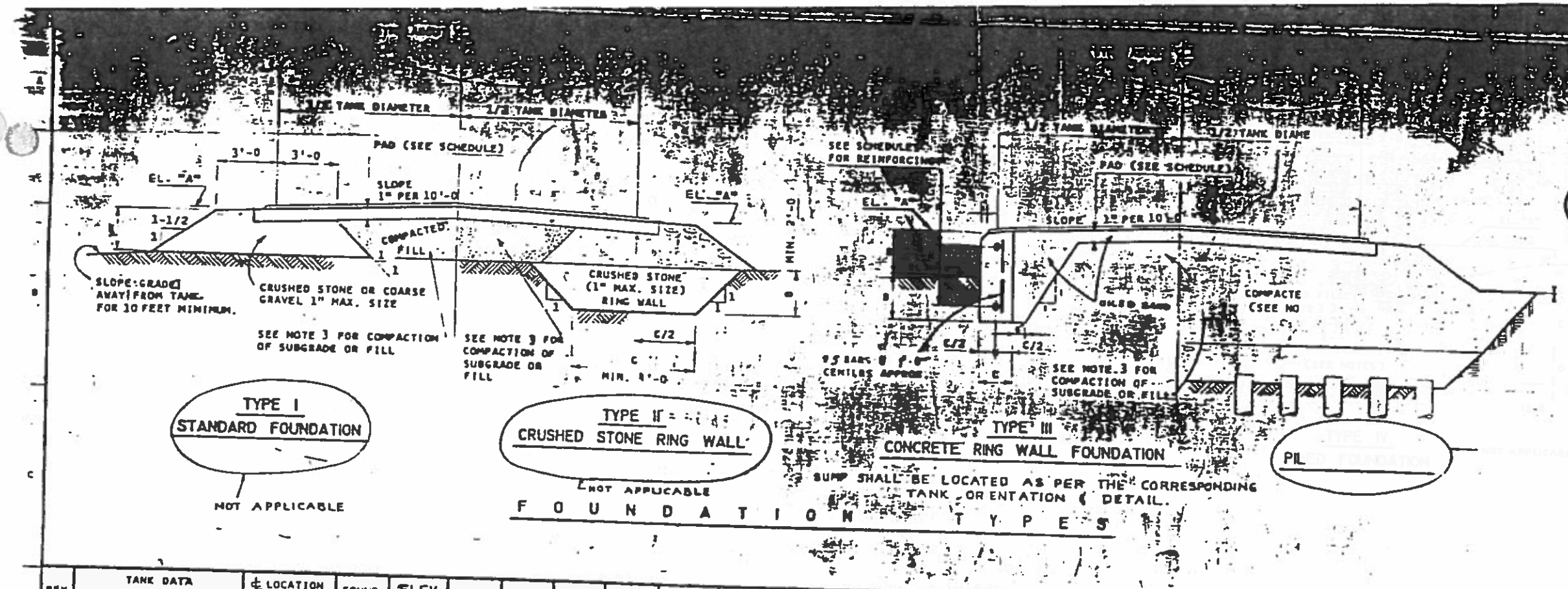


DETAIL "A"

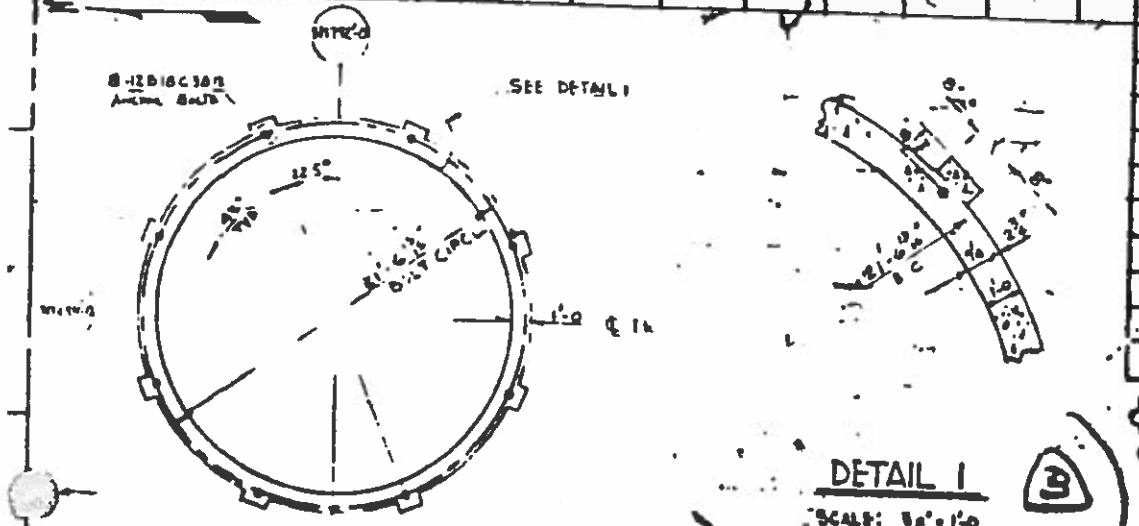
B	REV. WELD SYMBOL	4-29-93	JKH	CG
A	REV. WELD SYMBOLS	4-6-93	JKH	CG
NO	REVISION			

SCALE:
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 3/30/93
BY:

P.O.#: CHO-93-0001
S/O 2472 B | ITEM: TK-4455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO (N) 45'-0"ø x 32'-0" HIGH TANK
DETAIL OF NOZZLES MK "33" & "40"
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: DDG DATE:
CHECKED: C.G. APPROVED:



REV.	TANK DATA ITEM NO.	DIAMETER	HT.	℄ LOCATION COORD.	COORD.	FOUND. TYPE	ELEV. 'A'	B	C	D	E		PAD TYPE	PAD THICKNESS	REINFORCING	RING PROTECT (SEE NOTE 2)	QUANTITIES ASPHALT SEAL 1" TH'K	OILED SAND	CONCRETE RING WALL	FILL	CRUSHED STONE		REMARKS
	TK-3451	22'-0	22'-0	N1792	W1276	III	101'-1½	5'-0	1'-3		1'-1½		III	4"			S.Y.	52 C.Y.	20 C.Y.	C.Y.	C.Y.		
4	TK-3455	40'-0	32'-0	N1792	W1207	III	101'-2½	5'-0	1'-0		1'-2½		III	4"									AFTER SETTLEMENT, EL 'A' IS EXPECTED TO BE 101'-0"
5	TK-3459	21'-0	21'-0	N1792	W1248	III	101'-2"	5'-0	1'-0		1'-2"		III	4"				39.5 C.Y.	29.0 C.Y.				AFTER SETTLEMENT, EL 'A' IS EXPECTED TO BE 101'-0"
4	TK-3701	18'-0"		N 1865.0	W 1030'	III	102'-0"	2'-6"	1'-0"		2'-0"		III	4"				19.5 C.Y.	15.0 C.Y.				SEE PLOT PLAN FOR N.S LOCATION
																							ALLOW SPACE IN RING FDN. FOR DRAIN CONN. SEE DWG B-1218 C 38



REV.	QUANT.	UNIT	NO. DESCRIPTION	REMARKS
	---	S.Y.	ASPHALT SEAL 1" TH'K	
	69.0	C.Y.	OILED SAND	
	64.0	C.Y.	CONCRETE-RING WALL	
	5360	LBS	REINFORCING STEEL	
	ALL	C.Y.	FILL COMPACTED	
		C.Y.	CRUSHED STONE	
4	8	PCS	12 B 18 C 38 (ANCHOR BOLTS)	

REFERENCED DRAWINGS

REV.	DRAWING NO.	TITLE
	E-34-L-007-2	PLOT PLAN 3400 & 3700 AREAS
2	A1-133	ANCHOR BOLT STANDARD

APPROX. QUANTITY OF REBARS REQ'D.

REV. NO.	MARK NO.	2	3	4	5	6	7	8	9	10	11	TOTAL WEIGHT
	7 EA				1670	1410		2200				5280

GENERAL NOTES

ICKNESS AS SHOWN IN SCHEDULE MINIMUM 3 INCHES)

COMPACTED CLEAN SAND FINE GRAVEL SCREENINGS, CRUSHED STONE OR SIMILAR MATERIAL, NOT OVER 1 INCH MAXIMUM SIZE FILL SURFACE VOIDS W TH FINES AND SPRAY LIGHTLY W TH OIL

OILED SAND – CLEAN, COMMERCIAL SILICA SAND MIXED WITH A LOW CORROSIVITY OIL SUCH AS BUNKER "C" OR RAILROAD FUEL OIL. DETERMINE MIX BY TRIAL COMPACT THOROUGHLY. ASPHALT EMULSIONS MAY BE SUBSTITUTED FOR OILED SAND PADS

N T – S E ENGINEERING SPECIFICATIONS FOR FOUNDATIONS & M SC CIVIL CONSTRUCTION TOGETHER WITH SPECIFIC JOB REQUIREMENTS

N T – WHERE CALLED FOR IN THE SCHEDULE, CRUSHED STONE OR GRAVEL BEYOND THE TANK SHELL SHALL BE COVERED WITH A 1 INCH LAYER OF SAND-ASPHALT EXTENDING FROM THE OUTER TOE OF THE SLOPE TO 6 INCHES INSIDE THE SHELL. INSTALL AFTER TANK HAS BEEN WATER TESTED AND DRAINED.

NOTE 3 – COMPACTION OF SUBGRADE OR FILL. THE AREA OF THE TANK SHALL BE OVEREXCAVATED TO A DEPTH OF THREE FEET AND EXCAVATIONS SHALL EXTEND AT LEAST THREE FEET BEYOND THE TANK EDGE. THE EXCAVATED AREA SHALL BE REPLACED WITH A SAND OR SAND SHELL FILL COMPACTED TO AT LEAST 90 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED AASHO TEST

ARCO CHEMICAL COMPANY
OLEFINS PROJECT
CHANNELVIEW, TEXAS LUMMUS JOB NO. T7004
SUB JOB NO. T7004 CRACKING, QUENCH & TREATING AREA 3400

REV.	DESCRIPTION	BY	CHK				
	ISSUED FOR CONSTRUCTION						84
1	ADDED TANK 3701						84
2	ADDED CONC. FOUNDATION FOR TK 3455 SHOWN & A.B. LOCATION FOR TK 3455						84
11-6	REVISED EL 'A' FOR TK 3459						84
11-8	REVISED WEST CO-ORD FOR ALL TANKS						84
4	APPROVED FOR CONSTRUCTION						84

THE LUMMUS COMPANY
BLOOMFIELD, N.J.
LUMMUS JOB 12 CUSTOMER'S ORDER NO.

STORAGE TANK FOUNDATIONS
TANKS TK 3451, 55, 59, 3701
3459

TEST REPORT

2168 CHURCH ST.
EAST TROY, WI 53120

CUSTOMER ORDER NO. CRP2-55641 | C/O DATE | RATING | ENTRY DATE 9119E | SHIP | MARKS | MILL ORDER NO. 6T3-71861-2

TUBHOUB TUBFURA A C

TUBESALES
6161 BINGLE ROAD
HOUSTON, TX 77092

TUBESALES
175 TUBEWAY
FOREST PARK GEORGIA 30050

SPECIAL INSTRUCTIONS: Area C

5D | 5210 | F.O.B. S/P | SHIPPING NOTICE

TERMS: 30-1%-10

4500 337 R 172400 1 120 15.12

4 805 4.500X.337 17 - 24 FT RML
FULL FINISHED ANNEALED & PICKLED
TRENTWELD STAINLESS PIPE
A312 91b SA312 CORR TO MILP24691/3
304

100FT LBS PCS — QUANTITY ORDERED

10/05/92 WANTED
10/05/92 PROMISED

FEET 105.415
NET 1,480
PCS 5
GROSS 1,495
Boxes 1
Complete Shipment
B/L NC-42552-08
DATE 30-SEP-92
C.P.U. PP.D

REPORT OF TESTS

CHEMICAL ANALYSIS

HEAT #	C	MN	P	S	SI	NI	CR	MO	CU	N	CO
712717	.014	1.71	.031	.009	.59	8.71	18.18	.36	.36	.063	.17

Mechanical and NDE Tests

HEAT #	FLAN	FLAT	FLAR	RFLT	RBND	BEND	EDDY	UT	XRAY	DYPN	HYDRO	AIR
712717	OK										2,200	

HEAT #	LOT #	TENSILE	YIELD	ELON	HARDNS.	ID	OD	RMS GRAIN	CORROSION TEST	CORROSION VALI
712717		91,600	52,700	45 x					A262E	OK

REMARKS

TAG: HUU2-55641
STEEL MELTED: J & L

W56754 Tag 2460
8075472 0-9½"
712717
Jonda Love

TEST REPORTS
ACCEPTABLE. D URBAN
OCT 14 1992
RECEIVED

DATE 1-14-93

P.O. # W56754

2460

We Hereby Certify This Report To Be True and Correct According To The Records in Possession of this Corporation.
TRENT TUBE DIVISION - CRUCIBLE MATERIALS CORPORATION

Signed: [signature]

Dated: 9-30-92

OREGON STEEL MILLS

B892

PO Box 2760 Portland, Oregon 97208 · (503) 286-9551 TWX 910 464 1519

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO	DATE	PAGE
230115F	Oct 07, 1992	1

MILL ORDER NO.	DATE
11682	

CUSTOMER ORDER NO. 0701-410-121

JOB/REQ. NO.

SHIPPING NO.	DATE
230115	10/07/1992

CARRIER: SOUTHERN PACIFIC

CAR/TRUCK NO.: SSHB7725

SOLD TO:
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

B892

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

DSN CARBON PRESSURE VESSEL QUALITY ASTM A516-86 GRADE 70 ASME SA516 GRADE 70.

5/16 x 96 x 480

PHYSICAL PROPERTIES

	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8"	% ELONG 2"	% RA	HARDNESS BHN	BEND TEST	IMPACTS
2	0.2500 X 120.000 X 480.000										
	1 PC 4084 LBS	VC0008	A62	585	780	23					
	1 PC 4084 LBS	VC0015	B62	595	805	22					
3	0.3125 X 96.000 X 480.000 ✓										
	1 PC 4084 LBS	VC0026	B25	660	800	19	✓				
	3 PCS 12252 LBS TOTALS										

RECEIVED
DATE 1-18-93
P.O.# W56849
JOB # 2477

Certified a true copy of the original, retained in our file.
AMERICAN ALLOY STEEL, INC.

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Cb	Al	Cr	Mo	Ti	B	N	Ca	Zr	CE	Quench Crack
VC0008	.21	1.15	.023	.008	.20	.01	.01	<.01	<.002	.039	.02	.01							
VC0015	.21	1.07	.021	.008	.20	.01	.01	<.01	<.002	.039	.02	.01							
VC0026	.20	1.01	.018	.009	.21	.01	.02	<.01	<.002	.039	.01	.01							

******** END OF REPORT ********

TEST REPORT APPROVED DATE
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

I certify the above results to be correct as contained in the records of OREGON STEEL MILLS By Angie McCalen TEST REPORT CLERK

ORIGINAL FILE COPY
DO NOT REMOVE

DESCRIPTION: Item #7 (N) 5/16" x 96" x 480"
Tag. No. 2472

OREGON STEEL MILLS
P.O. Box 2760 Portland, Oregon 97208 · (503) 286-9651 TWX 910 464 1549

B888

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO.	DATE	PAGE
152051	DEC 30,1991	2

MILL ORDER NO.	DATE
PM-15735-02	11/08/91

CUSTOMER ORDER NO. 0701-410-033

JOB/REQ. NO.

SHIPPING NO.	DATE
F152051	12/30/91

CARRIER UP

CAR/TRUCK NO. UP259591

ORIGINAL FILE COP
DO NOT REMOVE

AMERICAN ALLOY
PLATE # N/A

SOLD TO: 54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

SHIP TO: THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

5/16 x 96 x 480 B888

DESCRIPTION	HEAT NO.	SLAB	PHYSICAL PROPERTIES: YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8"	% RA	HARDNESS (BHN)	BEND TEST	IMPACTS
** CONTINUED FROM PREVIOUS PAGE ** 1/4 X 96 X 480									
	VC0024	B74	575	785	22				
	VC0024	B75	580	790	22				
	VC0024	B76	580	795	25				
	VC0024	B77	585	800	22				
5/16 X 96 X 480 ✓									
	VC0022	B46	595	825	24				
	VC0022	B47	585	810	26				
	VC0022	B48	585	810	25				
	VC0022	B49	595	815	21				
	VC0022	A67	580	800	24				
	VC0022	A68	560	780	22				

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Cb	Al	Cr	Mo	Sn	N	Ca	B	Ce	Co
VC0022	.22	1.04	.022	.010	.19	.01	.01	<.02	<.002	.048	.01	.01						

RECEIVED
DATE 1-18-93
P.O. # W56849
JOB # 2472

Certified a true copy of the original retained in our file.
AMERICAN ALLOY STEEL, INC.

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.
TEST REPORT CLERK

Angie McCleland

RECEIVED
DATE
P.O. #
JOB #

CUSTOMER Wyatt Field Service
CUST P.O. # W56849
AAS SHIP # 98569
DATE SHIPPED 1-15-93
DESCRIPTION 5/16" x 96" x 240"
Tag: Job 2472

OREGON STEEL MILLS

PO Box 2760, Portland, Oregon 97208 - (503) 286-9651 TWX 910 464 1549

B890

ORIGINAL FILE COPY
DO NOT REMOVE

SOLD TO:
54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO	DATE	PAGE
152051	DEC 30, 1991	4

MILL ORDER NO.	DATE
PH-15735-02	11/08/91

CUSTOMER ORDER NO.: 0701-410-033

JOB/REQ. NO.:

SHIPPING NO.	DATE
F152051	12/30/91

CARRIER: UP

CAR/TRUCK NO: UP259591

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSH CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

B890

PHYSICAL PROPERTIES

DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8"	% RA	HARDNESS (BHN)	END TEST	IMPACTS
** CONTINUED FROM PREVIOUS PAGE ** 5/16 X 96 X 480	VC0023	A69	570	795	23				
	VC0023	A70	575	790	22				
	VC0023	B66	560	790	26				
	VC0023	B67	550	785	23				
	VC0023	B68	555	790	25				
	VC0023	B71	555	790	25				
	VC0023	B73	575	810	24				
	VC0023	B74	575	800	22				
	VC0044	A32	575	810	24				
	VC0046	A32	575	810	22				
	VC0046	A33	590	820	22				
	VC0046	A34	590	820	23				

RECEIVED
DATE 1-14-93
P.O. # 456849
JOB # 2472

Certified a true copy of the original, retained in our file.
AMERICAN ALLOY STEEL, INC.

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Al	V	Mo	Sn	Nb	N	Ca	B	CE	Grain Size
VC0044	.17	1.07	.024	.009	.21	.01	.02	<.02	<.002	.033	.02	.01						
VC0046	.21	1.06	.025	.008	.20	.01	.02	<.02	<.002	.046	.02	.01						

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

Angie McCasland
TEST REPORT CLERK

Certified true copy of original on file at OREGON STEEL MILLS By

OREGON STEEL MILLS

P.O. Box 2760, Portland, Oregon 97208 · (503) 286 5651 TWX 910 464 1549

B890

ORIGINAL FILE COPY
DO NOT REMOVE

SOLD TO:
54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

SHIP TO:
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO.	DATE	PAGE
152051	DEC 30,1991	4

MILL ORDER NO.	DATE
PH-15735-02	11/08/91

CUSTOMER ORDER NO.: 0701-410-033

JOB/REQ. NO.:

SHIPPING NO.	DATE
F152051	12/30/91

CARRIER: UP

CAR/TRUCK NO.: UP259591

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

B890

STORAGE PAGE

PHYSICAL PROPERTIES

ITEM	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG	% RA	HARDNESS BHN	HEAT TEST	IMPACTS
	HN CONTINUED FROM PREVIOUS PAGE HN 5/16 X 96 X 480									
		VC0023	A69	570	795	23				
		VC0023	A70	575	790	22				
		VC0023	B66	560	790	24				
		VC0023	B67	550	765	23				
		VC0023	B68	555	790	25				
		VC0023	B71	555	790	25				
		VC0023	B73	575	810	24				
		VC0023	B74	575	800	22				
		VC0046	A22	555	785	24				
		VC0046	A32	575	810	22				
		VC0046	A33	590	820	22				
		VC0046	A34	590	820	23				

RECEIVED
DATE 1-14-93
P.O. # 4156849
JOB # 2472

Certified a true copy of the original, retained in our file.
AMERICAN ALLOY STEEL, INC.

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al	Cb	V	B	N	Ca	Sn	CE	Ladle Grain Size
VC0044	.19	1.07	.024	.009	.21	.01	.02	<.02	<.002	.033	.02	.01						
VC0046	.21	1.06	.025	.008	.20	.01	.02	<.02	<.002	.046	.02	.01						

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

Angie McCoolank
TEST REPORT CLERK

Records are to be kept as contained in the records of OREGON STEEL MILLS, Inc.

Gulf States Steel, Inc.

GADSDEN AL 35904-1638

CERTIFICATE OF TESTS

MR16-91

PURCHASE ORDER DATE 08/22/91 PURCHASE ORDER NO 49547

CUSTOMER IDENTIFICATION

GSS ORDER NO 20757 ITEM 742

INVOICE DATE 08/29/91 INVOICE NO 742173852

ACCOUNT NUMBER 035 09704 TERMS 30-1/4-10

SOLD TO:
WYATT FIELD SERVICE CO
PO BOX 3956
HOUSTON TX 77253

SHIP TO:
WYATT FIELD SERVICE CO
GREENS PORT IND PARK 13609
IND PD SPUT PTRA 2176088
HOUSTON TX 77015

DATE SHIPPED 08/29/91 FROM BLA CITY ROUTE/VEHICLE IDENTIFICATION WY630711 SHEET NO

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS

LEONARD A. TROMAN
DIR QUALITY ASSURANCE AND RELIABILITY

ITEM NO	MATERIAL DESCRIPTION	QUANTITY SHIPPED
	PLATE CARBON ASTM A-36-90 APPLI DOMESTIC STEEL ONLY CUST ID► BWT-5104	
05	CC10 X 115 E000 SHEARED EDGE A 378 0000 IN HT 7489441 IPCS HT 7413748 SPCS HT 7413743 SPCS HT 7489938 SPCS HT 7413708 SPCS HT 7489441 IPCS HT 7489938 SPCS	49520
CH	C .25MX MN HT P .040MX S .05MX SI RFT	
MR	YLD 36000 MIN TEN 58/80000 % ELONG MIN 2 IN 23 OR 8 IN 20	
TI	1 TR W/SHPMNT 2 TR CA ATTN JOHN WILLIAMS	

8-29-91
W-40647
-7761-7764

ANALYSIS

ITEM NO	HEAT NO	GRADE	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL
05	7489441		19	.83	.007	.015	.076							
05	7413748		17	.93	.006	.015	.064							
05	7413743		19	.93	.005	.013	.063							
05	7489938		15	.81	.013	.018	.030							
05	7413708		17	.73	.010	.013	.056							

TEST RESULTS

ITEM NO	HEAT NUMBER	TEST OR PIECE IDENTITY NO	YIELD KSI	TENSILE STRGTH KSI	ELONG %	GALV. COATING	BEND TEST	HARD	CHARPY IMPACT V-NOTCH FT LBS AT TEST NO	SPEC SIZE	1	2	3	AVG
05	7489441		48	64	27.0									
	7413748		45	61	30.0									
	7413743		44	62	29.0									
	7489938		44	62	30.0									
	7413708		45	64	28.0									

br

Gulf States Steel, Inc.

GADSDEN AL 35904-1936

M816-01

07/09/91 W 49647

CERTIFICATE OF TESTS

CUSTOMER IDENTIFICATION

CSS ORDER NO. 20787 742

INVOICE DATE

INVOICE NUMBER 742-7385

ACCOUNT NUMBER 02509704 TERMS 30-3/4-10

UYATT FIELD SERVICE CO
P O BOX 3052
HOUSTON TX 77253

UYATT FIELD SERVICE CO
GREENS PORT IND PARK 13609
IND RD SPOT PTRA 2172288
HOUSTON TX 77015

DATE SHIPPED 07 26 91 FROM ALA CITY

ROUTE/VEHICLE IDENTIFICATION NU300747

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS

LEONARD A. TROMAN
DIR. QUALITY ASSURANC
AND METALLURGY

ITEM NO | MATERIAL DESCRIPTION | PKG | QUANTITY SHIPPED

9-25-91
W-49647
5161-5164

CHEMICAL ANALYSIS

ITEM NO	HEAT NO	GRADE	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL
05	7420000		.15	0.80	.006	.014	.088							
05	7489993		.14	0.89	.006	.011	.056							

TEST RESULTS

ITEM NO	HEAT NUMBER	TEST OR PIECE IDENTITY NO	YIELD KSI	TENSILE STRTH KSI	ELONG 2"	ELONG 8"	GALV COATING	BEND TEST	HARD	CHARPY IMPACT V NOTCH FT LBS AT TEST NO	SPEC SIZE	1	2	3	AVG
05	7420000		48	65		24.0									
	7489993		43	62		30.0									

鋼管検査証明書 INSPECTION CERTIFICATE

51522

1 OF 1

1977

Nippon Steel Corporation

PER : MITSUI & CO., LTD.

ORDER : 17212-(291211)

CONTRACT No : 1-843-N3-5-5-G115-06

QUALITY : SEAMLESS STEEL LINEPIPE

CLIENT :

CUSTOMER : PIPE EXCHANGE INTERNATIONAL, INC.

CUSTOMER'S CONTROL No : 52447

PATTERN : API SPEC 5L GRADE B/ASTM SPEC 5L GRADE X42/ASTM A106 GRADE B/ASME SA106 GRADE B

: CONTRACT NO. : 18C165

CERTIFICATE No : 005000273J0

PAGE 1

DATE OF ISSUE : 1991-05-22

ITEM	Quantity	TOTAL Weight	Heat No	Chemical Composition (%) C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	Ti	Ca	Control No. / LOT NO.	Tensile Test YS	TS	EL	Hardness Test	Impact Test Temp.	Energy	Lateral Expansion	Remarks
		Pc.																PSI							
		SPEC	P1K 683			1.10	0.025	0.025	0.40	0.40	0.40						SPEC MAX	42000	60000	23					
		SPEC	P1K 683			1.10	0.029	0.029																	
2"XS-2"×240"		LTD	25,364	21	17	64	18	6	2	2	4						46518	52600	72700	360					
				21	17	64	19	6																	
				21	17	64	17	6																	

TO BE CONTINUED

Visual & Dimension	Drift Test
GOOD	

Q.C. APPROVED

1-23-92

DATE

SIGNATURE

THESE MILL TEST REPORTS APPLY TO YOUR ORDER NO. _____

WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE RULES OF THE CONTRACT.

TO BE CONTINUED

八幡製鉄所 技術分析室長

MANAGER, INSPECTION

YAWATA WORKS

鋼管検査証明書
INSPECTION CERTIFICATE

2 of 3

日本製鉄株式会社
Nippon Steel Corporation

FOR : MITSUI & CO., LTD.
ORDER No. : 12512-E291211
ACT No. : 1-HA1-K3-5-5-G119-CA
QUALITY : SEAMLESS STEEL LINEPIPE
CATEM : API SPEC 5L GRADE B/API SPEC 5L GRADE X42/ASTM A106 GRADE B/ASME SA106 GRADE B

CLIENT :
CUSTOMER : PIPE EXCHANGE INTERNATIONAL, INC.
CUSTOMER'S CONTROL No. : J2447

CERTIFICATE No. : UC0002720
DATE OF ISSUE : 1551-05-22
PAGE : 2

品名	Quantity	TOTAL Weight KG	Heat No.	Chemical Composition (%) C	Si	Mn	P	S	Cu	Al	Ca	Control No. MILL	Test Piece No.	Tensile Test YS	TS	EL	Hardness Test	Impact Test Test Temp.	Value	Lateral Expansion	Hydrostatic Test PSI	SECONDS
2"×SCH-XXS×RD*																						
	17T	25,620	A32528	0.21	0.17	0.64	0.018	0.002	0.02	0.002		46516		52600	72700							
				P 0.21	0.17	0.64	0.018															
				P 0.21	0.17	0.63	0.018															
	15S	20,010	A32528	0.21	0.17	0.64	0.018	0.002	0.02	0.002		46516		52700	73600							
				P 0.21	0.17	0.65	0.018															

TO BE CONTINUED

外観・寸法 Visual & Dimensions	ドリフト試験 Drift Test	API Spec 5 L
GOOD		

Q. C.
APPROVED
1-3792
DATE
SIGNATURE

THESE MILL TEST REPORTS APPLY TO YOUR ORDER NO. _____

上記注文品は、納品書の通りまたは註記に従って製造され、その試験結果を満足していることを証明します。
WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE RULES OF THE CONTRACT.

TO BE CONTINUED
八幡製鉄所 試験分析室長
MANAGER, INSPECTION
YAWATA WORKS

鋼管検査証明書
INSPECTION CERTIFICATE

3 of 3

新日鐵住金株式会社
Nippon Steel Corporation

CUSTOMER : PIPE EXCHANGE INTERNATIONAL,INC.
CUSTOMER'S CONTROL No : 12447

DESCRIPTION : STAINLESS STEEL LINEPIPE
SPECIFICATION : API SPEC 5L GRADE B/API SPEC 5L GRADE X42/ASTM A106 GRADE B/ASME SA106 GRADE B

CERTIFICATE No : 060202210
DATE OF ISSUE : 1551-05-22
PAGE : 3

ITEM	Quantity	TOTAL Weight KG	Heat No	Chemical Composition (%) C	Si	Mn	P	S	CU	NI	CR	MO	V	CB	CEQ	CEN	Control No. / Test Piece No.	Tensile Test YS	TS	EL	RA	Hardness Test	Impact Test	Hydrostatic Test KPA	PSI	MIN	SECONDS
2"SCH-20 SEAMLESS																										
NC JOINT																										
O.CE PIPES			SEE PIPES																							
LIGHT		45,000	KG																							

TENSILE TEST SPECIMEN : LONGITUDINAL ---STRIP
TEN FORMULA ---
CEN FORMULA ---

Q.C. APPROVED
1-1992
DATE
SIGNATURE

THESE MILL TEST REPORTS APPLY TO YOUR ORDER NO. _____

上記1文品は、御指定の規格または仕様に従って製造され、その要求事項を満足していることを証明します。
WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE RULES OF THE CONTRACT.

八幡製鉄所 品質分析室長
MANAGER, INSPECTION
YAWATA WORKS

Gulf States Steel, Inc.

12-0702-01

PURCHASE ORDER DATE 11/13/92 PURCHASE ORDER NO 5635

CERTIFICATE OF TESTS

CUSTOMER IDENTIFICATION

SHIP. 6 SALES ORDER NO. 27574 ITEM NO. 742

CD 2 OFFICE BHM PC INVOICE DATE INVOICE NUMBER 742-22602

LC ACCOUNT NUMBER 38080003 TERMS 30-3/4-10

SOLD TO
INTSEL SOUTHWEST
DIV PECHINEY WORLD TRADE
PO BOX 41041
HOUSTON TX 77240104

SHIP TO
INTSEL SOUTHWEST
DIV PECHINEY WRLD TRD USA
SPIN NBR 4038
HELENDY TX

DATE SHIPPED 12-14-92 FROM ALA CITY ROUTE/VEHICLE IDENTIFICATION SOU 115796 SHEET NO. 1

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS.

C. F. BEARDEN, JR.
MGR. TECHNOLOGY AND QUALITY - PLATE PROD.

ITEM NO	MATERIAL DESCRIPTION	QUANTITY SHIPPED
	CR 30MX MO 12MX CB 02MX V 03MX	
	MR YLD 38000 MIN TEN 70/90000 % ELONG MIN 2 IN 21 OR 8 IN 17	
	TI 3 TR CA	

RECEIVED
DATE 1-15-93
P.O. # 056845
JOB # 2472

ANALYSIS

ITEM NO	HEAT NO.	GRAIN	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL

TEST RESULTS

ITEM NO	HEAT NUMBER	TESTOR PIECE IDENTITY NO	YIELD KSI	TENSILE STRENGTH KSI	ELONG 2"	ELONG 8"	GALV COATING	BEND TEST	HARD	CHARRPY IMPACT V NOTCH FT LBS AT				
										TEST NO	SPEC SIZE	1	2	3	AVG
01	7425367	8281	58	78		23									
	"	8282	57	77		22									
	"	8283	57	77		23									
		8284	56	79		26									

dc

P.O. DATE	PURCHASE ORDER NO.		
06/19/91	7025-2		
SHIPPERS NO.		MILL ORDER NO.	INVOICE NO.
H04381 07 28 91		V875350	154-119924
VEHICLE NUMBER	EJE 006049		H4381

VENDOR SOLD TO

DARY WORKS
DARY, INDIANA 46402

MELTED AND MANUFACTURED IN THE USA

PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
P O BOX 41041
HOUSTON TX 77241-1041

SHIP TO

PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

THIS IS TO CERTIFY THAT T
PRODUCT DESCRIBED HEREIN
MFGD., SAMPLED, TESTED AN
INSPECTED IN ACCORDANCE W
THE SPECIFICATION AND FUL
FILLS REQUIREMENTS IN EVE
RESPECT.

BB

PREPARED BY THE OFFICE OF
J. J. HARRINGTON Q. A.

DATE 7-30-91

SPEC & DESC

PLATE CARBON ASTM A516-M1986 GRADE 70 ASME SA516-M1989
EDITION-1990 ADDENDA DECEMBER 31, 1990 GRADE 70 PRESSURE VESSEL
QUALITY NORMALIZE CHARPY V-NOTCH LONGITUDINAL IMPACT TESTS EACH
PLATE AS HEAT TREATED 15/12 FT/LBS AT -50 DEG F
INSP: 01 MILL CERTIFIED T/R ANALYSIS

B925

ITEM NO	MATERIAL DESCRIPTION: THICKNESS OR SECTION	WIDTH THK OR FT WT	LENGTH	QUAN DEL	WEIGHT	HEAT NO	TEST OR PIECE IDENTITY		YIELD PT. KSI	TENSILE STR KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED OF AREA
02	3/4 " STEEL-TYPE = INGOT	120.0000	480"	01	12252	D21855							
	LONG FL SZ CHARPY IMPT V-NTCH -050 DEG F AVERAGE IMPACT STRENGTH +58 FT LBS						03X 2	#	54.0	77.0	25.0	45.0	
							FT LBS/ 051-066-056						
							IMPACT PCE ID = 03X 2						
	PRODUCT & TEST SPECIMENS WERE NORMALIZED AT 1660 DEG. F. FOR 0024 MINUTES COOLING COMPLETED IN STILL AIR.												
02	3/4 " STEEL-TYPE = INGOT	120.0000	480"	01	12252	D21855							
	YIELD STRENGTH @ 0.5% E.U.L.						03Y 2	#	51.5	73.0	27.0	47.0	

RECEIVED
DATE 2.9.92
P.O. # L157592
JOB # 2472

HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	W	CB	CO
D21855	HEAT	23	109	021	018	23	02	01	04	00		034		000			000	

###END OF DATA###

FINE GRAIN

MATRIX — DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LAST MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT

910728 1256 700118030 072891 0186167001 01 LML CBA 3 0 0 PAGE 1

METALLURGICAL TEST REPORT

PPTS05G55

ORIGINAL

PO DATE	PURCHASE ORDER NO 4162 -103
SHIPPERS NO F16267	MILL ORDER NO DF33755
VEHICLE OR WAYBILL CSX145222B	INVOICE NO 489-040927
	09/24/92

VENDOR: FAIRFIELD WORKS
P.O. BOX 599
FAIRFIELD, ALABAMA 35064

SOLD TO: TUBULAR STEEL INC
1031 EXECUTIVE PARKWAY DR
CREVE COEUR MO 63141 6251

MAIL TO: TUBULAR STEEL INC
22200 KATY BROOKSHIRE ROAD
KATY TX

THIS IS TO CERTIFY THAT TH
PRODUCT DESCRIBED HEREIN W
MFGD., SAMPLED, TESTED AND
OR INSPECTED IN ACCORDANCE
WITH THE SPECIFICATION AND
FULFILLS REQUIREMENTS IN
SUCH RESPECTS.

PREPARED BY THE OFFICE OF:
M.R. STEIN MGR. Q.A.

DATE SEPTEMBER 25, 1992

PIPE CARBON SMLS STD PIPE API 5L-39TH EDITION DTD 5/1/91 GRADE B ASTM A53-90B GRADE B ASTM A106-91A GRADE B/C HOT ROLLED MILL COAT PE PFJ 30 DEG.
TEST AT MILL

B728

ITEM NO	MATERIAL DESCRIPTION SIZE	WALL	SPECIFICATION & GRADE	MAIL	HEAT / LOT NO	MIN HYDRO PSI	YIELD STR PSI	TENSILE STR PSI	ELONG % IN 2"	GAGE WIDTH IN	FLAT
02	6.6250	0.432		SMLS	041345	4,000	50,300	79,400	42.6	1.5	OR
02	6.6250	0.432		SMLS	X45977	055EC 4,000	AS ROLLED 48,600	TENSILE. 79,500	40.8	1.5	OR
02	6.6250	0.432		SMLS	X45924	055EC 4,000	AS ROLLED 48,400	TENSILE. 79,400	40.6	1.5	OR
						055EC	AS ROLLED	TENSILE.			

YIELD STRENGTH @ .5% EXT.
LONGITUDINAL STRIP TENSILE SPECIMENS USED UNLESS NOTED OTHERWISE.
ALSO MEETS THE REQUIREMENTS OF ASME SA53 1989 EDITION, 1991 ADDENDA, & SA106 1989 EDITION, 1991 ADDENDA.

HOT FINISHED -- NO HEAT TREATMENT

ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.

RECEIVED
DATE 1-28-93

ITEM NO	HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI
	041345	HEAT	.26	.93	.010	.023	.23	.21	.09	.08	.03				.001		
		PROD	.24	.93	.010	.023	.23	.21	.09	.08	.03				.001		
	X45977	HEAT	.25	.92	.009	.020	.22	.20	.09	.08	.03				.001		
		PROD	.25	1.00	.009	.020	.22	.20	.09	.08	.03				.001		
	X45924	HEAT	.25	.93	.010	.020	.23	.20	.09	.08	.03				.001		
		PROD	.25	.93	.010	.020	.23	.20	.09	.08	.03				.001		

SO# W57490
JOB # 2477

TSI QUALITY CHECK
BY [illegible] DATE 10-15-92

JOB CONTRACT NO

TUBULAR PRODUCTS

METALLURGICAL TEST REPORT

ORIGINAL

PO DATE	PURCHASE ORDER NO
	9154
SHIPPERS NO.	MILL ORDER NO. / INVOICE NO.
VEHICLE IDENTITY	0833455

VENDOR

USS TUBULAR PRODUCTS

SOLD TO

TUBULAR STEEL INCORPORATED
1031 EXECUTIVE PARKWAY DR
CREVE COEUR MO 63141-6351

MAIL TO

TUBULAR STEEL INCORPORATED
1031 EXECUTIVE PARKWAY DR
CREVE COEUR MO 63141-6351

PO # USS

B928

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFG., SAMPLED, TESTED, AND/OR INSPD. IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS

APPROVED BY THE OFFICE OF:
D.S. DARKOWSKI MGR. MET
U.A. USS TUBULAR PRODUCTS
DATE 11/03/92

TSI QUALITY CHECK
BY GR DATE 12/1

ITEM NO	MATERIAL DESCRIPTION: SIZE	WALL	SPECIFICATION & GRADE	MATL	HEAT LOT NO	MIN HYDRO PSI	YIELD STR PSI	TENSILE STR PSI	ELONG % IN 2"	GAGE WIDTH IN	FLAT	BE
	3 1/2	.430	API 5L GR.B API FD 4/93 ASTM A53-90D GR.B ASME SA53 GR.B GRED 7140D. ASTM A106-91 GR.B/C ASME SA106 GR.B/C GRED 7140D.	765	N07751	2500	48100	72200	36.00	3/4	OK	

RECEIVED
DATE 1-28-93
P.O. # WS 7450
JOB # 2472

ITEM NO	HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
	N07751	HEAT	.14	.50	.012	.007	.25	.21	.21	.04	.01				.002				
	N07751	PROD	.14	.51	.004	.22	.21	.21	.21	.04	.01				.002				
	END OF DATA THIS SHEET																		

TUBULAR PRODUCTS

METALLURGICAL TEST REPORT

B543 PAGE 1 OF

10259 (pw)

JOB CONTRACT NO

PO DATE	PURCHASE ORDER NO
	3993-USS

SHIPPERS NO	MILL ORDER NO	INVOICE NO
T12701	DS78595 01	

VEHICLE IDENTITY PLYMOUTH

VENDOR

USS TUBULAR PRODUCTS

SOLD TO

DIXIE PIPE SALES
PO BOX 30050
HOUSTON TX 77230-0050

MAIL TO

DIXIE PIPE SALES
PO BOX 30050
HOUSTON TX 77230-0050

THIS IS TO CERTIFY THAT
PRODUCT DESCRIBED HEREIN
MFG., SAMPLED, TESTED, AI
OR INSPD. IN ACCORDANCE I
THE SPECIFICATION AND
FULFILLS REQUIREMENTS IN
SUCH RESPECTS.
APPROVED BY OFFICE OF:
D.S. DABLOWSKI MGR. MET.
Q.A. USS TUBULAR PRODUCTS

DATE 04/20/92

Mill Test Reports furnished by
DIXIE PIPE SALES, INC.
Apply to your Order No. 55917

ITEM NO	MATERIAL DESCRIPTION: SIZE	WALL	SPECIFICATION & GRADE	MAIN	HEAT LOT NO	MIN HYDRO PSI	YIELD STR PSI	TENSILE STR PSI	ELONG % IN 2	GAGE WIDTH IN	FLAT
1	24	.250	ASTM A[illegible]A GR. B ASME SA53 GR. B SI ED. 90 ADD. ASTM A[illegible] GR. B ASME SA[illegible] GR. B SI ED. 90 ADD. ALL SI GR. B [illegible]TH ED. [illegible]	SML	L4[illegible] 2C[illegible]	1[illegible]	51000	72000	35.0	1 1/2	OX
1	24	.500	ASTM A[illegible]A GR. B ASME SA53 GR. B SI ED. 90 ADD. ASTM A[illegible] GR. B ASME SA[illegible] GR. B SI ED. 90 ADD. ALL SI GR. B [illegible]TH ED. [illegible]	SML	N45[illegible] 2C[illegible]	1[illegible]	49500	7[illegible]	3[illegible]	1 1/2	OX

ITEM NO	HEAT NO	TYPE		MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
[illegible]	L[illegible]	HEAT	12	1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]				
[illegible]	[illegible]	HEAT	1[illegible]	1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]				
[illegible]	N45[illegible]	HEAT	12	1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]				
[illegible]	[illegible]	HEAT	12	1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]				
** END OF DATA	[illegible]	SHEET	***		ALL [illegible] FINGS AND MATERIAL AS [illegible] [illegible] TOR										PLACE IN THE USA.				

RECEIVED
DATE 9-14-92
P.O. # W55917
JOB # 2414

GARY WORKS
GARY, INDIANA 46402

MELTED AND MANUFACTURED IN THE USA

PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
P O BOX 41041
HOUSTON TX 77241-1041

PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

SHIP TO

P/O DATE	PURCHASE ORDER NO.		
11/13/92	5634		
SHIPPERS NO.		MILL ORDER NO.	INVOICE NO.
H08990 11 30 92		GF18280	154-166169
ORDER NO. EJE 005752			H0990

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND/O INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FUL- FILLS REQUIREMENTS IN SUCH RESPECT.

PREPARED BY THE OFFICE OF:
G.D.LUKES GEN MGR. Q.A

DATE 12-1-92 RECEIVED

PLATE CARBON ASME SA516-M1989 EDITION-1991 ADDENDA DECEMBER 31. 1991 GRADE 70 PRESSURE VESSEL QUALITY

T3842

MILL CERTIFIED T/R

DATE _____

P.O. # _____

MATERIAL DESCRIPTION			QUANTITY	WEIGHT	HEAT NO	TEST OR PIECE IDENTITY		YIELD STR. KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED. OF AREA	BEND
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9802 3 TO 1	M48345	74 3							
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9802 3 TO 1	M48345	74 3	H	50.5	73.5	28.0	48.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9802 3 TO 1	M48345	74 4							
##END OF DATA##						74 4	H	51.0	73.5	27.0	47.0		
						74 5							
						74 5	H	51.5	73.5	26.0	48.0		

#YIELD STRENGTH @ 0.5% E.U.L

TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	H	V	B	W	CB	CO
HEAT	18	103	018	008	24	02	02	03	01		026		000			003	

##END OF DATA##

FINE GRAIN

DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LEFT MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT.

1417 701022010 120192 R 0186147001 01 JFP SA 3 0 0 PAGE 1

Test Report 1013

010000773 (REV 9/91)

CONTRACT NO.

P.O. DATE 11/13/92 | PURCHASE ORDER NO. 5634

SHIPPERS NO. H01022 12 03 92 | MILL ORDER NO. GF18280 | INVOICE NO. 154-166520

VESSEL NO. EJE 006213 H1022

CARY WORKS
CARY, INDIANA 46402

MELTED AND MANUFACTURED IN THE USA

PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
P O BOX 41041
HOUSTON TX 77241-1041

SHIP TO
PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECT.

PREPARED BY THE OFFICE OF:
G. D. LUKES GEN. MGR. Q. A.

DATE 12-3-92

RECEIVED

DATE _____

P.O. # _____

PLATE CARBON ASME SA516-M1989 EDITION-1991 ADDENDA DECEMBER 31, 1991 GRADE 70 PRESSURE VESSEL QUALITY

1 MILL CERTIFIED T/R

MATERIAL DESCRIPTION			QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY		YIELD AT 0.308 KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% REQ. OF AREA	BEND
THICKNESS OR DIAMETER	WIDTH OR I.D. WT.	LENGTH											
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	01 = 24	4901 3 TO 1	M48345	73 2							
						73 2	H	52.0	73.5	29.0	48.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	01 = 24	4901 3 TO 1	M48345	73 3							
						73 3	H	52.0	73.5	28.0	50.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9802 3 TO 1	M48345	73 4							
						73 4	H	50.5	74.0	27.0	48.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9802 3 TO 1	M48345	73 5							

*YIELD STRENGTH @ 0.5% E.U.L.

*	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	W	CB	CO
15	HEAT	18	103	018	008	24	02	02	03	01		026		000			003	
	END OF DATA																	

FINE GRAIN

DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LEFT MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT.

	EQ DATE 11/13/92	PURCHASE ORDER NO. 5634	
	SHIPPERS NO. H01022 12 03 92	MILL ORDER NO. GF10200	INVOICE NO. 154-166528
	CUST EJE 006213		H1022

ARY WORKS
ARY, INDIANA 46402

MELTED AND MANUFACTURED IN THE USA

ECHINEY WORLD TRADE USA INC
NTSEL SOUTHWEST DIV
O BOX 41041
OUSTON TX 77241-1041

PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4030
MELENDY TX 77429

SHIP TO

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECT.

PREPARED BY THE OFFICE OF:
C. D. LUKES GEN MGR. Q A

DATE RECEIVED 12-3-92

DATE _____
P.O. # _____
JOB # _____

PLATE CARBON ASME SA516-M1989 EDITION-1991 ADDENDA DECEMBER 31, 1991 GRADE 70 PRESSURE VESSEL QUALITY

1 MILL CERTIFIED T/R

MATERIAL DESCRIPTION	WEIGHT	QUANTITY	WEIGHT	HEAT NO	TEST OR PIECE IDENTITY		YIELD PT. KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED OF AREA	BEND
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	01 = 24	4901 3 TO 1	M40345	73 2						
						73 2 II	52.0	73.5	29.0	48.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	01 = 24	4901 3 TO 1	M40345	73 3						
						73 3 II	52.0	73.5	28.0	50.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9002 3 TO 1	M40345	73 4						
						73 4 II	50.5	74.0	27.0	48.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9002 3 TO 1	M40345	73 5						

YIELD STRENGTH @ 0.5% E.U.L.

	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	W	CB	CO
5	HEAT	18	103	010	001	24	02	02	03	01		026		000			003	

FINE GRAIN

END OF DATA

DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LEFT MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT.

01161A7001 01 JCP CAA 3 0 0 PAGE 1

A Division of USX Corporation
01000772 (REV. 6/91)

Test Report

D840

USX

CONTRACT NO.

P.O. DATE	PURCHASE ORDER NO.
11/13/92	5634

SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.
H01022 12 03 92	GE18280	154-166528
EJE 006213		H1022

CARY WORKS
CARY, INDIANA 46402

MELTED AND MANUFACTURED IN THE USA

PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
P O BOX 41041
HOUSTON TX 77241-1041

SHIP TO
PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECT.

PREPARED BY THE OFFICE OF:
G. D. LUKES GEN. MGR. Q. A.

DATE: 12-3-92

RECEIVED
DATE _____
P.O. # _____

PLATE CARBON ASME SA516-#1989 EDITION-1991 ADDENDA DECEMBER 31, 1991 GRADE 70 PRESSURE VESSEL QUALITY

01 MILL CERTIFIED T/R

MATERIAL DESCRIPTION: THICKNESS OR DIAMETER	WIDTH OR O.D. WT.	LENGTH	QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	JOB #	TENSILE STR.	ELONGATION %	% RED. OF AREA	BEND
							KSI	KSI	IN 8" / IN 2"		
3/8 "	96.0000	480"			M48345	73 5 #	53.0	73.5	27.0 / 47.0		
3/8 "	96.0000	480"	02	9802	M48345	74 2 ✓					
STEEL-TYPE = CAST		REDUCTION RATIO = 24	3 TO 1								
###END OF DATA###						74 2 #	52.5	72.5	26.0 / 46.0		

#YIELD STRENGTH @ 0.5% E.U.L.

HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
345	HEAT	18	103	018	008	24	02	02	03	01		026		000			003	

###END OF DATA###

FINE GRAIN

DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LEFT MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT.

32-8850-01

CERTIFICATE OF TESTS

09/08/92 | O 23323

G | 26678 | 74E

74E-18980

S6755059 | 30-3/4-10

Bestline Steel Products Inc.
3001 W. Eleventh
Houston, TX 77008

1859

10 13 92 | ALA CITY | STILES TRK

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED ON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS

LEONARD A. TROMAN
DIR. QUALITY ASSURANCE AND METALLURGY

PLATE CARBON ASTM A-516-90 GRADE 70
ASME SA-516 DATE 07 01 89 GRADE 70
PVQ KILLED FINE GRAIN PRACTICE
CUST ID: 0412951

.2500 X 96.0000 SHEARED EDGE X 480.0000 IN

HT 7424460 T 891	PCS	
HT 7424460 T 892	PCS	
HT 7424460 T 893	PCS	
HT 7424460 T 894	PCS	
HT 7424460 T 895	PCS	
HT 7424460 T 896	PCS	
HT 7424460 T 897	PCS	✓
HT 7424460 T 898	PCS	
HT 7424460 T 899	PCS	
HT 7424460 T 900	PCS	
HT 7424460 T 901	PCS	
HT 7424460 T 902	PCS	

39204

RECEIVED
DATE 1-15-93
P.O. # 056797
JOB # 2472

C 27MX MN 85/1.20 P 035MX S 035MX SI 15/40 AL 020MIN CU 40MX NI 40MX

Floating roof deck

HEAT NUMBER	TEST PIECE IDENTITY NO.	YIELD KSI	TENSILE STRENGTH KSI	ELONG %	HARD
7424460	891	57	77		
	892	56	77	26	
	893	57	77	24	
	894	56	77	25	
	895	57	77	24	
	896	58	78	24	
	897	57	77	28	

HEAT	GRAIN	C	MN	P	S	SI	CU	NI	CR	MO	V	B
7424460		.21	1.08	.010	.010	.226	0.03	0.01	0.04	.02	.000	.003 .03

CONTINUED

2-0960-01

09/09/92 Q 23323

CERTIFICATE OF TESTS

E 14 IBN 6 28678 72

56755059 30-3/4-10

Bestline Steel Products Inc.
3301 W. Eleventh
Houston, TX 77008

0 13 92 ALA CITY STILES TRK

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN CONFORMANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED ON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS

LEONARD A. TROMAN
DIR QUALITY ASSURANCE
AND METALLURGY

CR 30MX MO 12MX CB 02MX V 03MX

YLD 38000 MIN TEN 70/90000 % ELONG MIN 2 IN 21 CR 8 IN 17

1 TR WAREHOUSE PICK-UP CLERK CA

TOTAL WT 39,2048 PCS 12

RECEIVED
DATE 1-15-92
P.O. # W56797
JOB # 2472

HEAT NUMBER	TESTED PIECE IDENTITY NO.	YIELD KSI	TENSILE KSI	ELONG %	REDUCTION OF AREA %	DAILY COATING	HARDNESS	CHARPY IMPACT V-NOTCH FT. LBS. AT TEST TEMP.	SPEC. MIN.	1	2	3	AVG.
7424463	898	57	77	26									
	899	56	76	25									
	900	56	76	24									
	901	58	77	24									
	902	56	77	26									

TEST REPORTS

FRIEDMAN INDUSTRIES, *Incorporated*

P.O. BOX 21147 • HOUSTON, TEXAS 77226 • (713) 672-9433

Wyatt Field Services
Houston, TX

1/29/93

Attn: John Williams

B914

P.O. W57492
Inv. 24330

P.O. W56170
Inv. 24331

HEAT NUMBER	SIZE	SPECIFICATIONS
052043	5/16 72 x 240	A36
1D0068	3/16 72 x 301	A36
1D0068	3/16 72 x 240	A36

CHEMICAL ANALYSIS

HEAT NUMBER	C	MN	P	S	SI	AL
052043	.132	.837	.12	.5	.100	.37
1D0068	.21	.71	.012	.022	.004	--

PHYSICAL PROPERTIES

HEAT NUMBER:	YIELD POINT PSI	TENSILE STRENGTH PSI	ELONG %	BEND TEST
052043	43,150	65,449	31% in 2"	
1D0068	52,500	67,300	25% in 8"	

WE HEREBY CERTIFY THAT THE ABOVE FIGURES ARE CORRECT AS CONTAINED IN THE RECORDS OF FRIEDMAN INDUSTRIES, INC.

RECEIVED

DATE 1-28-93

P.O. # W57492

JOB # 2472

FRIEDMAN INDUSTRIES, INC.

By Alicia Smith

Test Report

CONTRACT NO.

P.O. DATE 12/07/92 | PURCHASE ORDER NO. 60-8843/1627-H

SHIPPERS NO. GC637250C 01-13-93 | MILL ORDER NO. F856660 | INVOICE NO. GC637250C

VEHICLE IDENTITY BG 330275

NEVA STEEL
.O. BOX 2500
IOVO, UTAH 84603

NNESMANN PIPEASTEEL CORP
90 POST OAK BLVD
IUSTON TX 77056-3811

FRIEDMAN INDUSTRIES
4001 HOMESTEAD ROAD
SPINS #273001
HOUSTON, TX 77028

SHIP TO

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

Larry D. Clinger
MANAGER - QUALITY ASSURANCE
DATE 01-13-93

H. SHEET C.25MAX P.040MAX S.050MAX HR36S058 Y/P 36 KSI MIN T/S
I KSI MIN DRY NO OIL

MILL AA/SN CERTIFIED T/R ANALYSIS

MATERIAL DESCRIPTION: THICKNESS OR SECTION	WIDTH, DIA OR FT. WT.	LENGTH	QUANTITY	WEIGHT	HEAT NO.	ILSI OR PIECE IDENTITY	YIELD PT PSI	TENSILE STR. PSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED OF AREA	BEND
.1780"	72.0000"	COIL 576460	1	49450#	100068	.1780"	52500	67300	25.0			
						.1780"	52500	67900	25.0			
						END OF DATA						

	HM	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
60	HEAT	21	71	012	022	004												
EVA	STEEL COMPANY CERTIFIES ALL SMELTING, MELTING AND MANUFACTURING PROCESSES OCCURRED IN THE USA.																	
ND OF DATA***																		

RECEIVED
DATE 1-28-93
P.O. # 45788
JOB # 2472

9044 (3 C B A)

ÄLLOSUND

Stor Åkersvik

INSPECTION CERTIFICATE
(DIN 50049-3.1B)

(D10) 0701-410-108

DATE : 1992-04-22 51670 -50117
NO : 24976-002 PAGE : 1/ 2

PURCHASER ORDER NO:
420.424 (PART 1)

ORDER DATE: 1992-02-17
OUR ORDER NO: 35321-90-357

PRODUCT:
PRESSURE VESSEL STEEL PLATE

CONSIGNEE:
KLÖCKNER & CO
STAHL INTERNATIONAL
POSTFACH 10 09 51
W-4100 DUISBURG 1
FORBRUKSEP (TYSKLAND)

PURCHASER:
KLÖCKNER & CO
STAHL INTERNATIONAL

B578

STANDARD/RULES STEEL GRADE:
ASME-ASTM SA /A 51670 VTLTV

MARKING (STAMPING):
STEEL GRADE
TRADE MARK HEAT NO. PLATE NO.

1 1/8 x 120 x 430

MILL SHEET

ITEM	WORKS-NO.	DIMENSIONS T	W	L	NO.	WEIGHT MARKS (KG)	DELIV. COND.	STEEL PROC.	HEAT NO.	PLATE NO.	NOTES
0003	15562-003	1/2x96x490			2	5928	NORM	BOF	625041	61-2	
0003	15562-003	1/2x96x490			2	5928	NORM	BOF	625401	11-0	
0004	15562-004	1/2x120x480			1	3705	NORM	BOF	625411	02-0	
0005	15562-005	5/8x96x490			1	3705	NORM	BOF	625401	04-0	
0006	15562-006	5/8x120x480			1	4631	NORM	BOF	625051	61-5	
0008	15562-008	3/4x120x480			1	5559	NORM	BOF	624581	61-5	
0010	15562-010	1 x120x480			1	7410	NORM	BOF	623621	01-1	
0011	15553-001	1 1/8x120x480			10	45201	NORM	BOF	626201	01-0	

THE MATERIAL HAS BEEN NORMALIZED AT 900+-15 DEG.E ES C/2 MIN PER MM/COOLED IN STILL AIR.
ALL REQUIREMENTS IN ACCORDANCE TO THE ORDER AND ASME SA20 ARE FULFILLED.
THE DIMENSION AND SURFACE INSPECTION IS CARRIED OUT WITHOUT OBJECTIONS.
INSPECTION MILL TEST CERTIFICATE.

IT IS HEREBY CERTIFIED THAT THE ABOVE DESCRIBED MATERIAL IS TESTED WITH SATISFACTORY RESULTS IN ACCORDANCE WITH THE REQUIREMENTS OF THE ORDER.

QUALITY INSPECTION
JOSEFSSON/LAGERKRANZ
SUNDELL / IVARSSON

RECEIVED
DATE 8-28-92
P.O. # W55253
JOB # 5195

Address
Telephone Nat
Telex
Telefax Nat
Bank
Bankgiro
Postgiro
Org.nr
STOCKHOLM
STOCKHOLM
SWIFT-address
TRADE

SALLOSUND

INSPECTION CERTIFICATE
(DIN 50049-3.1B)

DATE : 1992-04-22 5167C -50117
NO : 34976-002 PAGE : 2(2

CHEMICAL COMPOSITION

OBTAINED LADLE ANALYSIS (%):

HEAT NO.	C	SI	MN	P	S	CR	NI	MO	V	TI	CU	AL	NB	B	N
23621	.20	.30	1.10	.011	.002	.01	.02	.002	.005		.01	.051	.020		
24581	.20	.28	1.09	.011	.003	.02	.02	.002	.016		.02	.040	.018		
25041	.21	.30	1.09	.009	.007	.02	.03	.002	.005		.02	.043	.019		
25051	.20	.32	1.11	.009	.002	.02	.02	.002	.010		.01	.033	.021		
25401	.20	.31	1.11	.012	.002	.03	.03	.003	.010		.02	.033	.017		
25411	.20	.30	1.09	.010	.002	.02	.03	.003	.007		.01	.048	.018		
28201	.20	.27	1.10	.018	.007	.03	.01	.015	.010		.01	.033	.017		

MECHANICAL TESTING

TENSILE TEST

TEST RESULTS:

HEAT	PLATE	MILL CODE	THICKNESS (MM)	TREATMENT:	SPECIMEN POS.	TYPE	REH (KSI)	RM (KSI)	ELONG. A5	ELONG. (%)
23621	01-1	405382	25.4		4	1	56	78	A200	28
24581	61-5	403236	19.1		4	1	57	79	A200	26
25041	61-2	377946	12.7		4	1	58	80	A200	25
25051	61-5	378116	15.9		4	1	58	80	A200	26
25401	11-0	378512	12.7		4	1	55	80	A200	24
25401	04-0	378611	15.9		4	1	59	79	A200	27
25411	02-0	378765	12.7		4	1	57	79	A200	23
28201	01-0	421197	28.6		4	1	54	78	A200	29

IMPACT TEST

TREATMENT:	SPECIMEN POS.	TYPE	TEMP DEG.F	N.TOUGHN. IND.	VALUES			AVG
	3	A	-51	43	30	27	33	
	3	A	-51	64	63	60	63	
	3	A	-51	78	85	77	80	
	3	A	-51	51	74	78	72	
	3	A	-51	66	60	83	70	
	3	A	-51	64	55	66	62	
	3	A	-51	104	71	54	76	
	3	A	-40	53	74	60	65	

RECEIVED
DATE 8-28-92
P.O.# W55953
JOB# 5195

TREATMENT : D=DELIVERY CONDITION
SPECIMEN POSITION: 3=TOP LONG., 4=TOP TRANSV.
SPECIMEN TYPE : A: CHARPY-V (DIN), 1: RECTANGULAR

Address
SSAB Oxelösund AB
Box 1000
S-613 81 Oxelösund
Sweden

Telephone
Nat 0155-540 00
Int +46 155 540 00

Telex
60050
S

Telefax
Nat 0155-540 73
Int +46 155 540 73

Bank
Skandinaviska Enskilda Banken
STOCKHOLM

Bankgiro
807-4405

Postgiro
37 76 44-7

Organ
04-556313 7031

Please effect payment through
Skandinaviska Enskilda Banken
STOCKHOLM
SWIFT-address ESSESESS

F 307 - A
Rev 1

Customer

REPUBLIC OF SOUTH AFRICA

Reg. No. 1970/216406

TEST AND ANALYSIS CERTIFICATE

SABS 0157 Listing no. LS 0208

Description of material: STEEL PLATES TO SPECIFICATION

Specification: ASTM A36/A36M STRUCTURAL PLATE GR A 1978

Edition: 1992

Material supplied: AS ROLLED

Test pieces taken: AS ROLLED

Order no.: MPX 3178/042

Cert Number: 11

Gross Mass: 5700 kg 11463 Lbs

Invoice Mass: 4440 kg 9788 Lbs

Exp Permit no.: 6(KEP)

Transport: RAIL

Type: 1

Dimensions: 12192 X 2438 X 10M_76
480" X 96" X 3/16"

Charge No / Lift card	Serial / Ply	Impact tests: Test Piece Dimensions (mm) W	T	Test Piece Position	Test Temp °C	Results Energies (Lbs) 1	2	3	Avg	Test Lat mm
K3H1817										
YPC0933										

Tensile tests: Test Piece Position	YS (MPa) (T.S1)	TS (MPa) (T.S1)	Yield/ Tensile Ratio	EL 200 mm %	RA %	Hardness Test
TA	366 030	483 0070	031 071	27	60	

Heat Treat °C (MPa) °F (T.S1)	Aust-enite	C MID %	MN ALT %	P %	S %	SI %	CU %	NI %	CR %	CEU
L		0 1800 0 0110	1 1400 0 0490	0 0100	0 0190	0 2700	0 0300	0 0100	0 0190	

Chemical analysis

Customer's requirements

Additional test results

All other requirements in accordance with the supplier's official order acceptance

Thickness test

Inspection

DESTINATION: RSA

Cast no. print shown: ARGON STIRRED CONCASTHARD

Test piece position: TX - TOP TRANSVERSE

Analysis: L - LADLE ANALYSIS

Date: 1993-08-03

For the Material Product Technology

RECEIVED
DATE 15-7-93
PO # W5104141
JOB # 93DK-5212

F 103 - A
Rev 1

Customer

ISCOR (LTD), VANDERBIJLPARK
REPUBLIC OF SOUTH AFRICA
Reg. No 01/07164/06

TEST AND ANALYSIS CERTIFICATE
SABS 0157 Listing no. LS 0208

Consignment of material: STEEL PLATES TO SPECIFICATION

Specification: ASTM A36/ABS SHIP PLATE GR A

Material supplied: AS ROLLED

Test piece as tested: AS ROLLED

Order no: MPA 20710642

Cust Number: A

Gross Mass: 26990 kg 59502 Lbs

Invoice Mass: 24430 kg 53856 Lbs

Exp Permit no: 6XXX

Transport: RAIL

Pgs: 1

Dimensions: 12192 X 2438 X (22)16 480" X 96" X M16"

Cast no / Lot no	Sheet / Qty	Impact tests: Test Piece Dimensions mm W / Thk	Test Piece Position	Temp °C	Results Dimensions Mils 1	2	3	Average	Lat Exp mm one	Tensile tests: Test Piece Position	YS (MPa) (KSI)	TS (MPa) (KSI)	Yield / Tensile Ratio	El 200 mm %	RA %	Hardness Test	Bend Test °C (MPa) °F (KSI)	Analysis	C %	Mn % ALT	P %	S %	Si %	Cu %	Ni %	Cr %	Mo %
1204696 VPC88905										TA	345 050	473 (068)	073 072	23	(3)			L	0.1400 0.0110	1.0400 0.0430	0.0210	0.0140	0.2310	0.0240	0.0100	0.0150	
1204697 VPC88904										TA	345 050	473 (068)	073 072	24	(3)			L	0.1400 0.0110	1.0400 0.0430	0.0110	0.0160	0.2310	0.0240	0.0100	0	
1204694 VPC88906										TA	345 050	473 (068)	073 072	23	(3)			L	0.1400 0.0110	1.0400 0.0430	0.0110	0.0160	0.2310	0.0240	0.0100	0.0150	

RECEIVED
DATE 10-27-92
P.O. # 456441
JOB # 5206 - 5212

Customer's representative

Additional test results

All testing requirements in accordance with the supplier's latest acceptance

Lifting mark:

Inspection

DESTINATION: MSA

Date: 1992-03-27

For The Manager Control Technology

Cast no. prefix denotes: LADLE FURNACE CONCAST(ARC)

Test piece position: TX - TOP TRANSVERSE

Analysis: L - LADLE ANALYSIS

OREGON STEEL MILLS

P.O. Box 2760, Portland, Oregon 97208 · (503) 286-9651 TWX 910 464 1549

REPORT OF CHEMICAL/PHYSICAL

CERTIFICATE NO	DATE
152051	DEC 30, 1991
MILL ORDER NO.	DATE
PM-15735-02	11/08/91
CUSTOMER ORDER NO.	
9701-410-033	
JOB/REQ NO.	
SHIPPING NO	DATE
F152051	12/30/9
CARRIER	
UP	
CAR/TRUCK NO.	
UP259591	

SOLD TO:
54252
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

SHIP TO:
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSH CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

PHYSICAL PROPERTIES

DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG	% RA	HARDNESS BHN	REACT TEST	IMPACTS
** CONTINUED FROM PREVIOUS PAGE ** 5/16 X 96 X 480	VC0023	A49	570	795	22				
	VC0023	A70	575	790	22				
	VC0023	B66	560	790	26				
	VC0023	B67	550	785	23				
	VC0023	B68	555	790	25				
	VC0023	B71	555	790	25				
	VC0023	B73	575	810	24				
	VC0023	B74	575	800	22				
	VC0044	A22	555	785	24				
	VC0046	A32	575	810	22				
	VC0046	A33	590	820	22				
	VC0046	A34	590	820	23				

RECEIVED
DATE 1-18-93
P.O. # W56849
JOB # 2472

CHEMICAL ANALYSIS

HEAT NO.	%C	%Mn	%P	%S	%Si	%Cu	%Ni	%Cr	%Mo	%Al	%Sn	%Nb	%V	%N	%Ti	%B	%Ca	CE
VC0044	.19	1.07	.024	.009	.21	.01	.02	<.02	<.002	.033	.02	.01						
VC0046	.21	1.04	.025	.008	.20	.01	.02	<.02	<.002	.046	.02	.01						

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

Angie McCleland
TEST REPORT CLERK

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF OREGON STEEL MILLS, INC.

OREGON STEEL MILLS

PO Box 2760 Portland Oregon 97208 (503) 286-9551 TWX 910 464 1549

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO	DATE	PAGE
230115F	Oct 07, 1992	1

MILL ORDER NO.	DATE
21682	

CUSTOMER ORDER NO.
0701-410-171

JOB/REL NO

SHIPPING NO	DATE
230115	10/07/1992

CARRIER
SOUTHERN PACIFIC

CAR/TRUCK NO.
SSW87725

SOLD TO
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL QUALITY ASTM A516-88 GRADE 70 ASME SA516 GRADE 70.

5/16 X 96 X 480

PHYSICAL PROPERTIES

ITEM NO	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG	% RA	HARDNESS BHN	END TEST	IMPACTS
2	0.2500 X 120.000 X 480.000									
	1 PC 4084 LBS	VC0008	A62	585	780	23				
	1 PC 4994 LBS	VC0015	B62	595	805	22				
3	0.3125 X 96.000 X 480.000 √									
	1 PC 4094 LBS	VC0026	B25	660	800	19				
	3 PCS 12252 LBS TOTALS									

RECEIVED
DATE 1-18-93
PO # W56849
JOB # 2477-

Certified a true copy of the original retained in our files.
AMERICAN ALLOY STEEL INC

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Cb	Al	Cr	Mo	Ti	B	N	Ca		CE	
VC0008	.21	1.15	.023	.008	.20	.01	.01	<.01	<.002	.039	.02	.01							
VC0015	.21	1.07	.021	.008	.20	.01	.01	<.01	<.002	.039	.02	.01							
VC0026	.20	1.01	.018	.009	.21	.01	.02	<.01	<.002	.039	.01	.01							

******* END OF REPORT *******

TEST REPORT APPROVED DATE 10-7-92
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

I certify the above results to be correct as contained in the records of OREGON STEEL MILLS By Angie McCaslend TEST REPORT CLERK

OREGON STEEL MILLS

PO Box 2160 Portland Oregon 97208 · (503) 286-9651 TWX 910 464 1549

54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

REPORT OF CHEMICAL/PHYSICAL TE

CERTIFICATE NO.	DATE	PA
152051	DEC 30, 1991	
MILL ORDER NO.	DATE	
FM-15735-02.	11/08/91	
CUSTOMER ORDER NO.		
0701-410-033		
JOB/REQ. NO.		
SHIPPING NO.	DATE	
P152051	12/20/91	
CARRIER		
UP		
CAR/TRUCK NO.		
UP259591		

IS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

1/4 X 96 X 480

ITEM	DESCRIPTION	PHYSICAL PROPERTIES HEAT NO.	SLAB	YIELD PSI (.2%)	TENSILE PSI	% ELONG		HARDNESS	ROLD TEST	IMPACTS
1	1/4 X 96 X 480	VC0023	B47	615	800	22				
		VC0023	B49	575	750	23				
		VC0023	B51	605	815	25				
		VC0023	B52	595	795	27				
		VC0023	B53	600	815	23				
		VC0023	B55	585	785	22				
		VC0023	B56	590	790	24				
		VC0023	B57	590	800	26				
		VC0023	B58	600	805	26				
		VC0023	B60	600	810	23				
		VC0023	B61	600	820	22				
		VC0024	A49	600	810	25				
		VC0024	A54	610	810	23				

RECEIVED
DATE 1-18-93
P.O # W56849
JOB # 2472

CHEMICAL ANALYSIS

HEAT NO.	%C	%Mn	%P	%S	%Si	%Cu	%Ni	%V	%Cb	%Al	%Cb	%Mo	%Ti	%B	%N	%Ca	%Sn	%Ce	%O
VC0023	.20	1.10	.024	.009	.20	.01	.01	<02	<002	.036	.01	.01							
VC0024	.20	1.08	.014	.005	.27	.02	.02	<02	<002	.042	.02	.02							

TEST REPORT APPROVED DATE 1-17-93
AMERICAN ALLOY STEEL CO
QUALITY ASSURANCE DEPT.
TEST REPORT CLERK

THIS MATERIAL IS TO BE STORED IN CONFORMANCE WITH THE RECORDS OF OREGON STEEL MILLS BY Angie McCleland

OREGON STEEL MILLS

PO Box 2750 Portland Oregon 97208 (503) 286-9651 TWX 910 464 1549

SHIPPED TO:
54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

SOLD TO:
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

REPORT OF CHEMICAL/PHYSICAL

CERTIFICATE NO.	DATE
152051	DEC 30,1991
MILL ORDER NO.	DATE
PM-15735-02	11/08/9
CUSTOMER ORDER NO.	
0701-410-033	
JOB/REL NO.	
SHIPPING NO	DATE
P152051	12/30/9
CARRIER	
UP	
CAR/TRUCK NO.	
UP259591	

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARSON PRESSURE VESSEL PLATE
ASTM A516-66 GRADE 70
ASME SA516 GRADE 70

5/16 x 96 x 480

WEIGHT	DESCRIPTION	HEAT NO	SLAB	PHYSICAL PROPERTIES YIELD PSI x 100	TENSILE PSI x 100	% ELONG	% RA	HARDNESS	IMPACTS TEMP	IMPACTS TEST
	** CONTINUED FROM PREVIOUS PAGE ** 5/1 X 96 X 480									
		VC0024	B74	575	785	22				
		VC0024	B75	580	790	22				
		VC0024	B76	590	795	25				
		VC0024	B77	595	800	22				
12	5/16 X 96 X 480 ✓									
		VC0022	B46	595	825	21				
		VC0022	B47	585	810	26				
		VC0022	B48	585	810	25				
		VC0022	B49	595	815	21				
		VC0023	A67	580	800	24				
		VC0023	A68	560	780	22				

RECEIVED
DATE 1-8-93
PO # W56899
JOB # 2472

Certified a true copy of data published in the AMERICAN ALLOY STEEL

HEAT NO.	%C	%Mn	%P	%S	%Si	%Cu	%Ni	%V	%B	%Al	%Cb	%Mo	%Ti	%N	%Sn	%Ca	%Cr	%Ce	%Co
VC0022	.22	1.04	.022	.010	.19	.01	.01	<.02	<.002	.048	.01	.01							

CHEMICAL ANALYSIS

TEST REPORT APPROVED DATE 1-05-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

I certify the above results to be the act and statement of the records of OREGON STEEL MILLS

By Angie McCleland
CLERK

OREGON STEEL MILLS

PO Box 2760, Portland, Oregon 97208 · (503) 286-9651 TWX 910 464 1549

REPORT OF CHEMICAL/PHYSICAL TE

CERTIFICATE NO	DATE	PA
152051	DEC 30, 1991	4

MILL ORDER NO.	DATE
PH-15735-02	11/08/91

CUSTOMER ORDER NO.
0701-410-033

JOBBER NO

SHIPPING NO	DATE
F152051	12/30/91

CARRIER
UP

CAR/TRUCK NO
UP259591

SOLD TO:
54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

SHIPPED TO:
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL PLATE
ASTM A516-96 GRADE 70
ASME SA516 GRADE 70

B891

DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG	% RA	HARDNESS BHN	HEAT TEST	IMPACTS
** CONTINUED FROM PREVIOUS PAGE **									
5/16 X 96 X 480									
	VC0023	A69	570	795	23				
	VC0023	A70	575	790	22				
	VC0023	B66	560	790	26				
	VC0023	B67	550	785	23				
	VC0023	B68	555	790	25				
	VC0023	B71	555	790	25				
	VC0023	B73	575	810	24				
	VC0023	B74	575	800	22				
	VC0044	A22	555	785	24				
	VC0046	A32	575	810	22				
	VC0046	A33	590	820	22				
	VC0046	A34	590	820	23				

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Sn	Al	Cb	V	Ti	B	N2	Ca	CE	Lbs/Ton
VC0044	.19	1.07	.024	.009	.21	.01	.02	<02	<002	.033	.02	.01							
VC0046	.21	1.06	.025	.008	.20	.01	.02	<02	<002	.046	.02	.01							

RECEIVED
DATE 1-8-93
P.O. # W56849
JOB # 2472

Certified a true copy of th original, retained in our fil AMERICAN ALLOY STEEL.

TEST REPORT APPROVED DATE 1-15-92
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

TESTING AND REPORTS TO BE MADE AS CONTAINED IN THE RECORDS OF OREGON STEEL MILLS

By Angie McCasland TEST REPORT CLERK

OREGON STEEL MILLS

PO Box 2760 Portland Oregon 97208 (503) 286-9651 TWX 910 464 1549

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

B892

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO.	DATE	PAGE
221602F	Jul 20, 1992	1

MILL ORDER NO.	DATE
21682	

CUSTOMER ORDER NO.: 0701-410-121

JOB/REQ. NO.:

SHIPPING NO.	DATE
221602	07/20/1992

CARRIER: SOUTHERN PACIFIC

CAR/TRUCK NO.: SP565576

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

SM CARBON PRESSURE VESSEL QUALITY ASTM A516-86 GRADE 70 ASME SA516 GRADE 70

5/16 X 96 X 480

PHYSICAL PROPERTIES

DESCRIPTION	HEAT NO.	SLAB #	YIELD PSI X 100	TENSILE PSI X 100	% ELONG IN 2"	BEND TEST	HARDNESS BHN	IMPACTS
0.3125 X 96.000 X 480.000								
1 PC 1084 LBS	VC0026	A66	500	745	21			
1 PC 4036 LBS	VC0026	B24	525	765	21			
0.3750 X 96.000 X 480.000								
1 PC 4901 LBS								
1 PC 4901 LBS	[illegible]	A9	540	815	20			
1 PC 4901 LBS	VC0003	A27	530	755	27			
1 PC 4901 LBS	VC0028	B40	530	765	22			
1 PC 4901 LBS	VC0028	B41	530	750	23			
1 PC 4901 LBS	VC0028	B42	525	755	24			
1 PC 4901 LBS	VC0029	B43	520	750	25			
1 PC 4901 LBS	VC0028	B44	530	750	27			
	VC0034	B33	545	780	24			
10 PCS 47376 LBS TOTALS								

RECEIVED

DATE 1-18-93

P.O. # 176-849

JOB # 2472

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Cb	V	N	Al	Ca	Sn	Sb
0026	.20	1.01	.018	.005	.21	.01	.02	.01	.002	.039	.01	.01				
0008	.21	1.15	.023	.008	.20	.01	.01	.01	.002	.039	.02	.01				
0028	.20	1.04	.027	.010	.21	.01	.02	.01	.002	.040	.01	.01				
0034	.21	1.03	.025	.008	.20	.01	.01	.01	.002	.047	.01	.01				

****** END OF REPORT ******

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

Angie McCleland TEST REPORT CLERK

GENEVA STEEL
JOB CONTROL

Mill Test Report

B870

GENEVA STEEL
P.O. BOX 2500
PROVO, UTAH 84603

HANNESHANN PIPESTEEL CORP
1990 POST OAK BLVD
HOUSTON TX 77056-3311

63012

P.O. DATE	PURCHASE ORDER NO.		
	60-6312/MH114312		
SHIPPERS NO.		MILL ORDER NO.	INVOICE NO.
GP56452A 06-21-93		EA43590	GP56452A
VEHICLE NUMBER	SSU87950		

SHIP TO
DELTA STEEL
7355 ROUNDHOUSE LANE
SPRR SPTN 2432
HOUSTON, TX

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

Larry D. Clinger
MANAGER - QUALITY ASSURANCE
DATE 06-21-93

PLATE ASTM A516-86 GRADE 70 AND ASME SA516-1987 EDITION
1990 ADDENDA GRADE 70 SECTION II PRESSURE VESSEL QUALITY NORMALIZED
CHARPY V-NOTCH LONGITUDINAL IMPACT TESTS EACH PLATE AS HEAT TREATED
15FT/LBS MIN AVERAGE 12FT/LBS MIN AT MINUS 50 DEG. F.FREQUENCY P.
01 MILL CERTIFIED T/R

MILL TEST REPORTS FURNISHED T
DELTA STEEL, INC.
JOB # 2472
CUSTOMER P.O. W57485
DELTA NUMBER WC 106707
HEAT NUMBER 1C1109/08 01
GRADE SA516-70

RECEIVED
DATE 1-21-93
P.O. # W57485
JOB # 2472

ITEM NO.	MATERIAL DESCRIPTION: THICKNESS OR SECTION	WIDTH DIA OR FT WT	LENGTH	QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	YIELD PT *KSI	TENSILE STR KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED OF AREA	REMD
	.2500"	96.0000"	480.0000"	1	32678	1C1109	03-04	58.3	81.4	23.0			
2	SIZE LONG CHARPY V-NOTCH IMPACT TESTS 05X10 MM TESTED AT -50 DEG F 32 FOOT LBS AVERAGE IMPACT STRENGTH 34 FT LBS ACTUAL GAGE TESTED .2500												
	.2500"	96.0000"	480.0000"	1	32678	1C1109	08-05	55.0	79.6	24.0			
2	SIZE LONG CHARPY V-NOTCH IMPACT TESTS 05X10 MM TESTED AT -50 DEG F 32 FOOT LBS AVERAGE IMPACT STRENGTH 32 FT LBS ACTUAL GAGE TESTED .2500												
	.2500"	96.0000"	480.0000"	2	65344	1C1159	08-03	61.5	83.0	24.0			
2	SIZE LONG CHARPY V-NOTCH IMPACT TESTS 05X10 MM TESTED AT -50 DEG F 30 FOOT LBS AVERAGE IMPACT STRENGTH 30 FT LBS ACTUAL GAGE TESTED .3750												
	.3750"	96.0000"	480.0000"	2	98024	2C5813	04-03	56.5	81.9	23.0			
4	SIZE LONG CHARPY V-NOTCH IMPACT TESTS 7.5X10MM TESTED AT -50 DEG F 51 FOOT LBS AVERAGE IMPACT STRENGTH 49 FT LBS ACTUAL GAGE TESTED .3750												

HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
1C1109	HEAT	23	1.20	.006	.020	.19	.02	.03	.03	.009		.045		.004			.004	
1C1159	HEAT	24	1.17	.008	.026	.20	.02	.03	.02	.004		.021		.018			.004	
2C5813	HEAT	24	1.18	.009	.013	.22	.03	.03	.02	.004		.056		.004			.004	

GENEVA STEEL COMPANY CERTIFIES ALL MELTING, MELTING AND MANUFACTURING PROCESSES OCCURRED IN THE USA.

END OF DATA****

FINE GRAIN
FINE GRAIN
FINE GRAIN

07 DECIMAL POSITIONS FOR CHEMISTRY

BETHLEHEM STEEL CORPORATION
QUALITY ASSURANCE DEPARTMENT
REPORT OF TESTS AND ANALYSES

JOHNS HARBOR PLANT

003-11981

DATE SHIPPED: 7-14-92

CAR OR VEHICLE NO: CSS-CHGO-MP

PHONE 00CA55

PAGE

SOLD TO: DELTA STEEL INC
PO BOX 2280
HOUSTON TX 77252

206810

SHIP TO: DELTA STEEL INC
SPOT 0275400
9217 S FREEWAY
FORT WORTH TX 76140

B867

SERIAL NUMBER	PAT NO	HEAT NUMBER	NO PCS	SIZE AND QUANTITY THICKNESS INCHES	WIDTH OR DIA INCHES	LENGTH INCHES	WEIGHT POUNDS	YIELD POINT PSI	TENSILE STRENGTH PSI	ELO IN
QUALITY STEEL MELTED & MANUFACTURED IN THE U. S. A.										
PLATES - ASTM A516-86 GR 70 PVQ										
MFST - LIFT MAX 10 TON-SIZES SEP UNLDG OH-PLATE HOOK										
CO# DF115808 GH 024-4541										
YIELD STRENGTH @ .5% E.U.L.										
42319		803X73660	2	1/4	96	480	6534	61300	81900	8
42320		803X73660	2	1/4	96	480	6534	56700	80700	8
42321		803X73660	2	1/4	96	480	6534	56900	80200	8
42322		803X73660	1	1/4	96	480	3267	45200	77700	8

RECEIVED
DATE 1-19-93
P.O. # W56727-A-C
JOB # 2-472

Q—QUENCH TEMPERATURE

N—NORMALIZE TEMPERATURE

SERIAL NUMBER	PAT NO	HEAT NUMBER	HARD	BEND	THICKNESS INCHES	TYPE	SIZE	ORI.	TEST TEMP F	CHARPY IMPACT ENERGY FT. LBS. 1	2	3	SHEAR (%) 1	2	3	LAT. EXP 1	2	MIL
803X73660																		

HEAT NUMBER	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Ti	Al	B	Cb	N	MICRO GRAIN SIZE
803X73660	.23	1.00	.017	.014	.21	1.015	.02	.04	.006	.004		.036		.042		

CHEMICAL ANALYSIS

AT THE ABOVE RESULTS ARE A TRUE AND CORRECT COPY
PREPARED AND MAINTAINED BY BETHLEHEM IN COMPLI
HE REQUIREMENTS OF THE SPECIFICATION CITED ABOVE

SUPT QUALITY ASSURANCE R. J. Hart Title

SUBSCRIBED AND SWORN TO BEFORE ME
THIS 15 DAY OF JULY 19 92

NOTARY PUBLIC
PORTER COUNTY INDIANA
MY COMMISSION EXPIRES JULY 31, 1992

12-22-92 11:37 T-GULF STATE STEEL1514 P:72 P05

Gulf States Steel, Inc.

GADSDEN, AL 35904-1935

3459-01

07/21/92 | 20A 9855

CERTIFICATE OF TESTS

CUSTOMER IDENTIFICATION

DIST. C | SHIP ORDER NUMBER 26182 | ITEM NO. 748

ITEM A | MAT'L 42 | OFFICE DIST EC | INVOICE DATE | INVOICE NUMBER 742-16180

LE | ACCOUNT NUMBER 65240202 | TERMS 30-3/4-10

SOLD TO:
RYERSON CENTRAL, JOSEPH T.
MERCHANDISING SERVICES
P O BOX 8000
CHICAGO IL 60680

SHIP TO:
RYERSON CENTRAL, JOSEPH T.
1211 KRESS STREET
HOUSTON TX 77020

DATE SHIPPED 09 29 92 | FROM ALA CITY | ROUTE/VEHICLE IDENTIFICATION 88W87850 | SHEET NO.

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS.

LEONARD A. TROMAN
DIR. QUALITY ASSURANCE AND METALLURGY

ITEM NO.	MATERIAL DESCRIPTION	AVG	QUANTITY SHIPPED
	PLATE CARBON J T RYERSON SPEC 3449-P DTD 04/25/91 ASTM A-516-90 GRD 70 ASME-SA 516 GRD 70 1989 EDITION 1991 ADDENDA PVQ BLUE & PINK DOMESTIC STEEL ONLY CUST ID: 343786		
01	.2500 X 96.0000 SHEARED EDGE X 480.0000 IN	A	19602
	HT 7417643 T 8853 1PCS HT 7417643 T 8855 1PCS HT 7417643 T 8856 1PCS HT 7417643 T 8857 1PCS HT 7417643 T 8858 1PCS HT 7417643 T 8859 1PCS		
H	C 27MX MN 85/1.20 P 035MX S 035MX SI 15/40 AL 020MIN CU 40MX NI 40MX CR 30MX MO 12MX CB 02MX V 03MX		
R	YLD 38000 MIN TEN 70/90000 X ELONG MIN 2 IN 21 OR 8 IN 17		
1	S TR WITHIN 24 HRS OF SHIPMENT TO SA 1 TR PO BOX 2606		

RECEIVED
DATE 1-18-93
P.O. # 056797-B
JOB # 2472

HEAT NO.	CHEM	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL
7417643		.18	1.09	.012	.013	.220	0.06	0.08	0.15	.04	.000	.000	.034

HEAT NUMBER	TENSILE PLATE IDENTIFICATION NO.	YIELD KSI	TENSILE STRENGTH KSI	ELONG 2"	ELONG 8"	GALV. COATING	BEND TEST	HARD.	CHARPY IMPACT V-NOTCH FT. LBS. AT TEST NO.	SPEC. SIZE	1	2	3	AVG.
7643	8853	60	75		25									
"	8855	61	76		24									
"	8856	57	75		26									
"	8857	58	76		21									
"	8858	61	76		24									
"	8859	59	76		26									

Gulf States Steel, Inc.

GADSDEN, AL 35904-1835

32-D702-01

CONTROL CARD | REQ. JOB CONTRACT NO

PURCHASE ORDER DATE: 11/13/92 | PURCHASE ORDER NO: 5635 | RELEASE

CERTIFICATE OF TESTS

CUSTOMER IDENTIFICATION

GSS ORDER NO. DIST: 6 | NUMBER: 27574 | SPLIT: 742 | ITEM NO:

DATE SHIPPED | OFFICE | INVOICE DATE | INVOICE NUMBER: 742-22602

LC | ACCOUNT NUMBER: 38080003 | TERMS: 30-3/4-10

SOLD TO:
INTSEL SOUTHWEST
DIV PECHINEY WORLD TRADE
PO BOX 41041
HOUSTON TX 77240104

SHIP TO:
INTSEL SOUTHWEST
DIV PECHINEY WRLD TRD USA
SPIN NBR 4038
MELENDY TX

DATE SHIPPED: 12 14 92 | FROM: ALA CITY | ROUTE/VEHICLE IDENTIFICATION: SOU 115796 | SHEET NO.

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS.

C. F. BEARDEN, JR.
MGR, TECHNOLOGY AND QUALITY - PLATE PROD.

ITEM NO.	MATERIAL DESCRIPTION	P/C	QUANTITY SHIPPED
	PLATE CARBON ASME SA-516 DTD 07/01/89 GRD-70 ASTM A-516-86 GRD 70 PVQ P243000A		
11	.2500 X 96.0000 SHEARED EDGE X 480.0000 IN P243000A	A	39204
	HT 7425367 T 8273 1PCS		
	HT 7425367 T 8274 1PCS		
	HT 7425367 T 8275 1PCS		
	HT 7425367 T 8276 1PCS		
	HT 7425367 T 8277 1PCS		
	HT 7425367 T 8278 1PCS		
	HT 7425367 T 8279 1PCS		
	HT 7425367 T 8280 1PCS		
	HT 7425367 T 8281 1PCS		
	HT 7425367 T 8282 1PCS		
	HT 7425367 T 8283 1PCS		
	HT 7425367 T 8284 1PCS		

H C 27MX MN 85/1.20 P 035MX S 040MX SI 15/40 AL 020MIN CU 40MX NI 40MX

RECEIVED

DATE 1-15-93

P.O. # W56815

JOB # 2472

HEAT NO	GRAIN	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROM	MOLY	COLUMBIUM	VANADIUM	AL
7425367		.21	1.05	.006	.016	.220	0.02	0.01	0.03	.01	.000	004	.03

HEAT NUMBER	TLSTOR PIECE IDENTITY NO	YIELD KSI	TENSILE STRGTH KSI	ELONG 2"	ELONG 8"	GALV COATING	BEND TEST	HARD.	CHARPY IMPACT V NOTCH FT. LBS. AT TEST NO	SPEC SIZE	1	2	3	AVG.	°F
7425367	8273	58	78		23										
"	8274	58	77		25										
"	8275	59	78		22										
"	8276	58	77		24										
"	8277	58	77		23										
"	8278	58	78		22										
"	8279	57	77		25										
"	8280	58	77												

WATT FIELD SERVICE COMPANY

WELDING PROCEDURE LIST

P.O. 3472

Customer: Exxon Petrochemical
Items T-3455 & T-3455

WPS #	Rev.	Comments	List Rev.
PW-1.8	0		0
PW-1.8(34-1)	0	Nozzle piping	

WPS ON 3472
-Yoncel: Petrochemical
Items T-3455 & T-3455

WYATT FIELD SERVICE CO.

WELDING PROCEDURE SPECIFICATION

WPS #: HW-1.S(34)-;
Supporting PQR #: HW-1.S(3)-- (69-5) & HW-1.S-1 (73-54)
Revision #: 0
Welding Processes: SMAW (Manual)

Base Metals:
P #: 1 to P #: 1
Thickness Range: 3/16 to 1-1/2"
Bevel:
5/16" & under: square or single vee.
Over 5/16": single or double vee.

Filler Metals:
SFA #: 5.1
Type: E6010 &/or E7018
A #: 1
F #: 3
F #: 4
Dia. 3/32 Amps 40-110
1/8 Amps 85-150
5/32 Amps 150-200
3/16 Amps 210-280

Consumable Insert: none

Preheat: 50 F min.
Interpass: 50-500 F
Maintenance: During Welding

Position & Progression :Any

Postweld Heat Treatment: none

Electrical Characteristics:
Current: Direct Polarity: reverse

Technique:
String or Weave Bead Single Electrode Peening: none

Notes:
1)Backing: Double welded or single welded with or without B.U.S.(as specified on drawings)
2)Root Gap: 1/8" Nom. for butt welds. 1/4" min. for B.U.S.
3)Max. pass thickness: 3/8"
4)Any or all of the electrode types or sizes listed may be used. E6010 must be used for the root pass of single welded joints.
5)Initial and interpass cleaning: Brushing and/or grinding.
6)Back Gouging: C-Arc Air and/or grinding. none required for fillets or single welded joints.
7)Non-metallic or non-fusing retainers: none

Approved: Andy Seale Date: 3/26/93

\3472\1S(34)

WELDING PROCEDURE QUALIFICATION RECORD

PQR#: HW-1.S(3)-H (89-5)
Process: SMAW

WPS#: HW-1.S(3)-H
Type: Manual

VARIABLES:

Base Material:
P#: 1
Thickness: 3/4" SA 285-C
Max. Pass Thickness: <1/2"

Filler Metal:
F#: 3 A#: 1 SFA: 5.1 Class: E6010
Size: 7/32"

Electrical:
Polarity: Rev. Electrodes: Single.
Amps: 240

Position: 3G, Horizontal
Preheat: 50 F Interpass: 500 F Max. PWHT: None

Test Results

Bend Tests:
Number: 4 Type: Side (QW-462.2) Results: Good

Tensile Tests:
Ultimate Stress: 64,200 psi Break Location: Plate
" " 63,000 psi " " Plate

Welders Name: F. Johnson
Test Conducted By: J. Skolaski

Emp.# 397
Date: 1-23-69

We certify that the statements made in this report are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By.: [signature] Date: 9-13-88

Editorial Rev. 8-13-86

1S(3)

WELDING PROCEDURE QUALIFICATION RECORD

PQR#: HW-1.S-I (73-64)
Process: SMAW

WPS#: HW-1.S-I
Type: Manual

VARIABLES:

Base Material:
P#: 1 SA 333-1
Thickness: 0.75 (5" XXH Pipe)
Max. Pass Thickness: <1/2"

Filler Metal:
F#: 4 A#: 1 SFA: 5.1 Class: E7018
Size: 1/8"

Electrical:
Polarity: Rev. Electrodes: Single
Electrode Size: 1/8" Amps: 120

Position: 6G, Inclined Fixed
Preheat: 50 F Interpass: 500 F Max. PWHT: none

Test Results:

Bend Tests:
Number: 4 Type: Side (QW-462.2) Results: Good

Tensile Tests:
Ultimate Stress: 70,500 psi Break Location: Pipe
" " 72,000 psi " " Pipe

Hardness (HRB): Weld: 193,187,169 HAZ: 165,190,179

Welders Name: J.T. Johnson
Test Conducted By: E.A. Zemba Emp.# 617
Date: 3-23-73

We certify that the statements made in this report are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By.: _____ Date: 5-13-88

Editorial Rev. 8/13/88

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME L.R. Davis S.S.# 454-88-8666 STAMP LRD
USING WPS NO. HW-1.3-I
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/8"	3/4" Max.
Fillet	---	Any
Diameter	Plate	Over 24" O.D.:Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-463.3(a)

	Result
1 Face & 1 Root Bend: 2G Position	Good
" " " 3G "	"
" " 4G "	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result NA

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing) NA
Length and Per Cent of Defects _____ inches _____ %
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by C. Hamblin Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date 9-15-87 Organization Wyatt Field Service Co.
By

Form #815

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME N.M. Stewart S.S.# 438-52-5358 STAMP NMS
USING WPS NO. HW-1.5-I
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/4"	Any
Fillet	---	Any
Diameter	Plate	*Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-462.2

	Result
2 Side Bends: 2G Position	Good
" " " : 3G "	"
" " " : 4G "	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result NA

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing)
NA
Length and Per Cent of Defects _____ inches _____%
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by W.N. Phillips Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date 9-19-86

Organization Wyatt Field Service Co.
By

Form #835

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME Kenneth Lyday S.S.# 453-94-0699 STAMP HL
USING WPS NO. EW-1.3-I
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/8"	3/4" Max.
Fillet	---	Any
Diameter	Plate	*Over 24" O.D.:Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-462.3(a)

	Result
1 Face & 1 Root Bend: 2G Position	Good
" " " 3G "	"
" " 4G "	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result NA

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing)
NA
Length and Per Cent of Defects _____ inches _____%
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by C. Hamblin Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date 9-11-87

Organization Wyatt Field Service Co.
By

Form #835

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder Name: Carl Turcin S.S.# 457-13-6325 Stamp: CT
WPS#: 4W-1.S-1

VARIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual or Semiautc.
Material Spec.	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove Welc Thickness	3/4"	Any
Pipe Diameter	Plate	>24" O.D.*.Any Fillet
Filler Metal:		
Spec. Number	SFA 5.1	
Class	E7018	
F Number	4	
Position	2G, 3G & 4G	1 thru 4
Progression	Uphill	Any
		Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

RT TEST

Results: Meets the requirements of Sec. IX

GUIDED BEND TEST RESULTS

Type: Side Bends Fig.# QW-462.2
Number of Bend Tests: 2 in each position.
Results: Meets the requirements of Sec. IX

Test Conducted By: Jeff Miller Date: 10/27/92
Specimen preparation and testing by Central Testing Co., Inc.

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the require ments of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: _____ Date: 11-16-92

-RT-SB

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME Rbt. B. Clark S.S.# 455-72-8496 STAMP PBC
USING WPS NO. HW-1.S-1
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/4"	Any
Fillet	---	Any
Diameter	Plate	*Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7016	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-462.2

	Result
2 Side Bends: 2G Position	Good
" " " ; 3G "	"
" " " ; 4G "	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result NA

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing)
NA

Length and Per Cent of Defects _____ inches _____ %
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by Ray Napper Laboratory Test No. NA

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date 5-6-87 Organization Wyatt Field Service Co.

By _____

Form #835

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME L.D. McClure S.S.# 233-74-7030 STAMP LDM
USING WPS NO. MW-1.1S-1
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/4"	Any
Fillet	---	Any
Diameter	Plate	*Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-462.2

	Result
2 Side Bends; 2G Position	
" " " ; 3G "	NA
" " " ; 4G "	"
	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result Good

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing)
NA

Length and Per Cent of Defects _____ inches _____ %
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by J. Peterson Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date 10-1-86 Organization Wyatt Field Service Co.
By

Form #835

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder Name: Claude V. Chapman S.S.# 458-90-0330 Stamp: CVC

WPS#: HW-1.S-1

VARIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual or Semiauto.
Material Spec.	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove Weld Thickness	3/4"	Any
Pipe Diameter	Plate	>24" O.D.*,Any Fillet
Filler Metal:		
Spec. Number	SFA 5.1	
Class	E7018	
F Number	4	
Position	2G, 3G & 4G	1 thru 4
Progression	Uphill	Any
		Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

RT TEST

Results: Meets the requirements of Sec. IX

Test Conducted By: JJ Williams Date: 1/7/93

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: Andy Searle Date: 1-8-93

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME R.A. Harbison S.S.# 452-27-6722 STAMP RAH
USING WPS NO. RW-1.3-1
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/4"	Any
Fillet	--	Any
Diameter	Plate	*Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	--
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-462.2

	Result
2 Side Bends; 2G Position	
" " " : 3G "	NA
" " " : 4G "	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result Good

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing)
NA

Length and Per Cent of Defects _____ inches _____ %
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by J. Peterson Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date 10-1-86 Organization Wyatt Field Service Co.
By

Form #835

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder Name: Todd Duvall S.S.# 453-45-1900 Stamp: TD
WPS#: HW-1.S-I Revision 0

VARIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Material Spec.	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove Weld Thickness	3/4"	Max. to be welded
Pipe Diameter	Plate	>24" O.D.* Any Fillet
Filler Metal:		
Spec. Number	SFA 5.1	
Class	E7018	
F Number	4	
Position	2G, 3G & 4G	1 thru 4
Progression	Uphill	Any
		Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

RT TEST

Results: Meets the requirements of Sec. IX

GUIDED BEND TEST RESULTS

Type: Side Bends Fig.# QW-462.2
Number of Bend Tests: 2 in each position.
Results: Meets the requirements of Sec. IX

Welding Test Conducted By: D.E. Steinhauser Date: 11-08-91
Mechanical Tests Conducted By: BIX Testing Laboratiee Lab Test #: A920

We certify that the statements in this record are correct and that the test welds were prepared. welded and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: [signature] Date: 01-10-92

...fSB2

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

er Name: Clay Baker S.S.# 450-15-7285
HW-1.S-1 Stamp: CB

-RIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
ocess		
ocess Type	SMAW	SMAW
terial Spec.	Manual	Manual or Semiauto.
cking	P-1	P-1 thru P-11 & P-4X
ove Weld Thickness	Weld Metal	With Backing
e Diameter	3/4"	Any
ler Metal:	Plate	>24" O.D.*,Any Fillet
Spec. Number		
Class	SFA 5.1	
F Number	E7018	
ition	4	1 thru 4
gression	2G. 3G & 4G	Any
	Uphill	Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

RT TEST

lts: Meets the requirements of Sec. IX

nducted By: Claude Chapman Date: 11/21/93

ify that the statements in this record are correct and that the welds were prepared, welded and tested in accordance with the require of Section IX of the ASME Code.

ACTURER: WYATT FIELD SERVICE COMPANY

Andy Searle Date: 11/22/93

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder Name: B.D. Hendrix S.S.# 527-19-3357
WPS#: HW-1.S-I Stamp: BDH

VARIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual or Semiauto.
Material Spec.	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove Weld Thickness	3/4"	Any
Pipe Diameter	Plate	>24" O.D.*,Any Fillet
Filler Metal:		
Spec. Number	SFA 5.1	
Class	E7018	
F Number	4	
Position	2G, 3G & 4G	1 thru 4
Progression	Uphill	Any
		Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

GUIDED BEND TEST RESULTS

Type: Side Bends Fig.# QW-462.2
Number of Bend Tests: 2 in each position.
Results: Meets the requirements of Sec. IX

Test Conducted By: Claude Chapman Date: 10-18-91

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: [signature] Date: 10-23-91

SB

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder: Clay Baker S.S.# 450-15-7285 Stamp: CB

WPS#:

VARIABL

	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process	Manual	Manual or Semiauto.
Materia	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove	3/4"	Any
Pipe Di	Plate	>24" O.D.*, Any Fillet
Filler		
Spec	SFA 5.1	
Clas:	E7018	
F Num	4	
Positior	2G, 3G & 4G	1 thru 4
Progress	Uphill	Any
*2-		Uphill

*Min. O.D. Pipe: Flat & Horizontal Only.

RT TEST

Results: s the requirements of Sec. IX

Test Conc

d By: Claude Chapman Date: 11/21/93

We certif t - statements in this record are correct and that the test welc e prepared, welded and tested in accordance with the require ments of o the ASME Code.

MANUFACTU WYATT FIELD SERVICE COMPANY

By: Date: 11/22/93

-RT

Lyondell Petrochemical Company

Calculations Chart

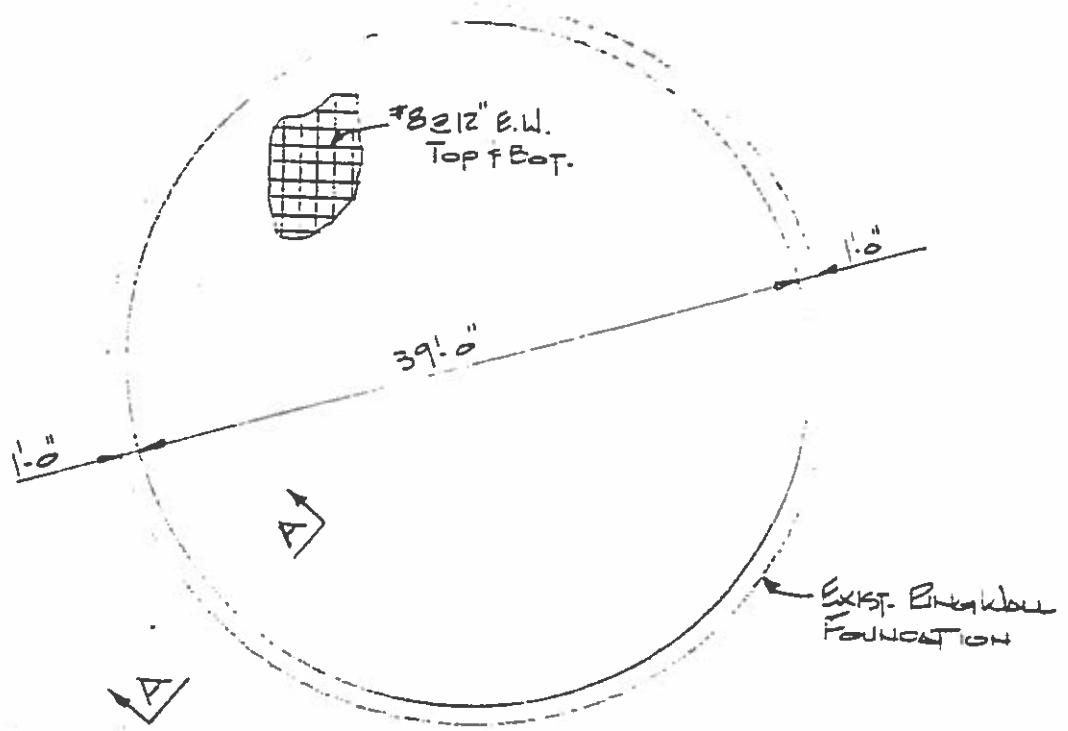
Sheet SK-1 of SK-2

Subject FOUNDATION FOR TANK T3455 & T4455

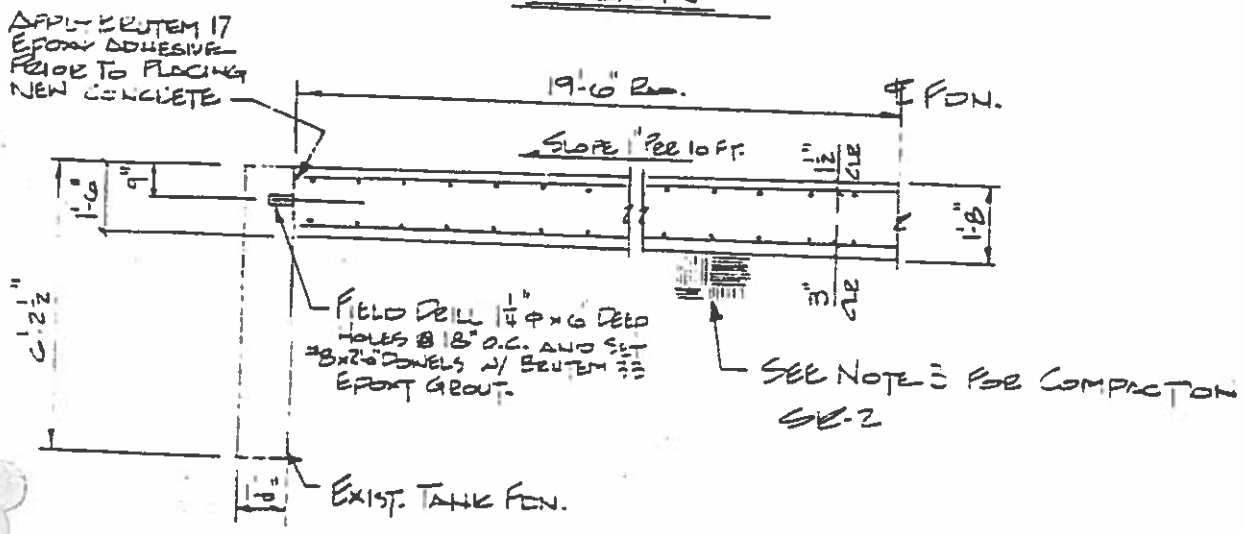
File

Date 1.11.93

By KAS



PLAN



SECTION "A-A"

Lyondell Petrochemical Company

Calculations Chart

Sheet SK-2 of SK-2

Project FOUNDATION FOR TANK T-3555 & T-4555

File

Date 1-11-93

By KGS

NOTES:

1. CONCRETE SHALL BE 4000 PSI AT 28 DAYS. CONCRETE TO BE IN ACCORDANCE WITH ACI CODES 301 & 318.

2. REINFORCING SHALL BE DEFORMED HIGH STRENGTH BARS, CONFORMING TO ASTM A615, GRADE 60.

3. EXISTING SUBGRADE SHALL BE COMPACTED TO 95% OF MAXIMUM DRY DENSITY PER ASTM D 1557.

4. EXISTING CONCRETE SURFACE PREPARATION AND EPOXY APPLICATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

Lyondell Petrochemical Company

Calculations Chart

Sheet 1 of 7

Subject TANK 3455

File

Date 1-29-93

By KCB

DESIGN CRITERIA

WEIGHTS : OUTER TK WT = 80,000# PER WYATT 1/29/93
INNER TK WT = 66,000# " " "
GEODESIC WT = 21,000# " " "
FLOATING ROOF WT = 28,000# " " "

SPECIFIC GRAVITY OF LIQUID = 1.05

TANK DIMENSIONS :

OUTER TANK : HEIGHT = 40'-0"
DIAMETER = 40'-0"
MAX. FILL HEIGHT = 31'-6"

INNER TANK : HEIGHT = 40'-0"
DIAMETER = 35'-0"
MAX. FILL HEIGHT = 37'-6"

SOIL DATA :

ALLOWABLE NET BEARING PRESSURE = 3500 PSF PER SOIL REPORT, P.5
ALLOW. NET BEARING PRESSURE (WIND + TEST) = 4200 PSF " " " "

Project TANK FOR

CHECK REINFORCING IN EXISTING RING WALL

(EFF. SUMMER TEMP = 105°, AND DNA = 0.2 C-0 FOR EXISTING TANK FOR DETAILS)

RADIAL FORCE ON RING WALL

$F = K_a[\gamma_L h + \text{SHELL WT (PSF)} + \text{FLOAT ROOF (PSF)} + \text{INNER TANK WT (PSF)} + (1/2)\gamma_s h]$

$= 0.3(6.21\text{ FT})[62.4^{\#}/\text{FT}^3(.05)(37.5\text{ FT}) + \frac{21600^{\#}}{12566\text{ FT}^2} + \frac{18000^{\#}}{9621.2\text{ FT}^2} + \frac{96000^{\#}}{109.96\text{FT}(3\text{ FT})} + 1/2(120^{\#}/\text{FT}^3)(6.21\text{ FT})]$

$= 0.3(6.21\text{ FT})[234^{\#}/\text{FT}^2 + 1.7^{\#}/\text{FT}^2 + 29.1^{\#}/\text{FT}^2 + 200^{\#}/\text{FT}^2 + 372.3^{\#}/\text{FT}^2]$

$= 0.3(6.21\text{ FT})(807.0^{\#}/\text{FT}^2) = 5725.5^{\#}/\text{FT}$

HOOP TENSION IN RING WALL

$T = (1/2)F_C = 1/2(5725.5^{\#}/\text{FT})(4\text{ FT}) = 11451.0^{\#}$

$T_2 = -T = 11451.0^{\#}$

$A_s = \frac{11451.0^{\#}}{.9(60000\text{ PSI})} = 0.21\text{ IN}^2$

6" @ PROVIDED = A_s PROVIDED = $1.77\text{ IN}^2 > 0.21\text{ IN}^2$

∴ EXISTING STEEL IS OK

TOWER TANK T-1

CHECK BEARING PRESSURE UNDER RINGWALL AGAINST PRESSURE UNDER MAIN PORTION OF TANK

SOIL PRESSURE UNDER MAIN PORTION OF TANK (PSF):

$P_o = \gamma_w H + \text{Shell Wt (psf)} + \text{Roof Load (psf)} + \text{Inner Tank Wt (psf)} + \gamma_{soil}$

$= 62.4\#/ft^3(1.0)(37.5ft) + \frac{31600\#}{1194.6ft^2} + \frac{28000\#}{1194.6ft^2} + \frac{60000\#}{1194.6ft^2} + 120\#/ft^3(6.21ft)$

$= 2343.7\#/ft^2 + 26.5\#/ft^2 + 23.4\#/ft^2 + 50.2\#/ft^2 + 745.2\#/ft^2$

Gross Pressure

$= 3298.9$ PSF $<$ 3500 PSF $+ 120\#/ft^3(6.21ft) = 4245$ PSF ALLOW. NET PRESSURE (PER SOIL REPORT p.5) — OK

ALLOW. GROSS PRESSURE

SOIL PRESSURE UNDER RINGWALL (PSF):

$P_o = \text{Weight of Shell}/\text{Circum.} / 2 + \frac{\text{Roof Load (psf)}}{2} + \frac{\text{Shell Wt (psf)}}{2} + \frac{\text{Floor Load (psf)}}{2} + \frac{\text{Inner Tank Wt (psf)}}{2} + \gamma_{soil} h$

$= \frac{36000\#}{125.66ft} / 1.0ft + \frac{2343.7\#/ft^2}{2} + \frac{26.5\#/ft^2}{2} + \frac{23.4\#/ft^2}{2} + \frac{225\#/ft^2}{2} + 150\#/ft^3(6.21ft)$

$= 286.5\#/ft^2 + 1171.9\#/ft^2 + 13.3\#/ft^2 + 11.7\#/ft^2 + 112.5\#/ft^2 + 931.5\#/ft^2$

$= 2977.6$ PSF

DIFFERENTIAL SETTLEMENT POSSIBLE DUE TO UNEQUAL SOIL PRESSURES

∴ PROVIDE CONCRETE SLAB INSIDE EXISTING RINGWALL FOOTING TOWARD TO INSIDE FACE TO DISTRIBUTE LOAD

CHECK BEARING PRESSURE W/ WIND LOADING UNDER RINGWALL

$P_o = 2977.6$ PSF $+ 731\#/ft/1ft_{FOOTING} = 3708.6$ PSF < 4200 PSF $+ 120\#/ft(6.21')$

GROSS PRESSURE — NET ALLOW PRESSURE — From WYATT p.17

$= 4945$ PSF

GROSS ALLOW PRESS.

OK

Lyondell Petrochemical Company

Calculations Chart

Sheet 4 of 7

File

Date 1.30.93

By KGS

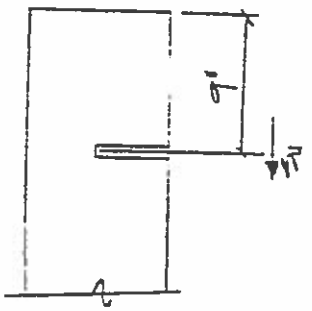
Subject: T-115 Tank Fdn

PROVIDE DOWELS TO TRANSFER LOAD BETWEEN CONCRETE SLAB AND RINGWALL

SHEAR TRANSFER: $V = (3298.9\ PSF - 297.6\ PSF)\ (1.5\ FT)\ (1.5\ FT) = 482^{\#}$

(1.5 FT: Dowel Spacing; 1.5 FT: Width Ringwall)

$S_U = 1.4\ (482^{\#}) = 675.^{\#}$



$$\phi S_n = \frac{4 \phi_s \sqrt{f'_c}\ A_{sc}}{1000}$$

Where: ϕS_n = Design Shear Resistance, Kips

ϕ_s = Shear Embedment Resistance Factor, 0.85

A_{sc} = Effective Projected Area of Shear Cone

$$A_{sc} = \pi L_s^2 (f_3 + f_4)$$

Where: L_s = Shear Embedment

f_3, f_4 = Edge Factors

$A_{sc} = \pi (9)^2 (0.25 + 0.25) = 127.2\ IN^2$

$$\phi S_n = \frac{4 (0.85)(\sqrt{3000})(127.2)}{1000} = 23.7^{K} > 0.675^{K}$$

Use #8 Dwl Set into 1¼" ϕ Holes w/ Bentem 33

Ict T-3455 TANK FDN

BASE MAT

TANK PROPERTIES (INNER TANK)

DIA. = 35'-0"
LIQUID LEVEL = 37'-6"

WT OF PRODUCT = $62.4\#/ft^3 (1.05)(37.5 ft)(962.1 ft^2) = 2,363,879.7\#$
USE 2,363,380#

WT OF TANK = 66,000#
Wall/ft of Circum = $15.3\#/(7.85 \cdot 12.8\#/(7.85)(2) + 10.2\#/(7.35)(2) = 181.2\#/$ of Circum.
Wall = $36,000\# - 181.2\#/(\pi)(35) = 13089\#$

WT OF ROOF = 28,000#
WT OF GIRDER = 21,000#

MAT DESIGN (TANK FDN DESIGN BASED ON PROCEDURE PRESENTED IN OCT. 1974 HYDROCARBON PROCESSING BY ANDREW A. BROWN, P.E.)

MAX. MOM. @ CENTER OF MAT

$$M_1 = \frac{P}{4\pi}\left[(1+\mu)\ln\frac{E}{b} + 1 - \frac{(1-\mu)b^2}{4E^2}\right]$$

$P = 2363,380\# + 13089\# + 28,000\# + 21,000\# = 2,425,469\#$

$$M_1 = \frac{2,425,469}{4\pi}\left[(1-0.25)\ln\frac{9.75}{.75} - 1 - \frac{(1-0.25)(.75)^2}{4(19.5)^2}\right]$$

$= 190,060\#$

Subject T345 TANK FDN

BASE MAT (CONT.)

$$M_2 = \frac{\rho c}{4}\left[\frac{E^2-C^2}{E^2}(1-\mu) + 2(1+\mu)\ln\frac{E}{C}\right]$$

$$= \frac{481.2(17.5)}{4}\left[\frac{(19.5)^2-(17.5)^2}{(19.5)^2}(1+0.25) + 2(1+0.25)\ln\left(\frac{19.5}{17.5}\right)\right]$$

$$= 876.7^{\#}$$

$$M_3 = -\frac{q E^2}{16}(3+\mu)$$

$$q = \frac{2363.880^{\#} + 60\,000^{\#} + 28.000^{\#} + 21.600^{\#}}{\pi(19.5)^2} = 2075.6 \text{ psf}$$

$$M_3 = -\frac{2075.6(19.5)^2}{16}(3+0.25) = -160,316^{\#}$$

$$M_{TOTAL} = 190,060^{\#} + 876.7^{\#} - 160,316^{\#} = 30620.7^{\#}$$

$$M_U = 30.62^{K}(1.4) = 42.9^{K}$$

$t = 18"$ $\quad d = 18" - 3" - 1" - 0.5" = 13.5'$

$$F = \frac{12(13.5)^2}{12000} = 0.182 \qquad K_U = \frac{42.9}{0.182} = 235.7 \qquad a_s = 4.31$$

$$A_s = \frac{42.9}{13.5(4.31)} = 0.74 \text{ IN}^2/\text{FT} \qquad \frac{\text{USE \#8 @ 12"}}{\text{E.W. T.B}} \quad A_s = 0.79 \text{ IN}^2/\text{FT}$$

Lyondell Petrochemical Company
Calculations Chart

Sheet 7 of 7
File
Date 1-30-93
By KGS

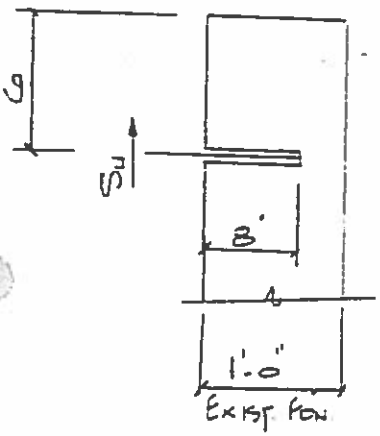
Subject T345S TANK FDN

ANCHOR BOLT DESIGN

DESIGN LOAD = 4887# USE 5000# FROM WYATT P. 11

USE 1"ϕ ANCHOR BOLT $A_s = 0.6060\ in^2 > 0.2444\ in^2$ REQ'D FROM WYATT, P. 11

CHECK SHEAR EMBEDMENT



S_u = FACTORED SHEAR FORCE, KIPS
$= 1.7(0.75)(5^K) = 6.375^K$

$$\phi S_n = \frac{4\,\phi_s\sqrt{f'_c}\,A_{sc}}{1000}$$

WHERE: ϕS_n = DESIGN SHEAR RESISTANCE, KIPS
ϕ_s = SHEAR EMBEDMENT RESISTANCE FACTOR, 0.85
A_{sc} = EFFECTIVE PROJECTED AREA OF SHEAR CONE, IN^2

$$A_{sc} = \pi L_s^2 (f_3 + f_4)$$

WHERE: L_s = SHEAR EMBEDMENT, IN
f_3, f_4 = EDGE FACTORS

$A_{sc} = \pi(6)^2(0.25+0.25) = 56.55$

$$\phi S_n = \frac{4(0.85)(\sqrt{3000})(56.55)}{1000} = 10.53^K > 6.375^K$$

USE 1"ϕ THREADED ROD (A36) SET INTO 1½"ϕ HOLE
W/ BEDTEM 33

REPORT

FOUNDATION INVESTIGATION

PROPOSED LYONDELL PLANT EXPANSION

CHANNELVIEW, TEXAS

FOR

ARCO CHEMICAL COMPANY

INTRODUCTION

General

This report presents the results of our soils and foundation investigation for a proposed expansion to the ARCO Chemical Company plant in Channelview, Texas. The proposed addition will manufacture olefins and consist of a process area, utilities area, holding pond, liquid bulk storage consisting of several large steel tanks, and a flare stack. The proposed expansion is shown on the Area Plan, Plate 1, and the siting of the proposed structure is shown on the Site Plan, Plate 2.

Purpose and Scope

The purpose of our investigation was to explore the subsurface soil and groundwater conditions at the site and to provide recommendation for both foundation support of the proposed structures and earthwork criteria.

The scope of our work included:

1) Drilling 24 borings to depths of between 25 to 110.5 feet and obtaining relatively undisturbed soil samples.
2) Digging four shallow test pits with a backhoe to obtain bulk samples of near-surface soils.

3) Performing laboratory tests on selected soil samples to determine their engineering characteristics.

4) Performing engineering analysis to evaluate various foundation types.

The detailed results of our field and laboratory investigations are presented in the Appendix.

Design Considerations

The major structures are to be constructed in the process area and consist of a quench tower, a gasoline fractionator, heaters and compressor supports. Extremely heavy test and operating loads will be imposed on several structures. Some typical loads are shown in the table below:

LOADS (KIPS)

Structure	Test	Operating	Overturning Moment FT-KIPS
Gasoline Fractionator	8,630	2600	13610
Quench Tower	10,830	6080	12500
Ethylene Fractionator	3,780	1825	19100
Propylene Fractionator	3,325	1550	--15500
Deethanizer	1,654	866	6184

We understand settlement will be controlling factor in design of the foundations. Total settlement must be less than two inches and differential settlement held to 1/4 inch within each area except the compressor

to extend below a depth of 11 feet and evidence of crayfish burrows were found in samples taken as deep as 20 feet. Since crayfish usually burrow down until they reach groundwater, at some time the groundwater level must have been considerably lower than its current elevation.

DISCUSSION AND RECOMMENDATIONS

General

It is our opinion that the subsurface conditions at the site are suitable for support of the proposed structures. Several types of foundations are feasible such as shallow spread footings, mats, and underreamed drilled shafts. Selection of the foundation type for each structure will probably depend upon settlement and economic criteria.

We recommend that foundations be designed for a maximum net bearing pressure under long term loading of 3,500 pounds per square foot at a minimum depth of three feet. This maximum net pressure may be increased to 4,200 pounds per square foot under short term loadings such as test or wind loadings. The net bearing pressure is the pressure imposed by the footing in excess of the adjacent soil overburden pressure. This pressure applies to spread, mat and belled footings above a depth of 35 feet. Below a depth of 35 feet a net bearing pressure of 4,300

pounds per square foot may be used for long term loads and 5,000 pounds per square foot for short term loading.

Due to the existence of a softer layer of silty sand and sand silt in the areas of Borings B, C, D, E, L, and U, we recommend special bearing criteria in the upper 14 feet in these areas. Footings founded between depths of three and six feet can be designed for the bearing pressure given above. Footings founded between 6 and 14 feet should be designed for a maximum net bearing pressure of 2,000 pounds per square foot under long term loads and 2,500 pounds per square foot under short term loadings.

This same layer is present in the southern portion of the site under the tanks and sphere areas. The same bearing values should be applied in these areas for footing founded between six and 16 feet.

Footings founded above, or in this layer, will experience settlements greater than those in the adjacent areas. This is discussed in the "Settlement" section of this report.

We understand that a major portion of the area in the process area will be covered with concrete paving and that many smaller pieces of equipment will be supported directly on this pavement. We recommend

a maximum bearing pressure of 4,000 pounds per square foot be used for loads supported directly upon the pavement. It should be noted that, if these loads are concentrated in small areas, their combined effect could influence the settlement behavior of adjacent structures.

Settlements

Settlement of foundations will depend upon their size, applied load, and embedment depth. The most compressible soils at the site are the upper clay layers and foundations placed above them will, size and pressure being equal, experience more settlement than foundations founded below these clay layers.

We have estimated settlements for some of the major structures assuming their foundations to be at various depths. These estimated settlements are presented in Plate 4 for the quench and gasoline fractionator towers, the heaters, and the compressors. These settlements were estimated assuming each structure was supported on a rigid mat. For the deeper depths, the mat was assumed to be supported on drilled and belled footings or piles. Estimated settlements of various sized mats and individual belled footings are presented in Plate 5.

Footings founded above the silty sand layer which exists between the 8 and 14-foot depth will experience additional settlement due to the

Uplift capacities for spread footing or mats may be calculated using the total buoyant weight of the footing and the soil above it. If the footings are poured neat, an additional force of 500 pounds per square foot may be applied to vertical planes projected upward from the footing base. The upper two feet of soil should be ignored.

Tanks

We recommend that the steel tanks be placed on a well compacted sand or sand-shell base. The area of the tank should be over-excavated to a depth of three feet and excavations should extend at least three feet beyond the tank edge. The excavated area should be replaced with a sand or sand shell fill compacted to at least 90 percent of the maximum dry density as determined by the Modified AASHO* test (T-180).

Belled Footings

Some difficulty may be encountered in installing drilled and belled footings below silt and sand layers. Water from these could enter the shaft during drilling. It is anticipated that small pumps could handle the water but some sloughing and caving should be expected. This problem could be minimized by drilling a straight shaft to the proposed foundation depth and then casing the shaft to the top level of the proposed bell. In this manner, sloughing could be reduced; however, unless the casing fits

*American Association of State Highway Officials

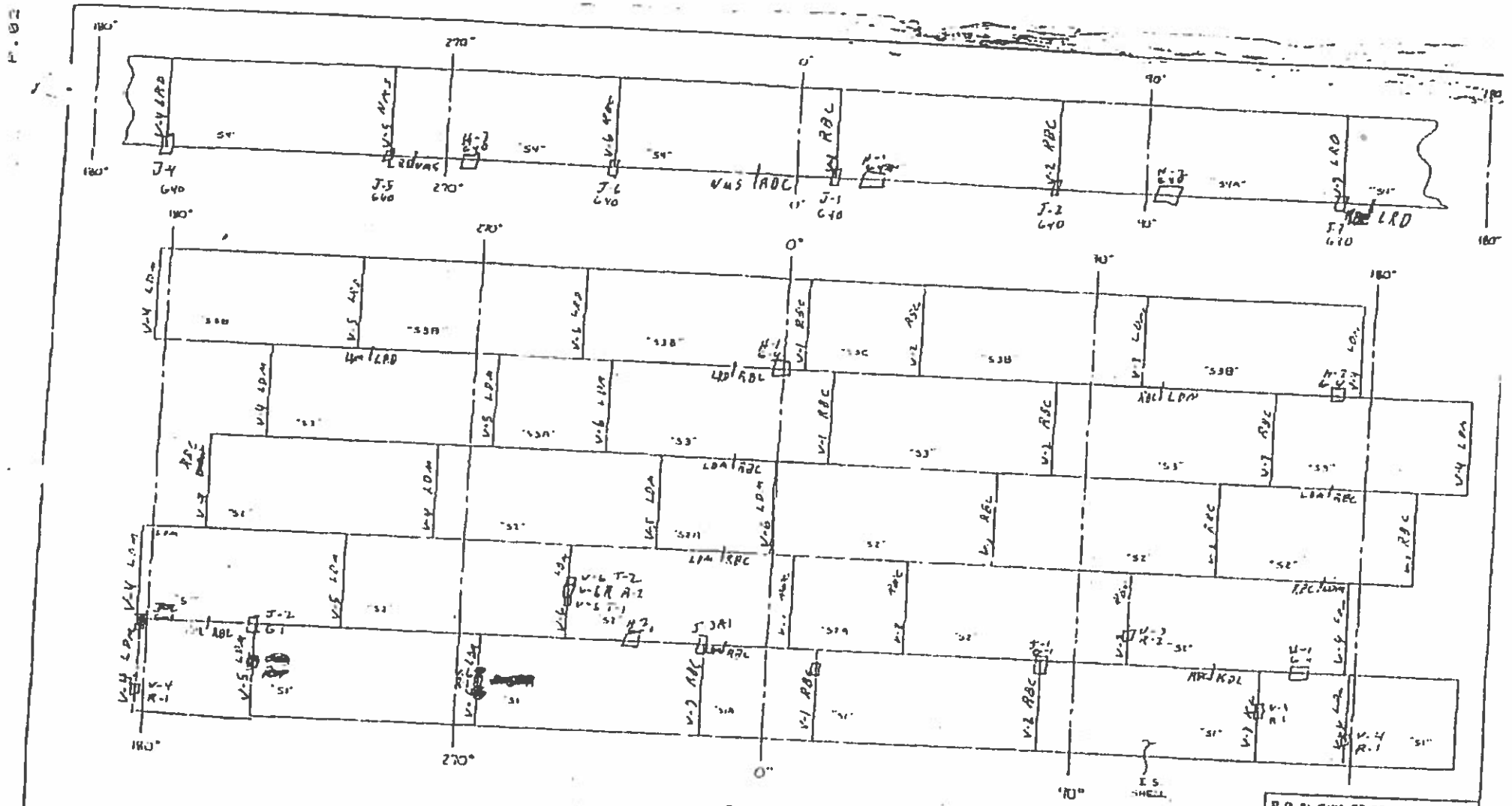
WYATT FIELD SERVICE CO. IV

QUALITY ASSURANCE CHECKLIST FOR TANKS

J/N: 2472 B Customer: LYONDELL Petrochemical TK# 4455

	Check	Inspector	Date	Comments
Material	✓	A.S/JH	6/15/93	
Fit Up	✓	A.S.	6/21/93	
WPS/PQR	✓	A.S/JH	5/21/93	
Welder Qual	✓	A.S/JH	6/15/93	
Weld Map	✓	A.S/JH	6/21/93	
RT	✓	A.S/JH	6/15/93	
Preesure Test	✓	A.S/JH.	6/24/93	
Name Plate	✓	A.S/J.H.	6/24/93	
Dimensional	✓	A.S./JH	6/15/93	

Form 500T Rev. 0



X-RAY : WELD MAP

P.O.#: CMJ-93-0001	
S/O 24728	ITEM: FA-4455
WYATT FORD SERVICE COMPANY HOUSTON, TEXAS	
MISC. MODIFICATIONS TO AN EXIST. 40'-0" ø x 32'-0" HIGH STACK	
X-RAY : WELD MAP	
CUSTOMER LYONDELL PETROCHEMICAL	
DRAWN: JCH DATE: 3-2-93	
ENGR: LC APPROVED	
NO. M-93 24728-WM REV	

SCALE

CERTIFIED FOR CONSTRUCTION
WYATT FORD SERVICE COMPANY
DATE: 3/23/93
BY: [signature]

NO. REVISION BY CHK DATE

GCT INSPECTION, INC.

1403 Illinois Ave.
South Houston, Texas 77587
Telephone: (713) 943-1760

RADIATION SURVEY AND WELD RADIOGRAPHIC REPORT

DATE _____ PO # _____ JOB NO _____ PAGE _____ OF _____

CUSTOMER _____ JOB LOCATION _____

RT ☒ UT ☐ ASME SEC I ☐ V ☐ VIII ☐ IX ☐

PT ☐ MT ☐ API 1104 ☐ AWS D1.1 ☐

BH ☐ V ☐ ANSI B31.3 ☐ ANSI B31.4 ☐

OTHER _____ OTHER _____

OFFICE USE ONLY

ST _____

OT _____

ST/TT _____

OT/TT _____

JOB # _____

TRAVEL TO JOB _____ ARRIVE JOB _____ 30 MIN LUNCH

TRAVEL TO SHOP _____ LEAVE JOB _____ IS THIS YOUR ONLY TICKET FOR THIS COMPANY TODAY?

TOTAL HOURS TRAVELED _____ TOTAL HOURS AT JOB _____ ☐ YES NO ☒ ☒ YES NO ☐

LEVEL II _____ 4½ x 10 _____ TOTAL WELDS _____ 4½ x 10

LEVEL I _____ 4½ x 17 _____ ACCEPTED _____ 4½ x 17

LEVEL I _____ OTHER _____ REPAIR _____ OTHER _____

MARKER	WELD NUMBER	ACCEPT	REPAIR	CUTOUT	DEFECT TYPE	WELD PASS	FROM	TO	COMMENTS
	V-1 Rg-1	✓							TK = 4455
	V-3 Rg-1	✓							
	V-4 Rg-1	✓							
	V-6 Rg-1	✓							
	V-3 Rg-2	✓							
	V-6 Rg-2								
	J-1 G-1	✓							
	J-2 G-1	✓							
	J-3 G-1	✓							
	F-1 G-1	✓							
	F-2 G-1	✓							

C ACCUMULATION OF DISCONTINUITIES
INADEQUATE PENETRATION
INADEQUATE PENETRATION DUE TO HIGH-LOW
INTERNAL CONCAVITY
INCOMPLETE FUSION
INCOMPLETE FUSION DUE TO COLD LAP

BT BURN THROUGH
ES ELONGATED SLAG INCLUSIONS
ISI ISOLATED SLAG INCLUSIONS
GP GAS POCKET
SP SPHERICAL POROSITY
CP CLUSTER POROSITY
WP WORMHOLE POROSITY

HB HOLLOW BEAD
C CRACK
CC CRATER CRACK
IU INTERNAL UNDERCUT
EU EXTERNAL UNDERCUT
LS LONG SEAM ALIGNMENT
AB ARC BURN

R ROOT PASS OR ADJACENT PIPEWALL
H HOT PASS
F FILLER PASS
C COVER PASS OR ADJACENT PIPEWALL
B H BETWEEN ROOT AND HOT PASS

NOTE RADIOGRAPHY PRODUCES TWO DIMENSIONAL IMAGES ONLY DEPTH OF DEFECTS REPORTED ARE GOOD FAITH OPINIONS ONLY

APPROVAL _____ DATE _____

Signing this report the client representative is certifying the hours and miles to be approved for payment by the client

GCT INSPECTION, INC.

1403 Illinois Ave.
South Houston, Texas 77587
Telephone: (713) 943-1760

RADIATION SURVEY AND WELD RADIOGRAPHIC REPORT

DATE 5-21-13 PO# FW 26218 PAGE 1 OF 1

CUSTOMER Wyatt Field Ser. Co. JOB NO 24722 TANK 1455

JOB LOCATION @ Kendall Pkwy 10m - Sheldon Rd

RT ☒ UT ☐ PT ☐ MT ☐ BH ☐ V ☐ OTHER 4 HR minimum

ASME SEC I ☐ V ☐ VIII ☐ IX ☐ API 1104 ☐ AWS D1.1 ☐ ANSI B31.3 ☐ ANSI B31.4 ☐ OTHER API 650

OFFICE USE ONLY: ST 1 OT ST/TT OT/TT JOB #

TRAVEL TO JOB: 15 min ARRIVE JOB: 5:15PM

TRAVEL TO SHOP: 15 min LEAVE JOB: 7:45PM

TOTAL HOURS TRAVELED: 1/2 HR TOTAL HOURS AT JOB: 2 1/2 HR

30 MIN LUNCH ☐ YES ☐ NO ☒

IS THIS YOUR ONLY TICKET FOR THIS COMPANY TODAY? ☒ YES ☐ NO

LEVEL II: J. DASINGER

LEVEL I: L. SCHACHTE

LEVEL I:

4½ x 10: 3

4½ x 17:

OTHER:

TOTAL WELDS: 3

ACCEPTED: 3

REPAIR: 0

4½ x 10

4½ x 17

OTHER

WELDER	WELD NUMBER	ACCEPT	REPAIR	CUTOUT	DEFECT TYPE	WELD PASS	FROM	TO	COMMENTS
	V-5R RG2	✓				1	2		TANK 1455
	V-5T1 RG2	✓				0	1		
	T-5T2 RG2	✓				2	3		

AC ACCUMULATION OF DISCONTINUITIES
IA INADEQUATE PENETRATION
ID INADEQUATE PENETRATION DUE TO ROOT
IC INTERNAL CONCAVITY
IF INCOMPLETE FUSION
IFD INCOMPLETE FUSION DUE TO COLD LAP

BT-BURN THROUGH
ESI-ELONGATED SLAG INCLUSIONS
ISI-ISOLATED SLAG INCLUSIONS
GP GAS POCKET
SP SPHERICAL POROSITY
CP-CLUSTER POROSITY
WP-WORMHOLE POROSITY

HB HOLLOW BEAD
C CRACK
CC CRATER CRACK
IU INTERNAL UNDERCUT
EU EXTERNAL UNDERCUT
LS LONG SEAM ALIGNMENT
AB ARC BURN

R ROOT PASS OR ADJACENT PIPEWALL
H HOT PASS
F FILLER PASS
C COVER PASS OR ADJACENT PIPEWALL
B H-BETWEEN ROOT AND HOT PASS

NOTE: RADIOGRAPHY PRODUCES TWO DIMENSIONAL IMAGES ONLY DEPTH OF DEFECTS REPORTED ARE GOOD FAITH OPINIONS ONLY

OWNER APPROVAL [signature] DATE

By signing this report the client representative is certifying the hours and miles to be approved for payment by the client.

GCT INSPECTION, INC.

1403 Illinois Ave.
South Houston, Texas 77587
Telephone: (713) 943-1760

RADIATION SURVEY AND WELD RADIOGRAPHIC REPORT

DATE 6-7-93 | PO # FW-26322 | JOB NO. 2472-B | PAGE 1 OF 1

CUSTOMER: Wyatt Field Services Co. | JOB LOCATION: Lyondell Petrochemical

RT ☒ UT ☐ | PT ☐ MT ☐ | BH ☐ V ☐ | OTHER

ASME SEC. I ☐ V ☐ VIII ☐ IX ☐ | API 1104 ☐ AWS D1.1 ☐ | ANSI B31.3 ☐ ANSI B31.4 ☐ | OTHER API 650

TRAVEL TO JOB: 45 mins | ARRIVE JOB: 5:30 PM | 30 MIN. LUNCH ☐ YES NO ☒ | IS THIS YOUR ONLY TICKET FOR THIS COMPANY TODAY? ☒ YES NO ☐

TRAVEL TO SHOP: 45 mins | LEAVE JOB: 9:15 PM

TOTAL HOURS TRAVELED: 1½ hrs | TOTAL HOURS AT JOB: 3¾ hrs.

LEVEL II: Terry Torgerson | 4½ x 10: 11 | TOTAL WELDS: 11

LEVEL I: Robert Field | 4½ x 17: | ACCEPTED: 11

LEVEL I: | OTHER: | REPAIR:

WELD #	SIZE	ACC	REPAIR	DEFECT TYPE	GRIND	HOT	R
J-1	G-40	✓		POR			
J-2	G-4-0	✓					
J-3	G-4-0	✓					
J-4	G-4-0	✓		POR			
J-5	G-4-0	✓		POR			
J-6	G-4-0	✓					
H-1	G-40	✓					
H-2	G-4-0	✓					
H-3	G-4-0	✓					
H-1	G-4	✓					
H-2	G-4	✓					

TK# 4455 Outer Tank

Outer Tank

INNER Tank

ACC-ACCUMULATION OF DISCONTINUITIES
IP-INADEQUATE PENETRATION
IPD-INADEQUATE PENETRATION DUE TO
IPH-HIGH-LOW
IPI-INTERNAL CONCAVITY
IF-INCOMPLETE FUSION
IFC-INCOMPLETE FUSION DUE TO COLD LAP

BT-BURN THROUGH
ESI-ELONGATED SLAG INCLUSIONS
ISI-ISOLATED SLAG INCLUSIONS
GP-GAS POCKET
SP-SPHERICAL POROSITY
CP-CLUSTER POROSITY
WP-WORMHOLE POROSITY

HB-HOLLOW BEAD
C-CRACK
CC-CRATER CRACK
IU-INTERNAL UNDERCUT
EU-EXTERNAL UNDERCUT
LS-LONG SEAM ALIGNMENT
AB-ARC BURN

R-ROOT PASS OR ADJACENT PIPEWALL
H-HOT PASS
F-FILLER PASS
C-COVER PASS OR ADJACENT PIPEWALL
B-BETWEEN ROOT AND HOT PASS

NOTE: RADIOGRAPHY PRODUCES TWO DIMENSIONAL IMAGES ONLY. DEPTH OF DEFECTS REPORTED ARE GOOD FAITH OPINIONS ONLY

CUSTOMER APPROVAL: C.V. Clegg | DATE: 6-7-93

By signing this report the client representative is certifying the hours and miles to be approved for payment by the client.

GCT INSPECTION, INC.

1403 Illinois Ave.
South Houston, Texas 77587
Telephone: (713) 943-1760

RADIATION SURVEY AND WELD RADIOGRAPHIC REPORT

DATE 12-11-93 | PO# FW26324 | JOB NO 24723 | PAGE | OF

CUSTOMER Wyatt Field Service Co. | JOB LOCATION Lyondell Channelview T

RT ☑ UT ☐ | ASME SEC. I ☐ V ☐ VIII ☐ IX ☐

PT ☐ MT ☐ | API 1104 ☐ | AWS D1.1 ☐

BH ☐ V ☐ | ANSI B31.3 ☐ | ANSI B31.4 ☐

OTHER | OTHER API 653

TRAVEL TO JOB 45 mins.	ARRIVE JOB 5:00 AM	30 MIN. LUNCH	IS THIS YOUR ONLY TICKET FOR THIS COMPANY TODAY?
TRAVEL TO SHOP 45 mins	LEAVE JOB 7:30 PM	☐ YES ☑ NO	☑ YES ☐ NO
TOTAL HOURS TRAVELED 1½ Hrs.	TOTAL HOURS AT JOB 2½		
LEVEL II Terry Torgerson	4½ x 10 4		TOTAL WELDS 4
LEVEL Robert Ford	4½ x 17		ACCEPTED 4
LEVEL I	OTHER		REPAIR

NUMBER	WELD NUMBER	ACCEPT	REPAIR	CUTOUT	DEFECT TYPE	WELD PASS	FROM	TO	COMMENTS
1	V-1 DS	✓				1	2		TK II 4455
2	J-1 DS	✓				1	2		
3	C-1 DS	✓			ICR	1	2		
4	C 2 DS	✓				1	2		

ACC ACCUMULATION OF DISCONTINUITIES
IA-INADEQUATE PENETRATION
IPD-INADEQUATE PENETRATION DUE TO HIGH-LOW
IC-INTERNAL CONCAVITY
IF-INCOMPLETE FUSION
IFD-INCOMPLETE FUSION DUE TO COLD LAP

BT-BURN THROUGH
ESI-ELONGATED SLAG INCLUSIONS
ISI-ISOLATED SLAG INCLUSIONS
GP-GAS POCKET
SP-SPHERICAL POROSITY
CP-CLUSTER POROSITY
WP-WORMHOLE POROSITY

HB-HOLLOW BEAD
C-CRACK
CC-CRATER CRACK
IU-INTERNAL UNDERCUT
EU-EXTERNAL UNDERCUT
LS-LONG SEAM ALIGNMENT
AB-ARC BURN

R ROOT PASS OR ADJACENT PIPEWALL
H HOT PASS
F FILLER PASS
C COVER PASS OR ADJACENT PIPEWALL
B H-BETWEEN ROOT AND HOT PASS

NOTE RADIOGRAPHY PRODUCES TWO DIMENSIONAL IMAGES ONLY DEPTH OF DEFECTS REPORTED ARE GOOD FAITH OPINIONS ONLY

CUSTOMER APPROVAL C. V. Ulya | DATE 6-11-93

By signing this report the client representative is certifying the hours and miles to be approved for ...

H & G INSPECTION COMPANY INC.

9315 Summer Bell • Houston, Texas 77074 • (713) 498-6517

DAILY WORK REPORT

PLEASE NOTE IF ANY HOURS ARE SIGNED FOR, A WORKDAY RATE WILL BE CHARGED.

DAILY RADIOGRAPHIC REPORT

RADIOGRAPHIC TERMS AND ABBREVIATIONS INDICATIONS

BT - BURN THROUGH
BTA - BURN THROUGH AREA
LP - LACK OF PENETRATION
NF - NON FUSION
SL - SLAG LINES

WC - WITHIN CODE
GL - GROUND LOW
SM - SURFACE MARKS
SI - SLAG INCLUSION
NW - NARROW WELD
NC - NO COMMENT

IU - INTERNAL UNDERCUT
EU - EXTERNAL UNDERCUT
C - CRACK
P - POROSITY OR GAS POCKETS
LC - LOW CROWN OR CAP

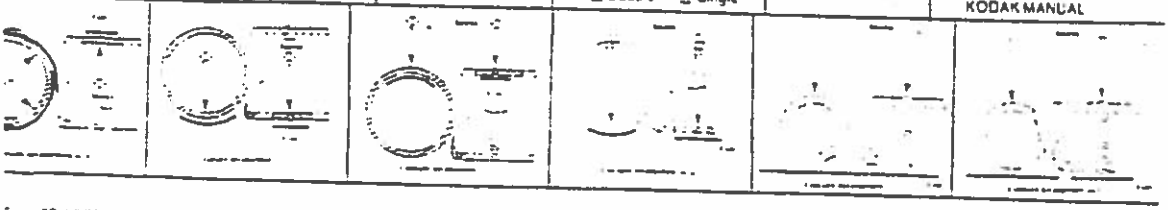
CUSTOMER NAME: _____ CONTRACTOR: _____

JOB LOCATION _____ CUST. JOB NO. _____

X-RAY NO.	WELDER AND/OR LOCATION	DIAMETER / THICKNESS	SOURCE TO FILM DISTANCE	ACCEPT	REJECT	DESCRIBE INDICATION	EXPOSURE TECH	X-RAY NO.	WELDER AND/OR LOCATION	DIAMETER / THICKNESS	SOURCE TO FILM DISTANCE	ACCEPT	REJECT	DESCRIBE INDICATION	EXPOSURE TECH
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SIGNATURE OF INSPECTOR CERTIFIES TIME AND MATERIAL TO BE CORRECT

IR-192 / CO-60			SCREENS: Lead	SCREEN THICKNESS: .005 Front .010 Back	FILM TYPE: KODAK / DUPONT ☐ AA ☐ 45 ☐ M ☐ 55 ☐ T ☐ 65	PENETRAMETER SIZE	☐ SOURCE SIDE ☐ FILM SIDE
EXPOSURE TECHNIQUE	GEOMETRIC UNSHARPNESS: .00 .02 Max	SOURCE TO OBJECT DISTANCE CONTACT	FILM VIEWING: ☐ Double ☐ Single	SOURCE DIMENSIONS: 1 x 1	FILM PROCESSING: KODAK MANUAL		



_____ APPROVAL _____ (Signed)

TOTAL WELDS _____

SIGNATURE _____ LEVEL _____

TECHNICIAN _____

RADIOGRAPHIC CODE _____

TRAVEL REPORT

MILES FROM _____ TO _____ TOTAL _____

_____ STANDBY (BAD WEATHER) CONTRACTOR NOT WORKING

DATE _____ REPORT NO 1

H & G INSPECTION COMPANY INC.

9315 Summer Bell • Houston, Texas 77074 • (713) 498-6517

DAILY WORK REPORT

PLEASE NOTE IF ANY HOURS ARE SIGNED FOR, A WORKDAY RATE WILL BE CHARGED.

DAILY RADIOGRAPHIC REPORT

RADIOGRAPHIC TERMS AND ABBREVIATIONS INDICATIONS:

BT - BURN THROUGH
BTA - BURN THROUGH AREA
LP - LACK OF PENETRATION
NF - NON FUSION
SL - SLAG LINES
WC - WITHIN CODE
GL - GROUND LOW
SM - SURFACE MARKS
SI - SLAG INCLUSION
NW - NARROW WELD
NC - NO COMMENT
IU - INTERNAL UNDERCUT
EU - EXTERNAL UNDERCUT
C - CRACK
P - POROSITY OR GAS POCKETS
LC - LOW CROWN OR CAP

CUSTOMER NAME: W... F... S... CONTRACTOR: _____

JOB LOCATION: I-10 FIMPNT CUST. JOB NO. ...

X-RAY NO.	WELDER AND/OR LOCATION	DIAMETER / THICKNESS	SOURCE TO FILM DISTANCE	ACCEPT	REJECT	DESCRIBE INDICATION	EXPOSURE TECH
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X-RAY NO.	WELDER AND/OR LOCATION	DIAMETER / THICKNESS	SOURCE TO FILM DISTANCE	ACCEPT	REJECT	DESCRIBE INDICATION	EXPOSURE TECH
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SIGNATURE OF INSPECTOR CERTIFIES TIME AND MATERIAL TO BE CORRECT

...192 ...D-6C	...	...	Lead	.005 From .010 Back	KODAK DUPONT ☐ AA ☐ M ☐ 45 ☐ 55 ☑ 65	PENETRAMETER SIZE: ...	☑ SOURCE SIDE ☐ FILM SIDE

...SURE ...ACE		SOURCE TO OBJECT DISTANCE CONTACT	FILM VIEWING ☐ Double ☑ Single		FILM PROCESSING KODAK MANUAL
	00.02 Max				

...TORS APPROVAL _____ (Signed)

...HOURS _____ TOTAL WELDS _____

...SIGNATURE _____ LEVEL _____

...CODE _____

TRAVEL REPORT

MILES FROM _____ TO _____ TOTAL _____

_____ STANDBY (BAD WEATHER) CONTRACTOR NOT WORKING

DATE 7-7-93 REPORT NO _____

CONCRETE POUR SLIP

FOUNDATION No.: TK 4455 PROJECT No.: 144-2015

APPLICABLE DWGS.: E44 C 127

CLASS OF CONCRETE: 5,000 LB PSI

VOLUME: 80 yds TYPE OF FINISH: BROOM

FORMWORK (alignment & elevation) CHECKED: ✓ BY:

REINFORCED STEEL (size, spacing) CHECKED: ✓ BY:

ANCHOR BOLTS (size, location, projection, length & sleeves) CHECKED: NA BY:

PIPE OR PIPING REQUIRED? NA BY:

CONDUIT REQUIRED? NA BY:

GROUND WIRE SLEEVE REQUIRED? NA

OTHER PENETRATIONS? NA

FOLLOW UP DATA

TEST CYLINDERS REFERENCE No.:

DATE CYLINDERS TAKEN: 4-26-93

CYLINDERS TAKEN BY: Paul Wright

NUMBER CYLINDERS TAKEN: 6 SLUMP: 5

7 DAY BREAK: 28 DAY BREAK:

REMARKS: 3 day 2900
2940

APPROVAL TO POUR

INSPECTOR
NAME (print): James Huntley
SIGNATURE: James Huntley
DATE: 4-26-93

CONTRACTOR
NAME (print): C.B. DAVIS
SIGNATURE: C B Davis
DATE: 4-26-93

ENGINEER
NAME (print):
SIGNATURE:
DATE:

COASTAL TESTING LABORATORIES, INC.

PASADENA 477-0121 • P. O. BOX 87653 • HOUSTON, TEXAS 77287-7653

PROJECT NO. 92-606
REPORT NO. 0426-168
DATE: 4/28/93
P.O. OR JOB NO. 350097-25

DAILY CONCRETE REPORT AND TEST RESULTS

PROJECT: Lyondell Chemical
CONTRACTOR Lyondell Chemical OWNER:
ENGINEER: ARCHITECT:
PRODUCER: FOR CONCRETE DESIGN MIX: 3000- psi
COURSE AGGR: FINE AGGR: CEMENT:
DESIGN WATER: GALS. WATER ADDED: GALS. WATER IN AGGR:
SLUMP, (ASTM C-143) ADMIXTURES
SPECIMENS MADE (ASTM C 172, C-31) 6 cyl MIX TEMP. AMB. TEMP.
CONCRETE PLACED CU. YDS SQ. YDS AIR CONTENT (ASTM C-173, C-231)
TECHNICIAN TIME: 6 cyl. + 1 vehicle charge TECHNICIAN:
LOCATION: LCC-4/26: 144-2015

6 cylinders p/u pn 4/28/93 by Jose

MARKS	DATE POURED	DATE TESTED	AGE DAYS	X-SECTION AREA	TOTAL LOAD	POUNDS SQ. IN	LOCATION ON JOB
LCC426	4/26	4/30	4	28.27	82	2900	
LSS426	4/26	4/30	4	28.27	83	2940	
LCC426	4/26	5/03	7	28.27	105	3710	
LCC426	4/26	5/03	7	28.27	95	3360	
LCC426	4/26	5/24	28	28.27	119	4210	
LCC426	4/26	5/24	28	28.27	124	4390	

COMPRESSIVE STRENGTH: ASTM C-39
FLEX. STRENGTH (CENTER PT): ASTM C-293
FLEX. STRENGTH (THIRD PT) ASTM C-78

COASTAL TESTING LABORATORIES, INC.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE APPROVAL OF THIS LABORATORY

CTL-37 (REV 11/90)

MCC

Wyatt Field Service Company

RECORD OF TEST

CUSTOMER: Lyondell Job No. 2472B

DESCRIPTION OF ITEM(S) TESTED: Inner Tank Bottom & Annular Rg.

TYPE OF TEST: Vacuum Test

TESTED AT 9 P.S.I.

(✓) ACCEPTED

( ) REJECTED

C. V. Chaffin
WYATT INSPECTOR OR SUPERVISOR

5-14-93
DATE

CUSTOMER INSPECTOR

5-14-93
DATE

FORM #413

Wyatt Field Service Company

RECORD OF TEST

CUSTOMER: LYONDELL Job No. 2472B

DESCRIPTION OF ITEM(S) TESTED: Replacement Bottom.

TYPE OF TEST: Vacuum Test.

TESTED AT 3 P.S.I.

(✓) ACCEPTED

( ) REJECTED

C. V. Clay
WYATT INSPECTOR OR SUPERVISOR

5-6-93
DATE

James Hunter
CUSTOMER INSPECTOR

5-6-93
DATE

FORM #413

Wyatt Field Service Company

RECORD OF TEST

CUSTOMER: LYONDELL Job No. 2472B

DESCRIPTION OF ITEM(S) TESTED: Floating Roof Deck

TYPE OF TEST: Vacuum Test

TESTED AT 5 P.S.I.

(4) ACCEPTED

( ) REJECTED

C. V. Clay
WYATT INSPECTOR OR SUPERVISOR

5-25-93
DATE

James Hunter L.P.C.
CUSTOMER INSPECTOR

5-25-93
DATE

FORM #413

Wyatt Field Service Company

RECORD OF TEST

CUSTOMER: LYONDELL Petrochemical Job No. 2472B

DESCRIPTION OF ITEM(S) TESTED: INNER & outer TANKS Item # 4455 AFTER WYATT Completed the MODIFICATIONS to the Existing 40'-0" x 32-0" High TANK.

TYPE OF TEST: * TANKS tested per API-650, 653, & WYATTS procedure ON DRAWING # W-92-2472B-2A

TESTED AT * P.S.I.

(✓) ACCEPTED

( ) REJECTED

Andy Searle
WYATT INSPECTOR OR SUPERVISOR

6/24/93
DATE

James C. Hewitt LPI
CUSTOMER INSPECTOR

6/24/93
DATE

FORM #413

WYATT FIELD SERVICE COMPANY

REPAD PNEUMATIC LEAK TESTS

JN: 2472B Customer: LYONDELL

Test Pressure: 15 PSI (15 PSI max. for API 650)

Nozzle #	Approved By	Date	Remarks
180	A.S. / J.H.	6/9/93	NO LEAKS
181	A.S. / J.H.	6/9/93	
37	A.S. / J.H.		
38	A.S. / J.H.		
51	A.S. / J.H.		
52	A.S. / J.H.		
17	A.S. / J.H.	6-11-93	NO LEAKS
31	A.S. / J.H.		
33	A.S. / J.H.		
35	A.S. / J.H.		

Form #463 Rev.0

REVO.DOC

REPORT OF ULTRASONIC THICKNESS [illegible]
OF STRUCTUAL STEEL

PROJECT: CAUSTIC SURGE TK.

AREA: OP 2

EQUIPMENT NO.: TK. 4455

DRAWING NO.: N/A

TYPE OF TEST EQUIPMENT:

READINGS		
NO.	READING	LOCATION
1	.497	TOP PLATE ASSEMBLY
2	.494	" " "
3	.492	" " "
4	.491	" " "
5	.495	" " "
6	.494	" " "
7	.492	" " "
8	.495	" " "
9	.995	GROUNB PLATE ASSEMBLIES BOLTED ON

INSPECTOR: James Huntley

CWI #91120901

REPORT OF ULTRASONIC THICKNESS [illegible]
OF STRUCTUAL STEEL

PROJECT: CAUSIC SURGE TANK

AREA: OP 2

EQUIPMENT NO.: TK 4455

DRAWING NO.: N/A

TYPE OF TEST EQUIPMENT: PANAMETRICS UT THICKNESS GAGE MODEL 26DL

READINGS		
NO.	READING	LOCATION
1	.260	VARIOUS LOCATIONS ROOF PANELS
2	.243	" " "
3	.247	" " "
4	.252	" " "
5	.265	" " "
6	.252	" " "
7	.252	" " "
8	.245	" " "
9	.250	" " "
10	.251	" " "
		* 0.250" Required

INSPECTOR: [signature]

CWI #91120901

REPORT OF ULTRASONIC THICKNESS [illegible]
OF STRUCTUAL STEEL

PROJECT: CAUSTIC SURGE TANK

AREA: OP 2

EQUIPMENT NO.: TK 4455

DRAWING NO.: N/A

TYPE OF TEST EQUIPMENT: PANAMETRICS UT THICKMESS GAGE MODEL 26DL

READINGS		
NO.	READING	LOCATION
1	.307	RADOM READINGS ROOF CHANNELS (WEB OF CHANNEL)
2	.307	" " "
3	.309	" " "
4	.308	" " "
5	.306	" " "
6	.304	" " "
7	.308	" " "
8	.309	" " "
9	.310	" " "
10	.308	" " "
		* 0.125" min. Required per North Star Drawing DR 2022, Sheet 3. Based on 3/4" nominal 6, 8.2 x 10.5 channel. Corr. CA = 0.057.

INSPECTOR: James Hendley

CWI #91120901

WYATT FIELD SERVICE COMPANY

MT REPORT

JN: 3472 B Customer: LYONDELL

Proc. #WQAS 209-5: Prod: _____ Yoke: ✓ A.C.: ✓ D.C.: _____

Seam # or Plate #	Mfgr. Stage	Defects*	Operator	Date
Nozz 9A	Completed Weld Inside / OUTSIDE	NONE	C.V.C / J.N.	5-6-93
Nozz 9B	Completed Weld Inside / OUTSIDE	None	C.V.C / J.H.	5-6-93
Nozz 9C	Completed Weld Inside / OUTSIDE	None	C.V.C / J.H.	5-6-93
Nozz 9D	Completed Weld Inside / OUTSIDE	None	L.D.M / J.H.	5-6-93
MANWAY 180	completed WELD	NONE	L.D.M / J.H.	5-6-93
Nozzle 45B			MLW JH	5-26-93
Nozzle 37				
Nozzle 38				
Nozzle 45A				
MANWAY 181	completed WELD	NONE	MLW J.H	6-1-93
51	"	None	A.S. J.H	6-9-93
52	"	None	A.S. J.H	6-9-93
17	Completed weld	None	A.S. J.H	6-11-93
31	" "	"	" J.H	"
33	" "	"	" J.H	"
35	" "	"	" J.H	"
[redacted]2	" "	"	A.S. JH	6/15/93
[redacted]3	" "	"	" JH	"
4	" "	"	" JH	"
5	" "	"	" JH	"
40	Completed welds	None	A.S. JH	6/15/93
45 CDEF	" "	"	A.S. JH	6/15/93
46	" "	None	A.S. JH	6/21/93

Attach Sketch of Defects if Necessary

WYATT FIELD SERVICE COMPANY

API 650: DIMENSIONAL INSPECTION

INNER TANK

J/N: 2472 B Customer: LTONDELL

	Tolerance	Actual	Inspector	Date
Circumference	NA			
Diameter 0-180	± 1"	34'-11" I.D.	A.S.	5/20/93
Diameter 45-225	"	34'-11 1/8"	A.S.	5/20/93
Diameter 90-270	"	34'-11 1/2"	A.S.	5/20/93
Diameter 135-315	"	34'-11"	A.S.	5/20/93
Plumbness 0	2 3/8"	1/2"	A.S.	6/21/93
Plumbness 90	"	3/4"	A.S.	6/21/93
Plumbness 180	"	1/2"	A.S.	6/21/93
Plumbness 270	"	7/8"	A.S.	6/21/93
Peaking	1/2" IN 36"	5/16"	A.S.	6/21/93
Banding	1/2 IN 36"	3/8"	A.S.	6/21/93

Form 650DIM

APPENDIX B

TESTING PROCEDURES

WQAS-209-5 MAGNETIC PARTICLE TESTING

WQAS-209-11 PENETRANT TESTING

CONTENTS

WQAS-209-5 MAGNETIC PARTICLE EXAMINATION OF WELDS AND SURFACES

PARAGRAPH

1. Scope
2. General
3. Responsibility
4. Qualifications
5. Equipment
6. Materials
7. Surface Preparation
8. Procedure
9. Evaluation of Indications
10. Acceptance Standards
11. Repair Requirements
12. Demagnetization
13. Reports

EXHIBIT

1. MT Report, Form #405

WQAS-209-5 MAGNETIC PARTICLE EXAMINATION OF WELDS AND SURFACES

1. Scope (Not For Use With ASME Section 1)

1.1 This procedure establishes the method and technique applicable to the dry powder magnetic particle examination of welds and surfaces. Either the prod technique or the yoke technique may be used. The prod technique shall be utilized, using direct or rectified magnetizing current and shall not be used after machining, final heat treatment, hydrostatic testing or when the areas of interest requiring magnetic particle examinations are impractical or inaccessible to prod application.

2. General

2.1 Magnetic particle examination is a method of nondestructive examination which provides for surface and limited subsurface detection of discontinuities in ferrous material. Requirements expressed in this magnetic particle procedure are intended to control the quality and reliability of the magnetic particle examination and the material being examined.

3. Responsibility

3.1 The Superintendent shall be responsible for assuring that MT procedures are readily available to all nondestructive examination personnel for reference and use. In addition, he shall assure that personnel are qualified to implement a procedure prior to making work assignments.

4. Qualifications

4.1 Personnel performing MT examinations will be certified as to their competency in the techniques of the MT examination method by the Q.A. Manager or the Inspector.

4.2 This procedure is certified to be in accordance with the requirements of Sec.VIII, Div. 1, Appendix 6; Sec. VIII, Div.2, Appendix 9; Sec.V, T-150 and the applicable parts of Sec.V, Article 7.

5. Equipment

5.1 Prod: Direct current (DC) obtained from DC generators or rectifiers shall be used to induce the magnetic flux field. In general, half-wave direct current shall be utilized as a magnetic field source due to the function of pulsation and powder mobility response. If rectified current is not half-wave, it must be three phase, full-wave rectified.

5.1.1 Note: For DC prod application, the open circuit voltage of the magnetizing equipment shall not exceed 25 volts.

5.2 Yokes: Fixed or articulated leg type Portable Electromagnetic (AC-DC) Yokes may be used as a magnetizing apparatus. Yokes shall have a lifting power of at least 10 lbs. at the maximum pole spacing that will be used for the alternating current electromagnetic yoke and a lifting power of at least 40 lbs. for the direct current electromagnetic yoke. Yokes shall be checked at least once a year in accordance with ASME Sec. V, T-746.3.

5.2.1 Note: Except for materials 1/4 inch or less in thickness, alternating current yokes are superior to direct current magnetic yokes of equal lifting power for the detection of surface discontinuities.

5.3 Magnetic Particle Application and Removal Equipment Magnetic particles shall be applied by mechanical shakers, bulb blowers or mechanical blowers. A commercial powder blower manufactured by Magnaflux Corporation or equivalent is considered an acceptable means of removing excess magnetic particles.

5.4 Lighting: The testing area shall be adequately illuminated for proper evaluation of the indications revealed on the examined surface.

5.5 Magnetizing equipment with an ammeter must be calibrated at least once a year in accordance with ASME Sec. V, T-731.

6. Materials

6.1 Magnetic Particles: The magnetic particles shall be those manufactured by Magnaflux Corporation or equivalent. Red, black or gray may be used as needed to provide contrast, however, red is universal and is acceptable for most surfaces.

7. Surface Preparation

7.1 The surface to be examined may be in the as welded condition; however, surface preparation by grinding or machining may be necessary where surface irregularities could mask indications.

7.2 Prior to magnetic particle examination, the surface to be examined and all areas within 1" of the surface to be examined shall be dry and free of all dirt, grease, lint, scale, welding flux and spatter, or other extraneous matter that could interfere with the examination.

7.3 Cleaning may be accomplished by sand or grit blasting, wire brushing, grinding or machining.

7.4 Back chipped welds shall be sufficiently ground to prevent nonrelevant indications. Root passes or subsequent layers of welds may be examined in the as welded condition provided there is no interfering rollover or undercutting.

8. Procedure

8.1 Pre-Examination: Prior to magnetic particle examination, the surface shall be examined to determine its compliance to paragraph 7. All unacceptable conditions must be corrected prior to magnetic particle examination. The temperature of the material to be examined shall not exceed 600 F.

8.2.1 Magnetizing Technique (Prods): Magnetize the area to be inspected by means of contact prods. Care shall be taken to prevent local over heating, arcing, or burning of the surface being inspected. To avoid these conditions, place the prods on the material to be examined before applying the current and turn off the current before the prods are removed.

8.2.2 Magnetizing Current: Direct or rectified magnetizing current shall be used at a minimum of 100 and a maximum of 125 AMP/In. of prod spacing for sections 3/4 inch thick or greater. For sections less than 3/4 inch thick, amperage shall be 90 to 110 AMP/In. of prod spacing.

8.2.3 Prod Spacing: Prod spacing shall be a maximum of 8 inches. Shorter spacing may be used to meet the geometric limitations of dimensions at the area being examined, or to increase the sensitivity; but prod spacing less than 3 inches is not usually feasible du to banding of the particles around the prods. The prod tips shall be kept clean and dressed and the contact areas of the test surface free from dirt, scale, oil etc. to minimize electrical arcing.

8.3.1 Magnetizing Technique (Yoke Method): Magnetization shall be accomplished by a Portable Electromagnetic Yoke provided with an on-off switch for convenience in applying and removing the yoke from the material. Direct or alternating current may be used subject to code or customer specifications.

8.3.2 Pole Spacing: Pole spacing shall be limited to 3 to 8 inches when using a fixed current device in order to comply with the yoke qualification specified in SA-275.

8.4 Direction of Magnetization: At least two separate examinations shall be performed on each area, with the prods placed so the lines of flux in one examination are approximately perpendicular to the lines of flux in the other.

8.5 Examination Coverage: Examinations shall be conducted with sufficient overlap to assure 100% coverage.

8.6 Application of Magnetic Particles: Magnetic particles shall be applied in such a manner that a light, dust-like coating settles upon the metal surface under examination. The magnetic field induction shall be in process during the application.

8.7 Removal of Magnetic Particles: The excess Ferro-magnetic Particles shall be removed by means of dry air current of sufficient force to remove excess particles without disturbing those particles which are indicative of discontinuities. This removal may be accomplished by bulb blowers or air of an approx-imately equal pressure. The magnetizing current shall remain on while the magnetic particles are being applied and while the excess particles are being removed.

8.7 Examination and Evaluation: Each area shall be examined immediately upon removal of excess particles and prior to application of the magnetic field in another direction or location. Indications will appear as collections of magnetic particles which cannot be removed by a properly directed air current.

9. Evaluation of Indications

9.1 Indications are the retention of magnetic particles. All such indications are not necessarily imperfections since excessive surface roughness and magnetic permeability variations, such as the edge of heat affected zones, etc., may produce similar indications.

9.2 Only indications which have a dimension greater than 1/16 inch shall be considered relevent. Any questionable or doubtful indications shall be re-examined to determine if they are relevant.

9.3 Any indication which is believed to be nonrelevant shall be regarded as an imperfection unless it is shown by reexamination and/or by surface conditioning that no unacceptable imperfection is present.

10. Acceptance Standards

10.1 Base Materials

Unless specified otherwise, all linear discontinuities, having length not parallel to the material surface, shall be removed. Discontinuities parallel to the surface, such as inclusions, shall be evaluated in accordance with the applicable Code and material specification.

10.2 Welds

Acceptance standards for welds shall be as specified in the code.

11. Repair Requirements

11.1 Unacceptable imperfections shall be removed and reexamination made to assure complete removal. Whenever an imperfection is removed and subsequent repair by welding is not required, the excavated area shall be blended into the surrounding surface so as to avoid sharp notches, crevices, or corners. Where welding is required after removal of an imperfection, the area shall be cleaned and welding performed in accordance with a qualified welding procedure.

11.2 Reexamination of Repaired Areas

After repairs have been made, the repaired area shall be blended into the surrounding surface so as to avoid sharp notches, crevices, or corners and reexamined by the magnetic particle method and by all other methods of examination that were originally required for the affected area, except that, when the depth of repair is less than the radiographic sensitivity required, reradiography may be omitted.

12. Demagnetization: Demagnetization is not normally required.

13. Reports

13.1 Examination results shall be reported on Form #405 (see exhibit 1).

11.2 Reexamination of Repaired Areas

After repairs have been made, the repaired area shall be blended into the surrounding surface so as to avoid sharp notches, crevices, or corners and reexamined by the magnetic particle method and by all other methods of examination that were originally required for the affected area, except that, when the depth of repair is less than the radiographic sensitivity required, reradiography may be omitted.

12. Demagnetization: Demagnetization is not normally required.

13. Reports

13.1 Examination results shall be reported on Form #405 (see exhibit 1).

MT REPORT

JN:_____ Customer:_____

Proc. #WQAS 209-5; Prod:_____ Yoke:_____ A.C.:_____ D.C.:_____

Seam # or Plate #	Mfgr. Stage	Defects*	Operator	Date

*Attach Sketch of Defects if Necessary

Form #405, Rev. 1

Exhibit 1

TO: MANAGER - QUALITY ASSURANCE

SUBJECT: CERTIFICATION OF N.D.E. PERSONNEL

THIS IS TO CERTIFY THAT ON 8/20/92 (DATE), W.C. Baker (NAME) (S.S.# 450-15-7285) WAS CERTIFIED AS A MT & PT (TYPE OF NDE) EXAMINER IN ACCORDANCE WITH ASME SECTION VIII DIVISION I. SECTION V. AS APPLICABLE. AND COMPANY PROCEDURES. I PERSONALLY OBSERVED THE PRACTICAL EXAMINATION FOR THE MT & PT (TYPE OF NDE) EXAMINER CLASSIFICATION AND PERFORMED THE CODE REQUIRED VISION TESTING.

VISION TEST EXPIRES: 8/20/93 (DATE).

Andy Searle
INSPECTOR

RE-EXAMINATION: VISION

DATE						
BY						
EXPIRES						

DATE						
BY						
EXPIRES						

FORM #844-1

TO: MANAGER - QUALITY ASSURANCE

SUBJECT: CERTIFICATION OF N.D.E. PERSONNEL

THIS IS TO CERTIFY THAT ON 1/8/92 (Date) C. Chapman (Name)

(S.S. # 458-90-0330) WAS CERTIFIED AS A MT, PT, & WMT (Type of NDE) EXAMINER IN ACCORDANCE WITH ASME SECTION VIII DIVISION I, SECTION V, AS APPLICABLE AND COMPANY PROCEDURES. I PERSONALLY OBSERVED THE PRACTICAL EXAMINATION FOR THE MT, PT, & WMT (Type of NDE) EXAMINER CLASSIFICATION AND PERFORMED THE CODE REQUIRED VISION TESTING.

VISION TEST EXPIRES: 1/8/93 (Date)

Andy Searle
INSPECTOR

Re-examination: Vision

Date	1-6-93								
By	A.S.								
Expires	1-6-94								

Date									
By									
Expires									

Form 844-1, Rev. 1

TO: MANAGER - QUALITY ASSURANCE

SUBJECT: CERTIFICATION OF N.D.E. PERSONNEL

THIS IS TO CERTIFY THAT ON 5/9/92 (DATE), Bruce Hendrix (NAME) (S.S.# 527-19-3357) WAS CERTIFIED AS A MT & PT (TYPE OF NDE) EXAMINER IN ACCORDANCE WITH ASME SECTION VIII DIVISION I. SECTION V. AS APPLICABLE. AND COMPANY PROCEDURES. I PERSONALLY OBSERVED THE PRACTICAL EXAMINATION FOR THE MT & PT (TYPE OF NDE) EXAMINER CLASSIFICATION AND PERFORMED THE CODE REQUIRED VISION TESTING.

VISION TEST EXPIRES: 5/9/93 (DATE).

Andy Searle
INSPECTOR

RE-EXAMINATION: VISION

DATE						
BY						
EXPIRES						

DATE						
BY						
EXPIRES						

FORM #844-1

MANAGER - [illegible] LITY ASSURANCE

SUBJECT: CERTIFICATION OF N.D.E. PERSONNEL

THIS IS TO CERTIFY THAT ON 8/20/92 (DATE), L.D. McClure (NAME), S.S.# 233-74-7030, WAS CERTIFIED AS A MT & PT (TYPE OF NDE) EXAMINER IN ACCORDANCE WITH ASME SECTION VIII DIVISION I. SECTION V. AS APPLICABLE. AND COMPANY PROCEDURES. I PERSONALLY OBSERVED THE PRACTICAL EXAMINATION FOR THE MT & PT (TYPE OF NDE) EXAMINER CLASSIFICATION AND PERFORMED THE CODE REQUIRED VISION TESTING.

VISION TEST EXPIRES: 8/20/93 (DATE).

Andy Soto
INSPECTOR

-EXAMINATION: VISION

PIRES						

E						
RES						

FORM #844-1

MANAGER - QUALITY ASSURANCE

BJECT: CERTIFICATION OF N.D.E. PERSONNEL

IS TO CERTIFY THAT ON 3/2/93 (DATE), Carl Turpin (NAME), 457-13-6325) WAS CERTIFIED AS A MT & PT (TYPE OF NDE)

MINER IN ACCORDANCE WITH ASME SECTION VIII DIVISION I. SECTION V.

APPLICABLE. AND COMPANY PROCEDURES. I PERSONALLY OBSERVED THE

TICAL EXAMINATION FOR THE MT & PT (TYPE OF NDE) EXAMINER

SIFICATION AND PERFORMED THE CODE REQUIRED VISION TESTING.

ON TEST EXPIRES: 3/2/94 (DATE).

Andy Searle
INSPECTOR

MINATION: VISION

FORM #844-1

TO: MANAGER - QUALITY ASSURANCE

SUBJECT: CERTIFICATION OF N.D.E. PERSONNEL

THIS IS TO CERTIFY THAT ON 3/2/93 (DATE), Carl Turpin (NAME)

(S.S.# 457-13-6325) WAS CERTIFIED AS A MT & PT (TYPE OF NDE)

EXAMINER IN ACCORDANCE WITH ASME SECTION VIII DIVISION I. SECTION V, AS APPLICABLE, AND COMPANY PROCEDURES. I PERSONALLY OBSERVED THE PRACTICAL EXAMINATION FOR THE MT & PT (TYPE OF NDE) EXAMINER CLASSIFICATION AND PERFORMED THE CODE REQUIRED VISION TESTING.

VISION TEST EXPIRES: 3/2/94 (DATE).

Andy Soule
INSPECTOR

RE-EXAMINATION: VISION

DATE						
BY						
EXPIRES						

DATE						
BY						
EXPIRES						

FORM #844-1

							C.V.C	5-3-93
							C.V.C.	5-3-93
							C.V.C.	5-3-93
							C.V.C.	5-3-93
							C.V.C.	5-3-93
							FG.1 C.V.C.	5-10-93
							FG.1 C.V.C	5-10-93
				5/16			FG.2&3 C.V.C.	5-12-93
				5/16			FG.2&3 C.V.C	5-12-93
				5/16			FG.2&3 C.V.C.	5-12-93
				5/16			FG.4 C.V.C.	5-25-93
				5/16			FG.4 C.V.C.	5-25-93
				1/4			FG.4 C.V.C.	5-25-93
				1/4			FG.3 C.V.C.	5-25-93
				1/4			FG.5 C.V.C.	5-25-93
				1/4			CUT FG.5 C.V.C.	6-1-93
				1/4			CUT FG5 C.V.C.	6-1-93

FINAL APPROVAL Andy Searle DATE 6/21/93

REDCHECKLST

							C.V.C.	6-1-93
							C.V.C.	5-18-93
							C.V.C.	5-18-93
							C.V.C.	5-18-93
							C.V.C.	5-18-93
							C.V.C.	5-18-93
							C,V,C	5-25-93
							C.V.C.	5-25-93
							C.V.C.	5-25-93
							C.V.C.	5-25-93
							C.V.C.	5-25-93
							C.V.C.	5-25-93
							C.V.C.	5-25-93
							C.V.C	5-10-93
							C.V.C	5-10-93

FECO-EOLST

FINAL APPROVE Andy Lodge DATE 6/24/93

PAGE 3 - 5

							C.V.C.	5-10-93
							C.V.C.	5-10-93
							C.V.C.	5-10-93
							C.V.C.	5-25-93
							C.V.C.	5-25-93
							C.V.C.	5-10-93
							C.V.C.	5-10-93
							C.V.C.	5-10-93
							C.V.C.	5-25-93
							C.V.C.	5-10-93
							C.V.C.	5-10-93
							C.V.C.	5-10-93
							C.V.C.	5-10-93
							C.V.C.	5-10-93
							C.V.C.	5-10-93

FINAL APPROVAL Andy Searle DATE 6/21/93

RECHECLST

							C.U.C.	5-4-93
							C.U.C.	5-10-93
						LEFT	C.U.C.	5-10-93
						RIGHT	C.U.C.	5-10-93
		BAG		1/4	STDCI		C.U.C	5-10-93
		BAG		1/4	STDCI		C.U.C	5-10-93
	113	BAG	7417703	1/4	STDCI		C.U.C.	5-10-93
				3/4"	STDCI		C.U.C	5-3-93
				1/8			C.U.C.	5-3-93
	138	156-70		3/8			C.U.C.	5-3-93
	141	156-70		3/4			C.U.C	5-10-93
	142	516-70		1/4			C.U.C.	5-10-93
	143	BAG		3/8	STDCI		C.U.C.	5-10-93
	150			3/8"			C.U.C	5-10-93
	153	BAG		1/4			C.U.C.	5-10-93
	170	BAG		3/8			C.U.C.	5-25-93

FINAL APPROVAL Andy Seeds DATE 6/21/93 RECCHELIST

							C.V.C.	5-25-93
							C.V.C.	5-7-93
							C.V.C.	5-7-93
							C.V.C.	5-3-93
							C.V.C.	5-18-93
							C.V.C.	5-18-93
							C.V.C.	5-18-93
							C.V.C.	5-18-93
							C.V.C.	5-25-93
							C.V.C.	5-25-93
							C.V.C.	5-25-93
							C.V.C.	5-25-93
							C.V.C. 5-25-93	5-25-93

FINAL APPROVAL Andy Seale DATE 6/21/93

FECCHECLST

ÄELC JUND

INSPECTION CERTIFICATE

DATE : 1991-10-22 51670 -10041
NO : 32255-009 PAGE : 2(2

CHEMICAL COMPOSITION

OBTAINED LADLE ANALYSIS (%):

HEAT NO.	C	SI	MN	P	S	CR	NI	MO	V	TI	CU	AL	NB	B	N
583121	.21	.31	1.13	.009	.004	.02	.03	.012	.004		.01		.002		
583131	.22	.28	1.17	.012	.004	.02	.03	.007	.003		.01		.002		
583141	.20	.30	1.14	.008	.004	.01	.03	.005	.007		.01		.002		

MECHANICAL TESTING

TEST RESULTS:

TENSILE TEST

HEAT	PLATE	MILL CODE	THICKNESS	TREATMENT:0	SPECIMEN POS.	SPECIMEN TYPE	REH (KSI)	RM (KSI)	ELONG. AX	ELONG. (%)
583121	04-0	779759	15.9		4	1	54	83	A200	27
583121	61-6	779874	12.7		4	1	54	83	A200	24
583131	12-0	779928	12.7		4	1	55	81	A200	25
583131	60-2	793172	14.3		4	1	54	81	A200	26
583131	60-4	785794	14.3		4	1	54	80	A200	24
583141	60-4	793309	14.3		4	1	53	81	A200	24
583141	61-0	793325	14.3		4	1	52	79	A200	26
583141	61-2	785980	14.3		4	1	52	79	A200	26
583141	60-8	785893	14.3		4	1	54	79	A200	28
583141	60-6	785950	14.3		4	1	53	79	A200	26

TEST RESULTS:

MCQUAID-EHN TEST

HEAT	PLATE	MILL CODE	THICKNESS	TREATMENT:0	TEST POSITION	GRAIN SIZE (ASTM E112)
3121		775739	22.2		9	10
3131		779887	7.9		9	10
3141		759523	22.2		9	10

TREATMENT : 0=DELIVERY CONDITION
SPECIMEN POSITION: 4=TOP TRANSV., 9=TOP
SPECIMEN TYPE : 1: RECTANGULAR

RECEIVED
DATE 1-23-92
P.O. # W53326
JOB # 2326

Oxelösund AB
000
01 OXELÖSUND

Telephone
Nat 0155-540 00
Int +46 155 540 00

Telex
60950
oxab s

Telefax
Nat 0155-540 73
Int +46 155 540 73

Bank
Skandinaviska Enskilda Banken
STOCKHOLM

Bankgiro
897-8468

Postgiro
37 78 44-2

Org nr
86-000313-7833

Please effect payment through
Skandinaviska Enskilda Banken
STOCKHOLM
SWIFT-address ESSESESS

SWEPCO TUBE CORPORATION

ONE CLIFTON BOULEVARD • P.O. BOX 1899 • CLIFTON, NEW JERSEY 07015

A1-58795

Swepco®

42-1231

TEST REPORT

SWEPCO NUMBER	DISTRIBUTION NUMBER	SOLD TO	DATE
K101098	ATL 1-58795	014597 TUBESALES	01/13/92

DESCRIPTION: SWEPCO WELDED PIPE T316/T316L. ANNEALED AND PICKLED. MFD. PER ASTM A312-89A AND ASME SA312-A90 ADDENDA. CORROSION TESTED PER MIL-P-#46917J

B900

QUANTITY	SIZE	ALLOY	HEAT NUMBERS
42 FT 2 PCS	10" SCH 40S 10.750X.365 MARK	316L	21550

HEAT NUMBER	C	MN	P	S	SI	CR	NI	MO	CO	N	CU		YIELD PSI	TENSILE PSI	% ELONG IN 4 INCHES	HARDNESS
21550	.025	1.590	.031	.012	.55	17.01	10.36	2.100	#N.05-CU.41			*	51260	91550	47.5	HRB87

TRANSVERSE TENSION TESTS SATISFACTORY
TRANSVERSE-GUIDED FACE BEND TEST SATISFACTORY
HYDRO TESTED AT 1100 PSI MIN SATISFACTORY

TEST REPORTS
JAN 16 1992
ACCEPTABLE

RECEIVED
DATE 3-11-96
P.O. # W57777
JOB # 2496

THESE TEST REPORTS APPLY TO
LINE ITEM
PURCHASE ORDER
NO.

W57777 JOB 2494
8079968
21550
0-3-½"
D. Millan

This certification affirms that above CMTR is correct and accurate including all test results and operations in compliance with the material specification and customer requirements.

Sworn to and subscribed to before me this 13 day of Jan. 1992

ENEVA STEEL

Test Report

CONTRACT NO.	P.O. DATE	PURCHASE ORDER NO.
		60-8244/W56200

SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.
GP62420A 11-23-92	EA53570	GP62420A

VEHICLE IDENTIFICATION: SSWB7777

ENEVA STEEL
.O. BOX 2500
ROVO, UTAH 84603

ANNESMANN PIPE&STEEL CORP
990 POST OAK BLVD
OUSTON TX 77056-3811

SHIP TO:
WYATT FIELD SERVICE COMPANY
GREENSPORT INDUSTRIAL PARK
13609 INDUSTRIAL ROAD
HOUSTON, TEXAS 77015
C012

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

Larry D. Clinger
MANAGER - QUALITY ASSURANCE
DATE 03FEB93

RECEIVED
MAR 23 '93 11:32AM MANNESMANN PIPE 713 960 0428

ATE ASTM A36-91 AND ASME SA36-1989 EDITION 1990 ADDENDA
ILLED FINE GRAIN LONGITUDINAL CHARPY V NOTCH IMPACT TEST
5/12FT/LBS AT PLUS 10 DEG F FREQUENCY

MILL CERTIFIED T/R

DATE 12-30-92
P.O. # W56200
JOB # 5206-5222

MATERIAL DESCRIPTION: THICKNESS OR SECTION	WIDTH DIA. OR FT. WT.	LENGTH	QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	YIELD PT. KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED. OF AREA	BEN
.3750"	96.0000"	368.0000"	2	75140	2C8070	.3750"	45.6	67.3	27.0			
SIZE LONG CHARPY V-NOTCH IMPACT TESTS 7.5X10MM TESTED AT +10 DEG F 47 55 53 FOOT LBS												
AVERAGE IMPACT STRENGTH 51 FT LBS ACTUAL GAGE TESTED .3750												
.3125"	96.6250"	321.6875"	1	28124	2C8070	.3125"	47.5	68.8	28.9			
SIZE LONG CHARPY V-NOTCH IMPACT TESTS 6.6X10MM TESTED AT +10 DEG F 64 63 82 FOOT LBS												
AVERAGE IMPACT STRENGTH 69 FT LBS ACTUAL GAGE TESTED .3125												
.3125"	96.0000"	321.6875"	1	27374	1C2664	.3125"	47.5	68.5	25.0			
SIZE LONG CHARPY V-NOTCH IMPACT TESTS 6.6X10MM TESTED AT +10 DEG F 72 71 71 FOOT LBS												
AVERAGE IMPACT STRENGTH 71 FT LBS ACTUAL GAGE TESTED .3125												
.3125"	96.0000"	321.6875"	2	54744	2C8070	.3125"	47.4	69.4	27.0			
SIZE LONG CHARPY V-NOTCH IMPACT TESTS 6.6X10MM TESTED AT +10 DEG F 80 68 62 FOOT LBS												
AVERAGE IMPACT STRENGTH 70 FT LBS ACTUAL GAGE TESTED .3125												

O.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO	
70	HEAT	16	83	010	016	23													FINE GRAIN PRACT
64	HEAT	16	94	010	025	22													FINE GRAIN PRACT

EVA STEEL COMPANY CERTIFIES ALL SMELTING, MELTING AND MANUFACTURING PROCESSES OCCURRED IN THE USA.

NO OF DATA***

32-E710-01

Gulf States Steel, Inc.

GADSDEN, AL 35904-1626

CERTIFICATE OF TESTS

SALES ORDER NO.			PURCHASE ORDER DATE
27892	01	742	12 10 92

RELEASE ORDER NO.: 1412

SHIPPED FROM: ALA CITY

ACCOUNT NUMBER: 63240202

PAGE NO.:

INVOICE NUMBER: 742-61173

DATE SHIPPED: 01 20 93

ROUTE/VEHICLE IDENTIFICATION: BILLS TRK

WE HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED ON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS.

E. F. BEARDEN, JR.
MGR. TECHNOLOGY AND QUALITY - PLATE PRODUCTS

RVERSON CENTRAL, JOSEPH T
ERCHANDISING SERVICES
O BOX 8000

HICAGO IL 60680

RVERSON CENTRAL, JOSEPH T
1211 KREBS STREET

HOUSTON TX 77020

ERIAL DESCRIPTION

LATE CARBON J T RVERSON SPEC 3449-P DTD 04/25/91 ASTM A-516-90 GRB 70 ASME-SA 516 GR 70 1989 EDITION 1991 ADDENDA PUR BLUE & PINK DOMESTIC STEEL ONLY
DST ID:L343786
3630008

QUANTITY SHIPPED: 12068

2500 X 96.0000 SHEARED EDGE X 480.0000 IN
1630008
7410587 T 1468 1 PCS
7410587 T 1469 1 PCS
7410587 T 1470 1 PCS
7410587 T 1471 1 PCS

M C 27RX MN 85/1.20 P 025MX S 025MX SI 15/40 AL 020MIN CU 40MX NI 40MX
CR 30MX MO 12MX CB 02MX V 03MX

R YLD 36000 MIN TEN 70/90000 X ELONG MIN 2 IN 21 GR B IN 17

RECEIVED

DATE 2-25-93

P.O. # W5776

2472

MOBIS 8808

HEAT	GRADE	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Cb	V	Al	N	B	Ca	Ti
1557		.20	1.06	.010	.017	.220	0.03	0.01	0.03	.02	.002	.000	.027				

HEAT	TEST OR PIECE IDENTITY NO.	YIELD KSI	TENSILE KSI	% ELONG 2"	% ELONG 8"	HARDNESS	BEND TEST	HEAT TREAT	YS/TS RATIO	% REQ. AREA	GALV COATING	DROP WEIGHT TEAR TESTS DIR	TEMP °F	1	2	AVG
1557	1468	59	78		24											
	1469	61	79		22											
	1470	63	77		22											
	1471	60	79		24											

HEAT	TEST OR PIECE IDENTITY NO.	HEAT TREAT	SIZE	DIR	TEMP °F	ENERGY 1	2	3	AVG	% SHEAR 1	2	3	AVG	MIN LATERAL EXPANSION 1	2	3	AVG

1. (T...STRUCTURAL

Gulf States Steel, Inc.

GADSDEN, AL 35904-1636

CERTIFICATE OF TESTS

[illegible] 01 542	PURCHASE ORDER DATE 12 10 92	ACCOUNT NUMBER 65240202	PAGE NO.	DIVISION NUMBER 742-611
[illegible]12	SHIPPED FROM ALB CITY	DATE SHIPPED 01 20 93	ROUTE/VEHICLE IDENTIFICATION STILES TRK

HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED ON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS.

C. F. BEARDEN, JR.
MGR. TECHNOLOGY AND QUALITY - PLATE PRODUCTS

SOLD TO

RVERSON CENTRAL, JOSEPH T
RCHANDISING SERVICES
O BOX 8000
ICAGO IL 60680

SHIP TO

RVERSON CENTRAL, JOSEPH T
1211 KRESS STREET
HOUSTON TX 77020

FILE C

MATERIAL DESCRIPTION

1" S TR WITHIN 24 HRS OF SHIPMENT TO SA 1 TR PO BOX 2606
HOUSTON TX 77252-2606

QUANTITY SHIPPED

RECEIVED
DATE 2-25-93
P.O. # W57706
JOB # 2472

TOTAL WT. 13,0658 PCS 1

HEAT	BRAND	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Cb	V	Al	N	B	Ca	Ti

TEST OR PIECE IDENTITY NO.	YIELD KSI	TENSILE KSI	% ELONG 2"	% ELONG 8"	HARDNESS	BEND TEST	HEAT TREAT	YS/TS RATIO	% RED AREA	GALV COATING	DROP WEIGHT TEAR TESTS DIR	TEMP °F	1	2	AVG

TEST OR PIECE IDENTITY NO.	HEAT TREAT	SIZE	DIR	TEMP °F	ENERGY 1	2	3	AVG	% SHEAR 1	2	3	AVG	MILS LATERAL EXPANSION 1	2	3	AVG

O JOB CONTRA

METALLURGICAL TEST REPORT

,0746

VENDOR
FAIRFIELD WORKS
P.O. BOX 599
FAIRFIELD, ALABAMA 35064

SOLD TO
DIXIE PIPE SALES INC
PO BOX 300650
HOUSTON TX 77230-0650

PO DATE	PURCHASE ORDER NO.
	4174-USS
SHIPPERS NO	MILL ORDER NO / INVOICE NO
P17040.	DS85090 / 488-041068
BN589580	11/11/92

MAIL TO
DIXIE PIPE SALES INC
C/O HOUSTON BELT & TERMINAL
ZONE 13 TRACK 93100
HOUSTON TX

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

PREPARED BY THE OFFICE OF:
M.R. STEIN MGR. Q.A.

DATE NOVEMBER 16, 1992

SPEC
SP PIPE CARBON SMLS STD PIPE API 5L-*39TH EDITION DTD 6/1/91 GRADE B ASTM A53-*90B GRADE B ASTM A106-*1991 GRADE B/C BLK REG MILL COAT PE BEV 30 DEG
INSP:01 MILL ALSO CERTIFY TO ASME

B918

Mill Test Reports furnished by
DIXIE PIPE SALES, INC.
Apply to your Order No. W57593

ITEM NO	MATERIAL DESCRIPTION: SIZE	WALL	SPECIFICATION & GRADE	MATL	HEAT / LOT NO	MIN HYDRO PSI	YIELD STR PSI	TENSILE STR PSI	ELONG % IN 2"	GAGE WIDTH IN	FLAT	HEAT TREAT
3	4.5000	0.5310	ROCKWELL B = 80.2	SMLS	X46547	7,100 05SEC	48,700 AS ROLLED TENSILE.	76,800	41.6	1.5	01	

YIELD STRENGTH @ .005 EXT.
LONGITUDINAL STRIP TENSILE SPECIMENS USED UNLESS NOTED OTHERWISE.
ALSO MEETS THE REQUIREMENTS OF ASME SA53 1989 EDITION, 1991 ADDENDA, & SA106 1989 EDITION, 1991 ADDENDA.

HOT FINISHED -- NO HEAT TREATMENT

RECEIVED
DATE 2-10-93
P.O. # W57593
JOB # 2477

ALL MELTING AND MANUFACTURING TOOK PLACE IN THE U.S.A.

ITEM NO	HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
	X46547	HEAT	25	94	010	007	22	01	01	02	00				00				
		PROD	24	95	011	008	23	01	01	02	00				00				
		END OF DATA																	

148 410031001 FBC05829. 2338310.

OXELÖSUND

0701-410-015

INSPECTION CERTIFICATE

Star Skoga Nozzle A/1

DATE : 1991-10-22 51670 -10041
NO : 30255-009 PAGE : 1(2

PURCHASER ORDER NO:
OT AA

DESIGNEE:
THYSSEN STEEL GROUP
200 RENAISSANCE CENTER
SUITE 1700
DETROIT, MICHIGAN 48243
SA

ORDER DATE: OUR ORDER NO:
1991-07-22 65121-00-193

PURCHASER:
THYSSEN STEEL GROUP

B970

PRODUCT:
PRESSURE VESSEL STEEL PLATE

STANDARD/RULES STEEL GRADE:
ASME-ASTM SA 516-70

MARKING (STAMPING):
STEEL GRADE
TRADE MARK HEAT NO. PLATE NO.

1/16 x 120 x 480

MILL SHEET

ITEM MARKS-NO.	DIMENSIONS T	W	L	NO.	WEIGHT (KG)	MARKS	DELIV. COND.	STEEL PROC.	HEAT NO.	PLATE NO.	NOTES
005	42523-005	1/2	X120X480	2	7410	LOT AA		BOF	593121	61-6	
005	42523-005	1/2	X120X480	2	7410	LOT AA		BOF	583131	12-0	
006	42523-006	9/16	X120X480	1	4169	LOT AA		BOF	583131	60-2	
006	42523-006	9/16	X120X480	1	4169	LOT AA		BOF	583131	60-4	
006	42523-006	9/16	X120X480	1	4169	LOT AA		BOF	583141	60-4	
006	42523-006	9/16	X120X480	1	4169	LOT AA		BOF	583141	60-6	
006	42523-006	9/16	X120X480	1	4169	LOT AA		BOF	583141	60-8	
006	42523-006	9/16	X120X480	1	4169	LOT AA		BOF	583141	61-0	
006	42523-006	9/16	X120X480	1	4169	LOT AA		BOF	583141	61-2	
007	42523-007	5/9	X120X480	1	4631	LOT AA		BOF	583121	04-0	
				12	46634						

REQUIREMENTS IN ACCORDANCE TO THE ORDER AND ASME SA20 ARE FULFILLED.
DIMENSION AND SURFACE INSPECTION IS CARRIED OUT WITHOUT OBJECTIONS
MATERIAL IS PRODUCED TO FINE GRAIN PRACTICE.

IS HEREBY CERTIFIED THAT THE ABOVE
CRIBED MATERIAL IS TESTED WITH
ISFACTORY RESULTS IN ACCORDANCE
H THE REQUIREMENTS OF THE ORDER.

QUALITY INSPECTION
Lars Lagerkranz
JOSEFSSON/LAGERKRANZ
SUNDELL / IVARSSON

RECEIVED
DATE 1-23-92
P.O. # W53326
JOB # 2326

Telephone
Nat 0155-540 00
Int +46 155 540 00
Telex 60990 stabs s
Telefax
Nat 0155-540 73
Int +46 155 540 73
Bank
Skandinaviska Enskilda Banken
STOCKHOLM
Bankgiro 887-6466
Postgiro 37 75 44-2
Org nr 04-556313-7933
Please effect payment through
Skandinaviska Enskilda Banken
STOCKHOLM
SWIFT-address

OREGON STEEL MILLS

B890

P.O. Box 2760, Portland, Oregon 97208 · (503) 286-9651 TWX 910 464 1549

REPORT OF CHEMICAL/PHYSIC

CERTIFICATE NO	DATE
152051	DEC 30, 1991

MILL ORDER NO.	DATE
PH-15735-02	11/08

CUSTOMER ORDER NO.
0701-410-033

JOB/REQ. NO.

SHIPPING NO.	DATE
P152051	12/30

CARRIER
UP

CAR/TRUCK NO.
UP259591

SOLD TO:
54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

1

S MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSH CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

B890

PHYSICAL PROPERTIES

ITEM	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG	% RA	HARDNESS BHN	BEND TEST	IMPACTS
	** CONTINUED FROM PREVIOUS PAGE **									
	5/16 X 96 X 480									
		VC0023	A69	570	795	23				
		VC0023	A70	575	790	22				
		VC0023	B66	560	790	26				
		VC0023	B67	550	785	23				
		VC0023	B68	555	790	25				
		VC0023	B71	555	790	25				
		VC0023	B73	575	810	24				
		VC0023	B74	575	800	22				
		VC0044	A22	555	785	24				
		VC0046	A32	575	810	22				
		VC0046	A33	590	820	22				
		VC0046	A34	590	820	23				

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Cb	Al	Cr	Mo	Sn	B	N	Ca	CE	Pcm
VC0044	.19	1.07	.024	.009	.21	.01	.02	<.02	<.002	.033	.02	.01						
VC0046	.21	1.06	.025	.008	.20	.01	.02	<.02	<.002	.046	.02	.01						

RECEIVED
DATE 1-18-93
P.O. # 45684
JOB # 2972

Certified a true copy o
original, retain in ou
AMERICAN ALLOY STE

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

We the above results to be correct as contained in the records of OREGON STEEL MILLS By Angie McCasland TEST REP
CLER

STORAGE PROC

713 676 1233

'93 01/15 15:10

OREGON STEEL MILLS

PO Box 2760, Portland, Oregon 97208 · (503) 286-9651 TWX 910 464 1549

B890

REPORT OF CHEMICAL/PHYSIC

CERTIFICATE NO	DATE
152051	DEC 30, 199
MILL ORDER NO.	DATE
PH-15735-02	11/08
CUSTOMER ORDER NO.	
0701-410-033	
JOB/REQ. NO.	
SHIPPING NO.	DATE
F152051	12/30
CARRIER	
UP	
CAR/TRUCK NO.	
UP259591	

S4232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

1

S MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

B890

PHYSICAL PROPERTIES

DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8" 2"	% RA	HARDNESS BHN	BEND TEST	IMPACTS
** CONTINUED FROM PREVIOUS PAGE **									
5/16 X 96 X 480									
	VC0023	A69	570	795	23				
	VC0023	A70	575	790	22				
	VC0023	B66	560	790	26				
	VC0023	B67	550	785	23				
	VC0023	B68	555	790	25				
	VC0023	B71	555	790	25				
	VC0023	B73	575	810	24				
	VC0023	B74	575	800	22				
	VC0044	A22	555	785	24				
	VC0046	A32	575	810	22				
	VC0046	A33	590	820	22				
	VC0046	A34	590	820	23				

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Cb	Al	Cr	Mo	B	N	Ca	CE
VC0044	.19	1.07	.024	.009	.21	.01	.02	<.02	<.002	.033	.02	.01				
VC0046	.21	1.06	.025	.008	.20	.01	.02	<.02	<.002	.046	.02	.01				

RECEIVED
DATE 1-18-95
P.O. # 45684
JOB # 2472

Certified a true copy o
original, retair in ou
AMERICAN ALLOY STE

TEST REPORT APPROVED DATE 1-15-95
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

I certify the above results to be correct as contained in the records of OREGON STEEL MILLS By Angie McCasland TEST REPORT CLERK

OREGON STEEL MILLS

PO Box 2760, Portland, Oregon 97208 · (503) 286-9651 TWX 910 464 1549

B888

SOLD TO:
54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056
P

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

1

REPORT OF CHEMICAL/PH

CERTIFICATE NO.	DATE
152051	DEC 30, 19
MILL ORDER NO.	DATE
PM-15735-02	11/
CUSTOMER ORDER NO.	
0701-410-03.5	
JOB/REQ. NO.	
SHIPPING NO.	DATE
P152051	12/
CARRIER	
UP	
CAR/TRUCK NO.	
UP259591	

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARSON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

5/16 x 96 x 480 B888

STORAGE PROD

ITEM	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG	% RA	HARDNESS BHN	BEND TEST	IMPACTS
	** CONTINUED FROM PREVIOUS PAGE ** 5/16 X 96 X 480									
		VC0024	B74	575	785	22				
		VC0024	B75	580	790	22				
		VC0024	B76	580	795	25				
2	5/16 X 96 X 480 ✓	VC0024	B77	585	800	22				
		VC0022	B46	595	825	24				
		VC0022	B47	585	810	26				
		VC0022	B48	585	810	25				
		VC0022	B49	595	815	21				
		VC0023	A67	580	800	24				
		VC0023	A68	560	780	22				

RECEIVED
DATE 1-18 93
P.O. # 45C899
JOB # 2472

Certified a true copy of original, rec'd in the AMERICAN ALLOY ST

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Cb	Al	Cr	Mo	Ti	B	N	Ca	CE
VC0022	.22	1.04	.022	.010	.19	.01	.01	<02	<002	.048	.01	.01					

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

I certify the above results to be correct as contained in the records of OREGON STEEL MILLS BY Angie McCleland TEST REPORT CLERK

'93 01/15 16:45

713 676 1233

OREGON STEEL MILLS

B892

P.O. Box 2760, Portland, Oregon 97208 · (503) 286-9551 TWX 910 464 1549

REPORT OF CHEMICAL/PHYSICAL T

SOLD TO

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

B892

CERTIFICATE NO	DATE
230115F	Oct 07, 1992
MILL ORDER NO.	DATE
21682	
CUSTOMER ORDER NO.	
0701-410-121	
JOB/REQ. NO.	
SHIPPING NO.	DATE
230115	10/07/199
CARRIER	
SOUTHERN PACIFIC	
CAR/TRUCK NO.	
SSW87725	

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL QUALITY ASTM A516-86 GRADE 70 ASME SA516 GRADE 70.

5/16 x 96 x 480

PHYSICAL PROPERTIES

OSM ITEM NO	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8" 1/2"	% RA	HARDNESS BHN	BEND TEST	IMPACTS
2	0.2500 X 120.000 X 480.000									
	1 PC 4084 LBS	VC0008	A62	585	780	23				
	1 PC 4084 LBS	VC0015	B62	595	805	22				
3	0.3125 X 96.000 X 480.000 ✓									
	1 PC 4084 LBS	VC0026	B25	660	800	19	✓			
	3 PCS 12252 LBS TOTALS									

RECEIVED
DATE 1-18-93
P.O. # 056849
JOB # 2477

Certified a true copy of the original, retained in our file.
AMERICAN ALLOY STEEL, INC

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Cb	Al	Cr	Mo	Ti	B	N	Ca	CE
VC0008	.21	1.15	.023	.008	.20	.01	.01	<.01	<.002	.039	.02	.01					
VC0015	.21	1.07	.021	.008	.20	.01	.01	<.01	<.002	.039	.02	.01					
VC0026	.20	1.01	.018	.009	.21	.01	.02	<.01	<.002	.039	.01	.01					

******* END OF REPORT *******

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

I certify the above results to be correct as contained in the records of OREGON STEEL MILLS

By Angie McPherson

TEST REPORT

CONTRACT NO

METALLURGICAL TEST REPORT

PO PT5056.55

ORIGINAL

P.O. DATE	PURCHASE ORDER NO.
	4162 -105
STATUS NO	MILL ORDER NO. / INVOICE NO.
P16267	0833755 / 489-040827
VEHICLE IDENTIFY CSX146237A	09/24/92

FAIRFIELD WORKS
P.O. BOX 599
FAIRFIELD, ALABAMA 35064

TUBULAR STEEL INC
1031 EXECUTIVE PARKWAY DR

CREVE COEUR MO 63141-6351

TUBULAR STEEL INC
27700 KATY BROOKSHIRE ROAD
KATY TX

B882

MAIL TO

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

PREPARED BY THE OFFICE OF:
M.R. STEIN MGR. Q.A.

DATE SEPTEMBER 25, 1992

PIPE CARBON SMLS STD PIPE API 5L-*39TH EDITION DTD 5/1/91 GRADE
B ASTM A53-*90B GRADE B ASTM A106-*1991 GRADE B/C BLK REG MILL
COAT PE BEV 30 DEG
01 MILL

MATERIAL DESCRIPTION

SIZE	WALL	SPECIFICATION & GRADE	MATL	HEAT / LOT NO.	MIN. HYDRO PSI	YIELD STR PSI	TENSILE STR PSI	ELONG. % IN 2"	GAGE WIDTH IN	FLAT	BEND
6.6250	0.4320		SMLS	U41898	4,000 OSSEC	50,300 AS ROLLED	78,400 TENSILE.	42.6	1.5	OK	
6.6250	0.4320		SMLS	X45972	4,000 OSSEC	48,600 AS ROLLED	78,500 TENSILE.	40.8	1.5	OK	
6.6250	0.4320		SMLS	X45974	4,000 OSSEC	48,400 AS ROLLED	78,400 TENSILE.	40.6	1.5	OK	

YIELD STRENGTH @ .005 EXT.
ITUDINAL STRIP TENSILE SPECIMENS USED UNLESS NOTED OTHERWISE.
MEETS THE REQUIREMENTS OF ASME SA53 1989 EDITION, 1991 ADDENDA,
HOT FINISHED -- NO HEAT TREATMENT
& SA106 1989 EDITION, 1991 ADDENDA

ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.

RECEIVED
DATE 1-28-93

HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
U41898	HEAT	.25	.94	.012	.026	.25	.02	.02	.04	.01				.00				
	PROD	.24	.95	.011	.007	.22	.01	.02	.03	.01				.00				
X45972	HEAT	.25	.97	.013	.005	.25	.02	.01	.03	.01				.00				
	PROD	.25	1.00	.012	.008	.24	.02	.01	.03	.01				.00				
X45974	HEAT	.25	.95	.012	.009	.23	.02	.01	.02	.00				.00				
	PROD	.25	.97	.012	.010	.24	.01	.01	.03	.00				.00				
	*** END OF DATA ***																	

P.O. # 057490

JOB # 2472

TSI QUALITY CHECK

BY [signature] DATE 10-15-92

1002101 ENCLOSED ARRANGEMENT

NORTH STAR STEEL
Seamless Tubular Products

CERTIFIED TEST REPORT

HEAT NO.: 9 SLN F30203

PRODUCT DESCRIPTION :
8.625 OD 0.500 WALL 43.39 LBS/FT PE DRL

GRADE : API 5L X42/B

B883

CHANICAL PROPERTIES:

CUSTOMER :
TUBULAR STEEL INC.

CUSTOMER ORDER NO.:
2965 -107

CUSTOMER SPEC.:

NSSO MILL ORDER NO.:
0-009855 -0

NSSH W/O NO.:

NSSH LOT NO.:

SPECIMEN CROSS SECTION			ACTUAL LOAD (KIPS)		STRENGTH (KSI)		ELONGATION	
IDTH (IN)	THICK (IN)	AREA (SQIN)	YIELD	TENSILE	YIELD	TENSILE	GAGE LENGTH	% ELONG
.504	0.490	0.7370	34.9	47.3	52.7	71.5	2	32.5

COMMENTS

This material is also manufactured to
ASTM A53B Rev. 91a
ASTM A106B Rev. 91a
ASME SA53-B
ASME SA106-B
No repair welding has been conducted
Material has no contamination by Mercury

NICAL ANALYSIS:
MS61

	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Al	B	Ti
AT	0.20	0.75	0.007	0.008	0.27	0.16	0.08	0.06	0.02	0.001	0.039	0.0000	0.000
ODUCT #1	0.21	0.73	0.006	0.007	0.25	0.16	0.08	0.06	0.02	0.001	0.037	0.0000	0.000
ODUCT #2	0.22	0.72	0.007	0.008	0.23	0.16	0.07	0.06	0.02	0.006	0.034	0.0000	0.000

STATIC TEST (psi):
3000

RECEIVED
DATE 1-28-93
P.O. # 1057490
JOB # 2472

PLEMENTAL UIREMENTS	YES	NO	REMARKS
NESS			
PY IMPCT TST			
APSE TEST			
OHARDNESS			
TENING TEST	X		PASSED
TEST			NOT APPLICABLE
NY HARDEN			
SIZE			

TSI QUALITY CHECK
BY MA DATE 8-25-92

This material has been produced and tested in accordance with the requirements of applicable specifications unless otherwise listed below. We hereby certify that the above test results are representative of those contained in the records of the company. Any modification to this certification, as provided by North Star Steel without the expressed written consent of North Star Steel negates the validity of this test report. North Star Steel is not responsible for the inability of this material to meet specific applications.

SIGNED Ivan K Clark

DATE 8/4/92

APPR

SWORN AND SUBSCRIBED TO BEFORE ME

THIS _____ DAY _____

Notary Public

MY COMMISSION EXPIRES _____

THIS CERTIFICATE IS NOTORIZED ONLY WHEN REQUESTED

TEST REPORT

2188 CHURCH ST.
EAST TROY, WI 53120

CUSTOMER ORDER NO	C.P.O. DATE	RATING	ENTRY DATE	SHIP	MARKS	MILL ORDER NO.
CRP2-55641			9119E		A	6T3-71861-2
TUBHOUB			TUBFORA		C	

SOLD TO:
TUBESALES
6161 BINGLE ROAD
HOUSTON, TX 77092

SHIP TO:
TUBESALES
175 TUBEWAY
FOREST PARK GEORGIA

SPECIAL INSTRUCTIONS: Area C

5D | 5210 F.O.B. S/P | 30050 SHIPPING NOTICE

TERMS: 30-M-10

4500 337 R 172400 1 120 | 15.18 LBS/FOOT

4 80S 4.500X.337 17 - 24 FT RML
FULL FINISHED ANNEALED & PICKLED
TRENTWELD STAINLESS PIPE
A312 91b SA312 CORR TO MILP24691/3
304

100 FT / LBS / PCS — QUANTITY ORDERED

10/05/92 WANTED
10/05/92 PROMISED

FEET	105.415
NET	1,480
PCS	5
GROSS	1,495
Boxes	1
Complete Shipment	
B/L NC-42552-08	
DATE	30-SEP-92
C.P.U.	PP.D

REPORT OF TESTS

CHEMICAL ANALYSIS

HEAT #	C	MN	P	S	SI	NI	CR	MO	CU	N	CO
712717	.014	1.71	.031	.009	.59	8.71	18.18	.36	.36	.063	.17

Mechanical and NDE Tests

HEAT #	FLAN	FLAT	FLAR	RFLT	RBND	BEND	EDDY	UT	XRAY	DYPN	HYDRO	AIR
712717	OK										2,200	

HEAT #	LOT #	TENSILE	YIELD	ELON	HARDNS.	ID	OD	RMS GRAIN	CORROSION TEST	CORROSION VALU
712717		91,600	52,700	45 x					A262E	OK

REMARKS

TAG: HUU2-55641
STEEL MELTED: J & L

W56754 Tag 2460
8075472 0-9½"
712717
Donda Love

TEST REPORTS
ACCEPTABLE D URBAN

OCT 14 1992

RECEIVED

DATE 1-14-93

P.O. # W56754

2460

We Hereby Certify This Report To Be True and Correct According To The Records in Possession of this Corporation.
TRENT TUBE DIVISION - CRUCIBLE MATERIALS CORPORATION

Signed: A Bingle

Dated: 9-30-92

OREGON STEEL MILLS

PO Box 2760 Portland, Oregon 97208 · (503) 286-9551 TWX 910 464 1519

B892

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DO NOT REMOVE

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO	DATE	PAGE
230115F	Oct 07, 1992	1

MILL ORDER NO. 11682 — DATE

CUSTOMER ORDER NO. 0701-410-121

JOB/REL NO.

SHIPPING NO. 230115 — DATE 10/07/1992

CARRIER SOUTHERN PACIFIC

CAR/TRUCK NO. SSW87725

SOLD TO

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

B892

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL QUALITY ASTM A516-86 GRADE 70 ASME SA516 GRADE 70.

5/16 x 96 x 480

PHYSICAL PROPERTIES

ITEM NO	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8"	% ELONG 2"	% RA	HARDNESS BHN	BEND TEST	IMPACTS
2	0.2500 X 120.000 X 480.000										
	1 PC 4084 LBS	VC0008	A62	585	780	23					
	1 PC 4084 LBS	VC0015	B62	595	805	22					
3	0.3125 X 96.000 X 480.000 ✓										
	1 PC 4084 LBS	VC0026	B25	660	800	19	✓				
	3 PCS 12252 LBS TOTALS										

RECEIVED
DATE 1-18-93
P.O.# W56849
JOB # 2477

Certified a true copy of the original, retained in our file.
AMERICAN ALLOY STEEL, INC.

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Cb	Al	Cr	Mo	Ti	B	Mg	Ca	N	OE	Unspecified Elem.
VC0008	.21	1.15	.023	.008	.20	.01	.01	K.01	K.002	.039	.02	.01							
VC0015	.21	1.07	.021	.008	.20	.01	.01	K.01	K.002	.039	.02	.01							
VC0026	.20	1.01	.018	.005	.21	.01	.02	K.01	K.002	.039	.01	.01							

******* END OF REPORT *******

TEST REPORT APPROVED DATE 10-7-92
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

I certify the above results to be correct as contained in the records of OREGON STEEL MILLS By Angie McCalard TEST REPORT CLERK

CUSTOMER Myatt Field Services
CUST P.O. # W56849
JOB # 98562
DATE RECEIVED 10-8-92
DESCRIPTION 5/16" (.312") x 96" x 480"
Tag: Job 2477

OREGON STEEL MILLS

PO Box 2760, Portland, Oregon 97208 · (503) 286-9651 TWX 910 464 1549

B888

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO.	DATE	PAGE
152051	DEC 30, 1991	3

MILL ORDER NO. PM-15735-02 DATE 11/08/91

CUSTOMER ORDER NO. 0701-410-033

JOB/REQ. NO.

SHIPPING NO. P152051 DATE 12/30/91

CARRIER UP

CAR/TRUCK NO. UP259591

SOLD TO: 54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

SHIP TO: THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSH CARSON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

5/16 x 96 x 480 B888

ITEM	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8"	% RA	HARDNESS (BHN)	BEND TEST	IMPACTS
	## CONTINUED FROM PREVIOUS PAGE ## 1/4 X 96 X 480									
		VC0024	B74	575	785	22				
		VC0024	B75	580	790	22				
		VC0024	B76	580	795	25				
		VC0024	B77	585	800	22				
13	5/16 X 96 X 480 ✓									
		VC0022	B46	595	825	24				
		VC0022	B47	585	810	26				
		VC0022	B48	585	810	25				
		VC0022	B49	595	815	21				
		VC0023	A67	580	800	24				
		VC0023	A68	560	780	22				

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Cb	Al	Cr	Mo	B	N2	Ti	Ca	CE (IIW)	CE (Pcm)
VC0022	.22	1.04	.022	.010	.19	.01	.01	<.02	<.002	.048	.01	.01						

TEST REPORT APPROVED DATE 1-15-92
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

Angie McCasland

TEST REPORT CLERK

Certified to be the data as contained in the records of OREGON STEEL MILLS By

RECEIVED
DATE 1-15-92
P.O. # W56849
JOB # 2472

Certified a true copy of the original retained in our file.
AMERICAN ALLOY STEEL, INC.

ORIGINAL FILE COPY
DO NOT REMOVE
AMERICAN ALLOY
PLATE # N/A

CUSTOMER Wyatt Field Service
CUST P.O. # W56849
A.A.S. S/O # 98508
DATE RAISED 1-15-92
DESCRIPTION Thru 3/4" x 96" x 240"
Tag: Job 2472

RECEIVED
DATE
P.O. #
JOB #

OREGON STEEL MILLS

PO Box 2760, Portland, Oregon 97208 - (503) 286-9651 TWX 910 464 1549

B890

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SOLD TO:
54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO	DATE	PAGE
152051	DEC 30, 1991	4

MILL ORDER NO.	DATE
PH-15735-02	11/08/91

CUSTOMER ORDER NO.
0701-410-033

JOB/REQ. NO.

SHIPPING NO.	DATE
F152051	12/30/91

CARRIER
UP

CAR/TRUCK NO.
UP259591

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

B890

PHYSICAL PROPERTIES

DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG	% RA	HARDNESS BHN	BEND TEST	IMPACTS
** CONTINUED FROM PREVIOUS PAGE **									
5/16 X 96 X 480									
	VC0023	A69	570	755	23				
	VC0023	A70	575	790	22				
	VC0023	B66	560	790	26				
	VC0023	B67	550	785	23				
	VC0023	B68	555	790	25				
	VC0023	B71	555	790	25				
	VC0023	B72	575	810	24				
	VC0023	B74	575	800	22				
	VC0046	A22	555	785	24				
	VC0046	A32	575	810	22				
	VC0046	A33	590	820	22				
	VC0046	A34	590	820	23				

RECEIVED
DATE 1-16-92
P.O. # 456849
JOB # 2972

Certified a true copy of the original, retained in our file.
AMERICAN ALLOY STEEL, INC.

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Cb	Sn	B	N	Al	Ca	CE	Grain Size
VC0044	.17	1.07	.024	.009	.21	.01	.02	<.02	<.002	.033	.02	.01						
VC0046	.21	1.06	.025	.008	.20	.01	.02	<.02	<.002	.046	.02	.01						

TEST REPORT APPROVED DATE 1-15-92
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

Angie McCasland
TEST REPORT CLERK

...ENTED IN THE U.S. BY OREGON STEEL MILLS

OREGON STEEL MILLS

PO Box 7760, Portland, Oregon 97208 · (503) 286 5651 TWX 910 464 1549

B890

ORIGINAL FILE COPY
DO NOT REMOVE

SOLD TO:
54233
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

1

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO	DATE	PAGE
152051	DEC 30, 1991	4
MILL ORDER NO.	DATE	
PH-15735-02	11/08/91	
CUSTOMER ORDER NO.		
0701-410-033		
JOB/REQ. NO.		
SHIPPING NO.	DATE	
P152051	12/30/91	
CARRIER		
UP		
CAR/TRUCK NO.		
UP259591		

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

B890

PHYSICAL PROPERTIES

ITEM	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8" 2"	% RA	HARDNESS (T) BHN	IMPACT TEST	IMPACTS
	## CONTINUED FROM PREVIOUS PAGE ## 5/16 X 96 X 480	VC0023	A69	570	755	23				
		VC0023	A70	575	790	22				
		VC0023	B66	560	750	26				
		VC0023	B67	550	765	23				
		VC0023	B68	555	790	25				
		VC0023	B71	555	790	25				
		VC0023	B72	575	810	24				
		VC0023	B74	575	800	22				
		VC0044	A32	555	765	24				
		VC0046	A32	575	810	22				
		VC0046	A33	590	820	22				
		VC0046	A34	590	820	23				

RECEIVED
DATE 1-14-93
P.O. # 4156849
JOB # 2472

Certified a true copy of the original, retained in our file.
AMERICAN ALLOY STEEL, INC.

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al	Nb	V	B	N	Ca	Sn	CE	Dry Charpy Lat Expan Mils
VC0044	.19	1.07	.024	.009	.21	.01	.02	<.02	<.002	.033	.02	.01						
VC0046	.21	1.06	.025	.008	.20	.01	.02	<.02	<.002	.046	.02	.01						

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

Results are those recorded in the records of OREGON STEEL MILLS By Angie McCalank TEST REPORT CLERK

Gulf States Steel, Inc.

GADSDEN AL 35904-1936

CERTIFICATE OF TESTS

MP16-91

PURCHASE ORDER DATE / PURCHASE ORDER NO: 07/09/91 W 49647

CUSTOMER IDENTIFICATION

GSS ORDER NO: G 20787 748

OFFICE INVOICE DATE: PCL

INVOICE NUMBER: 742173852

LE ACCOUNT NUMBER: 025 09704 TERMS: 30-3/4-10

S O
WYATT FIELD SERVICE CO
PO BOX 3062
HOUSTON TX 77253

WYATT FIELD SERVICE CO
GREENS PORT IND PARK 13609
IND RD SPOT DTRA 217&288
HOUSTON TX 77015

DATE SHIPPED: 07/25/91 FROM: ALA CITY ROUTE/VEHICLE IDENTIFICATION: WW30111

SHEET NO

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS

LEONARD A. TROIAN
DIR QUALITY ASSURANCE
AND METALLURGY

ITEM NO	MATERIAL DESCRIPTION	QUANTITY SHIPPED
	PLATE CARBON ASTM A-36-90 APPLI DOMESTIC STEEL ONLY CUST ID- 5161-5164	
05	.3830 X 115 5000 SHEARED EDGE X 378 5000 IN HT 7489441 1PCS HT 7413740 3PCS HT 7413743 3PCS HT 7489938 3PCS HT 7413708 1PCS HT 7430000 1PCS HT 7489943 3PCS	49520
CH	C 25MX MN BPT P 040MX S 05MX SI RFT	
MR	YLD 36000 MIN TEN 58/80000 % ELONG MIN 2 IN 23 OR 8 IN 20	
TI	1 TR W/SHPMNT 2 TR CA ATTN JOHN WILLIAMS	

8-25-91
W-49647
5161-5164

ANALYSIS

ITEM NO	HEAT NO	GRADE	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL
05	7489441		.19	.73	.007	.015	.078							
	7413740		.17	.93	.005	.015	.064							
	7413743		.19	.93	.005	.013	.083							
	7489938		.15	.91	.013	.018	.030							
05	7413708		.17	0.79	.010	.013	.056							

TEST RESULTS

ITEM NO	HEAT NUMBER	TEST OR PIECE IDENTITY NO	YIELD KSI	TENSILE STRENTH KSI	ELONG % 2"	ELONG % 8"	GALV. COATING	BEND TEST	HARD	CHARPY IMPACT V NOTCH FT LBS AT TEST NO	SPEC SIZE	1	2	3	AVG
05	7489441		48	64		27.0									
	7413740		45	61		30.0									
	7413743		44	62		29.0									
	7489938		44	62		30.0									
	7413708		45	64		28.0									

br

Gulf States Steel, Inc.

GADSDEN AL 35904-1936

M816-01

07/09/91 W 49647

CERTIFICATE OF TESTS

CUSTOMER IDENTIFICATION

SHIP ORDER NO 20787 742

OFFICE FC INVOICE DATE 742-7385

ACCOUNT NUMBER 82509704 TERMS 30-3/4-10

SOLD TO:
WYATT FIELD SERVICE CO
P O BOX 3052
HOUSTON TX 77253

SHIP TO:
WYATT FIELD SERVICE CO
GREENS PORT IND PARK 13609
IND RD SPOT PTRA 2172288
HOUSTON TX 77015

DATE SHIPPED 07 26 91 FROM ALA CITY ROUTE/VEHICLE IDENTIFICATION NU380347 SHEET NO.

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS

LEONARD A. TROMAN
DIR. QUALITY ASSURANC
AND METALLURGY

ITEM NO | MATERIAL DESCRIPTION | QUANTITY SHIPPED

9-25-91
W-49647
5161-5164

ANALYSIS

ITEM NO	HEAT NO	GRAIN	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL
05	7420000		.15	0.80	.006	.014	.088							
05	7489993		.14	0.89	.006	.011	.056							

TEST RESULTS

ITEM NO	HEAT NUMBER	TEST OR PIECE IDENTITY NO	YIELD KSI	TENSILE STRGTH KSI	ELONG 2"	ELONG 8"	GALV COATING	BEND TEST	HARD	CHARPY IMPACT V NOTCH FT. LBS. AT TEST NO	TEMP DEG F	1	2	3	AVG
05	7420000		48	65		24.0									
	7489993		43	62		30.0									

鋼管検査証明書

INSPECTION CERTIFICATE

51522

1 OF 3

1977

新日本製鐵株式會社
Nippon Steel Corporation

PER : MITSUI & CO., LTD.

ACT No : 17212 -E291211

ACT No : 1-843-N3-5-5-G115-06

ADDITY : SEAMLESS STEEL LINEPIPE

CATION : API SPEC 5L GRADE B/API SPEC 5L GRADE X42/ASTM A106 GRADE B/ASME SA106 GRADE B

: CONTRACT NO.: 18C165

CLIENT :
CUSTOMER : PIPE EXCHANGE INTERNATIONAL,INC.
CUSTOMERS CONTROL No. : 12447

CERTIFICATE No : 00300027JJ

PAGE 1

DATE OF ISSUE : 1991-05-22

Quantity	TOTAL Weight	Heat No	Chemical Composition (%) C	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	Ti	Ca	Control No. / MILL LOT NO.	Tensile Test YS	TS	EL	Hardness Test	Impact Test	Hydrostatic Test	Drift Test	Dimensions
	KG															PSI UNDER-L							
	SPEC	PIN PIPE	27	10	29	1025	40	40	40						SPEC PIPE	42000	60000	25					
	SPEC	PIN PIPE	30	10	29	1200	5060							1660									
2"SCH.2Lo"X60"																							
120	24,564	125210	21	17	64	18	8	2	2	4					46518	LH 52800	72700	60					
			0	3			13								1101426706								
			21	17	64	19	8																
			21	17	64	17	8																

HE CONTINUED

Q. C.
APPROVED
1-23-92
DATE
SIGNATURE

THESE MILL TEST REPORTS APPLY TO YOUR ORDER NO. _____

上記工場は、御指定の規格または仕様に従って製造され、その結果本品を満足していることを証明します。
WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE RULES OF THE CONTRACT.

TO BE CONTINUED
八幡製鐵所 試験分析室長
MANAGER, INSPECTION
YAWATA WORKS

鋼管検査証明書
INSPECTION CERTIFICATE

2 of 3

新日本製鐵株式會社
Nippon Steel Corporation

CUSTOMER : PIPE EXCHANGE INTERNATIONAL,INC.
CUSTOMERS CONTROL No : 32447

CERTIFICATE No : UC0002730
PAGE : 2
DATE OF ISSUE : 1991-03-22

SPECIFICATION : API SPEC 5L GRADE B/API SPEC 5L GRADE X42/ASTM A106 GRADE B/ASME SA106 GRADE B

Quantity	TOTAL Weight kg	Heat No.	Chemical Composition (%) C	Si	Mn	P	S	Cu	Al	Cr	Control No. MILL LOT NO.	Tensile Test YS PSI	TS PSI	UNDER-L (%)	Flattening Test	Impact Test	Hardness Test	Macro Test
177	25,620	A325280	21	17	64	18	6	2	2	4	46516	52800	72700	34				
			0	3			03				110(43067C5)							
			P	21	17	64	18	6										
			C	21	17	63	18	6										
155	20,010	A325280	21	17	64	18	6	2	2	4	46516	52700	73600	36				
			0	3			03				110(43067C1)							
			P	21	17	65	18	6										

TO BE CONTINUED

外観・寸法 Visual & Dimensions	ドリフト試験 Drift Test
GOOD	

Q.C. APPROVED
1-2392
DATE 4.2.92
SIGNATURE

THESE MILL TEST REPORTS APPLY TO YOUR ORDER NO. _____

上記注文品は、御指定の規格または仕様に従って製造され、その要求事項を満足していることを証明します。
WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE RULES OF THE CONTRACT.

TO BE CONTINUED

八幡製鐵所 試験分析室長
MANAGER, INSPECTION
YAWATA WORKS

鋼管検査証明書
INSPECTION CERTIFICATE

3 of 3

Nippon Steel Corporation

CUSTOMER : PIPE EXCHANGE INTERNATIONAL,INC.

CERTIFICATE No : QC020322J0 PAGE : 3

DATE OF ISSUE : 1551-05-22

ITEM : SEAMLESS STEEL LINEPIPE

SPECIFICATION : API SPEC 5L GRADE B/API SPEC 5L GRADE X42/ASTM A106 GRADE F/ASME SA106 GRADE B

Item	Quantity	TOTAL Weight	Heat No	Chemical Composition (%) C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	Ti	CEIIW	CEPCM	Control No. PILE LOT NO.	Tensile Test YS	TS	EL	YR	Hardness Test	Impact Test	Hydrostatic Test
2"XSC-2160"XAB*																									
				H 21 17 64 1F 0																					
NC ICIAL																									
O.CE PIPES			SCH PIPES																						
CIGHT			65,000 KG																						

TEASILE TEST SPECIMEN:ICROLLIDINAL ---STRIP

IEJ FORMULA ---

CEK FORMULA ---

2.5% UNDER-L

FSI

Q. C. APPROVED

1-JAN-92

DATE

SIGNATURE

THESE MILL TEST REPORTS APPLY TO YOUR ORDER NO. _____

外観・寸法 Visual & Dimension	ドリフト試験 Drift Test
GOOD	

上記は文面は、契約書の規格または註記に従って製造され、その要求事項を満足していることを証明します。
WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE RULES OF THE CONTRACT.

MANAGER, INSPECTION
YAWATA WORKS

Gulf States Steel, Inc.

GADSDEN AL 35904-1933

CERTIFICATE OF TESTS

32-D702-01

PURCHASE ORDER DATE: 11/13/92 PURCHASE ORDER NO: 15635

CUSTOMER IDENTIFICATION

SHIP: G S&S ORDER NO: 27574 ITEM NO: 742

OFFICE: 2 INVOICE DATE: INVOICE NUMBER: 742+22602

ACCOUNT NUMBER: 38080003 TERMS: 30-3/4-10

SOLD TO:
INTSEL SOUTHWEST
DIV PECHINEY WORLD TRADE
PO BOX 41041
HOUSTON TX 77240104

SHIP TO:
INTSEL SOUTHWEST
DIV PECHINEY URLD TRD USA
SPIN NBR 4038
MELENDY TX

DATE SHIPPED: 12-14-92 FROM: ALA CITY ROUTE/VEHICLE IDENTIFICATION: SOU 115796 SHEET NO:

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS.

C. F. BEARDEN, JR.
MGR. TECHNOLOGY AND QUALITY - PLATE PROD.

ITEM NO	MATERIAL DESCRIPTION	PKGS	QUANTITY SHIPPED
	CR 30MX MO 12MX CB 02MX V 03MX		
MR	YLD 38000 MIN TEN 70/90000 % ELONG MIN 2 IN 21 OR 8 IN 17		
TI	3 TR CA		

RECEIVED

DATE 1-15-93

P.O. # 056845

JOB # 2472

ANALYSIS

ITEM NO	HEAT NO.	GRAIN	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL

TEST RESULTS

ITEM NO	HEAT NUMBER	TESTOR PIECE IDENTIFY NO	YIELD KSI	TENSILE STRTH KSI	ELONG 2"	ELONG 8"	GALV COATING	BEND TEST	HARD	CHARPY IMPACT V NOTCH FT LBS AT TEST NO	SPEC SIZE	1	2	3	AVG	MIL
01	7425367	8281	58	78		23										
	"	8282	57	77		22										
	"	8283	57	77		23										
	"	8284	56	79		26										

dc

VENDOR: GARY WORKS, GARY, INDIANA 46402

** MELTED AND MANUFACTURED IN THE USA **

P.O. DATE	PURCHASE ORDER NO.		
06/19/91	7025-2		
SHIPPERS NO.		MILL ORDER NO.	INVOICE NO.
H04381 07 28 91		V875350	154-119724
VEHICLE IDENTITY	EJE 006049		H4381

SOLD TO: PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
P O BOX 41041
HOUSTON TX 77241-1041

SHIP TO: PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

THIS IS TO CERTIFY THAT T
PRODUCT DESCRIBED HEREIN
MFGD., SAMPLED, TESTED AN
INSPECTED IN ACCORDANCE W
THE SPECIFICATION AND FUL
FILLS REQUIREMENTS IN SUC
RESPECT.

BB

PREPARED BY THE OFFICE OF
J. J. HARRINGTON Q. A.

DATE 7-30-91

SPEC & MISC: PLATE CARBON ASTM A516-M1986 GRADE 70 ASME SA516-M1989
EDITION-1990 ADDENDA DECEMBER 31, 1990 GRADE 70 PRESSURE VESSEL
QUALITY NORMALIZE CHARPY V-NOTCH LONGITUDINAL IMPACT TESTS EACH
PLATE AS HEAT TREATED 15/12 FT/LBS AT -50 DEG F
INSP: 01 MILL CERTIFIED T/R ANALYSIS

B925

ITEM NO	MATERIAL DESCRIPTION: THICKNESS OR SECTION	WIDTH DIA OR I.D. WT	LENGTH	QUAN	WEIGHT	HEAT NO	TEST OR PIECE IDENTITY		YIELD PT. KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED OF AREA
02	3/4 " STEEL-TYPE = INGOT	120.0000	480"	01	12252	D21855							
	LONG FL SZ CHARPY IMPT V-NTCH -050 DEG F AVERAGE IMPACT STRENGTH +58 FT LBS				FT LBS/ 051-066-056 IMPACT PCE ID = 03K 2		03K 2	#	54.0	77.0	25.0	45.0	
	PRODUCT & TEST SPECIMENS WERE NORMALIZED AT 1660 DEG. F. FOR 0024 MINUTES. COOLING COMPLETED IN STILL AIR.												
02	3/4 " STEEL-TYPE = INGOT	120.0000	480"	01	12252	D21855							
	YIELD STRENGTH @ 0.5% E.U.L.						03Y 2	#	51.5	73.0	27.0	47.0	

HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
D21855	HEAT	23	109	021	018	23	02	01	04	00		034		000			000	

END OF DATA

FINE GRAIN

RECEIVED
DATE 2.9.93
P.O. # 615792
JOB # 2472

MATRIX 910728 1256 709118030 072891 0186167001 01 LML CBA 3 0 0 PAGE 1

DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LEFT MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT.

METALLURGICAL TEST REPORT

PATSD5G55

ORIGINAL

PO DATE	PURCHASE ORDER NO. 4162 -103
SHIPPERS NO. 5F16267	MILL ORDER NO. DF33755
VEHICLE OR WAYBILL NO. CSX145237A	INVOICE NO. 489-040927
	03/24/92

VENDOR
FAIRFIELD WORKS
P.O. BOX 599
FAIRFIELD, ALABAMA 35064

SOLD TO
TUBULAR STEEL INC
1031 EXECUTIVE PARKWAY DR
CREVE COEUR MO 63141-6251

MAIL TO
TUBULAR STEEL INC
27700 KATY BROOKSHIRE ROAD
KATY TX

THIS IS TO CERTIFY THAT TH
PRODUCT DESCRIBED HEREIN W
MFGD., SAMPLED, TESTED AND
OR INSPECTED IN ACCORDANCE
WITH THE SPECIFICATION AND
FULFILLS REQUIREMENTS IN
SUCH RESPECTS.

PREPARED BY THE OFFICE OF:
M.R. STEIN MGR. Q.A.

DATE SEPTEMBER 25, 1992

SPEC & GRADE: PIPE CARBON SMLS STD PIPE API 5L--39TH EDITION DTD 5/1/91 GRADE B ASTM A53--90B GR/TP B ASTM A106--1991 GRADE B/C DLR REG MILL COAT PE PFY 30 DEG.
INSP.AT MILL

B728

ITEM NO	MATERIAL DESCRIPTION SIZE	WALL	SPECIFICATION & GRADE	MAIL	HEAT / LOT NO	MIN HYDRO PSI	YIELD STR PSI	TENSILE STR PSI	ELONG % IN 2"	GAGE WIDTH IN	FLAT	
02	6.6250	0.432		SMLS	041896	4,000	56,300	79,400	42.6	1.5	OK	
02	6.6250	0.432		MLS	X45972	05SEC 4,000	AS ROLLED TENSILE. 48,600	79,500	40.8	1.5	OK	
02	6.6250	0.432		MLS	X45974	05SEC 4,000	AS ROLLED TENSILE. 48,400	79,400	40.6	1.5	OK	
	YIELD STRENGTH @ .495 EXT.					05SEC	AS ROLLED TENSILE.					
	LONGITUDINAL STRIP TENSILE SPECIMENS USED UNLESS NOTED OTHERWISE.											
	ALSO MEETS THE REQUIREMENTS OF ASME SA53 1989 EDITION, 1991 ADDENDA.						HOT FINISHED -- NO HEAT TREATMENT					
							& SA106 1989 EDITION, 1991 ADDENDA.					

RECEIVED
DATE 1-28-93

ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.

ITEM NO	HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	SB	NCO
	041896	HEAT	.25	.93	.011	.009	.23	.21	.11	.08	.01				.001				
		PROD	.24	.97	.012	.009	.23	.21	.11	.08	.01				.001				
	X45972	HEAT	.25	.97	.011	.009	.23	.21	.11	.08	.01				.001				
		PROD	.25	1.00	.012	.009	.23	.21	.11	.08	.01				.001				
	X45974	HEAT	.25	.95	.011	.009	.23	.21	.11	.08	.01				.001				
		PROD	.25	.97	.012	.009	.23	.21	.11	.08	.01				.001				

w57490

JOB # 2477

TSI QUALITY CHECK
BY MK DATE 10-15-93

4100710 TELOSETE 985015041

C/A 1-0-0 PAGE 1 OF 1

USS TUBULAR PRODUCTS

METALLURGICAL TEST REPORT

ORIGINAL

JOB CONTRACT NO

P.O. DATE | PURCHASE ORDER NO. 4159

SHIPPERS NO. | MILL ORDER NO. D833455 | INVOICE NO.

VEHICLE IDENTITY

VENDOR

USS TUBULAR PRODUCTS

SOLD TO

TUBULAR STEEL INCORPORATED
1031 EXECUTIVE PARKWAY DR
CREVE COEUR MO 63141-6351

MAIL TO

TUBULAR STEEL INCORPORATED
1031 EXECUTIVE PARKWAY DR
CREVE COEUR MO 63141-6351

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFG., SAMPLED, TESTED, AND/OR INSPD. IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS

APPROVED BY THE OFFICE OF:
D.S. DANKOWSKI MGR. MET
U.S. USS TUBULAR PRODUCTS
DATE 11/03/92

B928

TSI QUALITY CHECK
BY GP DATE 12/1

RECEIVED
DATE 1-28-93
P.O. # 105 9490
JOB # 2472

ITEM NO	MATERIAL DESCRIPTION: SIZE	WALL	SPECIFICATION & GRADE	MATL	HEAT/LOT NO	MIN HYDRO PSI	YIELD STR PSI	TENSILE STR PSI	ELONG % IN 2"	GAGE WIDTH IN	FLAT	BE
	3 1/2	.438	API 5L GR.B 39TH ED 6/91 ASTM A53-90B GR.B ASME SA53 GR.B EFED 91ADD. ASTM A106-91 GR.B/C ASME SA106 GR.B/C B96D 91ADD.	SMLS	N87751	2500	48100	72200	36.00	3/4	OK	

ITEM NO	HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
	N87751	HEAT	.24	.50	.012	.017	.23	.21	.21	.06	.01				.002				
	N87751	PROD	.24	.51	.009	.004	.22	.21	.21	.04	.01				.002				

* * * END OF DATA THIS SHEET * * * ALL [illegible] MATERIAL IN THIS PLACE IN THE NEW

TUBULAR PRODUCTS

METALLURGICAL TEST REPORT

B543 PAGE 1 OF

10259 (pkl)

JOB CONTRACT NO

P.O. DATE: 12.07.92

PURCHASE ORDER NO: 2988-USS

SHIPPERS NO: T12701

MILL ORDER NO: DS78525 01

INVOICE NO:

VEHICLE IDENTITY: PCY6710H

VENDOR: USS TUBULAR PRODUCTS

SOLD TO: DIXIE PIPE SALES
PO BOX 300650
HOUSTON TX 77230-0650

MAIL TO: DIXIE PIPE SALES
PO BOX 300650
HOUSTON TX 77230-0650

THIS IS TO CERTIFY THAT
PRODUCT DESCRIBED HEREIN
MFG., SAMPLED, TESTED, AI
OR INSP'D. IN ACCORDANCE
THE SPECIFICATION AND
FULFILLS REQUIREMENTS IN
SUCH RESPECTS.
APPROVED BY OFFICE OF:
D.S. DABKOWSKI MGR. MET.
Q.A. USS TUBULAR PRODUCTS

DATE 04/20/93

Mill Test Reports furnished by
DIXIE PIPE SALES, INC.
Apply to your Order No. 55917

ITEM NO	MATERIAL DESCRIPTION: SIZE	WALL	SPECIFICATION & GRADE	MAIL	HEAT/LOT NO	MIN HYDRO PSI	YIELD STR PSI	TENSILE STR PSI	ELONG % IN 2"	GAGE WIDTH IN	FLAT
1	4	.337	ASTM A53-93A GR. B ASME SA53 GR. B ED. 90 ADD. ASTM A106-93 GR. B ASME SA106 GR. B ED. 93 ADD. API 5L GR. B 44TH ED. 1993	SML	L40282 2C3022	1000	51000	72000	35.0	1 1/2	OK
1	4	.337	ASTM A53-93A GR. B ASME SA53 GR. B ED. 93 ADD. ASTM A106-93 GR. B ASME SA106 GR. B ED. 93 ADD. API 5L GR. B 44TH ED. 1993	SML	N45[illegible] 2C3022	1000	48500	72000	35.0	1 1/2	OK

ITEM NO	HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
1	L40282	HEAT	.17	1.01	.015	.011	.22	.12	.11	.08	.03				.002				
1	[illegible]	HEAT	.1[illegible]	1.00	.011	.012	[illegible]	.12	.11	.08	.03				.001				
1	N45[illegible]	HEAT	.17	1.04	.010	.007	.27	.13	.11	.04	.01				.001				
1	[illegible]	FROM	.17	1.02	.007	.003	.23	.11	.11	.07	.01				.001				
** END OF DATA **		CHEM					ALL MELTING AND MANUFACTURING TO BE PLACE IN THE USA.												

RECEIVED
DATE 9-14-92
P.O. # W5917
JOB # 2414

CARY WORKS
CARY, INDIANA 46402

P.O. DATE	PURCHASE ORDER NO.		
11/13/92	5634		
SHIPPERS NO.	M&L ORDER NO.	INVOICE NO.	
H08990 11 30 92	CF10280	154-166169	
EJE 005752		H0990	

MELTED AND MANUFACTURED IN THE USA

PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
P O BOX 41041
HOUSTON TX 77241-1041

SHIP TO
PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND/O INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FUL- FILLS REQUIREMENTS IN SUCH RESPECT.

PREPARED BY THE OFFICE OF:
G. D. LUKES GEN MGR. Q. A

DATE RECEIVED 12-7-92

PLATE CARBON ASME SA516-M1989 EDITION-1991 ADDENDA DECEMBER 31, 1991 GRADE 70 PRESSURE VESSEL QUALITY

01 MILL CERTIFIED T/R

T3842

DATE _____

P.O. # _____

MATERIAL DESCRIPTION			QUANTITY	WEIGHT	HEAT NO	TEST OR PIECE IDENTITY	YIELD STR. KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED. OF AREA	BEND
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9802 3 TO 1	M48345	74 3						
						74 3 H	50.5	73.5	28.0	48.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9802 3 TO 1	M48345	74 4						
						74 4 H	51.0	73.5	27.0	47.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9802 3 TO 1	M48345	74 5						
###END OF DATA###						74 5 H	51.5	73.5	26.0	48.0		

#YIELD STRENGTH @ 0.5% E U L

NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	H	V	B	N	CB	CO
15	HEAT	18	103	018	008	24	02	02	03	01		026		000			003	
	###END OF DATA###																	

FINE GRAIN

DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LEFT MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT.

1417 701077010 120192 R 0186147001 01 JFP SA 3 0 0 PAGE 1

Division of USX Corporation
01000773 (REV. 8/91)

Test Report 0013

CONTRACT NO.

P.O. DATE	PURCHASE ORDER NO.
11/13/92	5634

SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.
H01022 12 03 92	GF18280	154-166528

VESSEL NO. EJE 006213 H1022

CARY WORKS
CARY, INDIANA 46402

MELTED AND MANUFACTURED IN THE USA

PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
P O BOX 41041
HOUSTON TX 77241-1041

SHIP TO
PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECT.

PREPARED BY THE OFFICE OF:
C. D. LUKES GEN. MGR. Q. A.

DATE 12-3-92

RECEIVED

DATE _____

P.O. # _____

PLATE CARBON ASME SA516-M1989 EDITION-1991 ADDENDA DECEMBER 31, 1991 GRADE 70, PRESSURE VESSEL QUALITY

1 MILL CERTIFIED T/R

MATERIAL DESCRIPTION: THICKNESS OR DIAMETER	WIDTH DIA. OR FLWL	LENGTH	QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	YIELD (0.2%) KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED. OF AREA	BEND
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO = 24.3 TO 1	01	4901	M40345	73 2						
						73 2 H	52.0	73.5	29.0	40.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO = 24.3 TO 1	01	4901	M40345	73 3						
						73 3 H	52.0	73.5	28.0	50.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO = 24.3 TO 1	02	9802	M40345	73 4 ✓						
						73 4 H	50.5	74.0	27.0	48.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO = 24.3 TO 1	02	9802	M40345	73 5 ✓						

*YIELD STRENGTH @ 0.5% E.U.L.

	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	W	CB	CO
15	HEAT	18	103	018	008	24	02	02	03	01		026		000			003	

HHHEND OF DATAHHH

FINE GRAIN

DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LEFT MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT.

DI000073 (REV. 8/91)

CONTRACT NO.

P.O. DATE	PURCHASE ORDER NO.
11/13/92	5634

SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.
H01022 12 03 92	GF18200	154-166520

VESSEL EJE 006213 H1022

ARY WORKS
ARY, INDIANA 46402

MELTED AND MANUFACTURED IN THE USA

ECHINEY WORLD TRADE USA INC
NTSEL SOUTHWEST DIV
O BOX 41041
OUSTON TX 77241-1041

SHIP TO
PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECT.

PREPARED BY THE OFFICE OF:
G. D. LUKES GEN. MGR. Q A

DATE RECEIVED 3-9-93

PLATE CARBON ASME SA516-#1909 EDITION-1991 ADDENDA DECEMBER 31, 1991 GRADE 70 PRESSURE VESSEL QUALITY

1 MILL CERTIFIED T/R

DATE _____
P.O. # _____
JOB # _____

MATERIAL DESCRIPTION			QUANTITY	WEIGHT	HEAT NO	TEST OR PIECE IDENTITY		YIELD PT. KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED OF AREA	BEND
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	01 = 24	4901 3 TO 1	M48345	73 2							
						73 2	R	52.0	73.5	29.0	48.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	01 = 24	4901 3 TO 1	M48345	73 3							
						73 3	R	52.0	73.5	28.0	50.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9802 3 TO 1	M48345	73 4							
						73 4	R	50.5	74.0	27.0	48.0		
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9802 3 TO 1	M48345	73 5							

#YIELD STRENGTH @ 0.5% E.U.L.

TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	W	CB	CO
HEAT	18	103	010	001	24	02	07	03	01		026		000			003	

FINE GRAIN

###END OF DATA###

DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LEFT MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT.

01061A7001 01 JEP CAA 3 0 0 PAGE 1

A division of USX Corporation
01000772 (REV. 8/91)

Test Report

D&O

USX

P.O. DATE	PURCHASE ORDER NO.
11/13/92	5634

SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.
HD1022 12 01 92	GE18280	159-166528
EJE 006213		H1022

CARY WORKS
CARY, INDIANA 46402

MELTED AND MANUFACTURED IN THE USA

PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
P O BOX 41041
HOUSTON TX 77241-1041

SHIP TO
PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECT.

PREPARED BY THE OFFICE OF:
G. D. LUKES GEN. MGR. Q. A.

DATE: 12-3-92

RECEIVED

DATE _____

P.O. # _____

PLATE CARBON ASME SA516-#1989 EDITION-1991 ADDENDA DECEMBER 31, 1991 GRADE 70 PRESSURE VESSEL QUALITY

01 MILL CERTIFIED T/R

MATERIAL DESCRIPTION: THICKNESS OR SECTION	WIDTH DIA. OR I.E. WT.	LENGTH	QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	JOB #	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED. OF AREA	BEND
							KSI					
3/8 "	96.0000	480"			M48345	73 5 H	53.0	73.5	27.0	47.0		
3/8 "	96.0000	480"	02	9802	M48345	74 2						
STEEL-TYPE	= CAST	REDUCTION RATIO	= 24	3 TO 1								
						74 2 H	52.5	72.5	26.0	46.0		
###END OF DATA####												

#YIELD STRENGTH @ 0.5% E.U.I.

I NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
345	HEAT	18	103	018	008	24	02	02	03	01		026		000			000	
###END OF DATA####																		

FINE GRAIN

IX DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LEFT MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT.

CAA 2.0.0 PAGE 3

32-8850-01

CERTIFICATE OF TESTS

09/08/92 Q 23323

C 26678 745

748-18980

56755059 30-3/4-10

Bestline Steel Products Inc.
3001 W. Eleventh
Houston, TX 77008

1385 9

10 13 92 ALA CITY 6TILES TRK

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED ON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS

LEONARD A. TROMAN
DIR. QUALITY ASSURANCE AND METALLURGY

PLATE CARBON ASTM A-516-90 GRADE 70 ASME SA-516 DATE 07 01 89 GRADE 70 PVQ KILLED FINE GRAIN PRACTICE CUST ID: 0412951		
.2500 X 96.0000 SHEARED EDGE X 480.0000 IN	A	39204
HT 7424460 T 891 1PCS HT 7424460 T 892 1PCS HT 7424460 T 893 1PCS HT 7424460 T 894 1PCS HT 7424460 T 895 1PCS HT 7424460 T 896 1PCS HT 7424460 T 897 1PCS HT 7424460 T 898 1PCS HT 7424460 T 899 1PCS HT 7424460 T 900 1PCS HT 7424460 T 901 1PCS HT 7424460 T 902 1PCS		

C 27MX MN 85/1.20 P 035MX S 035MX SI 15/40 AL 020MIN CU 40MX NI 40MX

RECEIVED
DATE 1-15-93
P.O. # 156797
JOB # 2472

Floating roof deck

HEAT NO.	GRAIN	C	MN	P	S	SI	CU	NI	CR	MO	V	CB	TI
7424460		.21	1.08	.010	.010	.226	0.03	0.01	0.04	.02	.000	.003	.03

HEAT NUMBER	PIECE QUANTITY NO	YIELD KSI	TENSILE STRENGTH KSI	ELONG 2"	ELONG 8"	BEND TEST	HARD	CHARPY IMPACT V-NOTCH FT LBS AT TEST	TEMP	1	2	3	AVG
7424460	891	57	77		26								
	892	56	77		24								
	893	57	77		25								
	894	56	77		24								
	895	57	77		24								
	896	58	78		28								
	897	57	77										

CONTINUED

2-0960-01

09/08/92 Q 23323

CERTIFICATE OF TESTS

E 4 | BN | 6 26678 72

56755059 | 30-3/4-10 | 74E 18980

Bestline Steel Products Inc.
3001 W. Eleventh
Houston, TX 77008

0 13 92 | ALA CITY | STILES TRK

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED ON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS

LEONARD A. TROMAN
DIR QUALITY ASSURANCE
AND METALLURGY

CR 30MX MO 12MX CB 02MX V 03MX
YLD 38000 MIN TEN 70/90000 X ELONG MIN 2 IN 21 CR 8 IN 17
1 TR WAREHOUSE PICK-UP CLERK CA

TOTAL WT. 39,2048 PCS 12

RECEIVED
DATE 1-15-92
P.O. # W56797
JOB # 7472

HEAT NUMBER	TESTOR PLT IDENTITY NO.	WELDER														
7424460	898	57	77		26											
	899	56	76		25											
	900	56	76		24											
	901	58	77		24											
	902	56	77		26											

TEST REPORTS

FRIEDMAN INDUSTRIES, Incorporated

P.O. BOX 21147 • HOUSTON, TEXAS 77226 • (713) 672-9433

Wyatt Field Services
Houston, TX

1/29/93

Attn: John Williams

B914

P.O. W57492
Inv. 24330

P.O. W56170
Inv. 24331

HEAT NUMBER	SIZE	SPECIFICATIONS
052043 1D0068 1D0068	5/16 72 x 240 3/16 72 x 301 3/16 72 x 240	A36 A36 A36

CHEMICAL ANALYSIS

HEAT NUMBER	C	MN	P	S	SI	AL
052043 1D0068	.132 .21	.837 .71	.12 .012	.5 .022	.100 .004	.37 --

PHYSICAL PROPERTIES

HEAT NUMBER:	YIELD POINT PSI	TENSILE STRENGTH PSI	ELONG %	BEND TEST
052043 1D0068	43,150 52,500	65,449 67,300	31% in 2" 25% in 8"	

WE HEREBY CERTIFY THAT THE ABOVE FIGURES ARE CORRECT AS CONTAINED IN THE RECORDS OF FRIEDMAN INDUSTRIES, INC.

RECEIVED

DATE 1-28-93

P.O. # W57492

JOB # 2472

FRIEDMAN INDUSTRIES, INC.

By Alicia Smith

Test Report

CONTRACT NO.

P.O. DATE 12/07/92 | PURCHASE ORDER NO. 60-8843/1427-H

SHIPPERS NO. GC637250C 01-13-93 | MILL ORDER NO. F956460 | INVOICE NO. GC637250C

VEHICLE IDENTITY RG 330275

NEVA STEEL
.O. BOX 2500
1090, UTAH 84603

NNESMANN PIPE&STEEL CORP
990 POST OAK BLVD
IUSTON TX 77056-3811

SHIP TO
FRIEDMAN INDUSTRIES
4001 HOMESTEAD ROAD
SPINS #273001
HOUSTON, TX 77028

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

Larry D. Clinger
MANAGER - QUALITY ASSURANCE
DATE 01-13-93

R. SHEET C.25MAX P.040MAX S.050MAX HR36S058 Y/P 36 KSI MIN T/S
1 KSI MIN DRY NO OIL

MILL RA/SN CERTIFIED T/R ANALYSIS

MATERIAL DESCRIPTION: THICKNESS OR SECTION	WIDTH, DIA OR FT WT	LENGTH	QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	YIELD PT PSI	TENSILE STR PSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED OF AREA	BEND
.1780"	72.0000"	COIL 576460	1	49450#	100068	.1780"	52500	67300	25.0			
						.1780"	52500	67900	25.0			
						END OF DATA						

	HEAT	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
68	HEAT	21	71	012	022	004												
EVA STEEL COMPANY CERTIFIES ALL SMELTING, MELTING AND MANUFACTURING PROCESSES OCCURRED IN THE USA.																		
ND OF DATA***																		

8044 (3 C B A)

RECEIVED
DATE 1-28-93
P.O.# 4500245472
JOB # 2472

OXELÖSUND

Stor Skarven

INSPECTION CERTIFICATE
(DIN 50049-3.1B)

(B10) 0701-410-108

DATE : 1992-04-22 51670 -50117
NO : 24976-002 PAGE : 1/ 2

PURCHASER ORDER NO:
420.424 (PART 1)

CONSIGNEE:
KLÖCKNER & CO
STAHL INTERNATIONAL
POSTFACH 10 08 51
W-4100 DUISBURG 1
FORBUNDSREP TYSKLAND

ORDER DATE: 1992-02-17
OUR ORDER NO: 35321-00-357

PURCHASER:
KLÖCKNER & CO
STAHL INTERNATIONAL

B578

PRODUCT:
PRESSURE VESSEL STEEL PLATE

STANDARD/RULES STEEL GRADE:
ASME-ASTM SA /A 51670 YIELD

MARKING (STAMPING):
STEEL GRADE
TRADE MARK HEAT NO. PLATE NO.

1 1/8 X 120 X 480

MILL SHEET

ITEM	WORKS-NO.	DIMENSIONS T	W	L	NO.	WEIGHT (KG)	MARKS	DELIV. COND.	STEEL PROC.	HEAT NO.	PLATE NO.	NOTES
0003	15562-003	1/2x96x480			2	5928		NORM	BOF	625041	61-2	
0003	15562-003	1/2x96x480			2	5928		NORM	BOF	625401	11-0	
0004	15562-004	1/2x120x480			1	3705		NORM	BOF	625411	02-0	
0005	15562-005	5/8x96x480			1	3705		NORM	BOF	625461	04-0	
0006	15562-006	5/8x120x480			1	4631		NORM	BOF	625051	61-5	
0008	15562-008	3/4x120x480			1	5559		NORM	BOF	624581	61-5	
0010	15562-010	1 x120x480			1	7410		NORM	BOF	623621	01-1	
0011	15553-001	1 1/8x120x480			10	45201		NORM	BOF	626201	01-0	

THE MATERIAL HAS BEEN NORMALIZED AT 900+-15 DEG.C ES C/2 MIN PER MM/COOLED IN STILL AIR.
ALL REQUIREMENTS IN ACCORDANCE TO THE ORDER AND ASME SA20 ARE FULFILLED.
THE DIMENSION AND SURFACE INSPECTION IS CARRIED OUT WITHOUT OBJECTIONS.
INSPECTION MILL TEST CERTIFICATE.

IT IS HEREBY CERTIFIED THAT THE ABOVE DESCRIBED MATERIAL IS TESTED WITH SATISFACTORY RESULTS IN ACCORDANCE WITH THE REQUIREMENTS OF THE ORDER.

QUALITY INSPECTION
JOSEFSSON/LAGERKRANZ
SUNDELL / IVARSSON

RECEIVED
DATE 8-28-92
P.O. # 1W55253
JOB # 5195

Adress
ÖXELÖSUND AB
Box 1000
S-613 01 ÖXELÖSUND
Sweden

Telephone
Nat 0155 540 00
Int +46 155 540 00

Telex
60050
ossbo

Telefax
Nat 0155-540 73
Int +46 155 540 73

Bank
Skandinaviska Enskilda Banken
STOCKHOLM

Bankgiro
807-4480

Postgiro
37 38 44-2

Org nr
556038-7933

Please effect payment through
Skandinaviska Enskilda Banken
STOCKHOLM
SWIFT-address ESSESESS

PLEASE MARK:

OXELOSUND

INSPECTION CERTIFICATE
(DIN 50049-3.1B)

DATE : 1992-04-22 5167C -50117
NO : 34976-002 PAGE : 2/ 2

CHEMICAL COMPOSITION

OBTAINED LADLE ANALYSIS (%):

HEAT NO.	C	SI	MN	P	S	CR	NI	MO	V	TI	CU	AL	NB	B	N
23621	.20	.30	1.10	.011	.002	.01	.02	.002	.005		.01	.051	.020		
24581	.20	.28	1.09	.011	.002	.02	.02	.002	.016		.02	.040	.018		
25041	.21	.30	1.09	.009	.002	.02	.03	.002	.005		.02	.043	.019		
25051	.20	.32	1.11	.009	.002	.02	.02	.002	.010		.01	.033	.021		
25401	.20	.31	1.11	.012	.002	.03	.03	.003	.010		.02	.033	.017		
25411	.20	.30	1.09	.010	.002	.02	.03	.003	.007		.01	.048	.018		
28201	.20	.27	1.10	.018	.007	.03	.01	.015	.010		.01	.033	.017		

MECHANICAL TESTING

TEST RESULTS:

TENSILE TEST

HEAT	PLATE	MILL CODE	THICKNESS (MM)	TREATMENT:D	SPECIMEN POS.	SPECIMEN TYPE	REH (KSI)	RM	ELONG. AK	ELONG. (%)
23621	01-1	405382	25.4		4	1	56	78	A200	28
24581	61-5	403236	19.1		4	1	57	79	A200	26
25041	61-2	377946	12.7		4	1	58	80	A200	25
25051	61-5	378116	15.9		4	1	58	80	A200	26
25401	11-0	378512	12.7		4	1	55	80	A200	24
25401	04-9	378611	15.9		4	1	59	79	A200	27
25411	02-0	378765	12.7		4	1	57	79	A200	23
28201	01-0	421197	28.6		4	1	54	78	A200	29

IMPACT TEST

TREATMENT:D	SPECIMEN POS.	SPECIMEN TYPE	TEMP DEG.F	N.TOUGHN. IND.	(FT LB F) VALUES		AVE
	3	A	-51	43	30	27	33
	3	A	-51	64	63	60	63
	3	A	-51	78	85	77	80
	3	A	-51	51	74	78	72
	3	A	-51	68	60	83	70
	3	A	-51	64	55	66	62
	3	A	-51	104	71	54	76
	3	A	-40	53	74	60	66

RECEIVED
DATE 8-28-92
P.O.# W55953
JOB# 5195

TREATMENT : D=DELIVERY CONDITION
SPECIMEN POSITION: 3=TOP LONG., 4=TOP TRANSV.
SPECIMEN TYPE : A: CHARPY-V 10X10, 1: RECTANGULAR

Oxelösund AB
Box 1000
S-613 81 OXELÖSUND
Sweden

Telephone
Nat 0155-640 00
Int +46 155 640 00

Telex
20050
oxels s

Telefax
Nat 0155-640 73
Int +46 155 640 73

Bank
Skandinaviska Enskilda Banken
STOCKHOLM

Bankgiro
807-6460

Postgiro
37 75 40-3

Organ
04-556510-7033

Please effect payment through
Skandinaviska Enskilda Banken
STOCKHOLM
SWIFT-address ESSESESS

REPUBLIC OF SOUTH AFRICA

TEST AND ANALYSIS CERTIFICATE

SABS 0157 Listing no. LS 0208

Customer

Description of material: STEEL PLATES TO SPECIFICATION

Specification: ASTM A36/A36M STRUCTURAL PLATE GR A 0778

Edition: 1992

Material supplied: AS ROLLED

Test pieces taken: AS ROLLED

Order no: MPX 2070642

Cast Number: 0

Gross Mass: 5200 kg / 11461 Lbs

Nett Mass: 4440 kg / 9788 lbs

Exp Permit no.: 6000

Transport: RAIL

Pgs: 1

Dimensions: 12192 X 2438 X 12M.76 / 480" X 96" X 3/16"

Cast no / Lift card	Stencil / Dip	Impact tests: Test Piece Location and Size (Wid / Thk)	Test Direction (Long / Trans)	Temp °C / °F	Results Three Impacts ft lbs: 1 / 2 / 3 / Avg	Lat Exp mm or %	Tensile tests: Test Piece Position	YS (MPa) (T.S.I)	TS (MPa) (T.S.I)	Yield / Tensile Ratio	EL 200 mm %	RA %	Hardness Test	Hot Test °C (MPa) °F (T.S.I)	Anal. Type	Chemical analyses: C HD %	MN ALT %	P %	S %	SI %	CU %	NI %	CR %	V %	NB %
LS41857 VPC88838							TX	316 / 050	483 / 0070	071 / 071	21	61			L	0.1800 / 0.0039	1.2400 / 0.0490	0.0010	0.0140	0.2780	0.0100	0.0400	0.0190		

RECEIVED
DATE 10-27-92
PO # W50441
JOB # 9204-5412

Customer's representative

Additional test results

All other requirements in accordance with the supplier official order acceptance

Witnessing Inspection

Cast no. and/or steel name: ARGUN STIRRED CONCAST(ARC)

Test piece position: TX - TOP TRANSVERSE

Analysis: L - LADLE ANALYSIS

Date: 1992-08-03

For the Steel Product Technologist

ISCOR (LTD), VANDERBIJLPARK
REPUBLIC OF SOUTH AFRICA
Reg. No. 89/03164/06

TEST AND ANALYSIS CERTIFICATE

SABS 0157 Listing no. LS 0208

P 301 - A
Rev 3

Customer

Description of material: STEEL PLATES TO SPECIFICATION

Specification: ASTM A36/A36M STRUCTURAL PLATE GR A B 170 — Edition: 1992

Material supplied: AS ROLLED

Test pieces tested: AS ROLLED

Order no: MPX 2070662 — Cert Number: A

Gross Mass: 26990 kg / 59503 Lbs — Invoice Mass: 24430 kg / 53856 Lbs

Exp Permit no: 6XXX — Transport: RAIL — Pgs: 1

Dimensions: 13192 X 3416 X (11.76 / 480" X 96" X 5/16"

Cast no / Lot card	Series / Qty	Impact tests: Test Piece Dimensions mm (With / Thk)	Test Piece Position	Temp °C / °F	Results Discarded Blow 1	2	3	Avg	Lat Exp mm/cm	Tensile tests: Test Piece Position	YS (MPa) (KSI)	TS (MPa) (KSI)	Yield/Tensile Ratio	EL 200 mm %	RA %	Hardness Test	Hot Test °C (MPa) °F (KSI)	Analysis	C %	Mn %	P %	S %	Si %	Cu %	Ni %	Cb %	CE
1204694 VPCB8P05										TX	348 (50)	473 (68.9)	0.73 (0.72)	25	60			L	0.1400 / 0.0110	1.0400 / 0.0430	0.0110	0.0140	0.2310	0.0300	0.0100	0.0130	
1204694 VPCB8P04										TX	348 (50)	473 (68.9)	0.73 (0.74)	25	60			L	0.1400 / 0.0110	1.0400 / 0.0430	0.0110	0.0160	0.2310	0.0300	0.0100	0	
1204694 VPCB8P06										TX	348 (50)	473 (68.9)	0.73 (0.72)	25	60			L	0.1400 / 0.0110	1.0400 / 0.0430	0.0110	0.0160	0.2310	0.0300	0.0100	0.0130	

RECEIVED
DATE 10-27-92
P.O.# 56441
JOB # 5206 - 5212

Customer's representative

Additional test results

All testing requirements in accordance with the supplier's latest order requirements

Witnessed

Inspection

DESTINATION: USA

Date: 1992-07-27

Cast no. prefix letters: LADLE FURNACE CONCAST(ARC)

Test piece position: TX = TOP TRANSVERSE

Analysis: L = LADLE ANALYSIS

for Iscor Manager / Control Technologist

OREGON STEEL MILLS

PO Box 2760, Portland Oregon 97208 - (503) 266-9651 TWX 910 464 1549

54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

REPORT OF CHEMICAL/PHYSICAL

CERTIFICATE NO	DATE
152051	DEC 30, 1991
MILL ORDER NO.	DATE
FM-15735-02	11/08/91
CUSTOMER ORDER NO.	
0701-410-033	
JOB/REQ NO.	
SHIPPING NO	DATE
F152051	12/20/9
CARRIER	
UP	
CAR/TRUCK NO.	
UP259591	

S MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

STORAGE PROC

PHYSICAL PROPERTIES

DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8"	% ELONG 2"	% RA	HARDNESS BHN	HEAT TEST	IMPACTS
** CONTINUED FROM PREVIOUS PAGE **										
5/16 X 96 X 480	VC0023	A69	570	795	22					
	VC0023	A70	575	790	22					
	VC0023	B46	560	790	26					
	VC0023	B67	550	785	23					
	VC0023	B68	555	790	25					
	VC0023	B71	555	790	25					
	VC0023	B72	575	810	24					
	VC0023	B74	575	800	22					
	VC0044	A22	555	785	24					
	VC0046	A32	575	810	22					
	VC0046	A33	590	820	22					
	VC0046	A34	590	820	23					

RECEIVED
DATE 1-18-93
P.O. # W56849
JOB # 2472

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al	Sn	Nb	V	Ti	B	N	CE	CE (IIW)
VC0044	.19	1.07	.024	.009	.21	.01	.02	<.02	<.002	.033	.02	.01						
VC0046	.21	1.04	.025	.008	.20	.01	.02	<.02	<.002	.046	.02	.01						

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

Angie McCasland TEST REPORT CLERK

OREGON STEEL MILLS

PO Box 2760, Portland, Oregon 97208 (503) 285-9551 TWX 910 464 1549

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO	DATE	PAGE
230115F	Oct 07, 1992	1

MILL ORDER NO. 41682 — DATE

CUSTOMER ORDER NO. 0701-410-121

JOB/REQ. NO.

SHIPPING NO. 230115 — DATE 10/07/1992

CARRIER SOUTHERN PACIFIC

CAR/TRUCK NO. SSW87725

SOLD TO

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL QUALITY ASTM A516-86 GRADE 70 ASME SA516 GRADE 70.

5 1/16 X 96 X 480

PHYSICAL PROPERTIES

ITEM NO	DESCRIPTION	HEAT NO.	SCAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8"	% RA	HARDNESS BHN	IMPACTS
2	0.2500 X 120.000 X 480.000								
	1 PC 4084 LBS	VC0008	A62	585	780	23			
	1 PC 4084 LBS	VC0015	B62	595	805	22			
3	0.3125 X 96.000 X 480.000 ✓								
	1 PC 4084 LBS	VC0026	B25	660	800	19			
	3 PCS 12252 LBS TOTALS								

RECEIVED
DATE 1-18-93
PO # W56849
JOB # 2477

Certified a true copy of the original retained in our file.
AMERICAN ALLOY STEEL INC.

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Cb	Al	Ca	Mo	Ti	B	N	Co	Sn	CE	Sn Cu Ni Cr Mo
VC0008	.21	1.15	.023	.008	.20	.01	.01	<.01	<.002	.039	.02	.01							
VC0015	.21	1.07	.021	.008	.20	.01	.01	<.01	<.002	.039	.02	.01							
VC0026	.20	1.01	.018	.009	.21	.01	.02	<.01	<.002	.039	.01	.01							

******* END OF REPORT *******

TEST REPORT APPROVED DATE 10-7-92
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

I certify the above results to be correct as contained in the records of OREGON STEEL MILLS By Angie McCaleb TEST REPORT CLERK

OREGON STEEL MILLS

PO Box 2760 Portland Oregon 97208 · (503) 286-9651 TWX 910 464 1549

SOLD TO:
54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

SHIP TO:
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

REPORT OF CHEMICAL/PHYSICAL TE

CERTIFICATE NO.	DATE	PA
152051	DEC 30, 1991	

MILL ORDER NO.	DATE
PM-15735-02.	11/08/91

CUSTOMER ORDER NO.: 0701-410-033

JOB/REQ. NO.:

SHIPPING NO.	DATE
P152051	12/30/91

CARRIER: UP

CAR/TRUCK NO.: UP259591

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

1/4 X 96 X 480

PCS	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI X 100	TENSILE PSI X 100	% ELONG	% R.A.	HARDNESS BHN	ROCKWELL TEST	IMPACTS
1	1/4 X 96 X 480	VC0023	B47	615	800	23				
		VC0023	B49	575	750	23				
		VC0023	B51	605	815	25				
		VC0023	B52	595	795	27				
		VC0023	B53	600	815	22				
		VC0023	B55	585	785	22				
		VC0023	B56	590	790	24				
		VC0023	B57	590	800	26				
		VC0023	B58	600	805	26				
		VC0023	B60	600	810	23				
		VC0023	B61	600	820	22				
		VC0024	A48	600	810	25				
		VC0024	A54	610	810	23				

RECEIVED
DATE 1-18-93
P.O. # W56849
JOB # 2472

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al	Cb	V	Ti	N	B	Ca	CE	CE
VC0023	.20	1.10	.024	.009	.20	.01	.01	<.02	<.002	.036	.01	.01						
							.02	<.02	<.002	.042	.02	.01						

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

Angie McCleland
TEST REPORT CLERK

I certify the above results to be correctly as contained in the records of OREGON STEEL MILLS

ALLOY STEEL MILLS

PO Box 2750 Portland Oregon 97208 · (503) 286-9651 TWX 910 464 1549

SOLD TO:
54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

SHIP TO:
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

REPORT OF CHEMICAL/PHYSICAL

CERTIFICATE NO. 152051	DATE DEC 30,1991
MILL ORDER NO. PH-15735-02	DATE 11/08/9
CUSTOMER ORDER NO. 0701-410-033	
JOB/REL NO.	
SHIPPING NO. F152051	DATE 12/30/9
CARRIER UP	
CAR/TRUCK NO. UP259591	

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

5/16 x 96 x 480

DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG	% RA	HARDNESS BHN	IMPACT TEST	IMPACTS
** CONTINUED FROM PREVIOUS PAGE ** 1/4 X 96 X 480									
	VC0024	B74	575	785	22				
	VC0024	B75	580	790	22				
	VC0024	B76	590	795	25				
	VC0024	B77	595	800	22				
5/16 X 96 X 480 ✓	VC0022	B46	595	825	21				
	VC0022	B47	585	810	26				
	VC0022	B48	585	810	25				
	VC0022	B49	595	815	21				
	VC0023	A67	580	800	24				
	VC0023	A68	560	780	22				

RECEIVED
DATE 1-8-93
P.O. # W56899
JOB # 2472

Certified true copy of original records in our
AMERICAN ALLOY STEEL

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al	Co	Nb	B	N	V	Ca	Sn	CE	Mn/C
VC0022	.22	1.01	.022	.010	.19	.01	.01	<.02	<.002	.048	.01	.01							

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

I certify the above results to be correct as contained in the records of OREGON STEEL MILLS

By Angie McCleland
CSR

OREGON STEEL MILLS

PO Box 2760, Portland, Oregon 97208 · (503) 286-9651 TWX 910 464 1549

REPORT OF CHEMICAL/PHYSICAL TE

CERTIFICATE NO	DATE	PA
152051	DEC 30,1991	4

MILL ORDER NO.	DATE
PH-15735-02	11/08/91

CUSTOMER ORDER NO. 0701-410-033

JOB/REQ. NO.

SHIPPING NO.	DATE
F152051	12/30/91

CARRIER

LIC

CAR/TRUCK NO. UP259591

S4232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1425
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1425
HOUSTON, TX 77056

S MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL PLATE
ASTM A516-90 GRADE 70
ASME SA516 GRADE 70

B891

DESCRIPTION	HEAT NO.	SLAB	PHYSICAL PROPERTIES YIELD PSI x 100	TENSILE PSI x 100	% ELONG	% RA	HARDNESS BHN	BEND TEST	IMPACTS
** CONTINUED FROM PREVIOUS PAGE ** 5/16 X 96 X 480	VC0023	A69	570	755	23				
	VC0023	A70	575	790	22				
	VC0023	B66	560	790	26				
	VC0023	B67	550	785	23				
	VC0023	B68	555	790	25				
	VC0023	B71	555	790	25				
	VC0023	B72	575	810	24				
	VC0023	B74	575	800	22				
	VC0046	A32	575	810	22				
	VC0046	A33	590	820	22				
	VC0046	A34	590	820	23				

RECEIVED
DATE 1-8-93
P.O. # W56849
JOB # 2472

Certified a true copy of th original, retained in our fil AMERICAN ALLOY STEEL.

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al	Cb	V	Sn	B	N	Ca	Ti	CE
VC0044	.19	1.07	.024	.009	.21	.01	.02	<.02	<.002	.033	.02	.01						
VC0046	.21	1.06	.025	.009	.20	.01	.02	<.02	<.002	.046	.02	.01						

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

RESULTS FOR ABOVE HEATS TO BE ENTERED AS CONTAINED IN THE RECORDS OF OREGON STEEL MILLS BY Angie McCorkle TEST REPORT CLERK

OREGON STEEL MILLS

PO Box 2760 Portland Oregon 97208 (503) 286-9651 TWX 910 464 1549

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO.	DATE	PAGE
221602F	Jul 20, 1992	1

MILL ORDER NO.	DATE
21682	

CUSTOMER ORDER NO. 0701-410-121

JOB/REQ. NO.

SHIPPING NO.	DATE
221602	07/20/1992

CARRIER: SOUTHERN PACIFIC

CAR/TRUCK NO. SP565576

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

B892

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

SM CARBON PRESSURE VESSEL QUALITY ASTM A516-86 GRADE 70 ASME SA516 GRADE 70.

5/16 X 96 X 480

PHYSICAL PROPERTIES

DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG	BEND TEST	HARDNESS BHN	IMPACTS
0.3125 X 96.000 X 480.000								
1 PC 3084 LBS	VC0026	A6	500	745	21			
1 PC 4038 LBS	VC0026	B2	525	765	21			
0.3750 X 96.000 X 480.000								
1 PC 4901 LBS	662170	A9	540	815	20			
1 PC 4901 LBS	VC0003	A2	530	755	27			
1 PC 4901 LBS	VC0028	B4	530	765	22			
1 PC 4901 LBS	VC0028	B4	530	750	23			
1 PC 4901 LBS	VC0036	B6	525	755	24			
1 PC 4901 LBS	VC0029	B6	520	750	25			
1 PC 4901 LBS	VC0028	B6	530	750	27			
1 PC 4901 LBS	VC0036	B3	545	780	24			
10 PCS 67376 LBS TOTALS								

RECEIVED

DATE 1-18-93

P.O. # 456849

JOB # 2472

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Cb	V	Al	Sn	B	Ca	CE	CE
0026	.20	1.01	.018	.009	.21	.01	.02	<.01	<.002	.039	.01	.01					
0008	.21	1.15	.023	.008	.20	.01	.01	<.01	<.002	.038	.01	.01					
0028	.20	1.02	.027	.010	.21	.01	.01	<.01	<.002	.039	.02	.01					
0036	.21	1.03	.025	.008	.20	.01	.02	<.01	<.002	.040	.01	.01					
							.01	<.01	<.002	.047	.01	.01					

***** END OF REPORT *****

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL SY
QUALITY ASSURANCE DEPT.

Angie McCaelen TEST REPORT CLERK

JOB CONTRACT NO.

Metallurgical Test Report

B880

GENEVA STEEL
P.O. BOX 2500
PROVO, UTAH 84603

DANNESHANN PIPESTEEL CORP
1990 POST OAK BLVD
HOUSTON TX 77056-3311

63012

DELTA STEEL
7355 ROUNDHOUSE LANE
SPRR SPUR 2432
HOUSTON, TX

SHIP TO

P.O DATE	PURCHASE ORDER NO
	60-6312/MH114312

SHIPPERS NO	MILL ORDER NO.	INVOICE NO.
GP56452A 06-21-92	EA43590	GP56452A

VEHICLE IDENTITY: SSU87950

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

Larry D. Clingen
MANAGER - QUALITY ASSURANCE
DATE 06-21-92

PLATE ASTM A516-86 GRADE 70 AND ASME SA516-1987 EDITION
1990 ADDENDA GRADE 70 SECTION II PRESSURE VESSEL QUALITY NORMALIZED
CHARPY V-NOTCH LONGITUDINAL IMPACT TESTS EACH PLATE AS HEAT TREATED
15FT/LBS MIN AVERAGE 10FT/LBS MIN AT MINUS 50 DEG. F.FREQUENCY P.
01 MILL CERTIFIED T/R

ITEM NO.	MATERIAL DESCRIPTION: THICKNESS OR SECTION	WIDTH DIA. OR FT WT	LENGTH	QUAN. LOT	WEIGHT	HEAT NO	TEST OR PIECE IDENTITY	YIELD PT *KSI	TENSILE STR KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED. OF AREA	IMPACT
	.2500"	96.0000"	480.0000"	1	32671	1C1109	03-04	58.3	81.4	23.0			
/2 SIZE LONG	CHARPY V-NOTCH IMPACT TESTS 05X10 MM TESTED AT -50 DEG F												
	AVERAGE IMPACT STRENGTH 34 FT LBS ACTUAL GAGE TESTED												
	.2500"	96.0000"	480.0000"	1	32671	1C1109	.2500 08-05	55.0	79.6	24.0			
/2 SIZE LONG	CHARPY V-NOTCH IMPACT TESTS 05X10 MM TESTED AT -50 DEG F												
	AVERAGE IMPACT STRENGTH 32 FT LBS ACTUAL GAGE TESTED												
	.2500"	96.0000"	480.0000"	2	65341	1C1159	.2500 08-03	61.5	93.0	24.0			
/2 SIZE LONG	CHARPY V-NOTCH IMPACT TESTS 05X10 MM TESTED AT -50 DEG F												
	AVERAGE IMPACT STRENGTH 30 FT LBS ACTUAL GAGE TESTED												
	.3750"	96.0000"	480.0000"	2	98021	2C5813	.3750 04-03	56.5	84.9	23.0			
4 SIZE LONG	CHARPY V-NOTCH IMPACT TESTS 7.5X10MM TESTED AT -50 DEG F												
	AVERAGE IMPACT STRENGTH 49 FT LBS ACTUAL GAGE TESTED												
	.3750							51	59	39			

HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
1109	HEAT	23	1.20	006	020	19	02	03	03	009		045		004			004	
1159	HEAT	24	1.17	008	026	20	02	03	03	004		021		018			004	
5813	HEAT	24	1.18	009	013	22	03	03	03	004		054		004			004	

GENEVA STEEL COMPANY CERTIFIES ALL SMELTING, MELTING AND MANUFACTURING PROCESSES OCCURRED IN THE USA.

END OF DATA***

FINE GRAIN
FINE GRAIN
FINE GRAIN

07 DECIMAL POSITIONS CONSERVATIVE

MILL TEST REPORTS FURNISHED TO
DELTA STEEL, INC.
JOB# 2472
CUSTOMER P.O. #W57485
DELTA NUMBER WC 196707
HEAT NUMBER 1C1109/08-01
GRADE 516-70

RECEIVED
DATE 1-21-93
P.O. # W57485
JOB # 2472

JOHNS HARBOR PLANT

BETHLEHEM STEEL CORPORATION
QUALITY ASSURANCE DEPARTMENT
REPORT OF TESTS AND ANALYSES

003-11981

DATE SHIPPED 7-14-92

CAR OR VEHICLE NO CSS-CHGO-MP

PHONE 00C4EC

SOLD TO
DELTA STEEL INC
PO BOX 2280
HOUSTON TX 77252

206810

SHIP TO
DELTA STEEL INC
SPOT 0275400
9217 S FREEWAY
FORT WURTH TX 76140

B867

QUALITY STEEL MELTED & MANUFACTURED IN THE U.S.A.

PLATES - ASTM A516-86 GR 70 PVQ
MFST - LIFT MAX 10 TON-SIZES SEP UNLDG OH-PLATE HOOK
CO# DF115808 GH 024-4541
YIELD STRENGTH @ .5% E.U.L.

SERIAL NUMBER	PAT NO	HEAT NUMBER	NO PCS	SIZE AND QUANTITY THICKNESS INCHES	WIDTH OR DIA INCHES	LENGTH INCHES	WEIGHT POUNDS	YIELD POINT PSI	TENSILE STRENGTH PSI	ELO IN
42319		803X73660	2	1/4	96	480	6534	61300	81900	8
42320		803X73660	2	1/4	96	480	6534	56700	80700	8
42321		803X73660	2	1/4	96	480	6534	56900	80200	8
42322		803X73660	1	1/4	96	480	3267	45200	77700	8

RECEIVED
DATE 1-14-93
P.O. # W56727-A7C
JOB # 2-472

QUENCH TEMPERATURE — NORMALIZE TEMPERATURE

SERIAL NUMBER	PAT NO	HEAT NUMBER	HARD	BEND	THICKNESS INCHES	CHARPY IMPACT TYPE	SIZE	ORI.	TEST TEMP F	ENERGY FT. LBS. 1	2	3	SHEAR (%) 1	2	3	LAT. EXP 1	2	MIL

CHEMICAL ANALYSIS

	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Ti	Al	B	Cb	N	MANUFACTURING SIZE
803X73660	.23	1.00	.017	.014	.21	.015	.02	.04	.006	.004		.036		.002		

SUBSCRIBED AND SWORN TO BEFORE ME
THIS 15 DAY OF July 19 92
NOTARY PUBLIC
PORTER COUNTY INDIANA
MY COMMISSION EXPIRES JULY 31, 1992

AT THE ABOVE RESULTS ARE A TRUE AND CORRECT COPY
PREPARED AND MAINTAINED BY BETHLEHEM IN COMPLI
THE REQUIREMENTS OF THE SPECIFICATION CITED ABOVE.

SUPT. QUALITY ASSURANCE R. J. Hart

Gulf States Steel, Inc.

3459-01

CERTIFICATE OF TESTS

07/21/92 20A 9855

CUSTOMER IDENTIFICATION

ORD. C 26182 748

ITEM A MAIL 2 OFFICE DIST. EC INVOICE DATE 748-18160

LE ACCOUNT NUMBER 65240202 TERMS 30-3/4-10

SOLD TO: RYERSON CENTRAL, JOSEPH T.
MERCHANDISING SERVICES
P O BOX 8000
CHICAGO IL 60680

SHIP TO: RYERSON CENTRAL, JOSEPH T.
1211 KRESS STREET
HOUSTON TX 77020

DATE SHIPPED 09 29 92 FROM ALA CITY ROUTE/VEHICLE IDENTIFICATION 8SW87860 SHEET NO.

HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS.

LEONARD A. TROMAN
DIR. QUALITY ASSURANCE AND METALLURGY

ITM NO.	MATERIAL DESCRIPTION	AVG	QUANTITY SHIPPED
	PLATE CARBON J T RYERSON SPEC 3449-P DTD 04/25/91 ASTM A-516-90 GRD 70 ASME-SA 516 GRD 70 1989 EDITION 1991 ADDENDA PVQ BLUE & PINK DOMESTIC STEEL ONLY CUST ID: 343786		
01	.2500 X 96.0000 SHEARED EDGE X 480.0000 IN	A	19602
	HT 7417643 T 8853 1PCS HT 7417643 T 8855 1PCS HT 7417643 T 8856 1PCS HT 7417643 T 8857 1PCS HT 7417643 T 8858 1PCS HT 7417643 T 8859 1PCS		
H	C 27MX MN 85/1.20 P 035MX S 035MX SI 15/40 AL 020MIN CU 40MX NI 40MX CR 30MX MO 12MX CB 02MX V 03MX		
R	YLD 38000 MIN TEN 70/90000 X ELONG MIN 2 IN 21 OR 8 IN 17		
I	S TR WITHIN 24 HRS OF SHIPMENT TO SA 1 TR PO BOX 2606		

RECEIVED
DATE 1-18-93
P.O. # 056797-B
JOB # 2472

mtr

HEAT NO.	GRAIN	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL
7417643		.18	1.09	.012	.013	.220	0.06	0.08	0.15	.04	.000	.006	.034

HEAT NUMBER	TEST PIECE IDENTITY NO	YIELD KSI	TENSILE KSI	ELONG 1"	ELONG 8"	GALV. COATING	BEND TEST	HARD.	CHARPY IMPACT V-NOTCH FT. LBS. AT TEST NO.	SPEC. REQ.	1	2	3	AVG.
7417643	8853	60	75		25									
"	8855	61	76		24									
"	8856	57	75		26									
"	8857	58	76		21									
"	8858	61	76		24									
"	8859	59	76		26									

Gulf States Steel, Inc.

GADSDEN, AL 35904-1935

32-D702-01

CONTROL CARD | REQ. JOB CONTRACT NO.

PURCHASE ORDER DATE: 11/13/92 | PURCHASE ORDER NO.: 5635 | RELEASE

CERTIFICATE OF TESTS

CUSTOMER IDENTIFICATION

DIST. G | G&S ORDER NO. NUMBER 27574 | MPEL 742 | ITEM NO.

SALES DIST. CB | OFFICE DIST. CB | INVOICE DATE | INVOICE NUMBER 742-22602

LE | ACCOUNT NUMBER 38080003 | TERMS 30-3/4-10

SOLD TO:
INTSEL SOUTHWEST
DIV PECHINEY WORLD TRADE
PO BOX 41041
HOUSTON TX 77240104

SHIP TO:
INTSEL SOUTHWEST
DIV PECHINEY WRLD TRD USA
SPIN NBR 4038
MELENDY TX

DATE SHIPPED: 12.14.92 | FROM: ALA CITY | ROUTE/VEHICLE IDENTIFICATION: SOU 115796 | SHEET NO.

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS.

C. F. BEARDEN, JR.
MGR, TECHNOLOGY AND QUALITY - PLATE PROD.

ITEM NO.	MATERIAL DESCRIPTION	P/C	QUANTITY SHIPPED
	PLATE CARBON ASME SA-516 DTD 07/01/89 GRD-70 ASTM A-516-86 GRD 70 PVQ P243000A		
11	.2500 X 96.0000 SHEARED EDGE X 480.0000 IN P243000A	A	39204
	HT 7425367 T 8273 1PCS		
	HT 7425367 T 8274 1PCS		
	HT 7425367 T 8275 1PCS		
	HT 7425367 T 8276 1PCS		
	HT 7425367 T 8277 1PCS		
	HT 7425367 T 8278 1PCS		
	HT 7425367 T 8279 1PCS		
	HT 7425367 T 8280 1PCS		
	HT 7425367 T 8281 1PCS		
	HT 7425367 T 8282 1PCS		
	HT 7425367 T 8283 1PCS		
	HT 7425367 T 8284 1PCS		

H C 27MX MN 85/1.20 P 035MX S 040MX SI 15/40 AL 020MIN CU 40MX NI 40MX

RECEIVED

DATE 1-15-93

P.O. # W56815

JOB # 2472

HEAT NO	GRAIN	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL					
7425367		.21	1.05	.006	.016	.220	0.02	0.01	0.03	.01	.000	004	.03

HEAT NUMBER	TESTOR PIECE IDENTITY NO	YIELD KSI	TENSILE STGTH KSI	ELONG 2"	ELONG 8"	GALV COATING	BEND TEST	HARD.	CHARPY IMPACT: V NOTCH FT. LBS. AT TEST NO	SPEC SIZE	1	2	3	AVG.
7425367	8273	58	78		23									
"	8274	58	77		25									
"	8275	59	78		22									
"	8276	58	77		24									
"	8277	58	77		23									
"	8278	58	78		22									
"	8279	57	77		25									
"	8280	58												

WYATT FIELD SERVICE COMPANY

WELDING PROCEDURE LIST

Job: 2472 Customer: Lyondell Petrochemical
Items 1-2455 & 1-2456

WPS#	Rev.	Comments	List Rev.
HW-1.3	0		0
HW-1.3(34)-1	0	Nozzle piping	-

WPS JN 2472
Lyondell Petrochemical
Items T-3455 & T-4455

WYATT FIELD SERVICE CO.

WELDING PROCEDURE SPECIFICATION

WPS #: HW-1.S(34)-1
Supporting PQR #: HW-1.S(3)-4 (85-5) & HW-1.S-1 (73-84) Revision #: 0
Welding Processes: SMAW (Manual)

Base Metals:
P #: 1 to P # 1
Thickness Range: 3/16 to 1-1/4"
Bevel:
5/16" & under: square or single vee.
Over 5/16": single or double vee.

Filler Metals:
SFA #: 5.1 A #: 1
Type: E6010 F #: 3
&/or E7018 F #: 4
Dia.3/32 Amps 40-110
1/8 Amps 85-150
5/32 Amps 150-200
3/16 Amps 210-280

Consumable Insert: none

Preheat: 50 F min.
Interpass: 50-500 F
Maintenance: During Welding

Position & Progression :Any

Postweld Heat Treatment: none

Electrical Characteristics:
Current: direct Polarity: reverse

Technique:
String or Weave Bead Single Electrode Peening: none

Notes:
1)Backing: Double welded or single welded with or without S.U.S.(as specified on drawings)
2)Root Gap: 1/8" Nom. for butt welds. 1/4" min. for S.U.S.
3)Max. pass thickness: 3/8"
4)Any or all of the electrode types or sizes listed may be used. E6010 must be used for the root pass of single welded joints.
5)Initial and interpass cleaning: Brushing and/or grinding.
6)Back Gouging: C-Arc Air and/or grinding, none required for fillets or single welded joints.
7)Non-metallic or non-fusing retainers: none

Approved: Andy Seale Date: 3/26/93

\2472\1S(34)

WELDING PROCEDURE QUALIFICATION RECORD

PQR#: HW-1.S(3)-H (69-5)
Process: SMAW

WPS#: HW-1.S(3)-H
Type: Manual

VARIABLES:

Base Material:
P#: 1 SA 285-C
Thickness: 3/4"
Max. Pass Thickness: <1/2"

Filler Metal:
F#: 3 A#: 1 SFA: 5.1 Class: E6010
Size: 7/32"

Electrical:
Polarity: Rev. Electrodes: Single
Amps: 240

Position: 3G, Horizontal
Preheat: 50 F Interpass: 500 F Max. PWHT: None

Test Results:

Bend Tests:
Number: 4 Type: Side (QW-462.2) Results: Good

Tensile Tests:
Ultimate Stress: 64,200 psi Break Location: Plate
" " 63,000 psi " " Plate

Welders Name: F. Johnson
Test Conducted By: J. Skolaski

Emp.# 397
Date: 1-23-69

We certify that the statements made in this report are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By.: [signature] Date: 3-13-69

Editorial Rev. 8-13-68

1S(3)

WELDING PROCEDURE QUALIFICATION RECORD

PQR#: HW-1.S-I (73-64)
Process: SMAW

WPS#: HW-1.S-I
Type: Manual

VARIABLES:

Base Material:
P#: 1 SA 333-1
Thickness: 0.75 (5" XXH Pipe)
Max. Pass Thickness: <1/2"

Filler Metal:
F#: 4 A#: 1 SFA: 5.1 Class: E7018
Size: 1/8"

Electrical:
Polarity: Rev. Electrodes: Single
Electrode Size: 1/8" Amps: 120

Position: 6G, Inclined Fixed
Preheat: 50 F Interpass: 500 F Max. PWHT: none

Test Results:

Bend Tests:
Number: 4 Type: Side (QW-462.2) Results: Good

Tensile Tests:
Ultimate Stress: 70,500 psi Break Location: Pipe
" " 72,000 psi " " Pipe

Hardness (HRB): Weld: 193,187,189 HAZ: 185,190,179

Welders Name: J.T. Johnson
Test Conducted By: E.A. Zemba Emp.# 617
Date: 3-23-73

We certify that the statements made in this report are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: [signature] Date: 8-13-88

Editorial Rev. 8/13/88

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME L.R. Davis S.S.# 454-88-8666 STAMP LRD
USING WPS NO. Hw-1.S-1
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/8"	3/4" Max.
Fillet	---	Any
Diameter	Plate	Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-463.3(a)

	Result
1 Face & 1 Root Bend: 2G Position	Good
" " " 3G "	"
" " 4G "	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result NA

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing) NA
Length and Per Cent of Defects _____ inches _____ %
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by C. Hamblin Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date 9-15-87 Organization Wyatt Field Service Co.
By

Form #815

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME N.M. Stewart S.S.# 438-52-5358 STAMP NMS
USING WPS NO. Hw-1.5-I
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/4"	Any
Fillet	---	Any
Diameter	Plate	*Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-462.2	Result
2 Side Bends; 2G Position	Good
" " " ; 3G "	"
" " " ; 4G "	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result NA

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing)
NA
Length and Per Cent of Defects _____ inches _____ %
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by W.N. Phillips Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date 9-19-86

Organization Wyatt Field Service Co.
By

Form #835

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME Kenneth Lyday S.S.# 453-94-0699 STAMP KL
USING WPS NO. KW-1.3-1
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/8"	3/4" Max.
Fillet	---	Any
Diameter	Plate	*Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-463.3(a)

	Result
1 Face & 1 Root Bend: 2G Position	Good
" " " 3G "	"
" " 4G "	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result NA

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing)
NA

Length and Per Cent of Defects _____ inches _____ %
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by C. Hamblin Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date 9-11-87 Organization Wyatt Field Service Co.
By _____

Form #835

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder Name: Carl Turcin S.S.# 457-13-6325 Stamp: CT
WPS#: HW-1.S-I

VARIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual or Semiautc.
Material Spec.	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove Weld Thickness	3/4"	Any
Pipe Diameter	Plate	>24" O.D.*.Any Fillet
Filler Metal:		
Spec. Number	SFA 5.1	
Class	E7018	
F Number	4	
Position	2G, 3G & 4G	1 thru 4
Progression	Uphill	Any
		Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

RT TEST

Results: Meets the requirements of Sec. IX

GUIDED BEND TEST RESULTS

Type: Side Bends Fig.# QW-462.2
Number of Bend Tests: 2 in each position.
Results: Meets the requirements of Sec. IX

Test Conducted By: Jeff Miller Date: 10/27/92
Specimen preparation and testing by Central Testing Co., Inc.

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: _____ Date: 11-18-92

S-RT-SB

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME Rbt. B. Clark S.S.# 455-72-8496 STAMP RBC
USING WPS NO. HW-1.S-I
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/4"	Any
Fillet	---	Any
Diameter	Plate	*Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-462.2

	Result
2 Side Bends: 2G Position	Good
" " " ; 3G "	"
" " " ; 4G "	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result NA

FILLET WELD TEST RESULTS

Fracture Test (Describe location, natura, and size of any crack or tearing)
NA
Length and Per Cent of Defects _____ inches _____ %
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by Ray Napper Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date 5-6-87 Organization Wyatt Field Service Co.
By

Form #835

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME L.D. McClure S.S.# 233-74-7030 STAMP LDM
USING WPS NO. Rw-1.5-1
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/4"	Any
Fillet	---	Any
Diameter	Plate	*Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-462.2

	Result
2 Side Bends; 2G Position	
" " " ; 3G "	NA
" " " ; 4G "	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result Good

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing)
NA
Length and Per Cent of Defects _____ inches _____ %
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by J. Peterson Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date 10-1-86

Organization Wyatt Field Service Co.
By

Form #835

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder Name: Claude V. Chapman S.S.# 458-90-0330 Stamp: CVC
WPS#: HW-1.S-1

VARIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual or Semiauto.
Material Spec.	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove Weld Thickness	3/4"	Any
Pipe Diameter	Plate	>24" O.D.*,Any Fillet
Filler Metal:		
Spec. Number	SFA 5.1	
Class	E7018	
F Number	4	
Position	2G, 3G & 4G	1 thru 4
Progression	Uphill	Any
		Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

RT TEST

Results: Meets the requirements of Sec. IX

Test Conducted By: JJ Williams Date: 1/7/93

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: Andy Seale Date: 1-8-93

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME R.A. Harbison S.S.# 452-27-6722 STAMP RAH
USING WPS NO. HW-1.S-I
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/4"	Any
Fillet	---	Any
Diameter	Plate	*Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-462.2

	Result
2 Side Bends: 2G Position	NA
" " " : 3G "	"
" " " : 4G "	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result Good

FILLET WELD TEST RESULTS

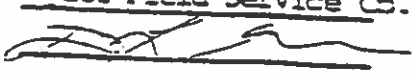
Fracture Test (Describe location, nature, and size of any crack or tearing)
NA
Length and Per Cent of Defects _____ inches _____%
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by J. Peterson Laboratory Test No. NA

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date 10-1-86

Organization Wyatt Field Service Co.

By 

Form #835

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder Name: Todd Duvall S.S.# 453-45-1900
WPS#: HW-1.S-1 Revision 0 Stamp: TD

VARIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Material Spec.	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove Weld Thickness	3/4"	Max. to be welded
Pipe Diameter	Plate	>24" O.D.*.Any Fillet
Filler Metal:		
Spec. Number	SFA 5.1	
Class	E7018	
F Number	4	
Position	2G, 3G & 4G	1 thru 4
Progression	Uphill	Any
		Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

RT TEST

Results: Meets the requirements of Sec. IX

GUIDED BEND TEST RESULTS

Type: Side Bends Fig.# QW-462.2
Number of Bend Tests: 2 in each position.
Results: Meets the requirements of Sec. IX

Welding Test Conducted By: D.R. Steinhauser Date: 11-08-91
Mechanical Tests Conducted By: BIX Testing Laboratiss Lab Test #: A920

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: [signature] Date: 01-10-92

5-RTSB2

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

er Name: Clay Baker S.S.# 450-15-7285
HW-1.S-1 Stamp: CB

RIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
ocess		
ocess Type	SMAW	SMAW
terial Spec.	Manual	Manual or Semiauto.
cking	P-1	P-1 thru P-11 & P-4X
ove Weld Thickness	Weld Metal	With Backing
e Diameter	3/4"	Any
ler Metal:	Plate	>24" O.D.*, Any Fillet
Spec. Number		
Class	SFA 5.1	
F Number	E7018	
ition	4	1 thru 4
gression	2G, 3G & 4G	Any
	Uphill	Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

RT TEST

lts: Meets the requirements of Sec. IX

nducted By: Claude Chapman Date: 11/21/93

rtify that the statements in this record are correct and that the welds were prepared, welded and tested in accordance with the require of Section IX of the ASME Code.

ACTURER: WYATT FIELD SERVICE COMPANY

Andy Searle Date: 11/22/93

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder Name: B.D. Hendrix S.S.# 527-19-3357
WPS#: HW-1.S-1 Stamp: BDH

VARIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual or Semiauto.
Material Spec.	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove Weld Thickness	3/4"	Any
Pipe Diameter	Plate	>24" O.D.*, Any Fillet
Filler Metal:		
Spec. Number	SFA 5.1	
Class	E7018	
F Number	4	
Position	2G, 3G & 4G	1 thru 4
Progression	Uphill	Any
		Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

GUIDED BEND TEST RESULTS

Type: Side Bends Fig.# QW-462.2
Number of Bend Tests: 2 in each position.
Results: Meets the requirements of Sec. IX

Test Conducted By: Claude Chapman Date: 10-18-91

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: [signature] Date: 10-23-91

-SB

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder: Clay Baker S.S.# 450-15-7285 Stamp: CB

WPS#:

VARIABL

	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	
Process	Manual	SMAW
Materia	P-1	Manual or Semiauto.
Backing	Weld Metal	P-1 thru P-11 & P-4X
Groove	3/4"	With Backing
Pipe Di	Plate	Any
Filler		>24" O.D.*,Any Fillet
Spec	SFA 5.1	
Clas	E7018	
F Num	4	
Positior	2G. 3G & 4G	1 thru 4
Progress	Uphill	Any
*2-		Uphill

*Plan. C.D. Pipe: Flat & Horizontal Only.

RT TEST

Results: [illegible] equirements of Sec. IX

Test Conc

[illegible] Claude Chapman Date: 11/21/93 97

We certif [illegible] statements in this record are correct and that the test weld[illegible]red. welded and tested in accordance with the require ments of [illegible] the ASME Code.

MANUFACTU WYATT FIELD SERVICE COMPANY

By: [illegible] Searle Date: 11/22/93

1S-RT

RT STATUS REPORT

Page #_____

Customer: LYONDELL

J/N: 2472-B

R.T. Contractor: GCT Inspection

Component: _____

Full or Spot: Full

Seam	Insp.	Date	AI	Date
MK-17	MLW	5-13-93	JH	5-13-93
W-1				
W-2				
W-3				
W-4				
MK-35				
W-1				
W-2				
W-3				
W-4				
MK-33				
W-1				
W-2				
W-3				
W-4	MLW	5-13-93	JH	5-13-93

Seam	Insp.	Date	AI	Date
MK-31	MLW	5-13-93	JH	5-13-93
W-1				
W-2				
W-3				
W-4	MLW	5-13-93	JH	5-13-93
MK 40				
W-1	A.S.	6/7/93	JH	6/2/93
W-2	A.S.	6/7/93	JH	6/2/93

Final Acceptance:

Inspector: Andy Searle

Date: 6/15/93

: James Hunter

Date: 6/15/93

Form 404, Rev.2

RT STATUS REPORT

Page #_____

Customer: Lyondell

J/N: 2472 B

R.T. Contractor: GCT Inspection

Component: TK # 4455

Full or Spot: Spot

Seam	Acceptance			
	Insp.	Date	AI	Date
RG-1				
V-1	MLW	5-21-93	JH	5-21-93
V-3	MLW	5-21-93	JH	5-21-93
V-4	MLW	5-21-93	JH	5-21-93
V-6	MLW	5-21-93	JH	5-21-93
RG-2				
V-3	MLW	5-21-93	JH	5-21-93
V-6R	MLW	5-24-93		
V-6 T1	MLW	5-24-93		
V-6 T2	MLW	5-24-93		
G-1				
V-1	MLW	5-21-93	JH	5-21-93
J-2	MLW	5-21-93	JH	5-21-93
J-3	MLW	5-21-93	JH	5-21-93

Seam	Acceptance			
	Insp.	Date	AI	Date
G-1				
H-1	MLW	5-21-93	JH	5-21-93
H-2	MLW	5-21-93	JH	5-21-93
G-4				
G4 H-1	A.S.	6/8/93	JH	6/8/93
G4 H-2	A.S.	6/8/93	JH	6/8/93
G4-0 H-1	A.S.	6/8/93	JH	6/8/93
G4-0 H-2	A.S.	6/8/93	JH	6/8/93
G4-0 H-3	A.S.	6/8/93	JH	6/8/93
G4-0 J1	A.S.	6/8/93	JH	6/8/93
G4-0 J2	A.S.	6/8/93	JH	6/8/93
G4-0 J3	A.S.	6/8/93	JH	6/8/93
G4-0 J4	A.S.	6/8/93	JH	6/8/93
G4-0 J5	A.S.	6/8/93	JH	6/8/93
G4-0 J6	A.S.	6/8/93	JH	6/8/93
V-1 J-1 DS	A.S.	6/15/93	JH	6/15/93
C-1 C-2 DS	A.S.	6/15/93	JH	6/15/93

Final Acceptance:

Inspector: Andy Searle

A.I.: James Hinton

Date: 6/15/93

Date: 6/15/93

Form 404, Rev.2

Form No. 501 Rev. 1

RECORD OF FIT-UP

Customer: LYONDELL

Job No. 2472 B

LONGITUDINAL SEAMS

Item	Approved	Date	A.I.	Approved	Date
~~Skirt Rings~~					
~~Bottom Head~~					
Ring #1	C.V.C.	5/12/93		JH	5/12/93
Ring # 2	C.V.C.	5/13/93		JH	5/13/93
Ring # 3	C.V.C.	5/17/93		JH	5/17/93
Ring # 4	C.V.C.	5/26/93		JH	5/26/93
Ring # 5	C.V.C.	6/1/93		JH	6/1/93
outer TANK					
Ring # 5	C.V.C.	6/3/93		JH	6/3/93

GIRTH SEAMS

Item	Approved	Date	A.I.	Approved	Date
~~Base Ring to Skirt~~					
~~Skirt Rings~~					
~~Skirt to Vessel~~					
~~Bottom Head to Ring #1~~					
Ring # 1 to Ring # 2	C.V.C.	5/14/93		JH	5/14/93
Ring # 2 to Ring # 3	C.V.C.	5/18/93		JH	5/18/93
Ring # 3 to Ring # 4	C.V.C.	5/24/93		JH	5/24/93
Ring # 4 to Ring # 5	C.V.C.	6/2/93		JH	6/2/93
outer TANK					
Rg # 4 to Rg # 5	C.V.C.	6/4/93		JH	6/4/93

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 5/3/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Laying #30 felt paper			JH		VT ok
2.	Fitting replacement btm.			JH		VT ok
3.	Checked heat number's			JH		VT ok
4.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Date: 5/4/93

Equipment Item/No: CAUSTIC SURGE TANK #4455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting replacement btm.			JH		VT ok
2.	Welding out replacement btm.			JH		VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 5/5/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Welding out replacement btm.			JH		VT OK
2.	Pain out 12:00			JH		
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 5/6/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Welding out replacement htm.			JH		VT ok (complete)
2.	Vacuum test replacement htm.			JH		ok
3.	Installed nozzle's 9A,9B,9C+9D			JH		VTok
4.	welding out nozzle's 9A,9B,9C+9D			JH		VTok
5.	MT nozzle's 9A,9B,9C+9D			JH		MTok
6.	Laying 3" grating between htms.			JH		VTok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 5/7/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Pulling down + tacking grating			JH		VTOK
2.	Began slotting shell for annular ring			JH		VTOK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 5/10/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Slotting shell installing annular rg.			JH		VT ok
2.	Welding annular ring butts			JH		VT ok
3.	Laying & fitting inner ft. btm			JH		VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 5/11/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Welding annular ring butts			JH		VT ok
2.	Installing nozzle's			JH		VT ok
3.	welding inner tk. btm.			JH		VT ok
4.	welding inside corner weld			JH		VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Date: 5/12/93

Equipment Item/No: CAUSTIC SURGE TANK #4455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Hanging ring #1			JH		VT OK
2.	Fitting + welding verts. ring #1			JH		VT ok
3.	welding inner fk. btm.			JH		VT ok (complete)
4.	Checked heat number's ring #1			JH		ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 5/13/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting + welding verts. ring #1			JH		VT ok (complete)
2.	Tacking + welding cornerweld inner tk.			JH		VTok
3.	Hanging ring #2			JH		VTok
4.	Welding verts. ring #2			JH		VTok
5.	Checked heat numbers ring #2			JH		ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 5/14/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Welding vert's. ring #2			JH		VT ok
2.	Fitting girth seam rg. #1 to rg. #2			JH		VT ok
3.	Welding girth seam rg #1 to rg #2			JH		VT ok
4.	Vacuum test inner tk. btm.			JH.		ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 5/17/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding girth seam rg #1 to rg #2			JH		VT ok
2.	welding cornerweld inner tk.			JH		VT ok
3.	Hanging ring #3			JH		VT ok
4.	Checked heat number's ring #3			JH		ok
5.	Fitting & welding vents rg #3			JH		VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Date: 5/18/93

Equipment Item/No: CAUSTIC SURGE TANK #4455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Welding verts ring #3			JH		VT ok
2.	Fitting girth seam rg. #2 to rg #3			JH		VT ok
3.	Welding overhead annular ring existing tk			JH		VT ok
4.	Welding cornerweld annular rg. existing tk			JH		VT ok
5.	Rain out 4:30					
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 5/19/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Equipment Item/No: CAUSTIC SURGE TANK #4455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	No work due to Lyondell will make-up Saturday			JH		
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API 650 Tank- Field Construction Inspection Checklist

Job No: 201[illegible]

Date: 5/20/13

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding overhead annular rg existing tk			JH		VT OK (complete)
2.	welding cornerweld annular rg existing tk			JH		VT OK (complete)
3.	welding girth seam rg. #2 to rg. #3			JH		VT OK
4.	Fitting nozzle's			JH		VT OK
5.	welding cornerweld inner tk.			JH		VT OK
6.	X-rayed 11 welds			JH		
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 5/21/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Viewed X-Rays (10 good 1 bad)			JH		ok
2.	welding girth seam rg. #2 to rg. #3			JH		VTOK
3.	welding corner weld inner tk.			JH		VTOK
4.	Fitting & welding anchor chairs			JH		VTOK
5.	welding nozzles rg #1 existing tk.			JH		VTOK
6.	welding 36" manway			JH		VTOK
7.	X-Rayed 7 welds			JH		
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 5-22-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Welding Manways			JH		VT ok
2.	Welding nozzle's + anchor clips			JH		VT ok
3.	Installed false structure floating roof			JH		ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Date: 5-23-93

Equipment Item/No: CAUSTIC SURGE TANK #4455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Laying floating roof deck			JH		VT ok
2.	Welding overhead floating			JH		VTok
3.	roof deck					
4.	Fitting outer ring plate floating roof			JH		VTOK
5.	welding manway's			JH		VTok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Date: 5-24-93

Equipment Item/No: CAUSTIC SURGE TANK #4455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Welding flat floating roof deck			JH		VT OK
2.	Fitting bulkheads & inner rim plate			JH		VT ok
3.	Vacuum test floating roof deck			JH		VT ok
4.	Hanging ring # 4			JH		VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Date: 5-25-93

Equipment Item/No: CAUSTIC SURGE TANK #4455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting bulkheads & inner rim plate			JH		VTOK
2.	Fitting vents ring #4			JH		VTOK
3.	welding vents. ring #4			JH		VTOK
4.	Fitting girth seam rg #3 to rg #4			JH		VTOK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Date: 5-27-93

Equipment Item/No: CAUSTIC SURGE TANK #4455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Weldings pontoons floating roof			JH		VTOK
2.	welding girth seam rg #3 to rg #4			JH		VTOK
3.	cutting off angle top ring existing ht.			JH		VTOK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Date: 6-1-93

Equipment Item/No: CAUSTIC SURGE TANK #4455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Hanging rg #5 inner tk.			JH		VT OK
2.	Fitting + welding verts. rg #5			JH		VT OK
3.	Fitting + welding expansion Loop's			JH		VT OK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Date: 6-2-93

Equipment Item/No: CAUSTIC SURGE TANK #4455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting girth seam rg.#4 to rg.#5 inner ht.			JH		VT ok
2.	Welding girth seam rg. #4 to rg. #5			JH		VT ok
3.	Fitting & welding out expansion loops			JH		VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 6-3-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding girth seam rg #4 long. #5 inner tk			JH		VT OK
2.	Hanging rg #5 outer tk			JH		VT OK
3.	Fitting verts. rg #5 outer tk.			JH		VT OK
4.	Fitting top angle inner tk.			JH		VT OK
5.	welding verts. rg #5 outer tk.			JH		VT OK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Date: 6-4-93

Equipment Item/No: CAUSTIC SURGE TANK #4455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding verts rg.#5 outer tk.			JH		VTOK
2.	Fitting girth seam rg#4 to rg#5 outer tk.			JH		VTOK
3.	welding girth seam rg#4 to rg#5 outer tk.			JH		VTOK
4.	Fitting top angle inner tk.			JH		VTOK
5.	fitting + welding expansion loop's			JH		VTOK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 6-5-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Welding girth seam rg #4 to rg #5 outer ht.			JH		VTOL
2.	Fitting top angle outer ht.			JH		VTOL
3.	Welding expansion loop's			JH		VTOL
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 6-7-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding girth seam rg. #4 to rg #5 outer tk.			JH		VTOK
2.	Fitting top angle outer tk.			JH		VTOK
3.	welding out expansion loop's			JH		VTOK
4.	welding top angle inner & outer tk.			JH		VTOK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 6-8-73

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding top angle inner & outer tks.			JH		VTOK
2.	welding nozzles 51+52			JH		VTOK
3.	Fitting baffle nozzle in & welding out			JH		VTOK
4.	Fitting rafter support's outer shell			JH		VTOK
5.						
6.						
7.						
8.						
9.						
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16.						
17.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 6-9-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4655

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Pontoon's complete			JH		VT ok
2.	welding top angle inner outer Hts.			JH		VT ok
3.	welding rafter clips outer shell			JH		VT ok
4.	Hanging rafter's			JH		VT ok
5.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 6-10-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Plumbing inner shell			JH		VT ok
2.	welding rafter clips inner shell			JH		VT ok
3.	Diesel test outer rim plate			JH		VT ok
4.	Fitting & welding door sheet			JH		VT ok
5.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Date: 6-11-93

Equipment Item/No: CAUSTIC SURGE TANK #4455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting + welding angle floating roof			JH		VT ok
2.	welding door sheet			JH		VT ok
3.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 6-14-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Laying & fitting roof			JH		VT OK
2.	welding rim angle floating roof			JH		VT OK
3.	welding roof			JH		VT OK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 20.5

Date: 6-15-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding roof			JH		VT ok
2.	installing floating roof legs			JH		VT ok
3.	fitting roof nozzles			JH		VT ok
4.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 6-16-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding roof			JH		VT ok
2.	installing seal			JH		VT ok
3.	welding roof nozzles & manway			JH		VT ok
4.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 6-17-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Welding roof nozzles + manway			JH		VTOK
2.	installing skimmer			JH		VTOK
3.	installing seal			JH		VTOK
4.	welding floating roof legs			JH		VTOK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 6-18-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #6455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Hanging platform			JH		VIok
2.	Installing stairway			Jdf		VTok
3.	Installing skimmer			JH		VTok
4.	Installing seal center column			JH		VTok
5.	Installing seal anti rotation device			JH		VTok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 6-21-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding anchor chairs			JH		VTOK
2.	MT + air test nozzles			JH		ok
3.	Installing vacu guage			JH		VTOK
4.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 6-22-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Completed anchor chairs			JH		VTOK
2.	Installing varec guage			JH		VTOK
3.	welding stairway & platform			JH		VTOK
4.	welding dollar plate, roof			JH		VTOK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 6-23-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #4455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Final walkdown			JH		VT OK
2.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

Date: 6-24-93

Equipment Item/No: CAUSTIC SURGE TANK #4455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Hydro inner tk.			JH		VTOK
2.	Hydro outer tk.			JH		VTOK
3.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 205

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW TX.

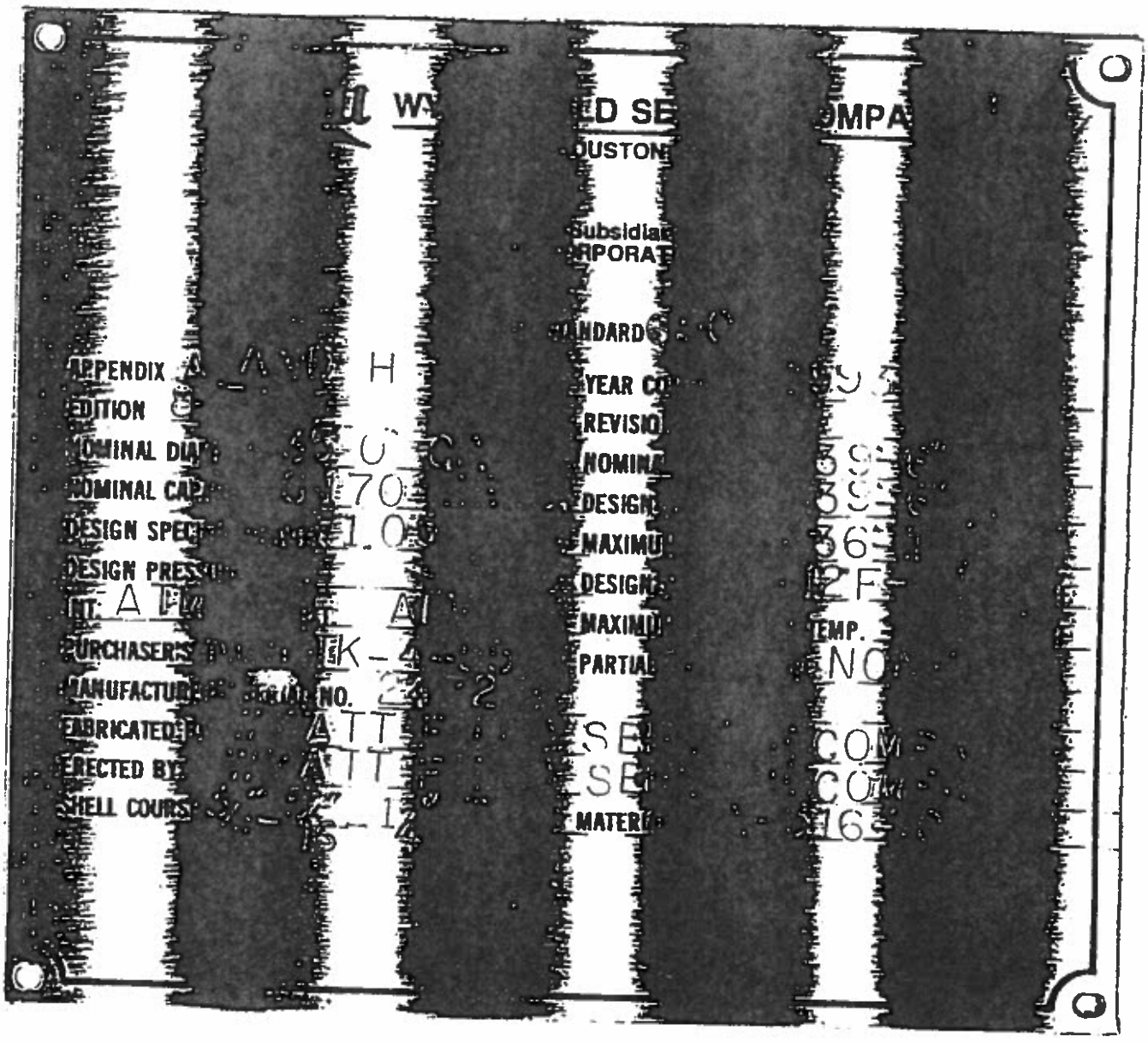
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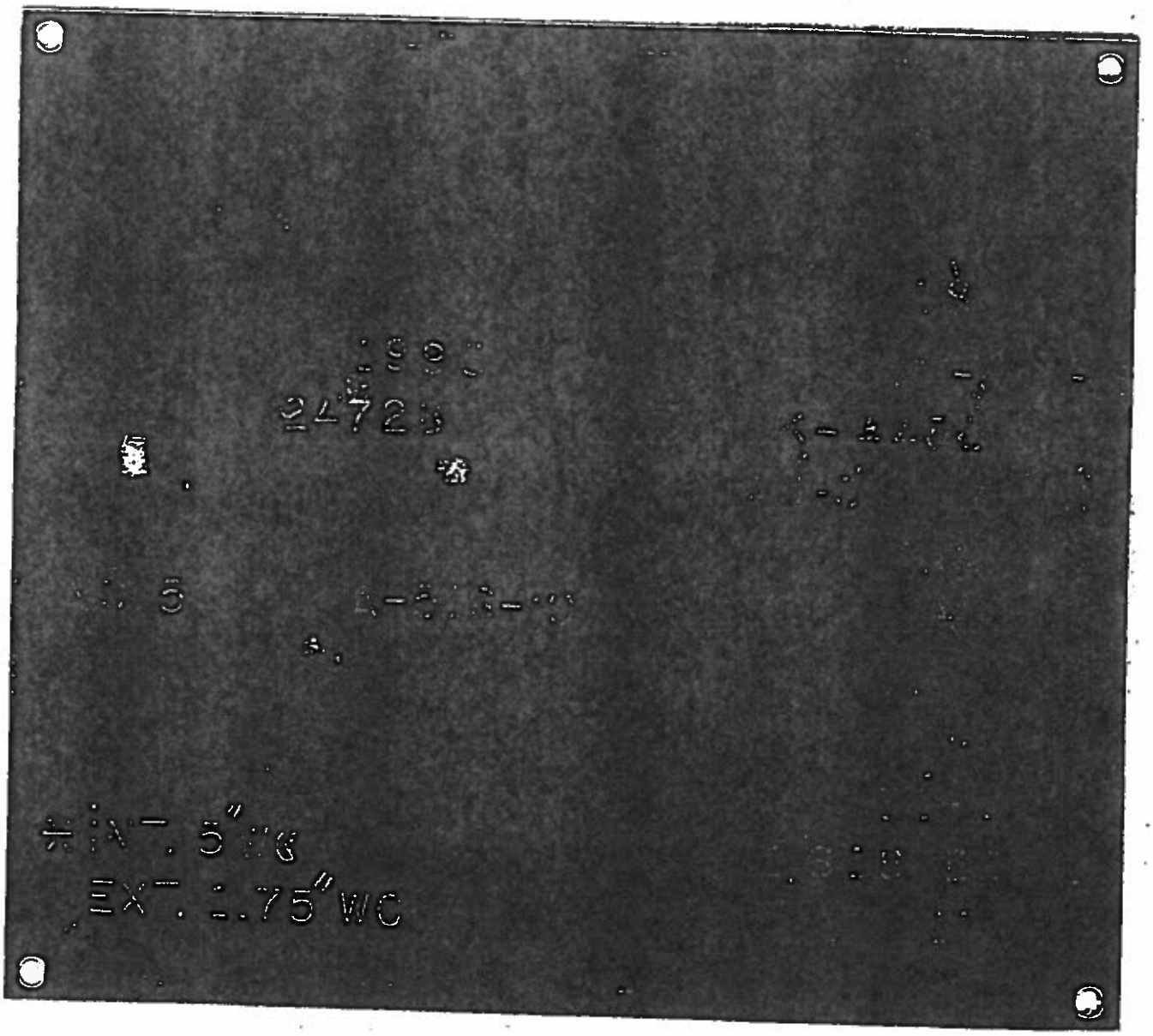
Equipment Item/No: CAUSTIC SURGE TANK #4455

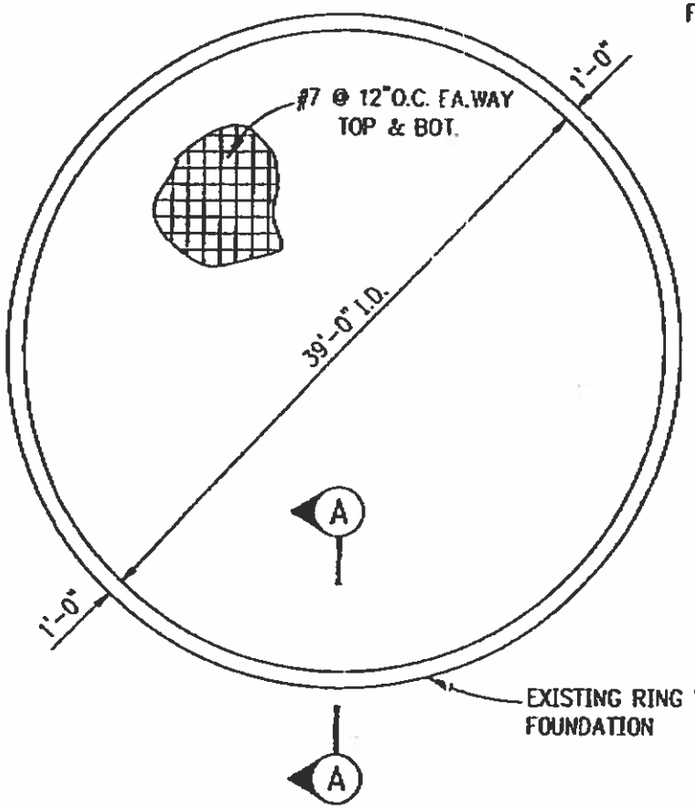
Inspector: JAMES HUNTLEY

Page 1 of 1

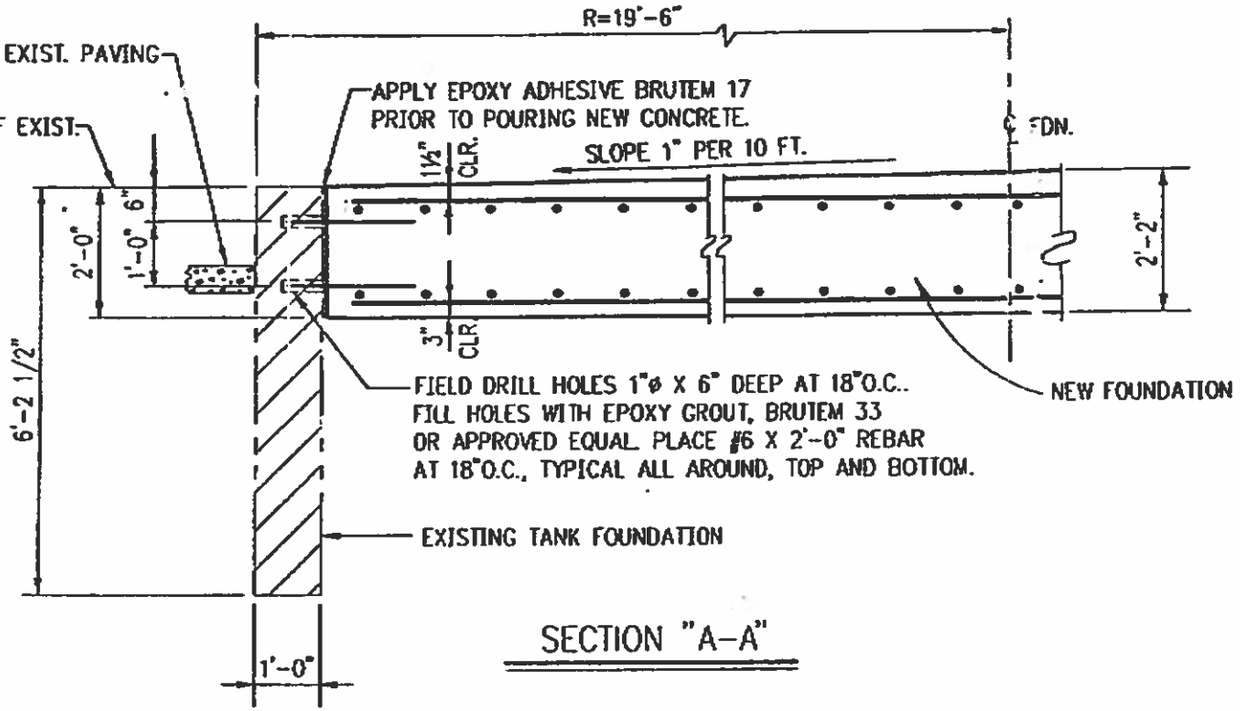
	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Final acceptance			JH		
2.						
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APPENDIX
EDITION
NOMINAL DIA
NOMINAL CAP
DESIGN SPEC
DESIGN PRES
PURCHASER'S
MANUFACTURE
FABRICATED
ERECTED BY
SHELL COURS
STANDARD
YEAR CO
REVISIO
NOMINA
DESIGN
MAXIMU
DESIGN
MAXIMU
PARTIAL
MATERI
TEMP.
NO
COM
COM
16


INT. 5" WC
EXT. .75" WC



PLAN



SECTION "A-A"

FDN. FOR TANK T3455 & T4455

NOTES:

1. CONCRETE SHALL BE NORMAL WEIGHT SAND AND AGGREGATE TYPE I PORTLAND CEMENT WITH 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI.
2. REINFORCING BARS SHALL CONFORM TO ASTM A615 GRADE 60.
3. ALL CONCRETE MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH ACI 318, LATEST EDITION.
4. EXISTING CONCRETE SURFACE PREPARATION AND EPOXY APPLICATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

Jacobs Engineering Group Inc.
Central Region Houston, Texas

CONTRACT NO. 58E69001 | DWG. NO. S-1 | REV. 0 | SCALE NTS

DWG. TITLE: T3455 & T4455
WASTE CAUSTIC SURGE TANK
LYONDELL PETROCHEMICAL CO.
DEANE/VELPY TEXAS

S-1

REFERENCE DRAWINGS

DWG. NO.	TITLE	DWG. NO.	TITLE

NO.	REVISION	BY	CHK	APP	DATE
0	ISSUED FOR CONSTRUCTION	MAR'96			

C.L.HAMDC 08/09/12
P.FOX
M.N.I

BLOCK NAME = DSIZE

Revision 3 5/27/2015

Lyondell Petrochemical Company

Calculations Chart

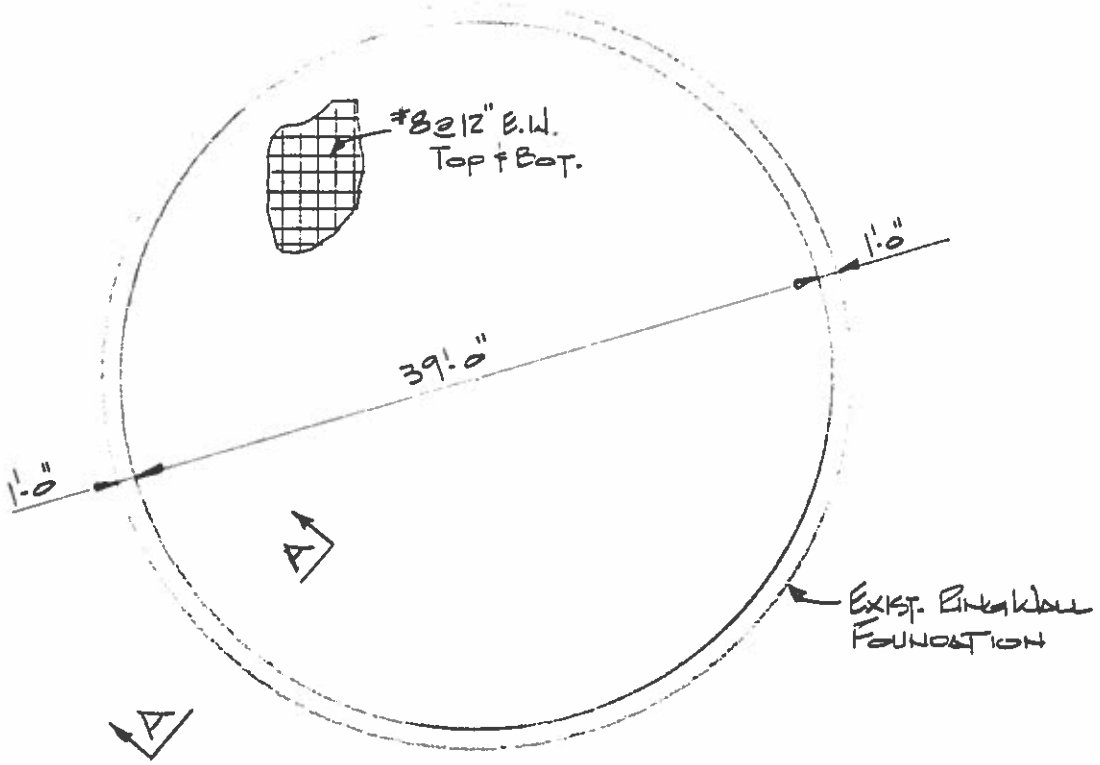
Sheet SK-1 of SK-2

File

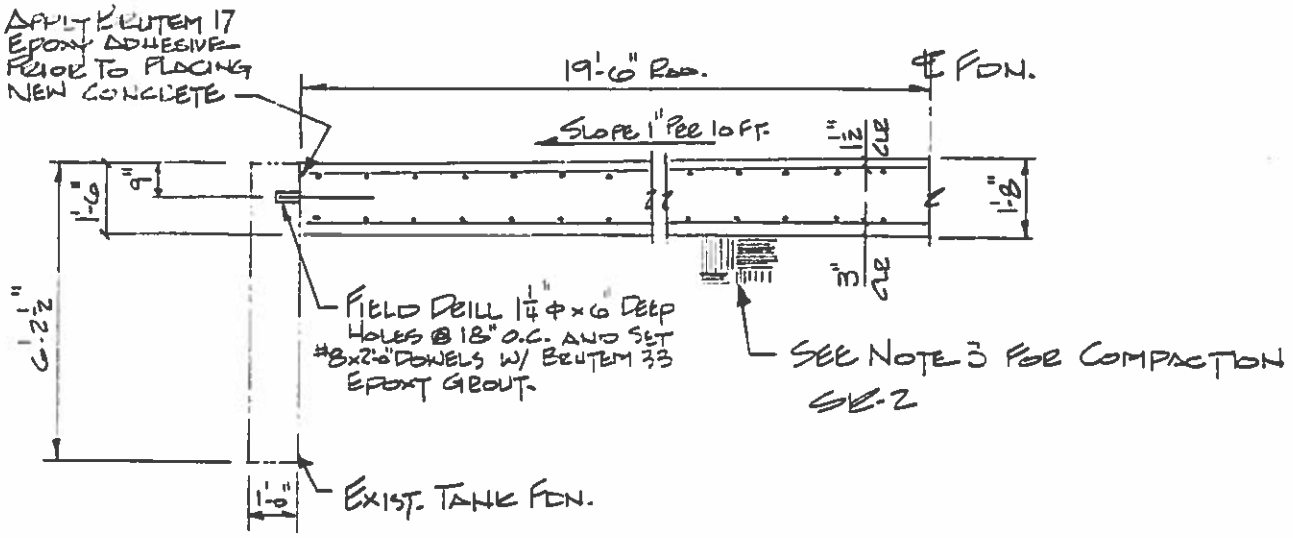
Subject FOUNDATION FOR TANK T3455 & T4455

Date 1.11.93

By KGS



PLAN



SECTION "A-A"

Revision 3 5/27/2015

LPC-03172 (9/88)

Lyondell Petrochemical Company

Calculations Chart

Sheet SK-2 of SK-2

File

Subject FOUNDATION FOR TANK T3455 + T4455

Date 1-11-93

By KGS

NOTES:

1. CONCRETE SHALL BE 4000 PSI AT 28 DAYS. CONCRETE TO BE IN ACCORDANCE WITH ACI CODES 301 + 318.

2. REINFORCING SHALL BE DEFORMED HIGH STRENGTH BARS, CONFORMING TO ASTM A615, GRADE 60.

3. EXISTING SUBGRADE SHALL BE COMPACTED TO 95% OF MAXIMUM DRY DENSITY PER ASTM D 1557.

4. EXISTING CONCRETE SURFACE PREPARATION AND EPOXY APPLICATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

Lyondell Petrochemical Company

Calculations Chart

Sheet 1 of 7

File

Subject TANK 3455

Date 1-29-93

By KGB

DESIGN CRITERIA

WEIGHTS : OUTER TK WT = 86,000# PER WTATT 1/28/93
INNER TK WT = 66,000# " " "
GEARING WT = 21,000# " " "
FLOATING ROOF WT = 28,000# " " "

SPECIFIC GRAVITY OF LIQUID = 1.05

TANK DIMENSIONS :

OUTER TANK : HEIGHT = 40'-0"
DIAMETER = 40'-0"
MAX. FILL HEIGHT = 31'-6"

INNER TANK : HEIGHT = 40'-0"
DIAMETER = 35'-0"
MAX. FILL HEIGHT = 37'-6"

SOIL DATA :

ALLOWABLE NET BEARING PRESSURE = 3500 PSF PER SOIL REPORT, P. 5
ALLOW. NET BEARING PRESSURE (WIND & TEST) = 4200 PSF " " " "

CHECK REINFORCING IN EXISTING RING WALL

(REF. LUMMUS DWG # 7091, ARCO DWG # C-24-C-073-3 FOR EXISTING TANK FDN DETAILS)

RADIAL FORCE ON RINGWALL

$$F = K_a \gamma (qH + \text{METAL WT (PSF)} + \text{FLOAT ROOF (PSF)} + \text{INNER TANK WT (PSF)} + (1/2)\gamma_s h)$$

$$= 0.3(6.21\,ft)\left[62.4\,\#/ft^3(1.05)(37.5\,ft) + \frac{21600\,\#}{1250.6\,ft^2} + \frac{28000\,\#}{962.1\,ft^2} + \frac{66000\,\#}{109.96\,ft(3\,ft)} + \frac{1}{2}(120\,\#/ft^3)(6.21\,ft)\right]$$

$$= 0.3(6.21\,ft)\left[2457\,\#/ft^2 + 17.2\,\#/ft^2 + 29.1\,\#/ft^2 + 200\,\#/ft^2 + 372.6\,\#/ft^2\right]$$

$$= 0.3(6.21\,ft)(3074.9\,\#/ft^2) = 5728.5\,\#/ft$$

HOOP TENSION IN RINGWALL

$$T = (1/2)FD = 1/2\,(5728.5\,\#/ft)(40\,ft) = 114570\,\#$$

$$T_u = 1.7T = 194769\,\#$$

$$A_s = \frac{194769\,\#}{.9(60{,}000\,psi)} = 3.61\,in^2$$

6-#3 PROVIDED IN EXIST. FDN. = $4.74\,in^2 > 3.61\,in^2$

∴ EXISTING FDN STL OK

CHECK BEARING PRESSURE AT U.F. UNDER RINGWALL AGAINST PRESSURE UNDER MAIN PORTION OF TANK

SOIL PRESSURE UNDER MAIN PORTION OF TANK (PSF)

$$P_o = q_s H + \text{GRTH WT (PSF)} + \text{FLOAT ROOF (PSF)} + \text{INNER TK WT (PSF)} + \gamma_s h$$

$$= 62.4\#/FT^3(1.05)(37.5FT) + \frac{21600\#}{1194.6FT^2} + \frac{28000\#}{1194.6FT^2} + \frac{66000\#}{1194.6FT^2} + 120\#/FT^3(6.21FT)$$

$$= 2457\#/FT^2 + 18.1\#/FT^2 + 23.4\#/FT^2 + 55.2\#/FT^2 + 745.2\#/FT^2$$

(Gross Pressure) = 3298.9 PSF < 3500 PSF (Net Pressure, Per Soil Report p.5) + $120\#/FT^3(6.21FT)$ = 4245 PSF (Allow. Gross Pressure) OK

SOIL PRESSURE UNDER RINGWALL (PSF)

$$P_o = \text{WT (INT OF OUTER T/CIRCUM.)}/2 + q_s H/2 + \frac{\text{GRTH WT (PSF)}}{2} + \frac{\text{FLOAT ROOF (PSF)}}{2} + \frac{\text{INNER TK WT (PSF)}}{2} + \gamma_c h$$

$$= \frac{86000\#}{125.66FT}/1.0FT + \frac{2457\#/FT^2}{2} + \frac{18.1\#/FT^2}{2} + \frac{23.4\#/FT^2}{2} + \frac{225\#/FT^2}{2} + 150\#/FT^3(6.21FT)$$

$$= 684.4\#/FT^2 + 1228.5\#/FT^2 + 9\#/FT^2 + 11.7\#/FT^2 + 112.5\#/FT^2 + 931.5\#/FT^2$$

$$= 2977.6 \text{ PSF}$$

DIFFERENTIAL SETTLEMENT POSSIBLE DUE TO UNEQUAL SOIL PRESSURES

∴ PROVIDE CONCRETE SLAB INSIDE EXISTING RINGWALL FDN, DOWELED TO INSIDE FACE TO DISTRIBUTE LOAD

CHECK BEARING PRESSURE W/ WIND LOADING UNDER RINGWALL

$P_o = 2977.6 \text{ PSF} + 731\#/FT/1FT \text{ FOR WIDTH} = 3708.6 \text{ PSF} < 4200 \text{ PSF} + 120\#/FT(6.21') = 4945 \text{ PSF}$ (Net Allow Pressure; Gross Pressure; Gross Allow Press.)

(731 #/FT from WYATT p.17)

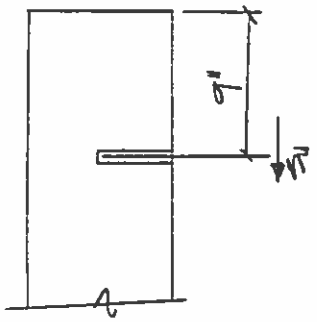
OK

PROVIDE DOWELS TO TRANSFER LOAD BETWEEN CONCRETE SLAB AND RINGWALL

SHEAR TRANSFER : $V = (3298.9\ psf - 2977.6\ psf)\ 1\ ft\ (1.5\ ft) = 482^{\#}$

(1.5 ft: ℄ WIDTH RINGWALL; 1 ft: DOWEL SPACING)

$S_u = 1.4\ (482^{\#}) = 675.^{\#}$



$$\phi S_n = \frac{4\,\phi_s \sqrt{f'_c}\ A_{sc}}{1000}$$

WHERE: ϕS_n = DESIGN SHEAR RESISTANCE, KIPS

ϕ_s = SHEAR EMBEDMENT RESISTANCE FACTOR, 0.85

A_{sc} = EFFECTIVE PROJECTED AREA OF SHEAR CONE

$$A_{sc} = \pi L_s^2 (f_3 + f_4)$$

WHERE: L_s = SHEAR EMBEDMENT

f_3, f_4 = EDGE FACTORS

$A_{sc} = \pi (9)^2 (0.25 + 0.25) = 127.2\ in^2$

$$\phi S_n = \frac{4 (0.85)(\sqrt{3000})(127.2)}{1000} = 23.7^{K} > 0.675^{K}$$

USE #8 DWL SET INTO 1¼" ϕ HOLE W/ BRUTEM 33

BASE MAT

TANK PROPERTIES (INNER TANK)

DIA. = 35'-0"
LIQUID LEVEL = 37'-6"

WT OF PRODUCT = $62.4\#/ft^3 (1.05)(37.5ft)(962.1ft^2) = 2,363,379.7\#$
USE 2,363,380#

WT OF TANK = 66,000#
$W_{wall}/ft_{of\ circum} = 15.3\#/1(7.85') + 12.8\#/1(7.85')(2) + 10.2\#/1(7.85')(2) = 481.2\#/1$ of circum.
$W_{FLR} = 66,000\# - 481.2\#/1(\pi)(35') = 13089\#$

WT of ROOF = 28,000#±
WT OF GIRDER = 21,600#

MAT DESIGN (TANK FDN DESIGN BASED ON PROCEDURE PRESENTED IN OCT. 1974 HYDROCARBON PROCESSING BY ANDREW A. BROWN, P.E.)

MAX. MOM. @ CENTER OF MAT

$$M_1 = \frac{P}{4\pi}\left[(1+\mu)\ln\frac{R}{b} + 1 - \frac{(1-\mu)b^2}{4R^2}\right.$$

$P = 2,363,380\# + 13089\# + 28,000\#± + 21,600\# = 2,426,569\#$

$$M_1 = \frac{2,426,569}{4\pi}\left[(1+0.25)\ln\left(\frac{19.5'}{17.5'}\right) + 1 - \frac{(1-0.25)(17.5')^2}{4(19.5')^2}\right]$$

$= 190,060\#$

BASE MAT (CONT.)

$$M_2 = \frac{\rho c}{4}\left[\frac{R^2-c^2}{R^2}(1-\mu) + 2(1+\mu)\ln\frac{R}{c}\right]$$

$$= \frac{481.2(17.5)}{4}\left[\frac{(19.5)^2-(17.5)^2}{(19.5)^2}(1+0.25) + 2(1+0.25)\ln\left(\frac{19.5}{17.5}\right)\right]$$

$$= 876.7^{1\#}$$

$$M_3 = \frac{-qR^2}{16}(3+\mu)$$

$$q = \frac{2,363,380^{\#} + 66,000^{\#} + 28,000^{\#} + 21,600^{\#}}{\pi(19.5)^2} = 2075.6 \text{ psf}$$

$$M_3 = -\frac{2075.6(19.5)^2}{16}(3+0.25) = -160,316^{1\#}$$

$$M_{TOTAL} = 190,060^{1\#} + 876.7^{1\#} - 160,316^{1\#} = 30620.7^{1\#}$$

$$M_u = 30.62^{1K}(1.4) = 42.9^{1K}$$

$t = 18"$ $\quad d = 18" - 3" - 1" - 0.5" = 13.5'$

$$F = \frac{12(13.5)^2}{12000} = 0.182 \quad K_u = \frac{42.9}{0.182} = 235.7 \quad a_w = 4.31$$

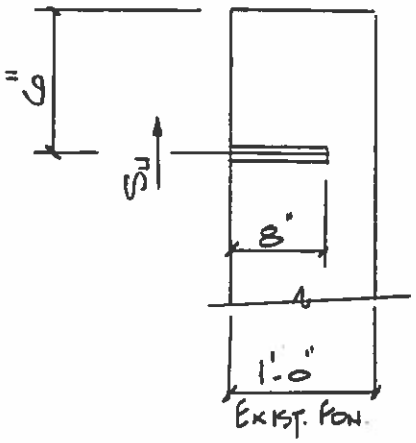
$$A_s = \frac{42.9}{13.5(4.31)} = 0.74 \text{ IN}^2/\text{FT} \quad \frac{\text{Use \#8 @ 12"}}{\text{E.W., T+B}} \quad A_s = 0.79 \text{ IN}^2/\text{FT}$$

ANCHOR BOLT DESIGN

DESIGN LOAD = 4887# USE 5000# FROM WYATT p. 11

USE 1"ϕ ANCHOR BOLT $A = 0.6060\ IN^2 > 0.2444\ IN^2$ REQ'D FROM WYATT, p.11

CHECK SHEAR EMBEDMENT



S_U = FACTORED SHEAR FORCE, KIPS
$= 1.7\,(0.75)(5^K) = 6.375^K$

$$\phi S_n = \frac{4\,\phi_s \sqrt{f'_c}\ A_{sc}}{1000}$$

WHERE: ϕS_n = DESIGN SHEAR RESISTANCE, KIPS
ϕ_s = SHEAR EMBEDMENT RESISTANCE FACTOR, 0.85
A_{sc} = EFFECTIVE PROJECTED AREA OF SHEAR CONE, IN^2

$$A_{sc} = \pi L_s^2 (f_3 + f_4)$$

WHERE: L_s = SHEAR EMBEDMENT, IN
f_3, f_4 = EDGE FACTORS

$A_{sc} = \pi (6)^2 (0.25+0.25) = 56.55$

$$\phi S_n = \frac{4(0.85)(\sqrt{3000})(56.55)}{1000} = 10.53^K > 6.375^K$$

USE 1"ϕ THREADED ROD (A36) SET INTO 1¼"ϕ HOLE W/ BEUTEM 33

April 14, 1993

Mr. Pat Mc Daniel
Lyondell Petrochemical Co.
P.O. Box 777
Channelview, TX 77530

Re: TK-3455, OP-I Waste Caustic Tank Assessment
The Hendrix Group Project No. H9303

Dear Mr. McDaniel,

Attached is a summary design and installation assessment report for TK-3455, a hazardous waste storage tank, located in the OP-I Olefins Unit at Lyondell Petrochemical Co.'s Channelview, TX plant. This assessment was conducted to meet the requirements of 40 CFR 264/265.192 and 264/265.193 for new hazardous waste storage tanks, and secondary containment for existing storage tanks, respectively. The summary report indicates that TK-3455 and its secondary containment meet the applicable EPA requirements for storage of hazardous waste.

A final report will be issued, including all supporting documentation, as soon as all outstanding documents are received. Outstanding items include final, as-built drawings, test and inspection reports, and material test reports.

I have enjoyed working with you on this project. If you have any questions concerning the contents of the report, please do not hesitate to call.

Sincerely,

David E. Hendrix, P.E.
President

SUMMARY

A design and installation assessment of TK-3455, OP-I Waste Caustic Tank, and its secondary containment, located at Lyondell Petrochemical Co.'s Channelview, TX facility, has been performed. The assessment was performed to address the requirements of 40 CFR 264/265.192 and 264/265.193, relating to the structural integrity and secondary containment of hazardous waste tank storage systems.

The assessment results indicate that the existing, altered exterior Tank 3455 and the new, interior Tank 3455 meet the 40 CFR requirements concerning structural integrity and secondary containment of hazardous waste storage tanks. A final report covering Tank 3455, including supporting documentation and details of the assessment findings, will be issued at a later date.

INTRODUCTION

This summary report covers a design and installation assessment of a secondary containment system for Tank 3455, located in the OP I Olefins unit at Lyondell Petrochemical Co.'s Channelview, Texas facility. The assessment included an engineering review of alterations made to the existing TK-3455, a design review of a new tank built inside the existing tank, a review of the secondary containment provisions for the new tank, and a field review of the construction. The purpose of the project was to provide secondary containment for the OP-I Waste Caustic hazardous waste tank, per the requirements of 40 CFR 265.193(a)(3).

SYSTEM DESCRIPTION

Tank TK-3455, OP-I Waste Caustic Tank, was originally built in 1975 to API-650, Appendix F as an on-ground, carbon steel tank, and was designed to handle a low concentration waste caustic stream from the T-3504 Acid Gas Absorber. Originally constructed, it was 40' in diameter by 32' tall, included an internally supported roof, and rested on a concrete ring-wall foundation. It was fabricated from ASTM A-283 Gr. C material with butt-welded shell plates and lap-welded roof and floor plates.

A project was recently initiated to provide secondary containment for TK-3455 to meet the requirements of 40 CFR 265.193(a)(3) pertaining to secondary containment for hazardous waste, as defined by the EPA. The project included constructing a new tank inside the existing tank, and modifying the existing tank to provide secondary containment for the newly constructed tank, which would handle the waste. The new tank was built to API-650, and included a floating roof. Modifications to the existing tank included adding eight feet to the tank height (to accommodate the new tank) and installing a false bottom with leak detection ports.

ASSESSMENT RESULTS

Based on the assessment results, the modified existing, and newly built Tank 3455 system, and associated foundation, appear to be adequately designed, and possess sufficient structural strength and compatibility with the hazardous waste to not leak, collapse, or rupture under normal operating conditions. A visual observation of the tank system in the field did not reveal any indications of damage or substandard construction.

The secondary containment for the TK-3455 tank system meets the 40 CFR 265.193 requirements pertaining to containment volume, leak detection, and compatibility with the hazardous waste.

PREPARED BY: _____ DATE: 4.14.93
President

HAZARDOUS WASTE TANK SYSTEM CERTIFICATION
TK-3455, WASTE CAUSTIC STORAGE TANK SYSTEM

Lyondell Petrochemical Co.
Channelview, Texas

April 14, 1993

I have performed and/or supervised the design and integrity assessment of Tank 3455, Waste Caustic storage tank system, as described in the attached summary report, located in the OP-I Olefins Unit at Lyondell Petrochemical Co.'s Channelview, Texas facility.

With regard to this duty, I certify under penalty of law that I have personally examined and am familiar with the information contained in this document, and that, based on my observations, and knowledge of the people responsible for obtaining the information reviewed, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

David E. Hendrix, P.E. D.E. Hendrix Date: 4-19-93
President

TK-3455
OP-I Waste Caustic Tank

Hazardous Waste Tank Assessment

LYONDELL PETROCHEMICAL
Channelview, Texas

THE HENDRIX GROUP, INC.

METALLURGICAL ENGINEERING
CORROSION INVESTIGATIONS
FAILURE ANALYSIS
TESTING

July 1, 1993

LYONDELL PETROCHEMICAL CO.
CHANNELVIEW, TEXAS

TK-3455
HAZARDOUS WASTE TANK ASSESSMENT

for:

Mr. Pat McDaniel

Lyondell Petrochemical Co.
P.O. Box 777
Channelview, TX 77530

The Hendrix Group Report No. H9303

by:

The Hendrix Group, Inc.
15823 N. Barkers Landing
Houston, TX 77079
(713) 556-8774

July 1, 1993

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Lyondell Petrochemical
Channelview, Texas

Tank 3455

40 CFR 264.192/193

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AVERY READY INDEX INDEXING SYSTEM

SUMMARY

A design and installation assessment of TK-3455, OP-I Waste Caustic Tank, and its secondary containment, located at Lyondell Petrochemical Co.'s Channelview, TX facility, has been performed. The assessment was performed to address the requirements of 40 CFR 264/265.192 and 264/265.193, relating to the structural integrity and secondary containment of hazardous waste tank storage systems.

The assessment results indicate that the modified outer Tank 3455, and the new, inner Tank 3455 meet the 40 CFR requirements concerning structural integrity and secondary containment of hazardous waste storage tanks.

INTRODUCTION

Tank 3455, OP-I Waste Caustic tank, located at Lyondell Petrochemical Company's Channelview, Texas facility, requires installation of secondary containment in 1993 per the requirements of 40 CFR 264/265.193(a)(3). This report details the results of a design review and installation assessment of a secondary containment system for Tank 3455. The review was conducted based on the requirements of 40 CFR 264/265.192-.193 and the corresponding requirements of 30 TAC 335.112(a)(9).

SCOPE OF ASSESSMENT

The assessment included performing a design review of modifications made to the existing TK-3455 to convert it to secondary containment service, a design review of a new tank and its foundation constructed inside the existing tank to hold the waste, a review of the secondary containment provisions for the new tank, and a field review of the construction.

SYSTEM DESCRIPTION

Overall Tank System Description

Secondary containment for Tank 3455 was provided by modifying the existing tank to convert it to secondary containment service, and installing a new smaller-diameter floating-roof tank on the inside of the existing tank to store the waste. The project included adding a fifth shell course to the existing tank to raise its height from 32′ feet to 40′, removing the original lap-welded floor plates from the existing tank, pouring a new reinforced concrete-

pad foundation for the interior tank and replacing the original floor plates with new lap-welded plates, adding a second, combination lap-welded/annular-ring false floor, and constructing the new tank inside the existing tank over the false floor. Leak-detection pipes were installed between the two floors and through the shell of the outer tank to detect any spills or leaks.

Outer Tank Description

Tank TK-3455, OP-I Waste Caustic Tank, was originally built in 1975 to API-650, Appendices A and F, as an on-ground, carbon steel tank. It was designed to store a low concentration waste caustic stream (sp. gr. 1.05) originating from the T-3504 Acid Gas Absorber. The existing tank was originally 40′ in diameter by 32′ tall, included an internally supported roof consisting of a center pipe column and radial rafters, and rested on a reinforced concrete ring-wall foundation. It was fabricated from ASTM A-283 Gr. C material with butt-welded shell plates and lap-welded roof and floor plates. The new shell course and bottom floor plates were fabricated from ASTM A 516 Gr. 70 material. Design pressures are 5" water column internal pressure and 1.75" water column external pressure. Design temperatures are 170°F maximum and 12°F minimum. The outer tank contains one 8" Groth pressure/vacuum vents and two 24" emergency vents.

Inner Tank Description

The new inner tank was built to API-650, including Appendices A and H, and includes a individual bulkhead design floating roof. It is approximately 39′ tall by 35′ in diameter and constructed of A 516 Gr. 70 butt-welded shell plates and combination lap-welded and annular ring bottom floor plates. It was designed for a specific gravity of 1.05 and atmospheric pressure. Design temperatures are 170°F maximum and 12° minimum.

ASSESSMENT CONSIDERATIONS

General

Checklists detailing the design, fabrication, and installation attributes reviewed and their dispositions are contained in Exhibit 2 to this report. The results of a mechanical and civil design review conducted by outside consultants under the direction of The Hendrix Group, Inc. are contained in Exhibit 3. Exhibits 4 through 11 contain supporting documentation associated with the design, materials, inspection, and testing of the two tanks and tank foundations.

Design Standards

The design standards employed in the design of the inner and outer tanks and the new concrete foundation are detailed in Exhibits 2, 3 and 6 of this report. In summary, both tanks were designed and built to API 650, 1988 ed. The design of the outer tank included the requirements of Appendix A and F. Optional Design for Small Tanks, and Tanks With Small Internal Pressures, respectively. The inner tank design included the requirements of Appendix A and H, Optional Design for Small Tanks and Internal Floating Roofs, respectively. The new concrete pad foundations was designed to the requirements of ACI 301 and 318. Calculations based on ASME B31.3 were used to design the expansion loops for the nozzles penetrating both tanks (Exhibit 3).

The results of the design review indicated that the design standards used for the inner and outer tanks and the tank foundation are appropriate for the intended application and that the requirements of the design standards were incorporated into the design calculations and fabrication drawings.

Hazardous Characteristics of the Waste

The contained waste is a low-concentration (<5%) aqueous caustic stream originating from the T-3504 Acid Gas Tower. Some naptha hydrocarbons are included in the stream as a rag layer. The primary hazardous characteristics of the waste are reactivity and corrosivity. A complete listing of the chemical components of the waste stream can be found in previous certification reports for Tank 3455.

Corrosion Protection Measures

No particular corrosion protection measures were considered necessary for the tank components exposed to the caustic waste. Thickness measurements taken on the existing outer tank from 1988 to 1992, as part of the certification process for existing hazardous waste tanks, indicated no significant shell wall-thickness loss since the tank initial service in 1976 (see previous certification reports for Tank 3455 on file). In addition, the existing tank shell, floor, and roof interior, and the bottom side of the original floor plates were visually inspected for corrosion during the project. No general or localized corrosion was observed to any components, including the bottom of the floor plates. Corrosion protection of the outer tank exterior is provided by application of a catalyzed epoxy paint. The interior of the outer tank and the exterior of the inner tank are protected from corrosion by a nitrogen purge used to exclude air from the tank annulus. The bottom-side of the false floor will also be purged. No particular corrosion-protection measures were considered necessary for the bottom-side of the floor sitting on the concrete foundation.

Protection of Underground Equipment

There are no underground tank components associated with Tank 3455.

Foundation Review

The original concrete ring-wall foundation for Tank 3455 was modified by adding a reinforced concrete pad to the interior of the ring-wall to support the inner tank. The inner concrete pad was connected to the outer ring-wall through the use of # 8, A 615 Gr. 60 dowels, or reinforcing bars. A civil design review of the foundation addition can be found in Exhibit 3 to this report. The results of the review indicate that, although the original assumptions used by Wyatt to design the concrete pad-dowel-ringwall connection were erroneous, a more rigorous finite-element analysis of the connection, combined with some qualified assumptions concerning load distributions, indicate that the design is capable of carrying all postulated loads.

Ancillary Equipment

No ancillary tank system equipment was included in the scope of this project.

Installation Assessment

An on-site review of the completed tank installation was performed by this writer. The checklist used to perform the review can be found in Exhibit 2. In summary, the results of the installation review indicate that: 1) the subject tank system was fabricated in general conformance with the as-built fabrication drawings, 2) the fabrication workmanship was adequate, and 3) no damage was observed at the time of the inspection.

Secondary Containment Assessment

General

Secondary containment for the inner tank is provided by the existing outer tank.

Materials of Construction

The secondary containment materials of construction are the existing outer tank shell and the false floor, manufactured from A 283 Gr. C carbon steel, except for the A 516 Gr. 70 top-shell course and the false floor. The outer tank materials are structurally able to contain the tank contents up to a maximum height of 31', and the carbon steel material possesses adequate corrosion resistance to the inner tank contents.

Foundation Data

The inner tank foundation is constructed from reinforced 4000 psi concrete, poured over a back-filled sub-grade compacted to 95% maximum density. A discussion of the secondary

containment foundation was covered under the tank "Foundation Review" section of this report.

Leak Detection

Leak detection for the secondary containment system is provided by four 1" pipes installed around the circumference of the outer tank between the two tank floors and six 3/4" pipes installed around the circumference of the outer tank just above the false bottom. The pipes are attached to ball valves that are opened daily to check for leaks.

Drainage

The steel grating installed between the two floors is arranged to permit drainage to the perimeter of the tank. In addition, the grating terminates several inches from the perimeter of the outer tank to allow migration of fluid around the tank circumference. No other drainage requirements were considered necessary to meet the secondary containment drainage requirements.

Containment Volume

The maximum fill height of the inner tank is approximately 39.5′. The 40′ tall outer tank has sufficient volume to contain the contents of the inner tank in case of a leak, considering that the contents of the inner tank would reach a maximum equilibrium level of about 31′ feet, with the waste partially contained by both tanks. No allowance for precipitation was included in the secondary containment volume requirements as the outer tank roof prevents any accumulation of water in the tank annulus.

Drainage

In the event of a leak or spill, the tank contents can be pumped out of the outer tank through one or more of the leak detection pipes.

Vapor Accumulation

Vapor accumulation in the inner tank is prohibited by use of the floating roof. The annulus between the two tanks is purged by nitrogen, preventing any buildup of ignitable vapors.

External Moisture Barrier

An external moisture barrier was not appropriate for the subject tank system design.

ASSESSMENT CONCLUSIONS

Based on the assessment results, the modified existing and newly built Tank 3455 system, and associated foundation, appear to be adequately designed, and possess sufficient structural strength and compatibility with the hazardous waste to not leak, collapse, or rupture under normal operating conditions. A visual observation of the tank system in the field did not reveal any indications of damage or substandard construction.

The secondary containment for the TK-3455 tank system meets the 40 CFR 265.193 requirements pertaining to containment volume, leak detection, and compatibility with the hazardous waste.

PREPARED BY: _____ DATE: 7-1-93

President
The Hendrix Group, Inc.

HAZARDOUS WASTE TANK SYSTEM CERTIFICATION
TK-3455, WASTE CAUSTIC STORAGE TANK SYSTEM

Lyondell Petrochemical Co.
Channelview, Texas

July 1, 1993

I have performed and/or supervised the design and integrity assessment of Tank 3455, Waste Caustic storage tank system, as described in the attached summary report, located in the OP-I Olefins Unit at Lyondell Petrochemical Co.'s Channelview, Texas facility.

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David E. Hendrix, P.E. D E Hendrix Date: 7-1-93
President

15823 North Barkers Landing • Houston, Texas 77079 • (713) 556-8774

THE HENDRIX GROUP, INC. METALLURGICAL ENGINEERING • CORROSION INVESTIGATIONS • FAILURE ANALYSIS • TESTING

April 14, 1993

Mr. Pat Mc Daniel
Lyondell Petrochemical Co.
P.O. Box 777
Channelview, TX 77530

Re: TK-3455, OP-I Waste Caustic Tank Assessment
The Hendrix Group Project No. H9303

Dear Mr. McDaniel,

Attached is a summary design and installation assessment report for TK-3455, a hazardous waste storage tank, located in the OP-I Olefins Unit at Lyondell Petrochemical Co.'s Channelview, TX plant. This assessment was conducted to meet the requirements of 40 CFR 264/265.192 and 264/265.193 for new hazardous waste storage tanks, and secondary containment for existing storage tanks, respectively. The summary report indicates that TK-3455 and its secondary containment meet the applicable EPA requirements for storage of hazardous waste.

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PREPARED BY: D E Hudson DATE: 4.14.93
President

HAZARDOUS WASTE TANK SYSTEM CERTIFICATION
TK-3455, WASTE CAUSTIC STORAGE TANK SYSTEM

Lyondell Petrochemical Co.
Channelview, Texas

April 14, 1993

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David E. Hendrix, P.E. D E Hendrix
President

Date: 4.14.93

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 0 Date: 10/16/92 Page: 1 of 1

Checklist Title: 40 CFR 264/265.192 Checklist- Tank Systems		**Project No:** #5303
Client: Lyondell Petrochemical Co.		**Location:** Channelview, TX
Tank System ID: #3455	**Equipment No:** #3455	**Date:** 6-28-93

	Attribute	Reference	Reviewed by	ACC /REJ
1.	Appropriate Design Standards	40 CFR 264/265.192 (1)	DEH	ACC
2.	Hazardous Characteristics of Waste	40 CFR 264/265.192 (2)	DEH	ACC
3.	Corrosion Protection Measures	40 CFR 264/265.192 (3)	DEH	ACC
4.	Protection of U/G Components	40 CFR 264/265.192 (4)	DEH	N/A
5.	Tank Foundations	40 CFR 264/265.192 (5i)	DEH	ACC
6.	Installation Inspection	40 CFR 264/265.192 (5b)	DEH	ACC
7.	Tightness Test	40 CFR 264/265.192 (5d)	DEH	ACC
8.	Ancillary Equipment	40 CFR 264/265.192 (5e)		N/A

Remarks:

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 0 Date: 10/16/92 Page: 1 of 1

Checklist Title: 40 CFR 264/265.193 Checklist- Secondary Containment		**Project No:** 19303
Client: Lyondell Petrochemical Co.		**Location:** Channelview, TX
Tank System ID: #3455	**Equipment No:** #3455	**Date:** 6-28-93

	Attribute	Reference(s)	Reviewed by	ACC/ REJ
1.	Constructed of or lined with compatible/impermeable materials (1)	40 CFR 264/265.193 (c1)	DEH	ACC
2.	Sufficient strength	40 CFR 264/265.193 (c1)	DEH	ACC
3.	Foundation design adequate (2)	40 CFR 264/265.193 (c2)	DEH	ACC
4.	Leak detection system (3)	40 CFR 264/265.193 (c3)	DEH	ACC
6.	Waste collection system (4)	40 CFR 264/265.193 (c4)	DEH	ACC
7.	Containment type and capacity (5)	40 CFR 264/265.193 (e2i,ii)	DEH	ACC
	Chemical resistant waterstops	40 CFR 264/265.193 (e2iii)		N/A
	Freedom from vapor buildup (6)	40 CFR 264/265.193 (e2v)	DEH	ACC
9.	Exterior moisture barrier	40 CFR 264/265.193 (evi)		N/A
10.	Ancillary equipment	40 CFR 264/265.193 (f)		N/A

Remarks: (1) Old tank used for secondary containment, all shell and floor plates in usual good condition after 14 years service, all shell plates above min. design per UT measurements, (See Hendrix Comp Report No. H9258, 10/26/92.

(2) Exhibit 2, Civil report.

(3) Provided by 4 X 1" pipes below false floor with valves; will be opened once per day. (Nozzles 9A-9D Wyatt drwgs, Exhibit 3.) Leaks through shell verified by nozzles 95A + 95F, 3/4"

(4) Pump out through leak detection nozzles

(5) Existing cone tank provides secondary containment.

(6) Top mounted breather vents.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 2 Date: 6/22/93 Page: 1 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank		Project No: H5303
Client: Lyndell Petrochemical Co.		Location: Channelview, TX
Tank System I.D.: # 3455	Equipment No: #3455	Date: 6-22-93

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	MATERIALS	API 650, Section 2		
A.	Plates meets API 650 requirements (1)	API 650, para. 2.2.1.1	DEH	ACC
B.	Plates meet toughness requirements (2)	API 650, para. 2.2.9	DEH	ACC
C.	Piping/forgings meet API 650 req'mts (1)	API 650, para. 2.5	DEH	ACC
D.	Flanges meet API 650 req'mts (1)	API 650, para. 2.6	DEH	ACC
E.	Bolts meet API 650 req'mts (1)	API 650, para. 2.7	DEH	ACC
F.	Welding electrodes meet API 650 req'mts (3)	API 650, para. 2.8	DEH	ACC
2.	DESIGN	API 650, Section 3		
A.	Verify tank design requirements	API 650, customer specs		
B.	Verify tank design stds. appropriate			
C.	Verify tank calcs./drwgs. to item 2a			
D.	Check tank calculations for:	API 650, Vendor calcs.		
i.	. Roof calcs. (if applicable)	API 650, para. 3.10.3		
ii.	. Allowable stresses used	API 650, para. 3.6.2		
iii.	. Specific gravity used			
iv.	. Shell course thicknesses	API 650, 3.6.3, 3.6.4		
v.	. Accuracy			

Remarks: (1) CMTR's, Exhibit 7, Wyatt drgs, Exhibit 5.

(2) A516 Gr 70 good to +~~50~~ 17 F design min temperature.

(3) WPS/PQR's, Exhibit 8.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 2 Date: 6/22/93 Page: 2 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank		**Project No:** H5303
Client: Lyondell Petrochemical Co.		**Location:** Channelview TX
Tank System I.D.: #3455	**Equipment No:** #3455	**Date:** 6-22-93

	Attribute	Reference	Reviewed by	ACC/ REJ
E.	Check drawings for:			
i.	Weld details (1)	API 650, paras. 3.1.2 - 3.1.5	DEH	ACC
ii.	Bottom plate thickness	API 650, 3.4.1, Table 3-1		
iii.	Min. top-angle size	API 650, para. 3.1.5.9e		
iv.	Shell openings	API 650, para. 3.7.1		
v.	Reinforcement and welding	API 650, para. 3.7.2		
vi.	Spacing of welds (1)	API 650, para. 3.7.3	DEH	ACC
vii.	Shell manholes	API 650, para. 3.7.5		
viii.	Shell nozzles and flanges	API 650, para. 3.7.6		
ix.	Flush connections (if present)	API 650, para. 3.7.7, 3.7.8		
x.	Roof thickness	API 650, 3.10.2.1, 3.10.2.2		
xi.	Supported cone roof	API 650, 3.10.4.2, 3.10.4.5		
xii.	Self-supported cone roof	API 650 para. 3.10.5		
xiii.	Dome and umbrella cone roofs	API 650, 3.10.6		
xiv.	Overturning stability	API 650, para. 3.11		
3.	Check calcs. vs. drwgs. for consistency			
4.	Check emergency relief vent size/settings (2)	API 2000	DEH	ACC
5.	Check pressure/vacuum vent size/settings (2)	API 2000	DEH	ACC

Remarks: (1) Wyatt drwgs, Exhibit 3.

(2) For calculations/settings see THE HENDRIX GROUP Report No. H9258, TK-3455, Hazardous Waste Assessment, 10/24/92.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 2 Date: 6/22/93 Page: 3 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank		**Project No:** H9563
Client: Lyndell Petrochemical Co		**Location:** Channelview Tx
Tank System I.D.: #3455	**Equipment No:** #3455	**Date:** 6-28-93

	Attribute	Reference	Reviewed by	ACC/ REJ
6.	Review welding procedures (1)	ASME Section IX	DEH	ACC
7.	Review CMTR's vs. spec. requirements (2)	ASTM	DEH	ACC
8.	SPECIAL DESIGN REQUIREMENTS			
A.	Optional design basis for small tanks	API 650, Appendix A		
B.	External floating roofs	API 650, Appendix C		
C.	Design for small internal pressures	API 650, Appendix F		
D.	Internal floating roofs	API 650, Appendix H		
E.	External loads on shell openings	API 650, Appendix P		

Remarks: (1) Exhibit 8.

(2) Exhibit 7.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 3/5/93 Page: 1 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank		**Project No:** H 9303
Client: Lyondell Petrochemical Company		**Location:** Channelview
Tank System I.D.: Secondary Containment Project	**Equipment No:** T-3455/T-4455	**Date:** 4/8/93

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	**MATERIALS**	API 650, Section 2		
A.	Plates meets API 650 requirements.	API 650, para. 2.2.2 - 2.2.5		
B.	Plates meet toughness requirements.	API 650, para. 2.2.9		
C.	Piping/Forgings meet API 650 req'mts.	API 650, para. 2.5		
D.	Flanges meet API 650 req'mts.	API 650, para. 2.6		
E.	Bolts meet API 650 req'mts.	API 650, para. 2.7		
F.	Welding electrodes meet API 650 req'mts.	API 650, para. 2.8		
2.	**DESIGN**	API 650, Section 3		
A.	Verify tank design requirements	API 650, customer specs	dac	acc.
B.	Verify tank design stds. appropriate		dac	acc.
C.	Verify tank calcs./drwgs. to item 2a.		dac	acc.
D.	Check tank calculations for:	API 650, Vendor calcs.		
i.	. Roof calcs. (if applicable)	API 650, para. 3.10.3	dac	acc.
ii.	. Allowable stresses used	API 650, para. 3.6.2	dac	acc.
iii.	. Specific gravity used	Calculations based on SG = 1.05	dac	acc.
iv.	. Shell course thicknesses	API 650, 3.6.3, 3.6.4	dac	acc.

Remarks:

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 4/5/93 Page: 2 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank		**Project No:** H 9303
Client: Lyondell Petrochemical Company		**Location:** Channelview
Tank System I.D.: Secondary Containment Project	**Equipment No:** T-3455/T-4455	**Date:** 4/8/93

	Attribute	Reference	Reviewed by	ACC/ REJ
E.	Check drawings for:			
i.	Weld details	API 650, paras. 3.1.2 - 3.1.5		
ii.	Bottom plate thickness	API 650, 3.4.1, Table 3-1	JAC	Acc. (1)
iii.	Min. top-angle size	API 650, para. 3.1.5.9e	JAC	Acc.
iv.	Shell openings	API 650, para. 3.7.1	JAC	Acc.
v.	Reinforcement and welding	API 650, para. 3.7.2	JAC	Acc.
vi.	Spacing of welds	API 650, para. 3.7.3		
vii.	Shell manholes	API 650, para. 3.7.5	JAC	Acc.
viii.	Shell nozzles and flanges	API 650, para. 3.7.6	JAC	Acc.
ix.	Flush connections (if present)	API 650, para. 3.7.7, 3.7.8	N/A	
x.	Roof thickness	API 650, 3.10.2.1, 3.10.2.2	JAC	Acc.
xi.	Supported cone roof	API 650, 3.10.4.2, 3.10.4.5	JAC	Acc.
xii.	Self-supported cone roof	API 650 para. 3.10.5	N/A	
xiii.	Dome and umbrella cone roofs	API 650, 3.10.6	N/A	
xiv.	Overturning stability	API 650, para. 3.11	JAC	Acc.
3.	Check calcs. vs. drwgs. for consistency		JAC	Acc.
4.	Check emergency relief vent size/settings	API 2000		
5.	Check pressure/vacuum vent size/settings	API 2000		

Remarks:

(1) Confirming stress calculations for grating between two bottoms not provided. Assume confirmation available from grating supplier.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 4/5/93 Page: 3 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank		**Project No:** H9303
Client: Lyondell Petrochemical Company		**Location:** Channelview
Tank System I.D.: Secondary Containment Project	**Equipment No:** T-3455/T-4455	**Date:** 4/8/93

	Attribute	Reference	Reviewed by	ACC/ REJ
6.	Review welding procedures	ASME Section IX		
7.	Review CMTR's vs. spec. requirements	ASTM		
8.	**SPECIAL DESIGN REQUIREMENTS**			
A.	Optional design basis for small tanks	API 650, Appendix A	JAC	Acc.
B.	External floating roofs	API 650, Appendix C	N/A	
C.	Design for small internal pressures	API 650, Appendix F	JAC	Acc.
D.	Internal floating roofs	API 650, Appendix H	JAC	Acc. (1)
E.	External loads on shell openings	API 650, Appendix P	JAC	Acc. (2)

Remarks:

(1) Calculations demonstrating floatation capabilities per API 650 Appendix H not provided. Assume confirmation available from roof supplier.

(2) Loads imposed by external piping systems not checked. Designs for flexibility loops for nozzles passing between both tank shells provided.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 0 Date: 10/16/92 Page: 1 of 1

Checklist Title: Civil Design Review Checklist- Secondary Containment		Project No:
Client: Lyondell Petrochemical		Location: Channelview, Texas
Tank System I.D.:	Equipment No: T-3455	Date: April 6, 1993

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	Verify civil design requirements	ACI 318		
2.	Verify civil calcs./drwgs. to item 1	ACI 318		
3.	Verify civil design stds. appropriate	NA		
4.	Verify chemical resistant waterstops	NA		
5.	Verify containment volume requirements	NA		
6.	Designed to protect against formation and ignition of vapors	NA		
7.	Designed to collect waste	NA		
8.	Designed to include impermeable lining	NA		
9.	External vapor barrier on below-grade sumps, etc.	NA		

Remarks: None

THE HENDRIX GROUP	API 650 TANK ALTERATION/REPAIR CHECKLIST	Rev. No. 1
		Date: 6/22/93
		Page: 1 of 1

Checklist Title: API 653 Field Alteration and Repair Checklist		Project No: H9303
Client: Lyondell Petrochemical Co.		Location: Channelview, TX
Tank System I.D.: # 3455	Equipment No: # 3455	Date: 6.22.93

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	MATERIALS			
1a.	Min. thicknes of replacement material	7.2.1	DEH	N/A
2.	FABRICATION			
1a.	Min. replacement shell-plate dimensions (1)	API 653, 7.2.2.1	DEH	N/A
1b.	Distance from existing welds (1)	API 653, 7.2.3.3	DEH	N/A
1c.	New or re-located nozzle insert plates (1)	API 653, 7.7	DEH	N/A
1d.	Nozzles near floor welds (2)	API 653, 7.8.2	DEH	ACC
1e.	Welds in critical annular plate zones (3)	API 653, 7.9.1.1	DEH	ACC
2.	INSPECTION			
2a.	UT examination for laminations	API 653, 10.1.2.1	DEH	N/A
2a.	Nozzle neck/repad weld MP inspection	API 653, 10.1.2.3 Exhibit 4	DEH	ACC
2b.	RT of insert plate butt welds	API 653, 10.1.2.5 Exhibit 6	DEH	N/A
2c.	RT of shell plates	API 653, 10.2.1 Exhibit 2	DEH	ACC
2d.	Tank hydro test	API 653, 10.3.1 Exhibit 6	DEH	ACC
2e.	Tank hydro exemption acceptance	API 653, 10.3.2	DEH	N/A

Remarks:

1) All modifications made to ± 1/2" shell plate.

2) 3/4" leak detection pipes (#45A/F) do not meet API 650, 5.7.3.3; however no liquid-height stresses are present as no product exists between Tanks

3) Nozzle # 31 supported by angle welded to floor between tanks; however no product between tanks.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 6/22/93 Page: 1 of 1

Checklist Title: Field Verification Checklist- Mechanical Systems		**Project No:** H5303
Client: Lyondell Petrochemical Co.		**Location:** Channelview, TX
Tank System I.D.: # 3455	**Equipment No:** #3455	**Date:** 6-28-93

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	Random UT verify pressure-containment material thicknesses	Vendor drawings		
2.	Verify sizing and set points of PSV(1)	Vendor calcs.	DEH	ACC
3.	Verify corrosion protection measures		DEH	ACC
4.	Verify nameplate info	Vendor drawings	DEH	ACC
5.	Verify installation w/o damage		DEH	ACC
6.	Check for overall fabrication workmanship quality		DEH	ACC
5.	Verify thermal expansion capabilities		DEH	ACC
7.	Compare vessel with as-built general arrangement drawing		DEH	ACC

Remarks:

(1) Two 24" Durlam md # AXC53324AP emergency vents installed; set to OPEN AT 2 oz. Breather vent NOT installed at time of inspection.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 6/21/93 Page: 1 of 1

Checklist Title: API 650 Tank- Inspection and Test Checklist		**Project No:** H9303
Client: Lyondell Petrochemical Co		**Location:** Channelview, TX
Tank System ID: #3455	**Equipment No:** #9455	**Date:** 6-28-93

	Attribute	Reference	Reviewed by	ACC /REJ
1.	MECHANICAL ATTRIBUTES			
1a.	Visual inspection of welds (1)	API 650, para. 6.5		
1b.	Testing of tank bottom welds (2)	API 650, para. 5.3.4	DEH	ACC
1c.	Testing of reinforcement plate welds (3)	API 650, para. 5.3.5	DEH	ACC
1d.	Shell presure-test results (4)	API 650, 5.3.6, F.4.4, or F.7.6	DEH	ACC
1e.	Roof pressure-test results (5)	API 650, para. 5.3.7	DEH	ACC
1f.	Shell plumbness (6)	API 650, para. 5.5.2	DEH	ACC
1g.	Shell roundness (7)	API 650, para. 5.5.3	DEH	ACC
1h.	Weld-joint radiography (8)	API 650, para. 6.1.2.1 or A.5.3	DEH	ACC
2.	CIVIL ATTRIBUTES			
2a.	Concrete break test results (9)	Project Specifications	DEH	ACC

Remarks:

(1)

(2) Wyatt Field Services Form #413, 2-18-93, Exhibit 6. (Also 2/22/93, 3/3/93)

(3) Wyatt Field Services; Form #463, Exhibit 6.

(4) Wyatt Field Services, Form #913, 9/13/93; Exhibit 6.

(5) Wyatt Field Services, Form 913, 9/13/93, Exhibit 6.

(6) Wyatt Field Services, Form 650 DIM, Exhibit 9.

(7) Wyatt Field Services, Form 650DIM; Exhibit 9.

(8) GCT Inspection Report, Exhibit 6.

(9) Coastal Testing Laboratories report NO. 0202-010, Exhibit 6.

THE HENDRIX GROUP

API 650 TANK

FIELD FABRICATION SURVEILLANCE CHECKLIST

Rev. No. 0

Date: 4-13-93

Page: 1 of 1

Checklist Title: API 650 Field Construction Vendor QA Program Surveillance Checklist

Project No: 2015

Location: Lyondell Chemical

Tank System ID: 2472-A

Equipment No: TK #3455

Date: 4-13-93

	Attribute	Reviewed w/att by QAE		ACC /REJ
1.	Latest drawing revisions on-site.	A.S.	J.H.	Acc
2.	Heat code map or plate stamping maintained.	A.S.	J.H.	Acc
3.	Approved weld procedures on-site.	A.S.	J.H.	Acc
4.	Approved NDT procedures on-site.	A.S.	J.H.	Acc
5.	Radiography weld map maintained.	A.S.	J.H.	Acc
6.	Tank fabrication/dimensions meet drawing requirements.	A.S.	J.H.	Acc
7.	Plate marking per API 650, 4.1.4	A.S.	J.H.	Acc
8.	Tack welds removed per API 650. 5.2.1.8	A.S.	J.H.	Acc
9.	Weld visual quality per API 650. 5.3.2.1	A.S.	J.H.	Acc
10.	Low-hydrogen electrodes in working ovens.	A.S.	J.H.	Acc
11.	QC inspection checklists in use and maintained.	A.S.	J.H.	Acc
12.	Identification of welded joints per API 650. 7.4	A.S.	J.H.	Acc
13.	Welder qualification test records/I.D.'s maintained per API 650. 7.3.3.	A.S.	J.H.	Acc
14.				
15.				

Remarks:

CARMAGEN
ENGINEERING INC.
7 Waverly Place / Madison, NJ 07940
Phone: (201) 822-3813 / FAX: (201) 822-3118

April 13, 1993

Mr. D.E. Hendrix
The Hendrix Group, Inc.
15823 North Barkers Landing
Houston, TX 77079

RE: The Hendrix Group Project No. H9303
Lyondell Petrochemical Company, Channelview, Texas
T-3455/T-4455 Hazardous Waste Tank Certification

Dear Mr. Hendrix:

Enclosed are three copies of a report documenting our mechanical engineering review of the subject, identical, atmospheric storage tanks. The review was performed at your request for the purpose of hazardous waste tank certification in accordance with the guidelines of 40 CFR 264.192/193.

Confirming our various telephone conversations and preliminary documentation, the mechanical design of these double shell/double bottom tanks is acceptable for the intended service. Additional recommendations were made during the course of this work which would reduce Lyondell's potential future maintenance activity but not have a detrimental impact on tank function. Additional documentation should also be provided to Lyondell from tank component sub-vendors, for the sake of completeness. The enclosed report provides all the necessary details to document our review.

This completes our planned work on this project. Let me know if you have any questions.

Very truly yours,

Vincent A. Carucci

CARMAGEN
ENGINEERING INC.
7 Waverly Place / Madison, NJ 07940
Phone: (201) 822-3813 / FAX: (201) 822-3118

Mechanical Engineering Review
T-3455/T-4455 Caustic Storage Tanks
Lyondell Petrochemical Company, Channelview, Texas

This report provides the results of a mechanical engineering design review made of T-3455/T-4455 Caustic Storage Tanks located at Lyondell Petrochemical Company, Channelview, Texas (LPC). This review was conducted in accordance with the guidelines contained in 40 CFR 264.192/193 governing hazardous waste storage facilities.

Several modifications to the design originally proposed by Wyatt Field Service Company were recommended and ultimately implemented in the final design. Overall, the mechanical design of these tanks is acceptable for the intended service. Several documentation type items are still open, and it is left to LPC to followup on these for record purposes. Other recommendations were made which would reduce LPC's later maintenance activity, but not impact overall tank integrity nor its acceptability for the intended service.

The following provides specific comments and recommendations. Attachment A summarizes the documents that were reviewed in conjunction with this work. Attachment B provides a checklist that was used in performing this evaluation, and summarizes the items that were reviewed and their acceptability.

General

Tanks T-3455/T-4455 are identical, double wall, atmospheric storage tanks consisting of an internal floating roof tank and an external fixed, supported cone roof tank. The tank has two steel bottoms extending under both shells with steel grating between the two bottoms. The objective is for the external shell and bottom to provide secondary containment and leak detection capability should there be a leak from the inner tank. The tank is designed in accordance with API 650 Appendix A, with Appendix F applicable to the external tank and Appendix H applicable to the internal tank.

The following summarizes the tank geometries and design conditions:

Diameter:	40'-0" for external tank 35'-0" for internal tank

Height:	40'-0" for external tank (maximum permitted fill height 31'-0") 39'-6" for internal tank
Corrosion allowance:	0.0625" for shell, roof and bottom of external tank 0.125" for shell and bottom of internal tank
Design pressure:	External tank • Internal 5" W.C. • External 1.75" W.C. Internal tank Atmospheric
Design metal temperature:	12°F to 170°F
Wind load:	110 mph
Seismic:	Zone 0
Stored liquid:	Caustic; Specific Gravity = 1.05

Conclusions and Recommendations

The mechanical design of storage tanks T-3455/T-4455, as described by the documentation listed in Attachment A, is acceptable for the intended service. Several changes were made to the original design proposed by Wyatt based on early review comments provided by Carmagen. The most significant of these were the addition of pipe flexibility loops between the two shells for lower nozzles that pass from the inner shell through the outer shell.

Several other recommendations were made during the course of our review which relate to either maintenance or documentation items. While these do not affect our conclusion that the basic tank mechanical design is acceptable for the intended service, we still recommend that they be followed. It is left for LPC to determine how to handle these items. These recommendations are summarized below:

- At 6" level alarm Nozzle 51, there is concern that cracking of the reinforcing pad fillet weld to the outer shell could be expected with time due to differential thermal expansion. Should such cracking occur, the secondary liquid containment capability of the outer shell would not be breached since liquid cannot reach this level on the outer shell. Should LPC desire to eliminate this potential maintenance problem, LPC could use a flexible metal hose or expansion joint designed for 3/8" compression and 7/16" differential vertical movement, or relocate the nozzle to the roof.

- Garlock Gylon 3510 gaskets are specified for the nozzle flanges. Unless this Teflon type gasket is required for the service fluid, it is preferable to use Grafoil instead. The Gylon 3510 will be prone to damage and result in flange leakage should it become hot due to a fire in the vicinity of the tank.

- The supports for the overflow pipe are all welded to both the pipe and the inner tank shell. Differential thermal expansion between the hot tank shell and the overflow pipe could result in weld cracks and possibly high bending loads on the nozzle. To eliminate this concern:

  - The lower two supports should be changed to guides that permit free vertical thermal expansion, but provide lateral restraint while permitting some "slop" for tank shell radial movement.

  - The top support should be moved higher to minimize the amount of differential vertical movement that must be absorbed. The detail should also be modified to be only a support without any restraint or guiding. One way to do this is by welding lugs to the pipe and have them rest on a support member welded to the tank shell.

- Calculations to demonstrate that the floating roof meets the floatation requirements of API-650, Appendix H, should be provided for LPC's records.

- Calculations to demonstrate the adequacy of the steel grating located between the two bottoms for the weight should be provided for LPC's records.

- The maximum allowable fill height of 31 ft. for the outer tank should be clearly shown on the final tank drawing and in the records. While this fill height cannot be exceeded in the current service, this documentation will help preclude any potential misunderstanding should the tank service be changed in the future.

Vincent A. Carucci
April 12, 1993

GROUP

HAZARDOUS WASTE STORAGE TANK ASSESSMENT

DOCUMENT REVIEW REVISION MASTER INDEX

Lyondell Petrochemical Company
Tank T-3455/T-4455

Rev. No. 0

Date: 1/18/93

Document Name	Document Number	Current Revision	Date Issued
Master Drawing List	W-92-2472A-1	8	2/16/93
General Notes	W-92-2472A-2	A	2/10/93
General Notes #2	W-92-2472A-2A	-	2/10/93
Elevation	W-92-2472A-3	E	2/10/93
Plan of Outer Tank	W-92-2472A-4	B	2/5/93
Plan of Inner Tank	W-92-2472A-5	B	2/5/93
Replacement Bottom Layout	W-92-2472A-6	A	1/20/93
Grating Layout	W-92-2472A-7	A	1/20/93
Detail of Annular Ring	W-92-2472A-8	A	1/20/93
Inner Tank Bottom Layout	W-92-2472A-9	A	1/20/93
Plan of Floating Roof	W-92-2472A-10	B	2/6/93
Deck Layout	W-92-2472A-11	A	1/27/93
Detail FLOAT. Roof Pontoon Ass'y.	W-92-2472A-12	A	1/27/93
Misc. Float Roof Details	W-92-2472A-13	A	1/27/93
Detail 8" Anti-Rotate Device	W-92-2472A-14	A	1/27/93
Detail Center Column Sleeve	W-92-2472A-15	B	2/10/93
TST Foam Log Seal For 35'-0" DIA. Tank	TST VMF1-0102-92	0	1/25/93
Type "E" Secondary Seal For 35'-0" DIA. Welded Tank	TST SEC-0102-92	0	1/25/93
Schedule of Openings (Shell)	W-92-2472A-18	B	2/11/93
Schedule of Openings (Shell)	W-92-2472A-18A	—	2/3/93
Schedule of Openings (Roof)	W-92-2472A-19	A	2/1/93
Detail of 24" Shell Manway	W-92-2472A-20	B	2/11/93
Misc. Nozzle Details	W-92-2472A-21	C (W/Carmagen changes 3/3c/93)	3/19/93
Detail of Nozzle MK 33 & Skimmer	W-92-2472A-22	A	2/16/93
Detail Roof Manway	W-92-2472A-23	A	2/1/93
T'l. Automatic Tank Gauge Assembly	W-92-2472A-24	A	2/10/93
Detail of 6"-150# Nozzle MK 52	W-92-2472A-25	A	2/10/93

THE HENDRIX GROUP

HAZARDOUS WASTE STORAGE TANK ASSESSMENT

DOCUMENT REVIEW REVISION MASTER INDEX

Lyondell Petrochemical Company
Tank T-3455/T-4455

Rev. No. 0

Date: 1/18/93

Document Name	Document Number	Current Revision	Date Issued
Detail 36" Shell Manway	W-92-2472A-26	A	2/11/93
Miscellaneous Details	W-92-2472A-27	A	2/10/93
Dt'l. of Center Column & Rafter Clips	W-92-2472A-28	A	2/10/93
Elevation of Stairway	W-92-2472A-29	A	2/10/93
Detail of Nozzle MK-33 @ Low Point	W-92-2472A-30	A	2/16/93
Tank Calculations	—	2	2/4/93
Nozzle Details	W-93-2472A-31	w/Carnagan changes 3/3c/93	3/19/93
Expansion Loop for 1½" XXS Temperature Connection Nozzle 40	—	Carnagan sketch	3/3c/93

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 3/5/93 Page: 1 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank	Project No: 11135
Client: Lyondell Petrochemical Company	Location: Channelview
Tank System I.D.: Secondary Containment Project Equipment No: T-3455/T-4455	Date: 4/8/93

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	**MATERIALS**	API 650, Section 2		
A.	Plates meets API 650 requirements.	API 650, para. 2.2.2 - 2.2.5		
B.	Plates meet toughness requirements.	API 650, para. 2.2.9		
C.	Piping/Forgings meet API 650 req'mts.	API 650, para. 2.5		
D.	Flanges meet API 650 req'mts.	API 650, para. 2.6		
E.	Bolts meet API 650 req'mts.	API 650, para. 2.7		
F.	Welding electrodes meet API 650 req'mts.	API 650, para. 2.8		
2.	**DESIGN**	API 650, Section 3		
A.	Verify tank design requirements	API 650, customer specs	vac	Acc.
B.	Verify tank design stds. appropriate		vac	Acc.
C.	Verify tank calcs./drwgs. to item 2a.		vac	Acc.
D.	Check tank calculations for:	API 650, Vendor calcs.		
i.	. Roof calcs. (if applicable)	API 650, para. 3.10.3	vac	Acc.
ii.	. Allowable stresses used	API 650, para. 3.6.2	vac	Acc.
iii.	. Specific gravity used	calculations based on SG = 1.05	vac	Acc.
iv.	. Shell course thicknesses	API 650, 3.6.3, 3.6.4	vac	Acc.

Remarks:

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 4/5/93 Page: 2 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank		**Project No:** H 9303
Client: Lyondell Petrochemical Company		**Location:** Channelview
Tank System I.D.: Secondary Containment Project	**Equipment No:** T-3455/T-4455	**Date:** 4/8/93

	Attribute	Reference	Reviewed by	ACC/ REJ
E.	Check drawings for:			
i.	Weld details	API 650, paras. 3.1.2 - 3.1.5		
ii.	Bottom plate thickness	API 650, 3.4.1, Table 3-1	Vac	Acc. (1)
iii.	Min. top-angle size	API 650, para. 3.1.5.9e	Vac	Acc.
iv.	Shell openings	API 650, para. 3.7.1	Vac	Acc.
v.	Reinforcement and welding	API 650, para. 3.7.2	Vac	Acc.
vi.	Spacing of welds	API 650, para. 3.7.3		
vii.	Shell manholes	API 650, para. 3.7.5	Vac	Acc.
viii.	Shell nozzles and flanges	API 650, para. 3.7.6	Vac	Acc.
ix.	Flush connections (if present)	API 650, para. 3.7.7, 3.7.8	N/A	
x.	Roof thickness	API 650, 3.10.2.1, 3.10.2.2	Vac	Acc.
xi.	Supported cone roof	API 650, 3.10.4.2, 3.10.4.5	Vac	Acc.
xii.	Self-supported cone roof	API 650 para. 3.10.5	N/A	
xiii.	Dome and umbrella cone roofs	API 650, 3.10.6	N/A	
xiv.	Overturning stability	API 650, para. 3.11	Vac	Acc.
3.	Check calcs. vs. drwgs. for consistency		Vac	Acc.
4.	Check emergency relief vent size/settings	API 2000		
5.	Check pressure/vacuum vent size/settings	API 2000		

Remarks:

(1) Confirming stress calculations for grating between two bottoms not provided. Assume confirmation available from grating supplier.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 4/5/93 Page: 3 of 3

Checklist Title: Mechanical Design Review Checklist- API 650 Tank	**Project No:** H9303
Client: Lyondell Petrochemical Company	**Location:** Channelview
Tank System I.D.: Secondary Containment Project **Equipment No:** T-3455/T-4455	**Date:** 4/8/93

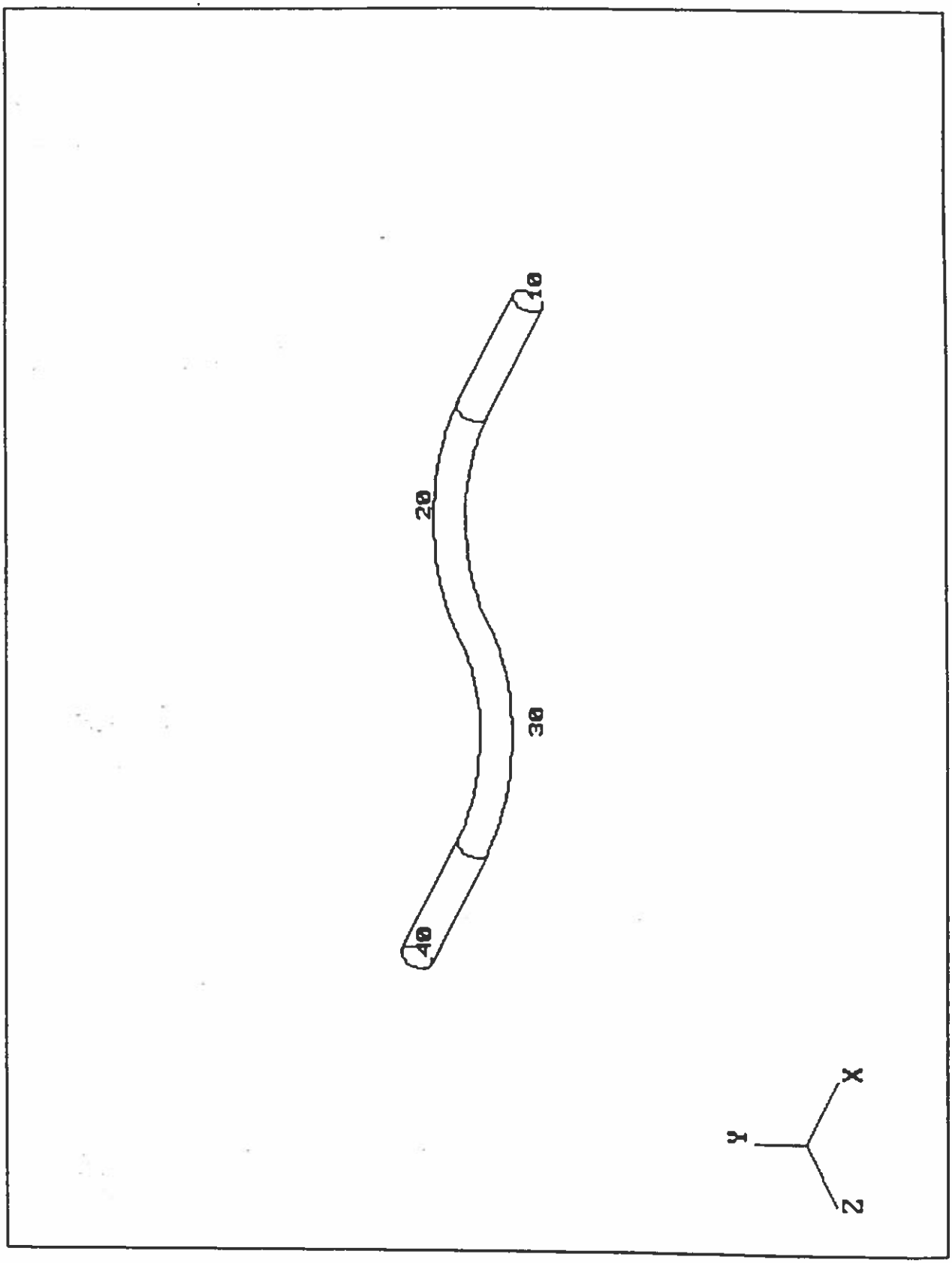
	Attribute	Reference	Reviewed by	ACC/ REJ	
6.	Review welding procedures	ASME Section IX			
7.	Review CMTR's vs. spec. requirements	ASTM			
8.	**SPECIAL DESIGN REQUIREMENTS**				
A.	Optional design basis for small tanks	API 650, Appendix A	Vac	Acc.	
B.	External floating roofs	API 650, Appendix C	N/A		
C.	Design for small internal pressures	API 650, Appendix F	Vac	Acc.	
D.	Internal floating roofs	API 650, Appendix H	Vac	Acc.	(1)
E.	External loads on shell openings	API 650, Appendix P	Vac	Acc.	(2)

Remarks:

(1) Calculations demonstrating floation capabilities per API 650, Appendix H not provided. Assume confirmation available from roof supplier.

(2) Loads imposed by external piping systems not checked. Designs for flexibility loops for nozzles passing between both tank shells provided.

CAESAR II PIPING FLEXIBILITY AND API 650 APPENDIX P CALCULATIONS
FOR 1.5" NOZZLE 40



ESAR II DISPLACEMENT REPORT FILE:LYON15 LYONDELL PETROCHEMICAL TANK
SE 1 (OPE) W+DIS+T1 DATE:MAR 31,1993 1.5" - 15 INCH Z BEND

JE	Translations(in.) DX	DY	DZ	Rotations(deg.) RX	RY	RZ
5	-.2118	.0000	.0000	.0000	.0000	-.0115
10	-.0728	.0000	.0000	.0000	-.1071	-.0016
20	-.0658	-.0004	.0000	.0020	.1790	-.0004
30	-.0542	-.0004	.0121	.0009	-.0436	-.0025
40	-.0588	.0000	.0000	.0000	-.1075	-.0025
45	.0928	.0000	.0000	.0000	.0000	.0000

NODE	-------Forces(lb.)------- FX	FY	FZ	-------Moments(ft.lb.)------ MX	MY	MZ	TYPE
10	673.	0.	0.	0.	0.	0.	Flex X
10	0.	0.	0.	1.	0.	0.	Rigid RX
10	0.	-9.	0.	0.	0.	0.	Rigid Y
10	0.	0.	0.	0.	-28.	0.	Flex RY
10	0.	0.	-359.	0.	0.	0.	Rigid Z
10	0.	0.	0.	0.	0.	6.	Flex RZ
40	-673.	0.	0.	0.	0.	0.	Flex X
40	0.	0.	0.	1.	0.	0.	Rigid RX
40	0.	-5.	0.	0.	0.	0.	Rigid Y
40	0.	0.	0.	0.	-28.	0.	Flex RY
40	0.	0.	359.	0.	0.	0.	Rigid Z
40	0.	0.	0.	0.	0.	-1.	Flex RZ
5	673.	-9.	-359.	1.	-28.	6.	Displ. Reaction
45	-673.	-5.	359.	1.	-28.	-1.	Displ. Reaction

NO CODE STRESS CHECK PROCESSED

ING CODE: B31.3 (1990)

IGHEST STRESSES: (lb./sq.in.)

OPE STRESS:	8208.	@NODE	30	ALLOWABLE:	0.
BENDING STRESS:	7684.	@NODE	30		
TORSIONAL STRESS:	34.	@NODE	20		
AXIAL STRESS:	524.	@NODE	10		
3D MAXIMUM SHEAR:	8208.	@NODE	30		

TRESS OPTIMIZATION PARAMETERS:

OPE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST OPE STRESS IN THE SYSTEM.

AVG. OPE STRESS 3402.

	/BETWEEN/	/BELOW/
PE STRESS 90-100%	33.33	66.67
OPE STRESS 80-90 %	.00	66.67
OPE STRESS 70-80 %	.00	66.67
OPE STRESS 60-70 %	.00	66.67
OPE STRESS 50-60 %	.00	66.67
OPE STRESS 25-50 %	.00	66.67
OPE STRESS 0-25 %	66.67	

PIPE ELEMENTS ANALYZED: 3

SAMPLED POINTS: 6

TA NT	----Forces(lb.)----- FX	FY	FZ	--Moments(ft.lb.)--- MX	MY	MZ	SIFI	SIFO	(lb./sq.in.) RESULT	ALLOW
10	-673	8	359	1	28	-5	1.00	1.00	1658	0
20	673	-1	-359	0	0	-1	1.00	1.00	354	0
20	-673	1	359	0	0	1	1.00	1.00	354	0
30	673	2	-359	0	-196	-1	1.00	1.00	8208	0
30	-673	-2	359	0	196	1	1.00	1.00	8208	0
40	673	5	-359	0	28	1	1.00	1.00	1628	0

NODE	Translations(in.) DX	DY	DZ	Rotations(deg.) RX	RY	RZ
5	.0000	.0000	.0000	.0000	.0000	.0000
10	.0000	.0000	.0000	.0000	.0000	.0037
20	.0000	-.0009	.0000	.0000	.0000	.0000
30	.0000	-.0005	.0000	-.0001	.0000	-.0038
40	.0000	.0000	.0000	.0000	.0000	-.0037
45	.0000	.0000	.0000	.0000	.0000	.0000

CAESAR II RESTRAINT REPORT FILE:LYON15 LYONDELL PETROCHEMICAL TANK
CASE 2 (SUS) W DATE:MAR 31,1993 1.5" - 15 INCH Z BEND

NODE	-------Forces(lb.)------- FX	FY	FZ	-------Moments(ft.lb.)------ MX	MY	MZ	TYPE
10	0.	0.	0.	0.	0.	0.	Flex X
10	0.	0.	0.	0.	0.	0.	Rigid RX
10	0.	-7.	0.	0.	0.	0.	Rigid Y
10	0.	0.	0.	0.	0.	0.	Flex RY
10	0.	0.	0.	0.	0.	0.	Rigid Z
10	0.	0.	0.	0.	0.	2.	Flex RZ
40	0.	0.	0.	0.	0.	0.	Flex X
40	0.	0.	0.	0.	0.	0.	Rigid RX
40	0.	-7.	0.	0.	0.	0.	Rigid Y
40	0.	0.	0.	0.	0.	0.	Flex RY
40	0.	0.	0.	0.	0.	0.	Rigid Z
40	0.	0.	0.	0.	0.	-2.	Flex RZ
5	0.	-7.	0.	0.	0.	2.	Displ. Reaction
45	0.	-7.	0.	0.	0.	-2.	Displ. Reaction

:AESAR II STRESS SUMMARY FILE:LYON15 LYONDELL PETROCHEMICAL TANK
:ASE 2 (SUS) W DATE:MAR 31,1993 1.5" - 15 INCH Z BEND

* CODE STRESS CHECK PASSED

:NG CODE: B31.3 (1990)

:GHEST STRESSES: (lb./sq.in.)

CODE STRESS:	84.	@NODE	10	ALLOWABLE:	20000.
BENDING STRESS:	84.	@NODE	10		
TORSIONAL STRESS:	63.	@NODE	20		
AXIAL STRESS:	0.	@NODE	20		
3D MAXIMUM SHEAR:	131.	@NODE	20		

:RESS OPTIMIZATION PARAMETERS:

CODE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST CODE STRESS IN THE SYSTEM.

AVG. CODE STRESS 58.

	/BETWEEN/	/BELOW/
ODE STRESS 90-100%	33.33	66.67
CODE STRESS 80-90 %	.00	66.67
CODE STRESS 70-80 %	33.33	33.33
CODE STRESS 60-70 %	.00	33.33
CODE STRESS 50-60 %	.00	33.33
CODE STRESS 25-50 %	33.33	.00
CODE STRESS 0-25 %	.00	

PIPE ELEMENTS ANALYZED: 3

SAMPLED POINTS: 6

DATA PNT	----Forces(lb.)----- FX	FY	FZ	--Moments(ft.lb.)--- MX	MY	MZ	SIFI	SIFO	(lb./sq.in.) CODE	ALLOW
10	0	7	0	0	0	-2	1.00	1.00	83	20000
20	0	0	0	0	0	-3	1.00	1.00	33	20000
20	0	0	0	0	0	3	1.00	1.00	33	20000
30	0	4	0	0	0	-1	1.00	1.00	58	20000
30	0	-4	0	0	0	1	1.00	1.00	58	20000
40	0	7	0	0	0	2	1.00	1.00	82	20000

SAR II DISPLACEMENT REPORT FILE:LYON15 LYONDELL PETROCHEMICAL TANK
E 3 (EXP) D3(EXP)=D1-D2 DATE:MAR 31,1993 1.5" - 15 INCH Z BEND

E	Translations(in.) DX	DY	DZ	Rotations(deg.) RX	RY	RZ
5	-.2118	.0000	.0000	.0000	.0000	-.0115
10	-.0728	.0000	.0000	.0000	-.1071	-.0052
20	-.0658	.0005	.0000	.0020	.1790	-.0004
30	-.0542	.0002	.0121	.0010	-.0436	.0013
40	-.0588	.0000	.0000	.0000	-.1075	.0012
45	.0928	.0000	.0000	.0000	.0000	.0000

ENSED TO: CARMAGEN ENGINEERING INC.
ESAR II RESTRAINT REPORT FILE:LYON15 LYONDELL PETROCHEMICAL TANK
SE 3 (EXP) D3(EXP)=D1-D2 DATE:MAR 31,1993 1.5" - 15 INCH Z BEND

	Forces(lb.)			Moments(ft.lb.)			
	FX	FY	FZ	MX	MY	MZ	TYPE
10	673.	0.	0.	0.	0.	0.	Flex X
10	0.	0.	0.	1.	0.	0.	Rigid RX
10	0.	-2.	0.	0.	0.	0.	Rigid Y
10	0.	0.	0.	0.	-28.	0.	Flex RY
10	0.	0.	-359.	0.	0.	0.	Rigid Z
10	0.	0.	0.	0.	0.	4.	Flex RZ
40	-673.	0.	0.	0.	0.	0.	Flex X
40	0.	0.	0.	1.	0.	0.	Rigid RX
40	0.	2.	0.	0.	0.	0.	Rigid Y
40	0.	0.	0.	0.	-28.	0.	Flex RY
40	0.	0.	359.	0.	0.	0.	Rigid Z
40	0.	0.	0.	0.	0.	1.	Flex RZ
5	673.	-2.	-359.	1.	-28.	4.	Displ. Reaction
45	-673.	2.	359.	1.	-28.	1.	Displ. Reaction

CAESAR II STRESS SUMMARY FILE:LYON15 LYONDELL PETROCHEMICAL TANK
CASE 3 (EXP) D3(EXP)=D1-D2 DATE:MAR 31,1993 1.5" - 15 INCH Z BEND

** CODE STRESS CHECK PASSED

NG CODE: B31.3 (1990)

IGHEST STRESSES: (lb./sq.in.)

CODE STRESS:	7684.	@NODE	30	ALLOWABLE:	49941.
BENDING STRESS:	7684.	@NODE	30		
TORSIONAL STRESS:	29.	@NODE	20		
AXIAL STRESS:	524.	@NODE	10		
3D MAXIMUM SHEAR:	8208.	@NODE	30		

RESS OPTIMIZATION PARAMETERS:

CODE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST CODE STRESS IN THE SYSTEM.

AVG. CODE STRESS 2952.

	/BETWEEN/	/BELOW/
ODE STRESS 90-100%	33.33	66.67
CODE STRESS 80-90 %	.00	66.67
CODE STRESS 70-80 %	.00	66.67
CODE STRESS 60-70 %	.00	66.67
CODE STRESS 50-60 %	.00	66.67
CODE STRESS 25-50 %	.00	66.67
CODE STRESS 0-25 %	66.67	

PIPE ELEMENTS ANALYZED: 3

SAMPLED POINTS: 6

CAESAR II FORCE/STRESS REPORT FILE:LYON15 LYONDELL PETROCHEMICAL TANK
CASE 3 (EXP) D3(EXP)=D1-D2 DATE:MAR 31,1993 1.5" - 15 INCH Z BEND

NTA NT	Forces(lb.) FX	FY	FZ	Moments(ft.lb.) MX	MY	MZ	SIFI	SIFO	(lb./sq.in.) CODE	ALLOW
10	-673	1	359	-1	28	-3	1.00	1.00	1119	49916
20	673	-1	-359	0	0	1	1.00	1.00	59	49966
20	-673	1	359	0	0	-1	1.00	1.00	59	49966
30	673	-1	-359	-1	-196	0	1.00	1.00	7684	49941
30	-673	1	359	1	196	0	1.00	1.00	7684	49941
40	673	-1	-359	-1	28	0	1.00	1.00	1103	49917

PE DATA

---

10 To 20 DX= -1.250 ft.

Dia= 1.500 in. Wall= .358 in. Insul= .000 in.

NERAL

T1= 170 F Mat= (1)LOW CARBON STEEL E= 29,500,000 lb./sq.in. v = .292

Density= .2899 lb./cu.in.

ND at "TO" end

Radius= 7.500 in. (user) Bend Angle= 90.000

SPLACEMENTS

Node 5 DX= -.234 in. DY= .000 in. DZ= .000 in. RX= .000 RY= .000

RZ= -.011

LOWABLE STRESSES

B31.3 (1990) Sc= 20,000 lb./sq.in. Sh1= 20,000 lb./sq.in. F1= 1.00

---

om 20 To 30 DZ= 1.250 ft.

ND at "TO" end

Radius= 7.500 in. (user) Bend Angle= 90.000

---

om 30 To 40 DX= -1.250 ft.

SPLACEMENTS

Node 45 DX= .092 in. DY= .000 in. DZ= .000 in. RX= .000 RY= .000

RZ= .000

TERIAL Changes:

0 20 Mat= (1)LOW CARBON STEEL E= 29,500,000 lb./sq.in. v = .292

Density= .2899 lb./cu.in.

ND ELEMENTS

10 20 Radius= 7.500 in. (user) Bend Angle= 90.000

20 30 Radius= 7.500 in. (user) Bend Angle= 90.000

SPLACEMENTS

10 20 Node 5 DX= -.234 in. DY= .000 in. DZ= .000 in. RX= .000

RY= .000 RZ= -.011

30 40 Node 45 DX= .092 in. DY= .000 in. DZ= .000 in. RX= .000

RY= .000 RZ= .000

LOWABLE STRESS Changes

10 20 B31.3 (1990) Sc= 20,000 lb./sq.in. Sh1= 20,000 lb./sq.in.

F1= 1.00

WRC 297 FLEXIBLE NOZZLES

Nozzle Node = 10 Nozzle Connecting Node = 5 Nozzle OD = 1.500 in.
Nozzle Thk = .358 in. Vessel OD = 420.000 in. Vessel Thk = .250 in.
Distance to Support = 44.312 in.
Distance to Opposite Support = 429.687 in. Vessel Temp = 170.00 F
Vessel Mat = 1 Vessel Dir Vec = .0000 1.0000 .0000

Nozzle Node = 40 Nozzle Connecting Node = 45 Nozzle OD = 1.500 in.
Nozzle Thk = .358 in. Vessel OD = 480.000 in. Vessel Thk = .250 in.
Distance to Support = 44.312 in.
Distance to Opposite Support = 435.687 in. Vessel Temp = 12.00 F
Vessel Mat = 1 Vessel Dir Vec = .0000 1.0000 .0000

NGER CONTROL AND LOCATION DATA

. of Hanger Design Load Cases = 1 Actual Cold Load Flag = 0.0
ort Range Spring Flag = 0.0 Default Hanger Table = 1

IPUT UNITS USED...

S= ENGLISH NOM/SCH INPUT= ON

LENGTH	inches	x	1.000	=	in.
FORCE	pounds	x	1.000	=	lb.
MASS(dynamics)	pounds	x	1.000	=	lbm
MOMENTS(INPUT)	inch-pounds	x	1.000	=	in.lb.
MOMENTS(OUTPUT)	inch-pounds	x	.083	=	ft.lb.
STRESS	lbs./sq.in.	x	1.000	=	lb./sq.in.
TEMP. SCALE	degrees F.	x	1.000	=	F
PRESSURE	psig	x	1.000	=	lb./sq.in.
ELASTIC MODULUS	lbs./sq.in.	x	1.000	=	lb./sq.in.
PIPE DENSITY	lbs./cu.in.	x	1.000	=	lb./cu.in.
INSULATION DENS.	lbs./cu.in.	x	1.000	=	lb./cu.in.
FLUID DENSITY	lbs./cu.in.	x	1.000	=	lb./cu.in.
TRANSL. STIF	lbs./in.	x	1.000	=	lb./in.
ROTATIONAL STIF	in.lb./deg.	x	1.000	=	in.lb./deg
UNIFORM LOAD	lb./in.	x	1.000	=	lb./in.
G LOAD	g's	x	1.000	=	g's
WIND LOAD	lbs./sq.in.	x	144.000	=	lb./sq.ft.
ELEVATION	inches	x	.083	=	ft.
COMPOUND LENGTH	inches	x	.083	=	ft.
DIAMETER	inches	x	1.000	=	in.
WALL THICKNESS	inches	x	1.000	=	in.

:TUP FILE PARAMETERS

ECT_GEOMETRY_THRU_CNODES =	YES
ALLOWED_BEND_ANGLE =	.5000000E+01
X_ALLOWED_BEND_ANGLE =	.9000000E+02
ND_LENGTH_ATTACHMENT_PERCENT =	.5000000E+01
N_ANGLE_TO_ADJACENT_BEND_PT =	.5000000E+01
OP_CLOSURE_TOLERANCE =	.1000000E+01
E_PRESSURE_STIFFENING =	DEFAULT
E_PD/4T	NO
SE_HOOP_STRESS_ON_OD	NO
PHA_TOLERANCE =	.5000000E-01
SLD-FORCE =	NO
R_DEF_RESWGT_STIF =	.1000000E+13
COMP_SNG_TOL =	.1000000E+11
ND_AXIAL_SHAPE =	NO
ICT_STIF =	.5000000E+05
ICT_NORM_FORCE_VAR =	.2500000E+00
ICT_ANGLE_VAR =	.3000000E+02
ICT_SLIDE_MULT =	.1000000E+01
D_TOLERANCE =	.1000000E+01
D_INC =	.2000000E+01
CORE_NUMERICAL_CHECK =	NO
TCORE_NUMERICAL_CHECK =	NO
DUCED_INTERSECTION =	B31.1(POST1980)
E_WRC330	NO
_REDUCED_SIF_FOR_RFT_AND_WLT	NO
1_REDUCED_Z_FIX =	YES
S_1_BRANCH_FLEX	NO
STRESS_CASES_CORRODED =	NO
D_TORSION_IN_SL_STRESS =	DEFAULT
D_F/A_IN_STRESS =	DEFAULT
CASIONAL_LOAD_FACTOR =	.0000000E+00
FAULT_CODE =	B31.3
31.3_SUS_CASE_SIF_FACTOR =	.1000000E+01
LLOW_USERS_BEND_SIF =	NO
E_SCHNEIDER	NO
RINTER_TYPE =	DOT_MATRIX
AGE_LENGTH =	US
LOTTER_TYPE =	HPGL
TRCT_DBASE=	AISC89.BIN

XECUTION CONTROL PARAMETERS

Rigid/ExpJt Print Flag	.000
Thermal/Weight Print Flag ..	.000
Bourdon Option	.000
Loop Closure Flag	.000
Liberal Allowable Flag	1.000
Uniform Load Option	.000
Ambient Temperature	70.000 F
Plastic Coefficient	.000
Eqn Optimizer	.000
Mode Selection	.000
Eqn Ordering	.000

XECUTION CONTROL PARAMETERS

inued...

Collins	.000
Degree Determination	.000
User Eqn Control	.000

ORDINATE REPORT

	X (in.)	Y (in.)	Z (in.)
	.0000	.0000	.0000
20	-15.0000	.0000	.0000
30	-15.0000	.0000	15.0000
40	-30.0000	.0000	15.0000

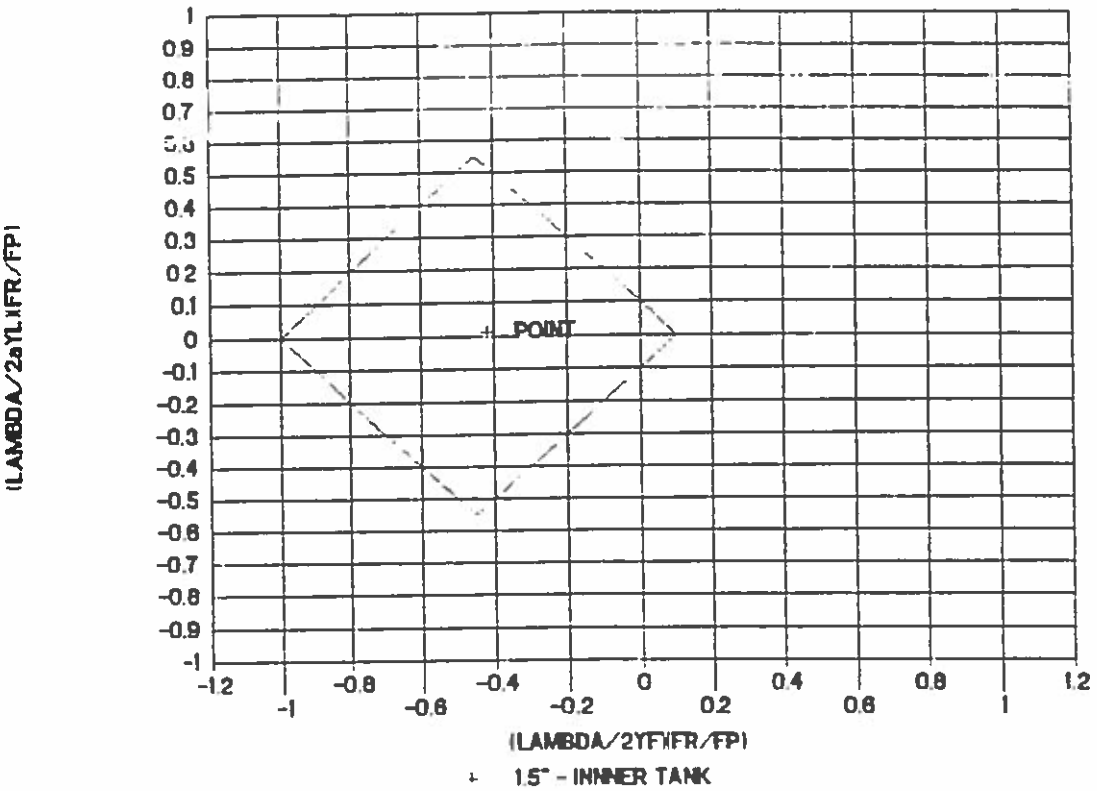
LYONDELL PETROCHEMICAL T-3455 & T-4455

1.5 INCH NOZZLE - 15 INCH Z BEND

(Nomenclature & Equations Per API 650 Appendix P)	INSIDE TANK	OUTSIDE TANK
a=outside radius of opening,inches=	0.95	0.95
E=modulus of elasticity,psi=	2.90E+07	2.90E+07
FR=radial thrust load, lbs=	-673	673
ML=longitudinal moment,in-lbs=	48	-12
MC=circumferential moment, in-lbs=	336	336
FP=presure thrust load on nozzle, lbs=	33.55	44.61
G=specific gravity of liquid=	1	1
H=maximum allowble filling height, inches=	372	480
L=distance from tank bottom,inches=	44.3125	44.3125
R=nominal radius of tank, inches=	210	240
t=shell thickness at opening,inches=	0.25	0.25
deltaT= design - installation temperature,F=	100	-58
Xa= L + a, inches=	45.2625	45.2625
Xb= L - a, inches=	43.3625	43.3625
Xc= L, inches=	44.3125	44.3125
alpha=thermal expansion coefficient	6.67E-06	6.67E-06
beta=1.285/(Rt)^.5	0.1773	0.1659
betaL=beta*L	7.8587	7.3511
(Rt)^.5=	7.2457	7.7460
L/2a=	23.3224	23.3224
a/R=	0.0045	0.0040
R/t=	840	960
lambda=a/(Rt)^.5	0.1311	0.1226
W=radial growth of the shell ,inches=	0.2118	-0.0928
Theta=rotation of shell, radians=	-0.0002	0.0000
SHELL PARAMETERS		
Xa/(Rt)^.5=	6.2468	5.8434
Xb/(Rt)^.5=	5.9846	5.5981
Xc/(Rt)^.5=	6.1157	5.7207
YF (from P-4A)=	3.3	3.8
YL (from P-4A)=	23	25
YC (from P-4B)=	70	80
INTERCEPTS FOR NOMOGRAM		
GREATER OF .1 OR (1-.75Xa/(Rt)^.5)	0.1000	0.1000
GREATER OF .1 OR (1-.75Xb/(Rt)^.5)	0.1000	0.1000
GREATER OF .1 OR (1-.75Xc/(Rt)^.5)	0.1000	0.1000
FR/FRmax	-0.3985	0.2273
ML/MLmax	0.0086	-0.0014
MC/MCmax	0.0197	0.0122
SPRING STIFFNESES		
KR (from WRC 297), lbs/in=	4.77E+03	4.36E+03
KL (from WRC 297), in-lbs/deg=	5.90E+03	5.74E+03
KC (from wrc 297), in-lbs/deg=	2.95E+03	2.97E+03

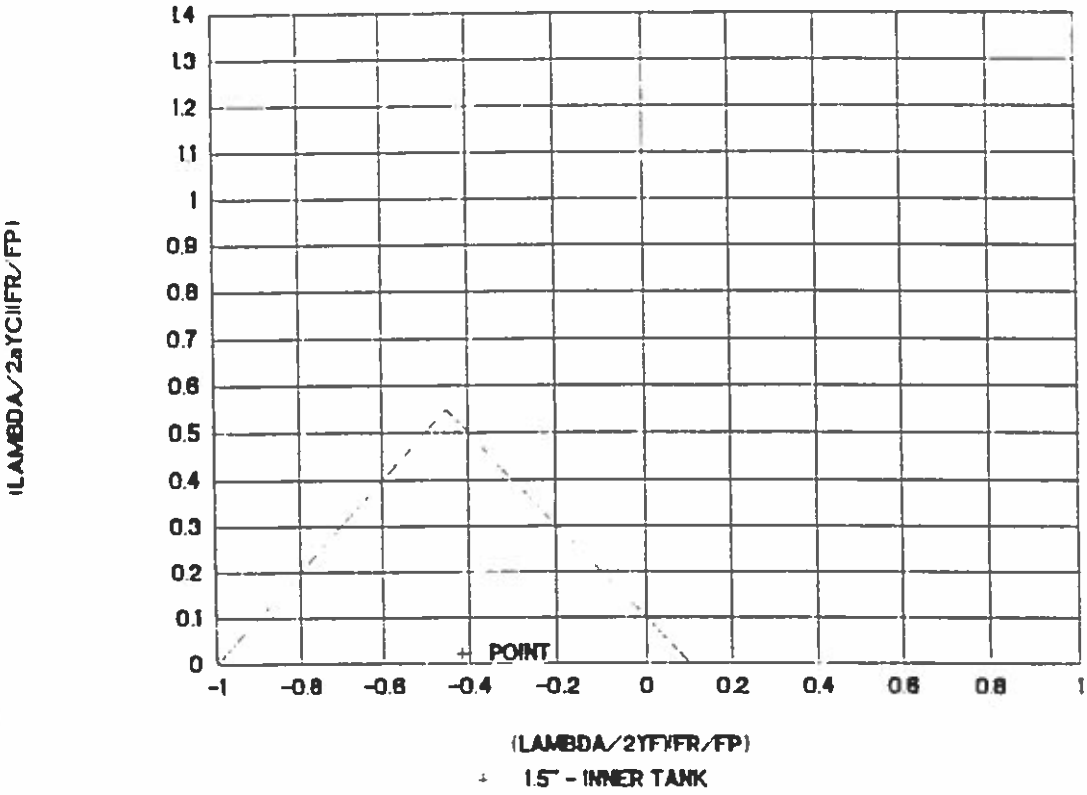
LONGITUDINAL MOMENT vs. AXIAL LOAD

COMPARISON PER API 650 APPENDIX P



CIRCUMFERENTIAL MOMENT vs. AXIAL LOAD

COMPARISON WITH API 650 APPENDIX P



Lyondell Petrochemical Company
Civil Engineering Review
Robert M. Eshbach, PE
Pennsylvania Registration No. PE-019643-E

April 8, 1993
Reading, PA

REPORT

on

CIVIL ENGINEERING EVALUATION

of

FOUNDATION DESIGN

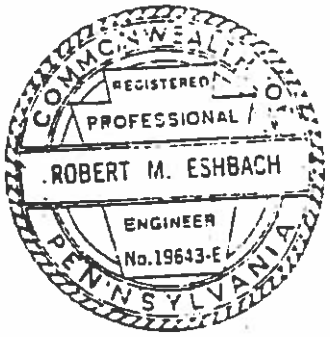
for

TANK T-3455

at

LYONDELL PETROCHEMICAL COMPANY

Channelview, Texas



Submitted To:

David E. Hendrix
President
The Hendrix Group, Inc.
Metallurgical Engineering, Corrosion Testing
P.O. Box 35717
Houston, Texas 77235

INTRODUCTION

Calculations and the related drawings were prepared by Douglass Engineering, Inc. in order to provide secondary containment for Tank T-3455 at the Lyondell Petrochemical Plant in Channelview, Texas. The secondary containment was provided by the existing tank which was modified in order to permit installation of a new inner storage tank which will rest on a new concrete slab. The slab will be attached to the interior of the original ring wall using drilled and grouted dowels.

This report provides the results of a design review of the drawings and calculations representing the new structural design of the slab and its connection to the ring wall. The specific issues evaluated include:

a. Analysis to establish design forces and moments
b. Dowel design
c. Slab design.

DOCUMENTS REVIEWED:

1. Memorandum No. WBD-119-93 of January 19, 1993 from W.B. Douglas of Douglass Engineering, Inc. transmitting:

   a. Lyondell Petrochemical Company (LPC) Drawing E-34-C-127, Rev. 1, "TK-3455 and TK-4455, "Waste Caustic Surge Tank Foundation", January 15, 1993.

   b. Lummus Drawing 7081/ARCO Drawing D-34-C-073-5, "Storage Tank Foundations".

   c. Lummus Drawing 7081/ARCO Drawing D-44-C-073-1, "Storage Tank Foundations".

   d. Engineering sketches SK-1 and SK-2, Foundation for Tank T3455 & T4455, dated 1/11/93.

   e. Calculations for Existing T-3455 Tank Foundation, dated 1/4/93 and 1/14/93, six pages.

2. Selected pages from Wyatt Field Service Company calculations for analysis of tank, dated January 21, 1993.

   a. Sheets 8 and 10 (computer output) for outside tank
   b. Sheets 14 and 15 (computer output) for inside tank
   c. Sheets 18 and 19 for inner and outer tanks

3. TK 3455 Tank Foundation Calculations, prepared by Ken Schiller, dated January 29, 1993, seven pages.

ADDITIONAL REFERENCES:

1. American Petroleun Institute (API) Standard 650, Eighth Edition, November, 1988

   a. Section 3.2, Design Considerations
   b. Section 3.3, Special Consideraitons
   c. Section 3.10.2.1, Minimum Live load
   d. Section 3.11, Wind Load on Tanks
   e. Section 5.5.6, Dimensional Tolerances for Foundations
   f. Appendix B, Recommendations for Construction of Foundations for Vertical Cylindrical Oil Storage Tanks

2. American Concrete Institute (ACI)

   a. ACI 318-89, "Building Code Requirements for Reinforced Concrete", Chapter 10, "Flexure and Axial Loads".

   b. ACI 349-90, "Code Requirements for Nuclear Safety-Related Concrete Structures", Appendix B, "Steel embedments".

3. Brown, Andrew W., "A New Approach to Tank Foundation Design", Hydrocarbon Processing, October, 1974.

4. Dames & Moore, "Report, Foundation Investigation", Proposed Lyondell Plant Expansion, Channelview, Texas

5. ASTM D 1557, "Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort".

DESIGN BASIS:

The material properties and other pertinent data listed below were obtained from the drawings and calculations submitted for review. They form the basis for the design and this evaluation.

1. Concrete:
   28 day Concrete Compressive Strength: 4000 psi

2. Reinforcement:
   ASTM A615, Grade 60
   Yield Strength 60000 psi

3. Subgrade Compaction: 95% of maximum dry density in accordance with ASTM D1557.

4. Coefficient of Active Earth Pressure (K_a): 0.3

5.	Allowable Net Bearing Pressure: Long term loads Transient loads	 3500 psf 4200 psf
6.	Specific Gravity of Tank Contents:	1.05
7.	Unit Weight of Soil:	120 pcf
8.	Tank design basis:	API 650

ASSUMPTIONS:

1. The adequacy for the design of the tank or its anchorage to the foundation is not within the scope of this review.
2. The design for the Tank T3455 and T4455 foundations, as represented on Jacobs Engineering Group, Inc. Drawing S-1, (dated September 9, 1992) is superceded by the design shown on Lyondell Petrochemical Drawing E-34-C-127, Rev. 1.
3. Inclusion of a roof live load is not appropriate for this design.
4. The tank configuration is consistent with the data in the computer analysis output prepared by Wyatt Field Services and included in the calculations submitted for review.
5. Minimal excavation of the preloaded soil beneath the existing tank is required. Any removed material is replaced with a stable fill material such as sand or soil-cement, and such fill has been compacted to at least 95% of its maximum dry density.

STRUCTURAL FEATURES CHECKED:

1. Design approach consistent with physical attributes and anticipated behavior of structure.
2. Appropriate consideration of all potential loads in the calculations. As a minimum, these would include the effects of dead, live, earth pressure, hydrostatic and wind loads on the supporting structures.
3. Accuracy (freedom from errors) of calculations
4. Bearing pressures within allowable limits.
5. Dimensional accuracy and compatibility with existing features.
6. Required concrete dimensions provided.
7. Provision of minimum required size, length and arrangement of reinforcing steel to satisfy both strength and serviceability requirements.
8. Proper clearances over reinforcing steel.

EVALUATION

GENERAL

The calculations, sketches and drawings submitted for review and identified as items 1, 2, and 3 of DOCUMENTS REVIEWED were evaluated in detail for accuracy and conformance to applicable industry codes and standards. That evaluation was intended to ensure that the represented design was capable of withstanding all applied loads and, in doing so, satisfy the intent of the design.

The criteria documents providing the basis for the review are:

1. ACI 318-89 which, though not referenced in the calculations, is the governing document for design of reinforced concrete structures.

2. American Petroleun Institute (API) Standard 650, Eighth Edition, November, 1988

3. Dames & Moore, "Report, Foundation Investigation", Proposed Lyondell Plant Expansion, Channelview, Texas

4. ACI 349-90, "Code Requirements for Nuclear Safety-Related Concrete Structures", Appendix B, "Steel embedments".

ANALYSIS

The calculations developed to determine the forces inducing tension in the ring wall were found to be acceptable. These calculations demonstrated the acceptability of the existing ring wall under new loading.

The calculations to determine bearing pressures, however, were somewhat confusing with respect to the distribution of the imposed load between the slab and the ring wall. The calculations for determining hoop tension in the ring wall and also those for determining soil pressure under the main portion of the tank indicate that the entire weight of the tank contents, the floating roof, the grating and the inner tank are transferred directly to the slab. However, the calculation for soil pressure under the ring wall indicates that 50% of the weight of these components is also applied directly to the ring wall. Both distributions, of course, canot be correct.

Presumably, the intent of the calculation was to assume a conservative distribution of load in lieu of conducting a rigorous analysis of a very complex configuration of components at the base of the tanks. Doing so was appropriate, but the assumption should have maximized the differential load between the slab and the ring wall, as would be required to arrive at a suitable estimate of the shear load on the dowels. This could have been accomplished by conservatively assuming that the ring wall carries only the outer tank and that all other loads are applied to the interior area.

The analysis is considered further in subsequent sections of the report.

DOWELS

The calculations generated to design the dowels connecting the new slab to the ring wall were inadequate in a number of respects:

1. The shear to be carried by the dowels was assumed to be the difference between the soil pressure under the ring wall and that under the slab. This is an erroneous simplification of a relatively complex situation.

   In reality, the applied load is shared between the dowels and the soil beneath the slab. The specific proportion of the load being carried by each element is, however, not easily determined since it is a function of the stiffness (or the deformability) of all the elements carrying or transferring load. For instance, if the slab were infinitely stiff (zero bending deformation) none of the applied load would pass to the subgrade, and the dowels would be required to carry the total applied load. They are not capable of doing so. If, on the other hand, the slab had no flexural stiffness (if it were a flexible membrane) the subgrade would carry the entire load, and there would be no load on the dowels. The actual condition is somewhere in between.

   One approach might have been to base the design of the dowels on the assumption that the soil carries none of the load. This would have been conservative but safe. A more rational analysis would attempt to quantify the distributionof load. To do so would require simultaneous consideration of the shear stiffness of the dowels, the flexural stiffness of the ring wall, the flexural stiffness of the slab and the bearing stiffness of the soil beneath both the slab and the ring wall. Only then could one establish (and then only theoretically) how much of the load applied to the surface of the slab is transferred to the subgrade and how much is transferred to the dowels.

   Unfortunately, determination of that proportion is not practical using hand calculations. Rather, a finite element analysis capable of evaluating soil-structure interaction would be much more appropriate.

   Therefore, in order to resolve concerns for the distribution of the applied loads, a number of simplified finite element analyses were carried out using the computer program IMAGES 3D. In these analyses the new slab was conservatively required to support all dead loads except those of the outer tank. Also, the stiffness of the soil, represented by soil springs for which the deformation characteristics were a function of the modulus of subgrade reaction, was varied between 100 pci (a relatively soft soil) and 800 pci (a relatively firm soil). The stiffness of the dowels was constant for all the analyses. This variation of the spring stiffness was of sufficient range to permit an evaluation of the degree to which the shear force on the dowels varies with the stiffness of the soil. The results of these analyses can be summarized very briefly as follows:

K_s	Dowel Shear
100 #/in^3	22.75 kips
400	17.39 kips
800	15.52 kips

It is apparent that the dowel shear varies inversely with the value of K_S. Fortunately, the variation is not linear. The maximum dowel shears is only 47% greater than the minimum over a range in which the corresponding maximum modules value is 800% greater than the minimum. The dowel shear, therefore, can be seen to be relatively insensitive to variations in the stiffness of the soil, but not so much so that the soil stiffness can be disregarded.

Nevertheless, these values are considerably in excess of the values determined in the calculations for dowel shear. They are used in the remainder of this report as the primary basis for the conclusions regarding the adequacy of the design. To reach that conclusion it is necessary to compare the potential dowel load with the load capacity of the dowels and of the concrete supporting those dowels.

Consider first the capacity of the concrete. A shear force acting vertically upward on the dowel will impose a load on the concrete which will tend to break out the top surface of the slab. The capacity to resist that breakout is a function of the strength of the concrete and of the distance of the loading point from the edge of the concrete. In this case that distance is nine inches, and the concrete strength is 4000 psi. It can be determined, using the methodoloy of ACI 349, Appendix B, "Steel Embedments" that the concrete can withstand a dowel shear of up to 27000 pounds. This is greater that the pure shear capacity of the dowel itself which, for a #8 reinforcing bar, is determined to be about 19000 pounds.

The shear capacity of the dowel is, therefore, the more critical element. If its capacity of 19 kips is compared to the dowel shears determined by the finite element analysis for various soil stiffnesses, it can be seen that the dowel would be overloaded if the soil were characterized by a long term K_S value of about 350 ksi or less.

2. In addition to the calculations generated to determine the dowel loads, the calculations performed to design the dowels were not appropriate. This design provides for inserting #8 reinforcing bars into holes drilled into the ring wall every 18 inches and anchoring them in place using epoxy grout. The objections to this calculation are:

   a. The depth of embedment for the steel bar was determined using a procedure appropriate for a headed anchor subject to tensile loading. However, the anchor is not headed (such that the failure cone considered in the calculations cannot develop) and the loading on the dowel will be primarily shear rather than tension. The approach was, therefore, inappropriate, but alternative calculations indicate that it did result in an adequate design for the dowels.

   b. The load on the dowel was apparently identified by "Wyatt" to be 4887 pounds. The "Wyatt" document making that determination was not included in the calculations, however, such that the means for arriving at that load could not be evaluated.

   c. "Brutem 33", the adhesive for anchoring the rebar in the concrete, is no longer being manufactured. It is presumed that an appropriate substitution was made.

3. The stability of the tank under high winds was apparently evaluated by Wyatt and not included in this evaluation.

SLAB

The bending moments in the slab were determined using a paper written by Andrew W. Brown and entitled "A New Approach to Tank Foundation Design", Hydrocarbon Processing, October, 1974. This paper was reviewed and found to provide a rational means for analyzing the slab. Also, the review of the calculations indicated appropriate application of the recommendations of the paper.

CONCLUSIONS

The calculations adequately demonstrated that the imposed loads can be carried by the existing ring wall and by the new slab. The design of the dowels connecting the slab and ring wall were generally inadequate. For that reason, independent finite element analyses were carried out for this evaluation. These analyses lead to the following conclusions:

1. Specific information regarding the actual, long-term value for the subgrade modulus is not available. Definitive conclusions, based on quantitative analysis, regarding the adequacy of the dowel is, therefore, not possible. However, qualitative conclusions can be drawn from the following considerations:

   a. The subgrade for the new inner tank is reported to have been prepared by minimizing excavation of the in-situ soil which was preconsolidated from the load of the previously existing tank. Materials that were removed were replaced with stable backfill material such as layers of soil-cement and sand, which were compacted to 95% of their maximum dry density. While it is not possible to assign a numerical value for K_s, it is reasonable to assume, on the basis of these considerations, that the subgrade prepared as described would have a coefficient of subgrade reaction of at least 300 pci.

   b. The finite element analysis was based on an assumption that the slab carried all loads except the weight of the outer tank. In reality, the facilities provided at the base of the tank, such as the 3" grating subfloor, will influence the distribution of the load so that the ing wall will carry a much greater portion of the imposed load than assumed by this analysis. The dowel load will then be correspondingly less.

   c. The dowel capacity of 19 kips was based on the yield strength of the dowel. If the ultimate strength of the dowel were considered, the capacity would increase about 50% (to 28.5 kips). This is approximately equal to the capacity of the concrete to accept the dowel load.

   These factors suggest that the load imposed on the dowels will not be in excess of their capacity.

2. Maximum soil pressures under the main portion of the tank and under the ring wall are less than the allowable bearing capacities, under both normal and transient conditions, specified in the soils report.

3. The base mat has sufficient depth and sufficient reinforcement to carry the imposed loads.

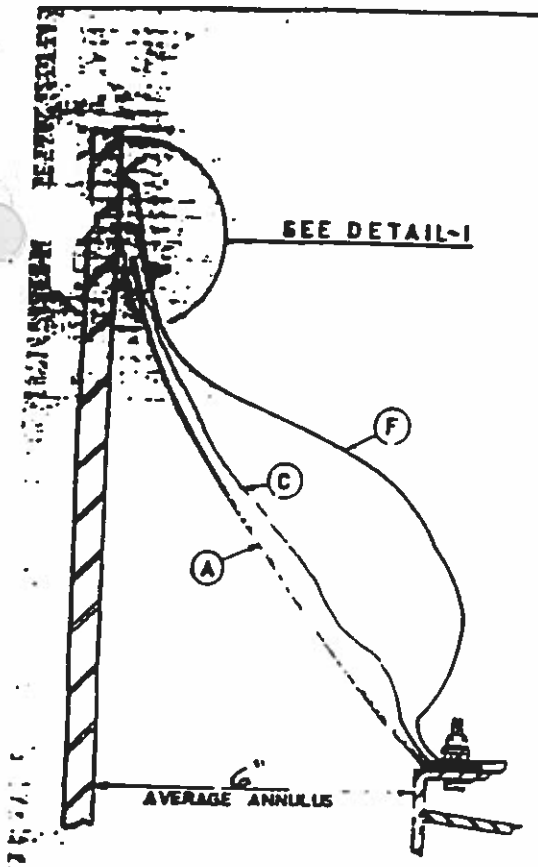
It is concluded, on the basis of the foregoing rationale, therefore, that the design shown on Lyondell Petrochemical Company Drawing Drawing E-34-C-127 is capable of safely carrying all postulated loads. The attached "Hazardous Tank System Assessment - New Tank System Checklist" summarizes the bases for these conclusions.

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT NEW TANK SYSTEM CHECKLIST	Rev. No. 0 Date: 10/16/92 Page: 1 of 1

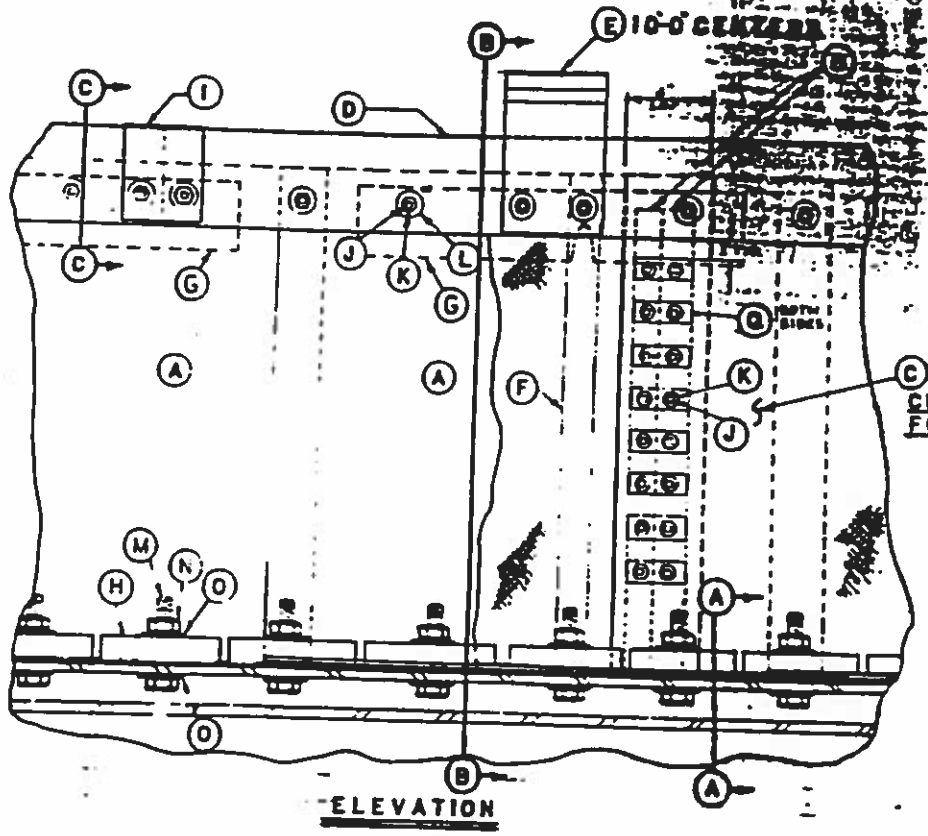
Checklist Title: Civil Design Review Checklist- Secondary Containment		Project No:
Client: Lyondell Petrochemical		Location: Channelview, Texas
Tank System I.D.:	Equipment No: T-3455	Date: April 8, 1993

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	Verify civil design requirements	ACI 318		
2.	Verify civil calcs./drwgs. to item 1	ACI 318		
3.	Verify civil design stds. appropriate	NA		
4.	Verify chemical resistant waterstops	NA		
5.	Verify containment volume requirements	NA		
6.	Designed to protect against formation and ignition of vapors	NA		
7.	Designed to collect waste	NA		
8.	Designed to include impermeable lining	NA		
9.	External vapor barrier on below-grade sumps, etc.	NA		

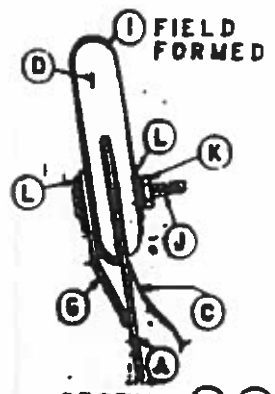
Remarks: None



SECTION (B)(B)

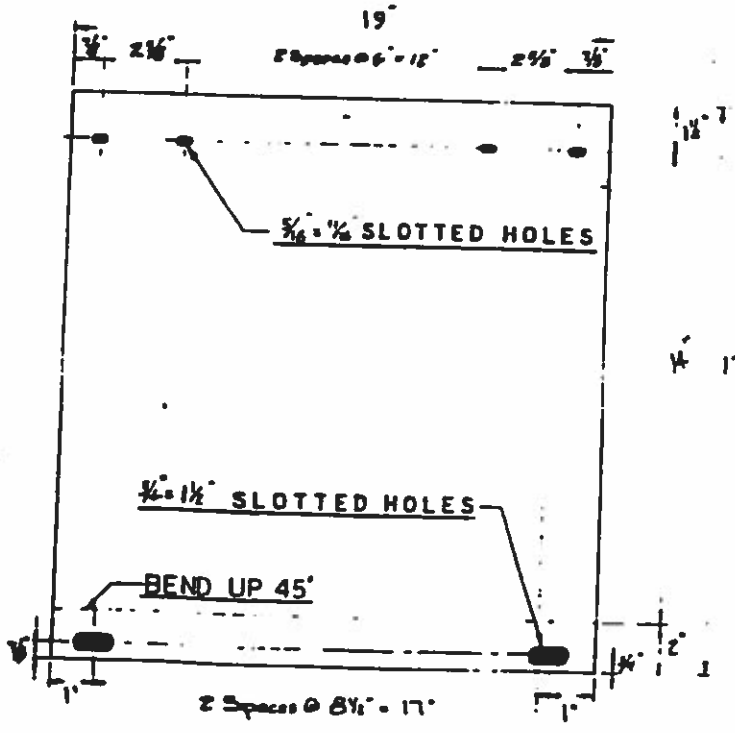


ELEVATION

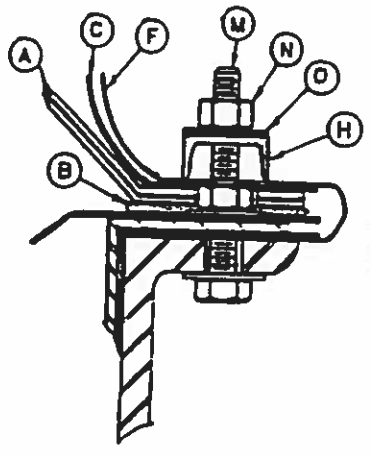


SECTION (C)(C)

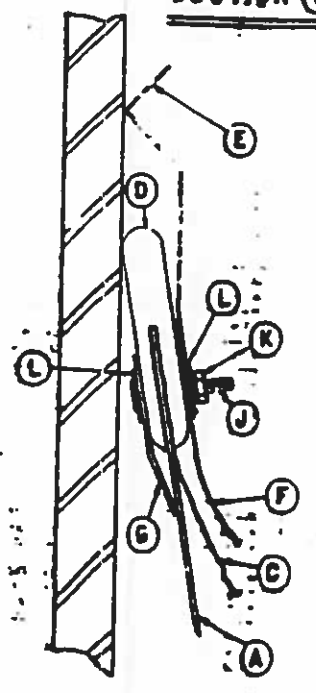
MARK	DESCRIPTION	MATERIALS	GRADE (LBS)	GRADE (LBS)	SHAPE (LBS)	PART
A	SECONDARY SEAL PLATES	Vapor Galvanized	76	78	1825	
B	GASKET	Polyethylene Foam	111	120	30	
C	VAPOR BARRIER FABRIC	Polyethylene Fl with	111	118	30	
D	SEAL TIP	Nitrile/PVC Alloy	118	118	119	
E	GROUND SHUNT	Stainless Steel	11	12	4	
F	GROUND STRIP	Stainless Steel	11	12	4	
G	ANTI-HANGUP	Vapor Fabricated	76	78	26	
H	CLAMP CHANNEL	Galvanized Steel	181	185	91	
I	SEAL SPLICE PLATE	Stainless Steel	.3	.3	1	
J	3/8" x 1 1/4" RAW HD MACH SCREW	Stainless Steel	344	400	4	
K	3/8" HEX NUT	Stainless Steel	344	400	1	
L	3/8" LOCK WASHER	Stainless Steel	459	480	5	
M	3/8" x 2" HEX HD TAP BOLT	Stainless Steel	See	Sheet	1 of 2	Add "F"
N	1/2" HEX NUT	Stainless Steel	151	175	3	
O	3/8" WASHER	Stainless Steel	151	175	2	
P	1/2" TINNERMAN CLIP	Coated Carbon Steel	See	Sheet	1 of 2	Add "J"
Q	VAPOR BARRIER SPLICE	Vapor Stainless Steel	15	20	1	



STANDARD SEAL PLATE MARK-A



SECTION (A)(A)



DETAIL-1

FIELD NOTES:

1. The polyvent seaming of the vapor barrier fabric (Mark Q) make a field check with a pointed object before attempting to pass gaskets under.
2. Vapor barrier fabric is to be installed with approximately 2" to spare.
3. Anti-hangups (Mark G) are to be placed on the center of each seal plate. Do not install across the seal plate lap joints.
4. Lap seal plates in a staggered pattern.
5. Vapor barrier splice can be performed by taping or fusion welded with a hot air gun and knife.

Number of:	6"
Rim bolt spacing:	8'-6" Centers
Type of rim connection:	Horizontal
Anti-rotation device:	Gauge Pole
Existing primary seal height above rim:	0"

Operation Note:
Do not operate tank where Secondary Seal System projects above the bottom edge of Guide Slots or Damage may occur to the Secondary Seal System.

Wyatt FIELD SERVICE COMPANY			
S/O 2472A	DWG. NO. WJ-92-2472A-17	REV. A	
TK-2495			
JOB NO. 92-102	ORDER NO.		
TYPE "A" SECONDARY SEAL FOR 35'-0" DIA WELDED TANK			
91	DL	NONE	

SCHEDULE OF OPENINGS

DETAIL OF OPENINGS

MARK NO.	NO. REQ'D.	SIZE	FLANGE RATING	FACING	NOZZLE SERVICE	FLANGE TYPE	NECK TYPE	NECK O.D.	REINFORCING PAD	BLIND FLANGE	FLANGE BOLTING	GASKETS	NOZZLE PROJ (SEE NOTE #3)	ATTACHMENTS TYPE	ATTACHMENTS O.S. FILLET "A"	ATTACHMENTS I.S. FILLET "B"	ATTACHMENTS PAD FILLET "C"	REMARKS
37	ONE	3"	150#	RF		(86) 3" 150# SLIP ON FLG 1/16" RF (A-105)	(89) 3" SCH 160 PIPE x 8" LG (A-106-B)	3½"	(153) 1/4" TK x 3 5/8" ID x 10 1/2" OD PAD (A-36)				6"	II	1/4	1/4	1/4	SEE SHT #21 FOR DTL OF BAFFLE
38	ONE	3"	150#	RF		(86) 3" 150# SLIP ON FLG 1/16" RF (A-105)	(89) 3" SCH 160 PIPE x 8" LG (A-106-B)	3½"	(153) 1/4" TK x 3 5/8" ID x 10 1/2" OD PAD (A-36)				6"	II	1/4	1/4	1/4	SEE SHT #21 FOR DTL OF BAFFLE
52	ONE	6"	150#	RF	OVERFLOW				SEE DETAIL ON DWG #W-92 2472 - 25									

WELD NECK FLANGE ATTACHMENT DETAIL

TYPE I

TYPE II

TYPE III

TYPE IV

SLIP-ON FLANGE ATTACHMENT DETAIL

TYPE V

NOTES

1. ALL NOZZLE AND MANWAY FLANGE BOLT HOLES IN VESSEL SHELL ARE TO STRADDLE THE VERTICAL CENTERLINES (UNLESS OTHERWISE NOTED).
2. ALL NOZZLE AND MANWAY FLANGE BOLT HOLES IN VESSEL HEADS ARE TO STRADDLE THE NORTH/SOUTH CENTERLINES (UNLESS OTHERWISE NOTED).
3. NOZZLE PROJECTIONS ARE MEASURED FROM FACE OF FLANGE TO OUTSIDE OF SHELL AT THE NOZZLE CENTERLINE (UNLESS OTHERWISE NOTED).
4. ALL REINFORCEMENT PADS OR EACH SECTION (IF MADE IN SECTIONS) SHALL HAVE ONE (1) 1/4" NPT, TELL TALE HOLE AND SHALL BE TESTED WITH 15 PSIG AIR AND SOAP SUDS.
5. (147) SEE SHT #2 FOR MAG. PART. NOTE

FILE NAME: SPEEDSHT

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/03/93
BY:

NO.	REVISION	DATE	BY	CHK'D

P.O.#: CHO-93-0001

S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'0"ø x 32'0" HIGH TANK

SCHEDULE OF OPENINGS (SHELL)

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: ODG DATE: 2-3-93
CHECKED: C.E. APPROVED:

NO. W-92-2472A-1BA REV.

SCHEDULE OF OPENINGS

DETAIL OF OPENINGS

	MARK NO.	NO. REQ'D	SIZE	FLANGE RATING	FACING	NOZZLE SERVICE	FLANGE TYPE	NECK TYPE	NECK O.D.	REINFORCING PAD	BLIND FLANGE	FLANGE BOLTING	GASKETS	NOZZLE PROJ. (SEE NOTE 6)	ATTACHMENTS TYPE	ATTACHMENTS O.S. FILLET "A"	ATTACHMENTS I.S. FILLET "B"	ATTACHMENTS PAD FILLET "C"	REMARKS
	180	ONE	36"	API 650	FF	MANWAY QUICK TANK	○	○		○ SEE DETAIL ON SHT. #26	○	○	○						
	181	ONE	24"	API 650	FF	MANWAY INNER TANK	○	○		○ SEE DETAIL ON SHT. #20	○	○	○						
*	171	ONE	3"	150#	LF	OUTLET	○	○		○ SEE DETAIL ON SHT. #31	○	○	○						
*	31	ONE	4"	150#	RF	DRAIN	○	○		○ SEE DETAIL ON SHT. #21	○	○	○						
	32A THRU 32C	ONE EA	3"	150#	RF	SKIMMING NOZZLE	○	○		○	(104) 3"-150# BLIND FLG 1/16" RF (A-105)	(105) (4) 5/8"Ø x 3 3/4" LG STUDS 'Y' (2) HHHN EA (A-193-B7) (A-194-2H)	(106) 1/16" THK GSKT FOR 3"-150# RF FLG. GARLOCK GYLON 3510 (OFF WHITE)						FIELD TO BLEND OFF EXIST. NOZZLES
*	35	ONE	3"	150#	RF	UTILITY CONN.	○	○		○ SEE DETAIL ON SHT. #31	○	○	○						
	46	ONE	1½	150#	RF	EXT. LEVEL CONN.	(115) 1½"-150# LONG WELD NECK x 9"LG. ½6" RF (A-105)	○	2 5/8"	○	○	○	○	6"	VII	¼	¼	—	
	50	ONE	6"	150#	RF	OVERFLOW	○	○		○	(150) 6"-150# BLIND FLG. 1/16" RF (A-105)	(151) (8) ¾"Ø x 4" LG. STUDS 'Y' (2) HHHN EA. (A-193-B7) (A-194-2H)	(152) 1/16" THK GSKT FOR 6"-150# RF FLG. GARLOCK GYLON 3510 (OFF WHITE)						FIELD TO BLEND OFF EXIST. NOZZLE
*	40	ONE	1½	150#	RF	TEMP GAUGE	○	○		○ SEE DETAIL ON SHT. #32	○	○	○						
	45A THRU 45F	ONE EA	¾	150#	RF	COND. INDICATOR	(111) ¾"-150# LONG WELD x 9"LG. 1/16" RF (A-105)	○	1 5/8"	○	(112) ¾"-150# BLIND FLG. 1/16" RF (A-105)	(113) (4) ½"Ø x 2½" LG STUDS 'Y' (2) HHHN EA (A-193-B7) (A-194-2H)	(114) 1/16" THK GSKT. FOR ¾"-150# RF FLG. GARLOCK GYLON 3510 (OFF WHITE)	6"	VI	¼	¼	—	
	90A THRU 90D	ONE EA	1"	150#	RF	NITROGEN PURGE	(107) 1"-150# LONG WELD NECK x 9"LG. 1/16" RF (A-106)	○	2"	○	(108) 1"-150# BLIND FLG. 1/16" RF (A-105)	(109) (4) ½"Ø x 2¾" LG. STUDS 'Y' (2) HHHN EA. (A-193-B7) (A-194-2H)	(110) 1/16" THK GSKT FOR 1"-150# RF FLG. GARLOCK GYLON 3510 (OFF WHITE)	8½"	VI	¼	¼	—	
*	33	ONE	3"	150#	RF	SKIMMING NOZZLE	○	○		○ SEE DETAIL ON SHT. #22	○	○	○						
*	51	ONE	6"	150#	RF	HIGH LEVEL CONN.	(76) 6"-150# SLIP-ON FLG. 1/16" RF (A-105)	(77) 6" SCH. 80 PIPE x 3'-3" LG. (A-106-B)	6 5/8"	(78) ¼" R x 6¾" I.D. x 15¼" O.D. (A-516-70) (2) REQ'D	○	○	○	10"	VII I	¼	¼	¼	SEE DETAIL OF SPACER ON SHT. #26
							○	○		○	○	○	○						

WELD NECK FLANGE ATTACHMENT DETAIL

I.S. INNER SHELL — TYPE I

I.S. OUTER SHELL — TYPE II

TYPE III

Field Note
DO NOT WELD THIS SIDE

TYPE IV

SLIP-ON FLANGE ATTACHMENT DETAIL

TYPE V

TYPE VII

TYPE VI

NOTES

1. ALL NOZZLE AND MANWAY FLANGE BOLT HOLES IN TANK SHELL ARE TO STRADDLE THE VERTICAL CENTERLINES (UNLESS OTHERWISE NOTED).
2. ALL NOZZLE AND MANWAY FLANGE BOLT HOLES IN TANK ROOF ARE TO STRADDLE THE NORTH/SOUTH CENTERLINES (UNLESS OTHERWISE NOTED).
3. NOZZLE PROJECTIONS ARE MEASURED FROM FACE OF FLANGE TO OUTSIDE OF OUTER SHELL AT NOZZLE CENTERLINE (UNLESS OTHERWISE NOTED).
4. ALL REINFORCEMENT PADS OR EACH SECTION (IF MADE IN SECTIONS) SHALL HAVE ONE (1) 1/4" NPT. TELL TALE HOLE AND SHALL BE TESTED WITH 15 PSIG AIR AND SOAP SUDS. EXCEPT NOZZ. NK-"51" OUTER TANK PAD
5. [1TT] SEE SHT. "2 FOR MAG. PART NOTE

* DENOTES NOZZLES THAT PENETRATE BOTH SHELLS

6) ALL PAD TEST HOLES ON INNER TANK TO BE PLUGGED W/ ¼" PIPE PLUGS & REMOVED AFTER HYDROTEST OF OUTER TANK

FILE NAME: SPECIFICATION

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/03/93
BY:

NO.	REVISION	DATE	BY	CHK'D
D	MOVED NOZZ. NK "40" TO SHT. "32	1-29-93	JKH	CC
C	REMOVED NOZZLES NK-"19" & "33" TO SHT. "31 ADD PAD	1-29-93	JKH	CE
B	ADD GASKETS, TYPE VII, & NOTE 6. REV. NOTE "4	1-28-93	JKH	CC
A	REV. PER CUST. APPROVAL	1-25-93	JKH	CC

P.O.#: CHO-93-0001
S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST 40'-0"Ø X 32'-0" HIGH TANK

SCHEDULE OF OPENINGS (SHEET)

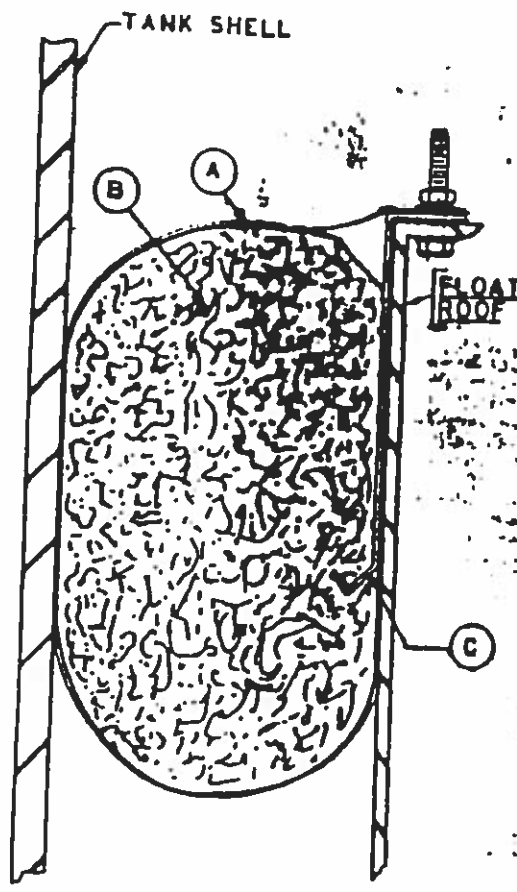
CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-29-93
CHECKED: C.C. APPROVED:

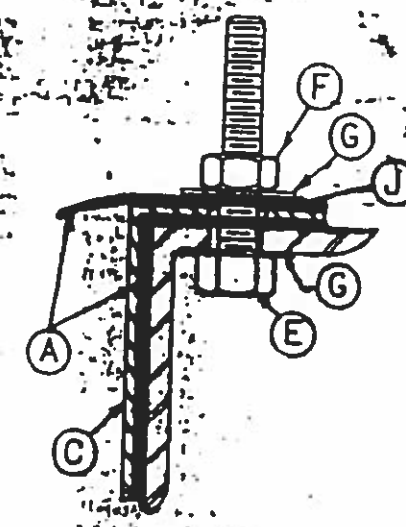
NO. W, -92-2472A-18 REV. D

Wyatt FIELD SERVICE COMPANY
HOUSTON, TEXAS

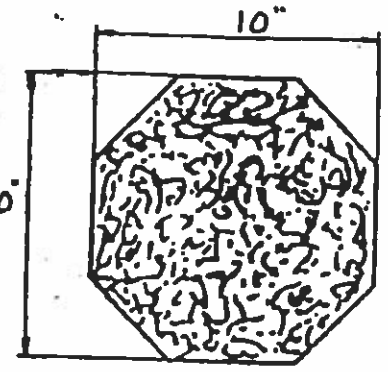
S/O 2472A | DWG. NO. W-92-2472A-16 | REV. A



SECTION (A)-(A)

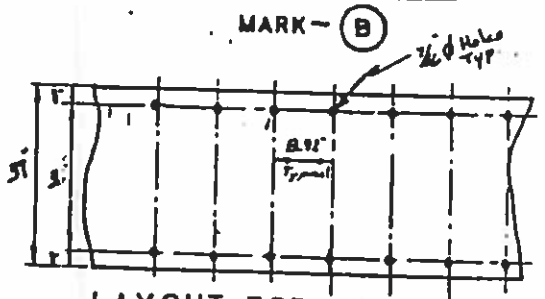


SECTION (B)-(B)

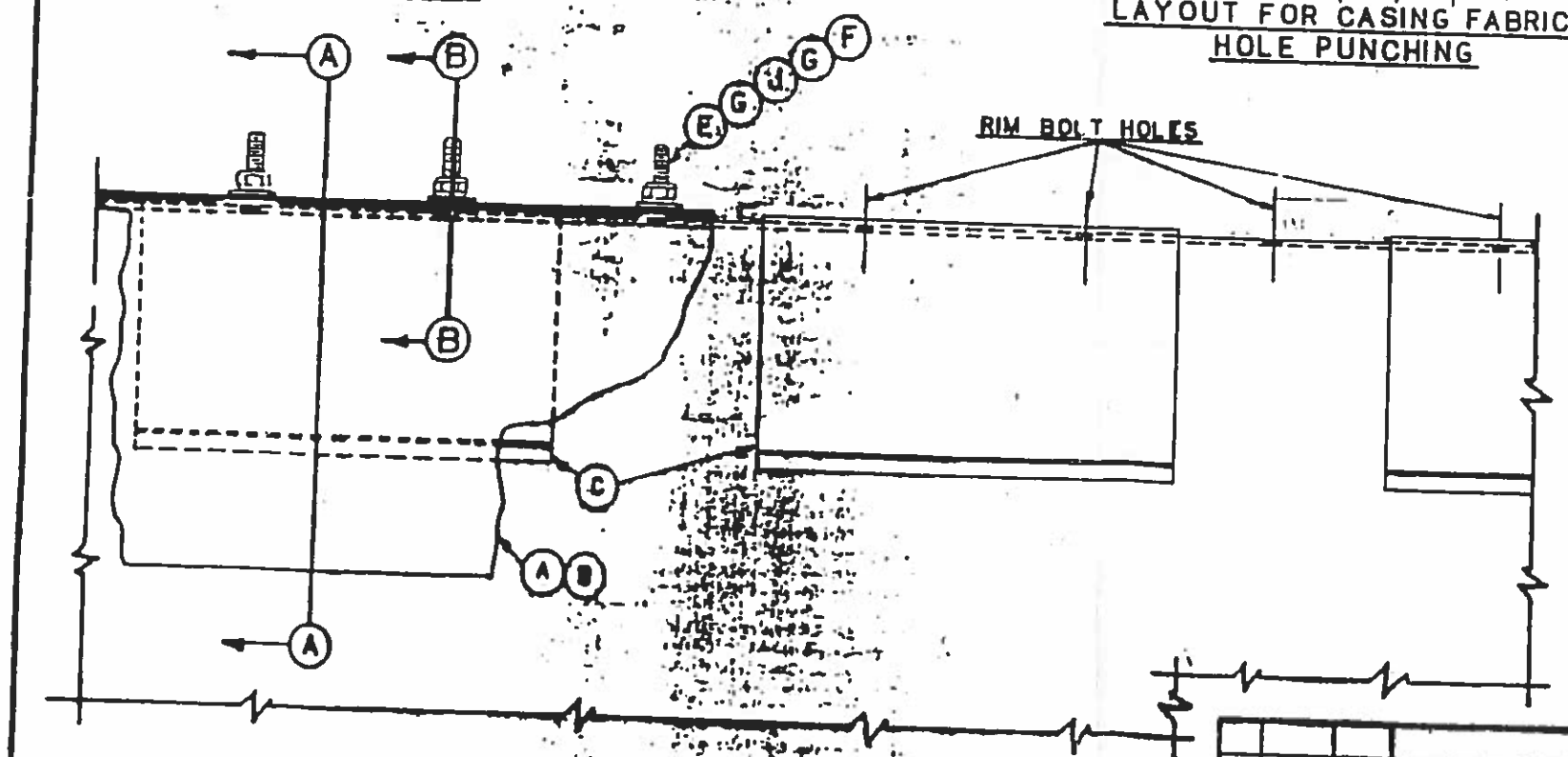


FOAM LOG

MARK - (B)



LAYOUT FOR CASING FABRIC HOLE PUNCHING



ELEVATION

BILL OF MATERIALS

MARK	DESCRIPTION	MATERIAL	QUAN REQD	QUAN SHPD	SHIPPING WEIGHT
A	SEAL FABRIC ~ GOTOFLO	20mil Teflon coated fiberglass	115.5'	115'	64
B	OCTAGONAL FOAM ~ 10"	URETHANE 10' LG	115.5'	120'	56
C	HOLD DOWN PLATES	16 GA. Galvanize	51	53	166
D	CLAMP CHANNEL	GALVANIZE x 8' LG	Stock	Stock	Stock
E	3/8 x 2" HEX HD. TAP	Stainless Steel	151	175	13
F	3/8" HEX NUT	Stainless Steel	181	175	3
G	3/8" STANDARD WASHER	Stainless Steel	302	350	4
H	FABRIC SPLICE KIT	.002x1" FEP Teflon Tape	6.3'	7'	1
I					
J	TINERMAN CLIPS	COATED G.S.	151	175	1

GENERAL NOTES

1. ALL STEEL PARTS COMING IN CONTACT WITH THE SEAL FABRIC MUST BE FREE OF BURRS AND SHARP EDGES.
2. SEAL FABRIC SPECIFICATIONS:
   A. CASING FABRIC - Mem GOTOFLO Teflon Coated Fiberglass
   B. SPLICE WITH FEP Teflon Tape by Use of Heat Iron.
3. FOAM LOG SPECIFICATIONS:
   PRIME QUALITY POLYETHER TYPE URETHANE FOAM WITH THE FOLLOWING VALUES:
   A. COMPRESSION SET NOT TO EXCEED 10% @ 75% DEFLECTION.
   B. INDENTATION LOAD DEFLECTION---RMA VALUE 15:38 AT 25% DEFLECTION.
   C. DENSITY---1.0 TO 1.2 LBS./CU. FT.
   D. TENSILE STRENGHT---10# PER SQ. IN.
   E. ELONGATION---180% MIN.
   F. TEMPERATURE--- -20°F to 200°F.
4. FIELD NOTES:
   A. EXTRA LENGTH SEAL FABRIC HAS BEEN SUPPLIED. CUT OFF EXCESS. MAKE LAP IN SPLICE 4" WIDE.
   B. EXTRA FOAM HAS BEEN SUPPLIED. IF ANY EXCESS CUT OFF. FOAM IS TO BE INSTALLED IN SEAL FABRIC WITHOUT PIECING AND EACH 10'-0" SECTION SHALL BE COMPRESSED IN LENGTH APPROX. 6".
   C. SKIP DRILLING HOLES PER HOLD DOWN PLATE. SEE ELEVATION.

TANK DATA REQUIRED

ANNULUS: 6"

RIM HOLE SPACING: 8½" Centers

ANTI ROTATION DEVICE: Gauge Pole

PRODUCT LEVEL FROM TOP OF RIM: 14.44"

VAPOR MOUNTED

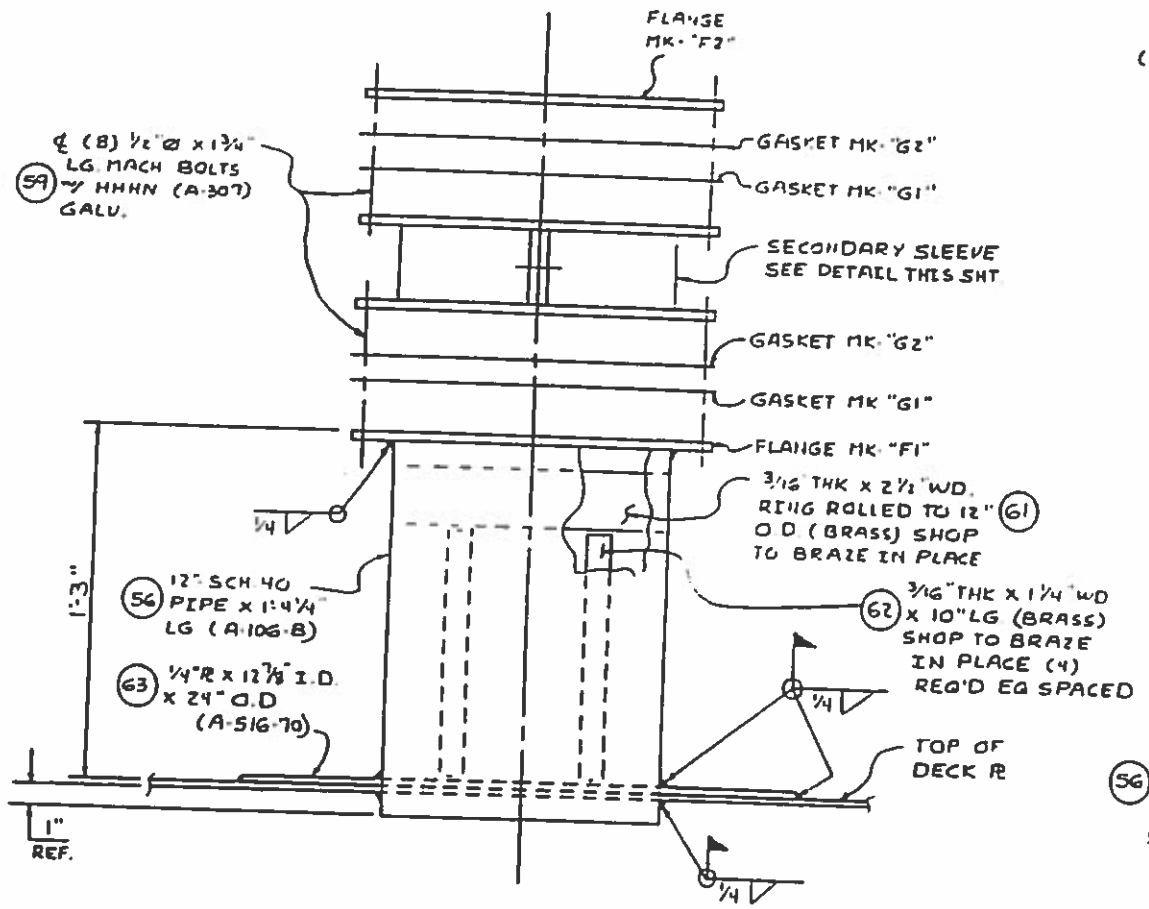
NO.	DATE	BY	REVISION DESCRIPTION

CUSTOMER INFORMATION	
TANK NO. TK-3455	Wyatt Field Service Company Lyondell Petrochemical Channelview TX
ORDER NO. W-5744C/2472	JOB NO. 92-102

TST FOAM LOG SEAL FOR 35'-0" DIA. TANK

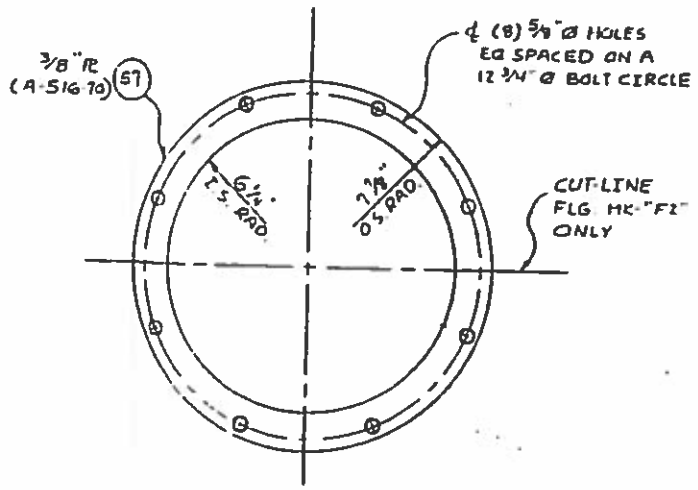
Designed by	Checked by	Approved	SCALE	DATE
vl		vl	NONE	1-25-93

SHEET NO.	DRAWING NO.	REV.
1 of 2	TST-VMFL-0102-92	0



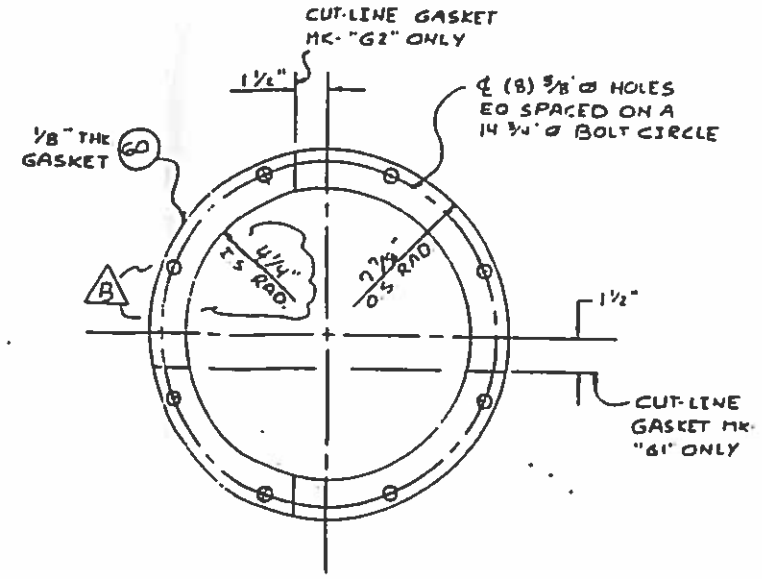
DETAIL CENTER COLUMN SLEEVE

(ONE) ASS'Y REQUIRED



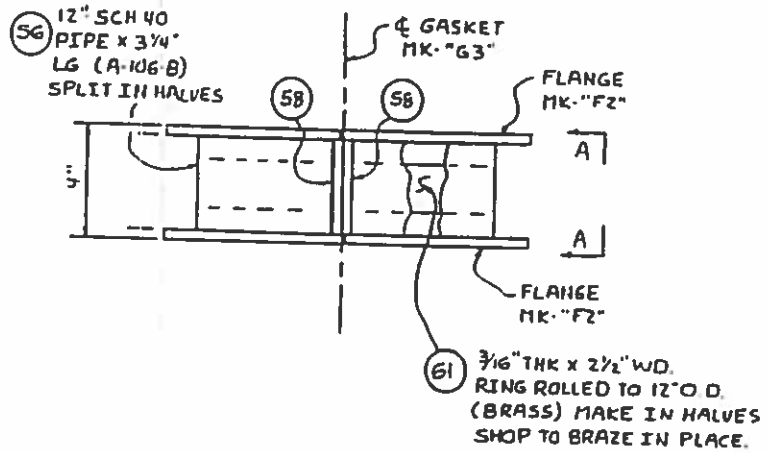
DETAIL SLEEVE FLANGE

(ONE) REQ'D MK "F1"
(3) REQ'D MK-"F2"



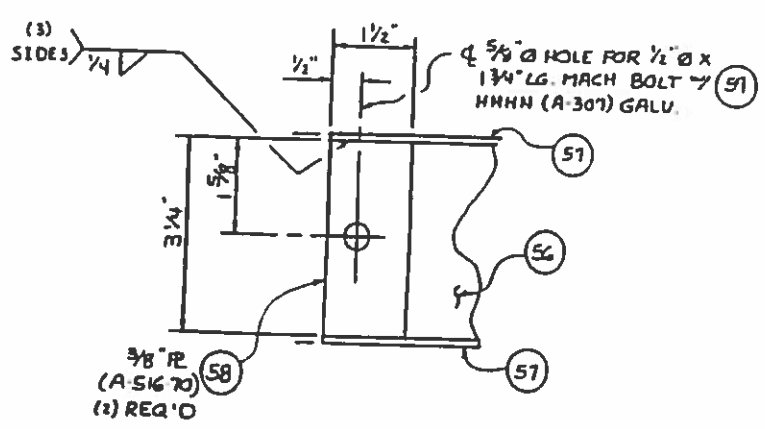
DETAIL SLEEVE GASKET

(2) REQ'D MK-"G1"
(2) REQ'D MK-"G2"



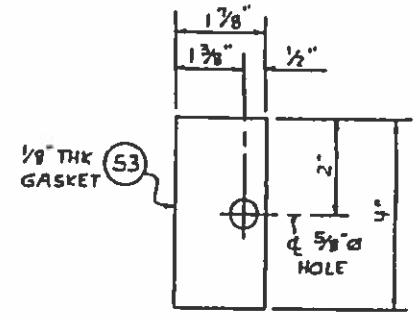
DETAIL SECONDARY SLEEVE

ONE ASS'Y REQ'D



VIEW "A-A"

TYP. IN (2) PLACES



DETAIL SLEEVE GASKET

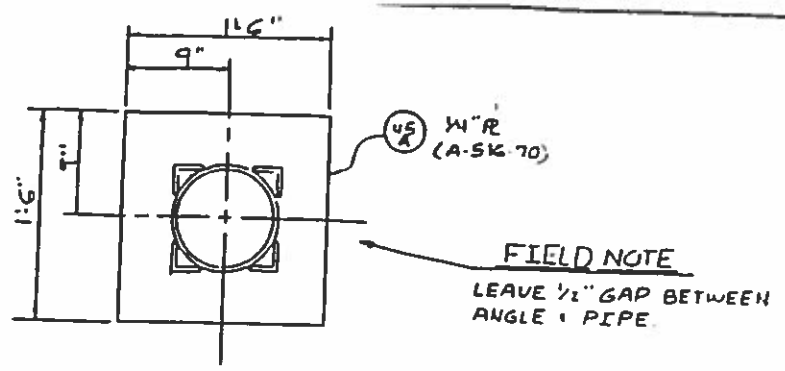
(2) REQ'D MK- "G3"

SCALE:

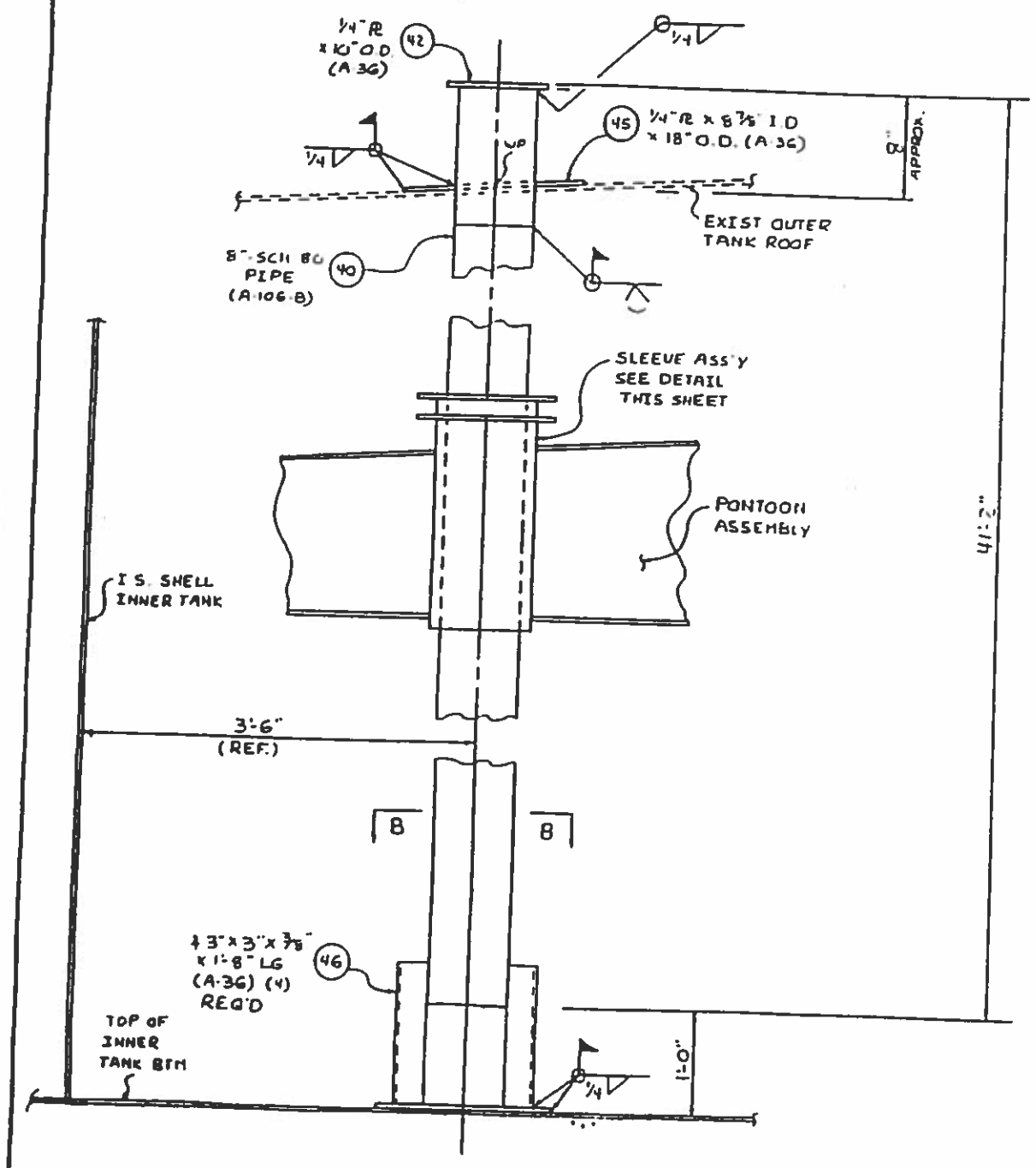
CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/27/93
BY:

NO.	REVISION	DATE	BY	CHK'D
B	REV. I.D. OF GASKET	2-10 93	JKH	CC.
A	REV. PER CUST. APPROVAL	1-27 93	JKH	CC.

P.O.#: CHO-93-001
S/O 2472A | ITEM: TK-3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS FOR AN EXIST. 40'-0" ø x 32'-0" HIGH TANK
DETAIL CENTER COLUMN SLEEVE
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: JKH DATE: 1-22-93
CHECKED: C.C APPROVED:
NO. W-92-2472A-15 REV. B

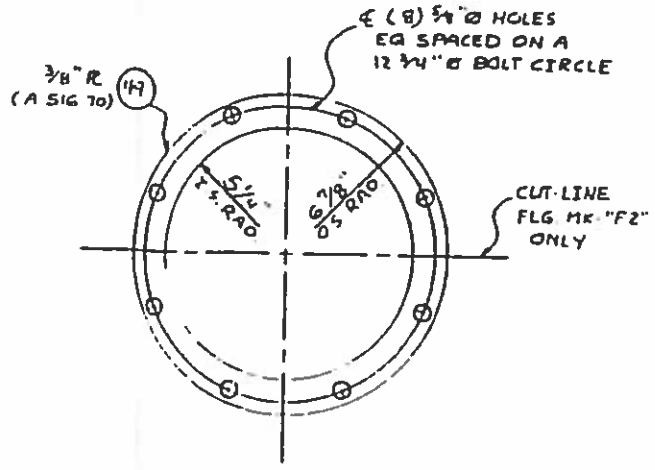


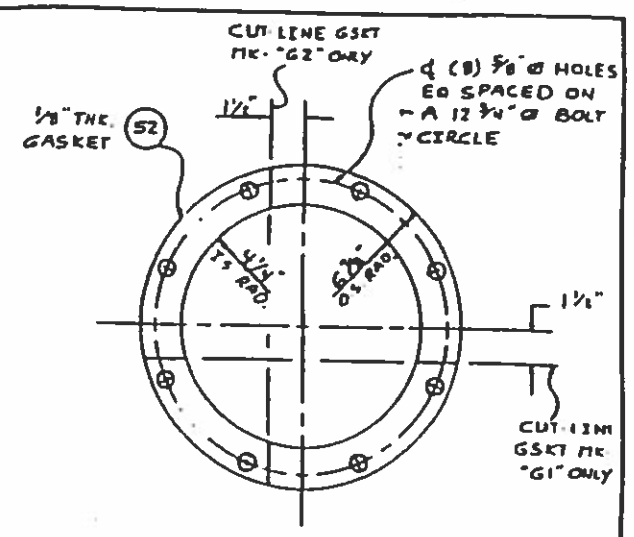
VIEW B-B



DETAIL 8" ANTI-ROTATION DEVICE

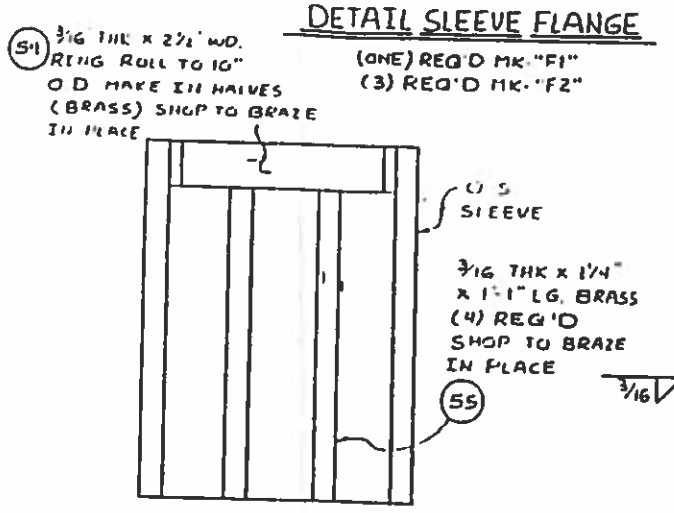
(ONE) ASS'Y REQUIRED



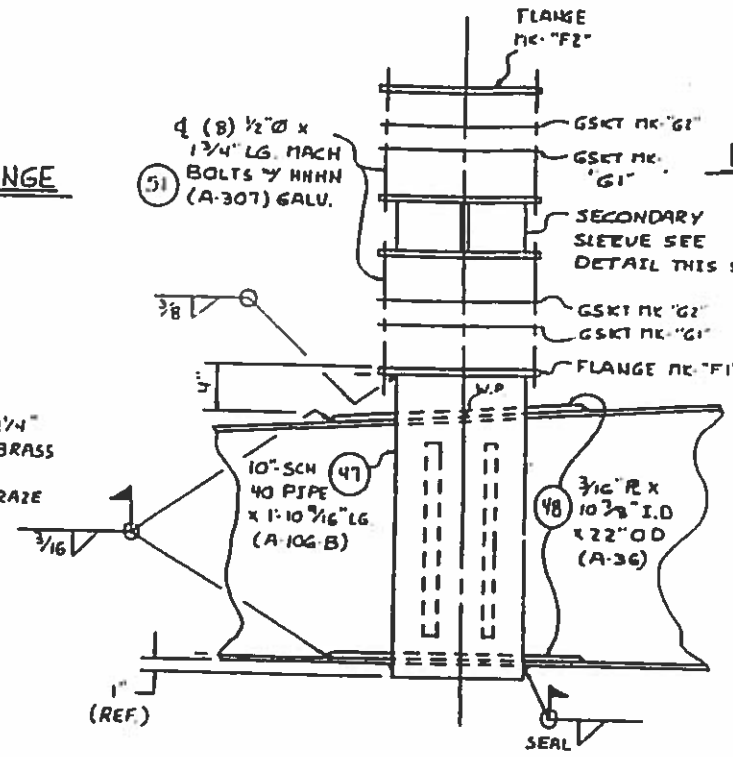


DETAIL SLEEVE FLANGE

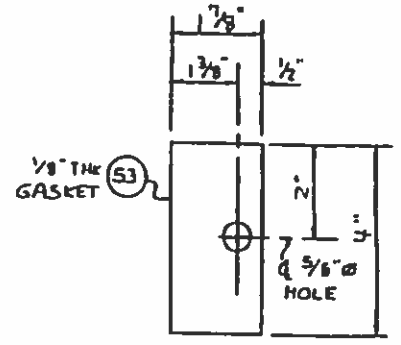
(ONE) REQ'D MK-"F1"
(3) REQ'D MK-"F2"



DETAIL ANTI SPARK INSERTS

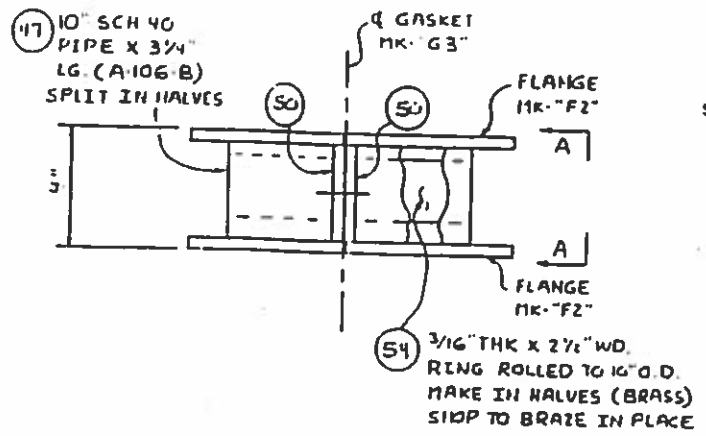


DETAIL SLEEVE ASSEMBLY



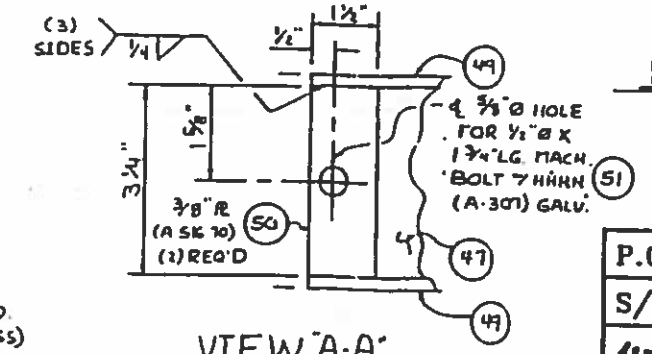
DETAIL SLEEVE GASKET

(2) REQ'D MK-"G1"
(1) REQ'D MK-"G2"



DETAIL SECONDARY SLEEVE

ONE ASS'Y REQ'D



VIEW A-A

TYP. IN (2) PLACES

A	REV. PER CUST. APPROVAL	1-27-93	JKH	CE
NO.	REVISION	DATE	BY	CHKD

SCALE:

CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 4/1/93
BY:

P.O.#: CHO-93-0001

S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS FOR AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK

DETAIL 8" ANTI-ROTATE DEVICE

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-21-93
CHECKED: C.E. APPROVED:

NO. W-92-2472A-14 REV. A

DRAWING NO.	REV.	DRAWING DESCRIPTION	LIST REV.	ISSUE STATUS A C S F
W-92-2472A-2	B	GENERAL NOTES (SHT. 1 OF 2)	12	X X X X
W-92-2472A-3	G	ELEVATION	12	X X X X
W-92-2472A-4	C	PLAN OF OUTER TANK	12	X X X X
W-92-2472A-5	B	PLAN OF INNER TANK	7	X X X X
W-92-2472A-6	A	REPLACEMENT BOTTOM LAYOUT	1	X X X X
W-92-2472A-7	A	GRATING LAYOUT	1	X X X X
W-92-2472A-8	A	DETAIL OF ANNULAR RING	1	X X X X
W-92-2472A-9	A	INNER TANK BOTTOM LAYOUT	1	X X X X
W-92-2472A-10	B	PLAN OF FLOATING ROOF	7	X X X X
W-92-2472A-11	A	DECK LAYOUT	3	X X X X
W-92-2472A-12	A	DETAIL OF PONTOON ASSEMBLY	3	X X X X
W-92-2472A-13	A	MISC. FLOATING ROOF COMPONENTS	3	X X X X
W-92-2472A-14	A	DETAIL 8" ANTI-ROTATION DEVICE	3	X X X X
W-92-2472A-15	B	DETAIL OF CENTER COLUMN SLEEVE	7	X X X X
W-92-2472A-16	A	DETAIL OF FOAM LOG SEAL	5	X X X X
W-92-2472A-17	A	DETAIL OF SECONDARY SEAL	5	X X X X
W-92-2472A-18	D	SCHEDULE OF OPENINGS (SHELL)	11	X X X X
W-92-2472A-18A		SCHEDULE OF OPENINGS (SHELL)	5	X X X X
W-92-2472A-19	A	SCHEDULE OF OPENINGS (ROOF)	5	X X X X
W-92-2472A-20	B	DETAIL 24" SHELL MANWAY	7	X X X X
W-92-2472A-21	D	MISC. NOZZLE DETAILS	11	X X X X
W-92-2472A-22	B	DETAIL OF NOZZLE MK-"33" & SKIMMER	11	X X X X
W-92-2472A-23	A	DETAIL 24" ROOF MANWAY	5	X X X X
W-92-2472A-24	A	DETAIL OF VAREC GAUGE	7	X X X X
W-92-2472A-25	C	DETAIL OF NOZZLE MK-"52"	12	X X X X
W-92-2472A-26	A	DETAIL 36" SHELL MANWAY	7	X X X X
W-92-2472A-27	A	MISCELLANEOUS DETAILS	7	X X X X
W-92-2472A-28	A	DETAIL OF CENTER COLUMN & CLIPS	7	X X X X
W-92-2472A-29	A	ELEVATION OF STAIRWAY	7	X X X X
W-92-2472A-30	A	DTL OF NOZZLE MK-"33" @ LOW POSITION OF ROOF	8	X X X X
W-92-2472A-31	A	NOZZLE DETAILS	11	X X X X
W-92-2472A-32		DETAIL OF NOZZLES MK-"33" & "40"	11	X X X X
W-92-2472A-EKF1		PLAN OF SUGGESTED FALSEWORK (WYATT USE ONLY)	9	- - - X
W-92-2472A-SL1	E	SHIPPING LIST (WYATT USE ONLY)	11	- - X X
W-92-2472A-SL2	A	SHIPPING LIST (WYATT USE ONLY)	5	- - X X
W-92-2472A-SL3		SHIPPING LIST (WYATT USE ONLY)	5	- - X X
W-92-2472A-SL4	A	SHIPPING LIST (WYATT USE ONLY	7	- - X X
W-92-2472A-SL5	B	SHIPPING LIST (WYATT USE ONLY)	11	- - X X
W-92-2472A-WM		X-RAY & WELD MAP (WYATT USE ONLY)	5	- - X X

DRAWING NO.	REV.	DRAWING DESCRIPTION	LIST REV.	ISSUE STATUS A C S F
W-92-2472A-2A		GENERAL NOTES (SHT. 2 OF 2)	7	X X X X

DRAWING NO.	REV.	DRAWING DESCRIPTION	LIST REV.	ISSUE STATUS A C S F

WELDING PROCEDURE LIST

PROC. NO.	REV.	COMMENTS	LIST REV.	ISSUE STATUS A C S F
HW-1 S	0	SMAW (MANUAL)	3	X X X X

FILE NAME: LIST

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/12/93
BY: [signature]

NO.	REVISION	DATE	BY	CHK'D
12	REV. AS NOTED	4-26-93	JKH	CG
11	REV. AS NOTED	3-31-93	JKH	CG
10	REV. AS NOTED	3-19-93	JKH	CG
9	REV. AS NOTED	2-26-93	DDS	CG
8	REV. AS NOTED	2-16-93	DDS	CG
7	REV. AS NOTED	12-28-92	JKH	CG

P.O.#: CHO-93-0001

S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK

MASTER DRAWING LIST

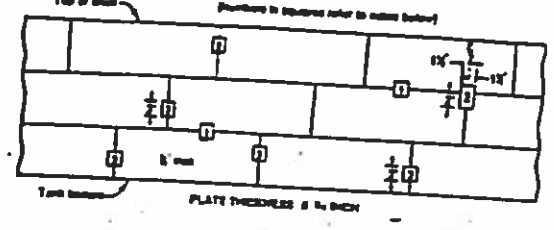
CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH | DATE: 1-13-93

CHECKED: CG | APPROVED:

NO. W-92-2472A-1 | REV. 12

RADIOGRAPHIC STANDARDS



A.3.4 The joint efficiency factor shall be 0.85 with the spot radiography required by A.5.3. By agreement between the purchaser and the manufacturer, the spot radiography may be omitted and a joint efficiency factor of 0.70 shall be used.

A.5.3 When radiographic inspection is required (Joint efficiency = 0.85), the spot radiographs required for vertical joints shall conform to 8.1.2.2, Item a, excluding the 3/8 inch shell-thickness limitation and excluding the additional random spot radiograph. Spot radiographs for horizontal joints shall conform to 8.1.2.3.

Notes:
1. Horizontal spot radiograph in accordance with 8.1.2.3, one to the first 10 feet and one in each 200 feet thereafter.
2. Vertical spot radiograph in accordance with 8.1.2.2, Item a: one in the first 10 feet and one in each 200 feet thereafter. 25 percent of welded shall be at intersections.
3. Vertical spot radiograph of each vertical seam in the lowest course (see 8.1.2.2, Item a). Such radiographs shall satisfy the requirements of Note 2 for the horizontal seams and be used to satisfy that requirement.
4. Spot radiographs of all intersections over 10 feet (see 8.1.2.2, Item b).
5. Spot radiograph of fourteen of each vertical seam in lowest shell course over 10 feet (see 8.1.2.2, Item b).
6. Complete radiograph of each vertical seam over 1 inch. The completed radiograph may include the spot radiograph of the intersection of the first or intermediate seams of 4 feet (see 8.1.2.2, Item a).

Figure 6-1—Radiographic Requirements for Tank Shells

8.1.2 NUMBER AND LOCATION OF RADIOGRAPHS

8.1.2.1 Except when deleted under the provisions of A.3.4, radiographs shall be taken as specified in 8.1.2 through 8.1.5.

8.1.2.2 The following requirements apply to vertical joints:

a. For butt-welded joints in which the thinner shell plate is 1½ inch or less, one spot radiograph shall be taken in the first 10 feet of completed vertical joint of each type and thickness welded by each welder or welding operator. The spot radiographs taken in the vertical joints of the lowest course may be used to meet the requirements of Note 3 in Figure 6-1 for individual joints. Thereafter, without regard to the number of welders or welding operators, one additional spot radiograph shall be taken in each additional 100 feet (approximately) and any remaining major fraction of vertical joint of the same type and thickness. At least 25 percent of the selected spots shall be at junctions of vertical and horizontal joints, with a minimum of two such intersections per tank. In addition to the foregoing requirements, one random spot radiograph shall be taken in each vertical joint in the lowest course (see Figure 6-1, top panel).

b. For butt-welded joints in which the thinner shell plate is greater than 1½ inch and up to and including 1 inch in thickness, spot radiographs shall be taken per item a. In addition, all junctions of vertical and horizontal joints in plates in this thickness range shall be radiographed; each film shall clearly show not less than 2 inches of weld length on each side of the vertical intersection. In the lowest course, two spot radiographs shall be taken in each vertical joint; one of the radiographs shall be as close to the bottom as is practicable, and the other shall be taken at random (see Figure 6-1, center panel).

c. Vertical joints in which the shell plates are more than 1 inch thick shall be fully radiographed. All junctions of vertical and horizontal joints in this thickness range shall be radiographed; each film shall clearly show not less than 2 inches of weld length on each side of the vertical intersection (see Figure 6-1, bottom panel).

d. The butt weld around the periphery of an insert manhole or nozzle shall be completely radiographed.

8.1.2.3 One spot radiograph shall be taken in the first 10 feet of completed horizontal butt joint of the same type and thickness (based on the thickness of the thinner plate at the joint) without regard to the number of welders or welding operators. Thereafter, one radiograph shall be taken in each additional 200 feet (approximately) and any remaining major fraction of horizontal joint of the same type and thickness, not including the junctions of vertical joints required by 8.1.2.2, Item c (see Figure 6-1).

8.1.2.4 For the purposes of 8.1, plates shall be considered of the same thickness when the difference in the specified or design thickness does not exceed ⅛ inch.

8.1.2.5 When two or more tanks are erected in the same location for the same purchaser, either concurrently or serially, the number of spot radiographs to be taken may be based on the aggregate footage of welds of the same type and thickness in each group of tanks rather than on the footage in each individual tank.

8.1.2.6 It should be recognized that the same welder or welding operator may not weld both sides of the same butt joint. It is therefore permissible to inspect the work of two welders or welding operators with one spot radiograph if they weld opposite sides of the same butt joint. When a spot radiograph is rejected, further spot radiographs shall be used to determine whether one or both welders or welding operators were at fault.

8.1.2.7 Insofar as is possible, an equal number of spot radiographs shall be taken from the work of each welder or welding operator, except that this requirement does not apply where the length of joints welded by a welder or welding operator is much less than average.

8.1.2.8 As welding progresses, radiographs shall be taken as soon as is practicable. The location for taking spot radiographs may be determined by the purchaser's inspector.

8.1.2.9 Each radiograph shall clearly show a minimum of 3 inches of weld length. The film shall be centered on the weld and shall be of sufficient width to permit adequate space for the location of identification marks and a thickness gauge or penetrameter.

8.1.2.10 When bottom annular plates are required by 5.5.1, the radial joints shall be radiographed. For double butt-welded joints, one spot radiograph shall be taken on 10 percent of the radial joints. For single welded joints using a backup bar, one spot radiograph shall be taken on 50 percent of the radial joints. Locations of radiographs shall preferably be at the outer edge where the shell-plate joint joins the annular plate. The minimum length of the radiograph shall be 6 inches. Extra care must be exercised in the interpretation of radiographs of single welded joints that have a backup bar. In some cases, additional exposures taken at an angle may resolve the acceptability of questionable indications.

HYDRO-TEST PROCEDURE

SEE SHT. # 2A

PAINT NOTES

SHOP PAINT

1) THE FOLLOWING SURFACES OF OUTER TANK ARE TO BE SANDBLASTED TO SSPC-SP5 (WHITE METAL):
   - A) EXTERNAL SURFACE OF SHELL RG. #5
   - B) EXTERNAL SURFACE OF TOP ANGLE (5"x3"x¼")
   - C) BOTH SIDES OF ANCHOR CHAIR TOP PLATES, GUSSETS, & BOLTING PLATES.
2) MASK OFF 2" FROM EDGES OF SHELL RG #5 PLATES & PRIME WITH HEMPEL 154 U EXOPY PRIMER TO A DRY FILM THICKNESS OF 4 MILS.
3) ALL PAINTING TO BE DONE BY OTHERS FOR WYATT. (SG)

FIELD PAINT

1) THE FOLLOWING SURFACES OF OUTER TANK ARE TO BE POWER TOOL CLEANED TO SSPC-SP-3.
   - A) AREAS DAMAGED BY WELDING ON SHELL RGS #1 & #5, ANCHOR CHAIRS, TOP ANGLE, & CONE ROOF
   - B) AREAS DAMAGED BY SCAFFOLD LUGS.
   - C) DOOR SHEET AREAS DAMAGED BY WELDING
   - D) NOZZLE AREAS DAMAGED BY WELDING.
2) DAMAGED AREAS TO BE PRIMED W/ HEMPEL 154 U EPOXY PRIMER TO A DRY FILM THICKNESS OF 4 MILS.
3) SHELL RING #5 & DAMAGED AREAS TO BE FINISH COATED WITH HEMPEL 8562 EPOXY FINISH TO A DRY FILM THICKNESS OF 4 MILS (COLOR: WHITE)
4) ALL PAINTING TO BE DONE BY OTHERS FOR WYATT (SG)
5) PAINTING OF INTERNAL SURFCACES OF OUTER TANK, INNER TANK (INTERNAL & EXTERNAL) & FLOATING ROOF TO BE PAINTED BY CUSTOMER IF REQUIRED.

(B)

DESIGN DATA & GENERAL NOTES (INNER TANK)

DESIGN, FABRICATION, ERECTION & TESTING TO BE IN ACCORDANCE WITH API-650 8TH EDITION, NOVEMBER 1988 APP. A & H

CODE NAME PLATE REQ'D: YES

DESIGN PRESSURE	:
	INT: ATM.
	EXT: ATM.
DESIGN TEMPERATURE	: 12°F - 170°F
SPECIFIC GRAVITY	: 1.05
JOINT EFFICIENCY	: .85
RADIOGRAPH	: SEE STANDARDS THIS SHT.
CORROSION ALLOWANCE:	SHELL ⅛" BOTTOM ⅛"
DESIGN LIQUID LEVEL:	39'-6"
ROOF CONSTRUCTION	: PONTOON FLOAT. ROOF
BOTTOM CONSTRUCTION:	LAP WELD
HYDROTEST	: SEE PROCEDURE THIS SHT.
WIND LOAD	: 110 MPH
EARTHQUAKE ZONE	: 0 .
NOMINAL CAPACITY	: 6,170 BBLS TO BOTTOM OF OVERFLOW

NDE NOTES

1) MT DENOTES MAGNETIC PARTICLE EXAMINATION OF ALL NOZZLE TO SHELL ATTACHMENT WELDS (INCLUDING REINF. PAD TO SHELL) PRIOR TO HYDRO TEST. ANY DEFECTS FOUND ARE TO BE REPAIRED & RETESTED
2) ALL SHELL NOZZLE REINFORCING PADS ARE TO BE TESTED W/ 15 P.S.I. AIR & SOAP SUDS PRIOR TO HYDRO TEST. ANY DEFECTS FOUND ARE TO BE REPAIRED & RETESTED.
3) ALL SHELL (INNER & OUTER TANKS) TO ANNULAR RING ATTACHMENT WELDS TO BE LIQUID PENETRANT TESTED PRIOR TO HYDRO-TEST. ANY DEFECTS FOUND ARE TO BE REPAIRED & RETESTED
4) ALL SEAMS IN OUTER BOTTOM, INNER BOTTOM, FLOATING ROOF DECK, & EXISTING CONE ROOF TO BE VACUUM BOX TESTED, PER API 650 PARAGRAPH 5.5.3, UPON COMPLETION OF WELDING ANY DEFECTS FOUND ARE TO REPAIRED & RETESTED BEFORE PROCEEDING WITH CONSTRUCTION

WEIGHTS

OUTER TANK (EMPTY) -	86,000#
INNER TANK (EMPTY) -	66,000#
GRATING SPACER -	21,600#
FLOATING ROOF -	28,000#
	201,600#

NOTES

1) NAME PLATE TO BE INSTALLED ON INNER TANK ABOVE THE 24" M.W.
2) SEE SHT. # 27 FOR DT'L OF NAME PLATE BRACKET

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
A Subsidiary of WYATT CORPORATION

API STANDARD 650

APPENDIX	A & H
EDITION	8TH
NOMINAL DIAMETER	35'-0" O.D.
NOMINAL CAPACITY	6,170 BBLS.
DESIGN SPECIFIC GRAVITY	1.05
DESIGN PRESSURE	
INT ATM.	EXT ATM.
PURCHASER'S TANK NO.	TK-3455
MANUFACTURER'S SERIAL NO.	2472A
FABRICATED BY	WYATT FIELD SERVICE COMPANY
ERECTED BY	WYATT FIELD SERVICE COMPANY
SHELL COURSES	3/8", 5/16", & 1/4" R MATERIAL A-516-70
YEAR COMPLETED	1993
REVISION NUMBER	
NOMINAL HEIGHT	39'-6"
DESIGN LIQUID LEVEL	39'-6"
MAXIMUM TEST LEVEL	36'-1⅛"
DESIGN METAL TEMP.	12°F - 170 °F
MAXIMUM OPERATING TEMP.	170 °F
PARTIAL STRESS RELIEF	NONE

(B)

DT'L OF CODE NAME PLATE

NO.	REVISION	DATE	BY	CHK'D
B	REV NAME R & CAPACITY	4-23-93	JKH	CC
A	REV. PER CUST. APPROVAL	2-19-93	JKH	CC

SCALE: —

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/11/93
BY: Charles Gray

P.O.#: CHO-93-0001

S/O 2472A | ITEM: TK-3466

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø X 32'-0" HIGH TANK

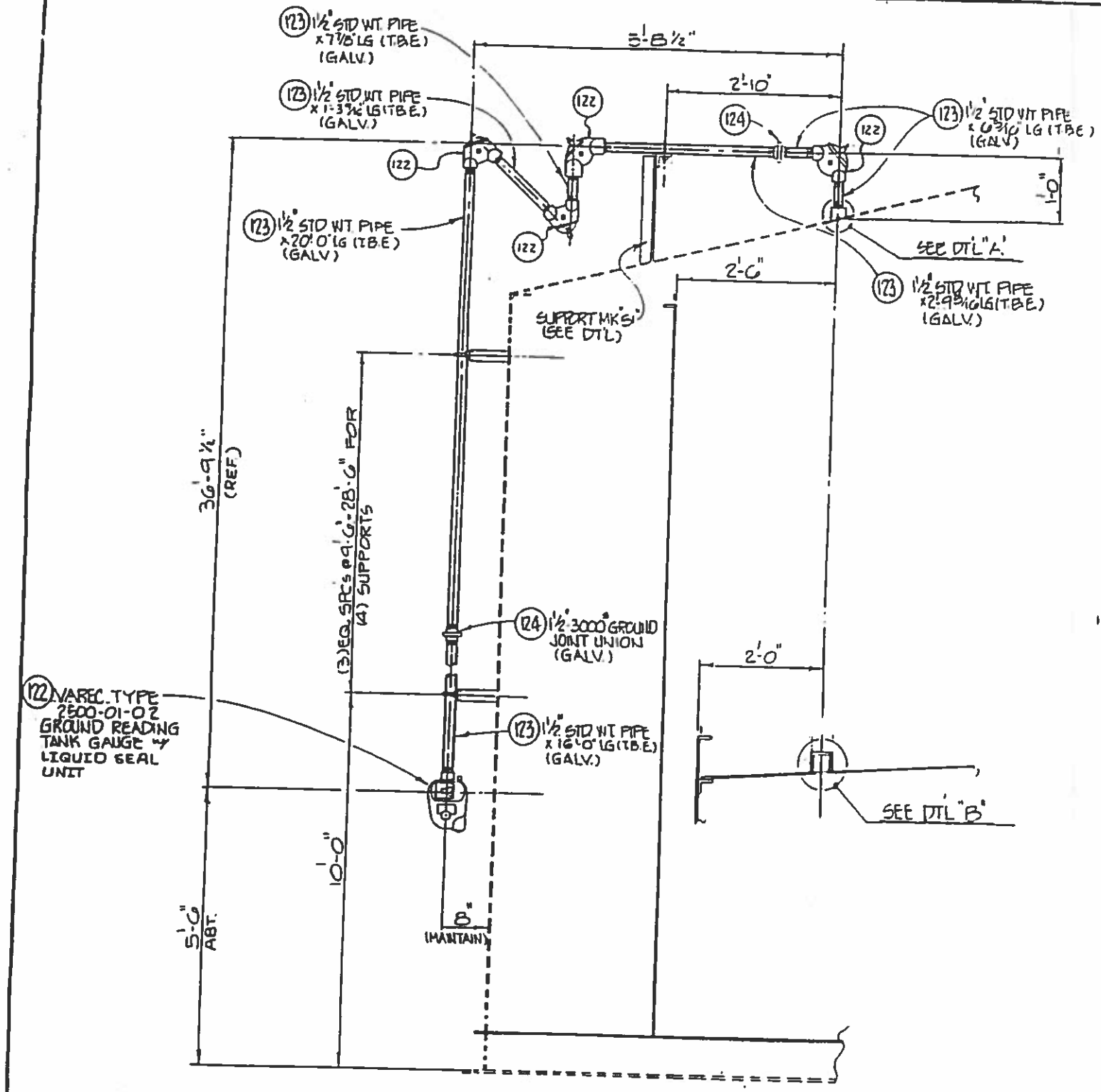
GENERAL NOTES #1

CUSTOMER: LYONDELL PETROCHEMICAL

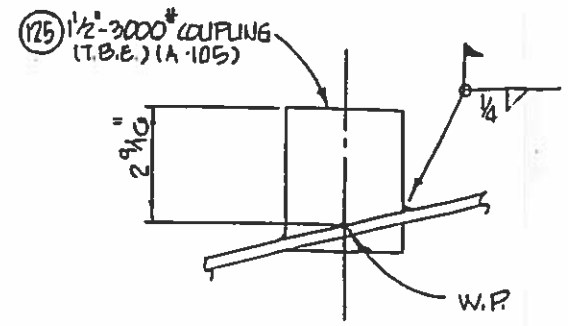
DRAWN: JKH DATE: 2-4-93

CHECKED: C.C. APPROVED:

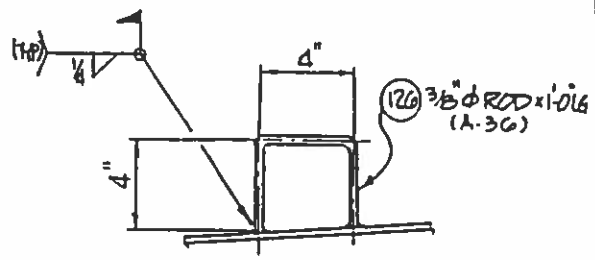
NO. W-92-2472A-2 REV. B



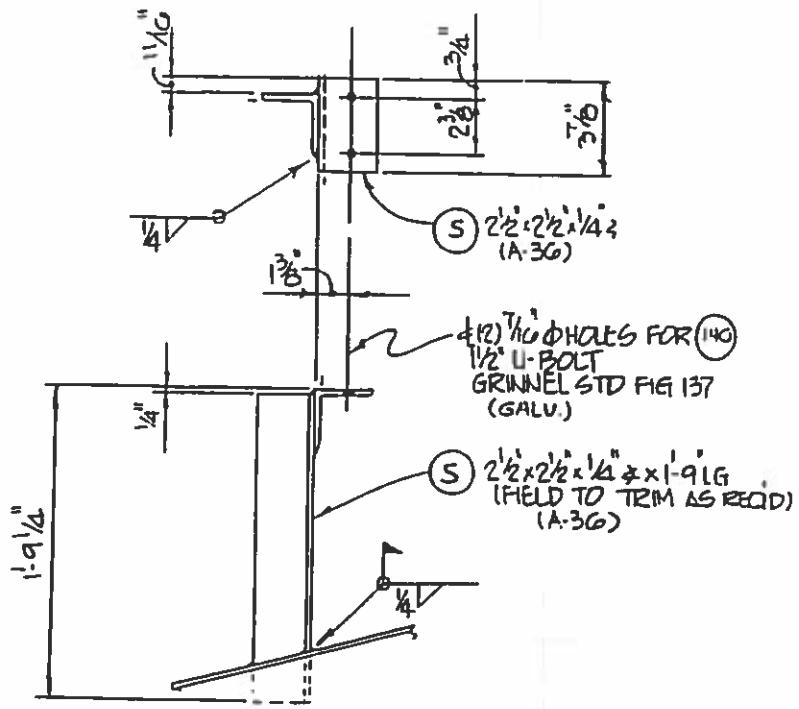
DETAIL AUTOMATIC TANK GAUGE ASS'Y



DETAIL "A"



DETAIL 'B'



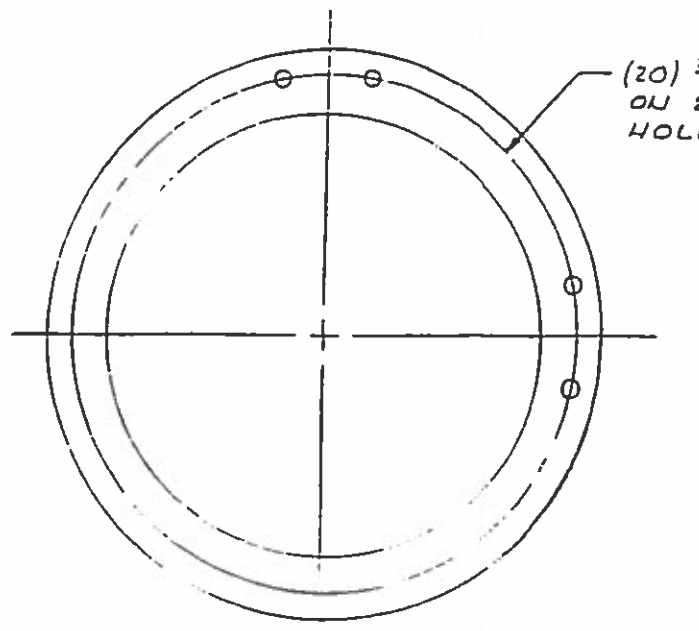
DETAIL OF SUPPORT
ONE (1) REQ'D MK 'S1"

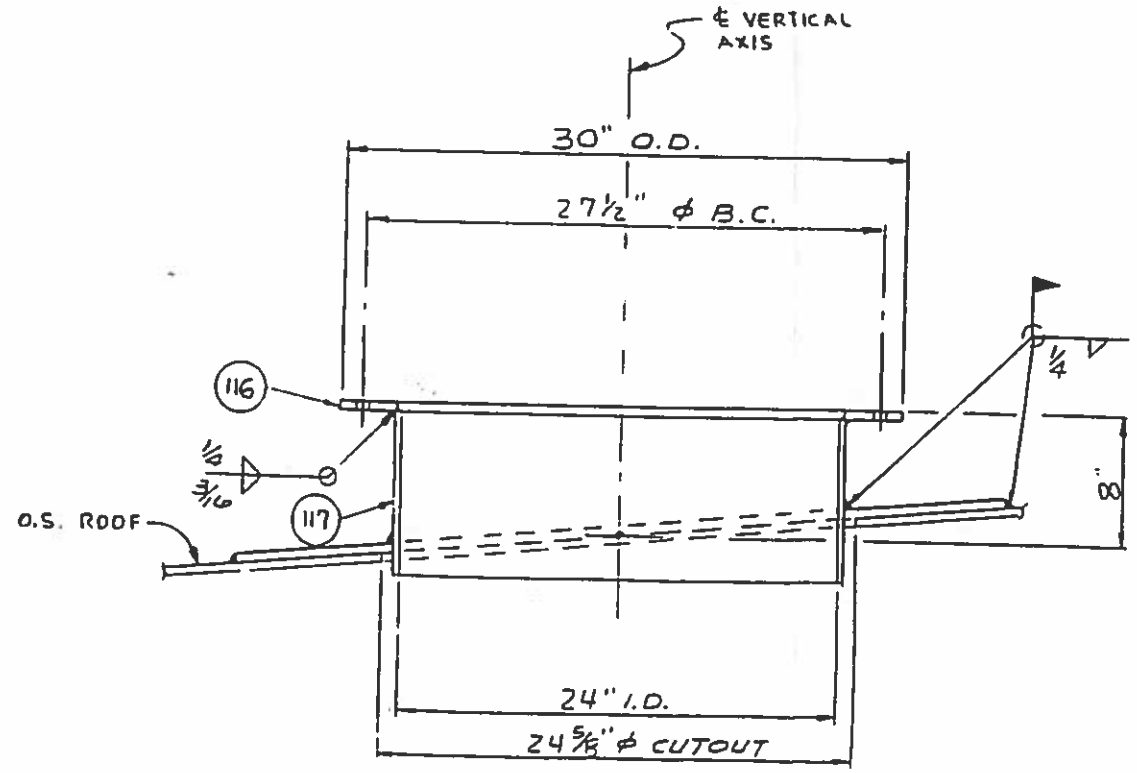
NO.	REVISION	DATE	BY	CHK'D
A	REV. PER CUST. APPROVAL	2-10 93	JKH	C.G.

SCALE:
CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/12/93
BY:

P.O.#: CHO-93-0001
S/O 2472A | ITEM: TK 3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0" ϕ x 32'-0" HIGH TANK
DT'L AUTOMATIC TANK GAUGE ASS'Y
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: ODG DATE: 1-30-93
CHECKED: C.G. APPROVED:
NO. W-92-2472A-24 REV. A

ORDER NO.		Dwg. No.	
ITEM	QUAN.	DESCRIPTION & SIZE	WEIGHT
116	1	1/4" PL X 24 1/2" I.D. X 30" O.D. A-36	
117	1	1/4" PL X 12" X 76 3/16" (A-36) ROLL TO	
–	–	24" I.D. & CBW LG SEAM	
118	1	1/4" PL X 24 5/8" I.D. X 46" O.D. A-36	





DETAIL 24" ROOF MANWAY

ONE REQD MK "2"

A	REV. PER CUST. APPROVAL	2-1 93	JKH	CC
BY	REVISION	DATE	BY	CHD

S/O 2472 A | TANK NO. TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

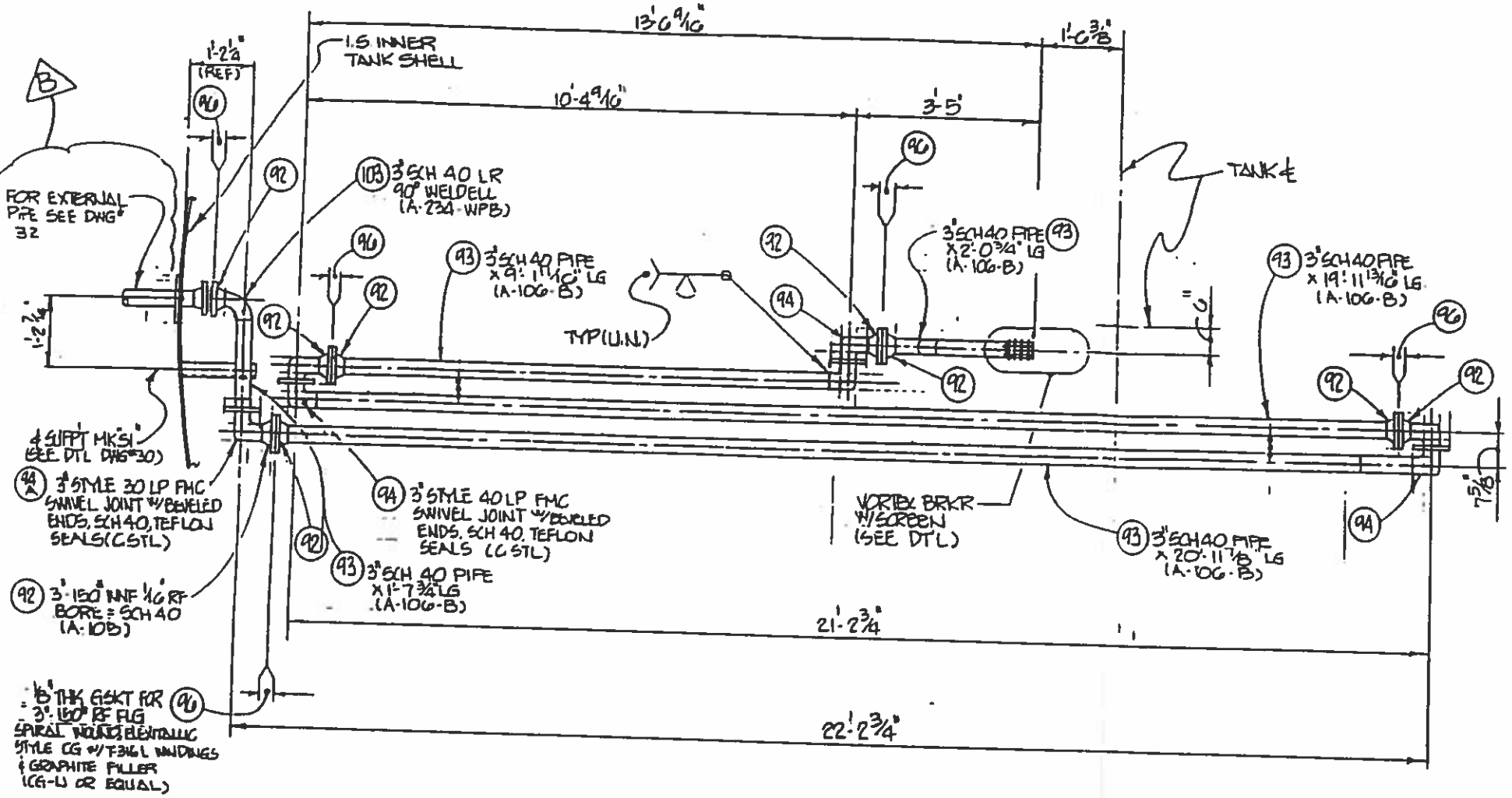
MISC. MODIFICATIONS TO AN EXIST. 40'-0" X 32'-0" HIGH TANK

DETAIL ROOF MANWAY

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-27-93
CHECKED: C.C. APPROVED:

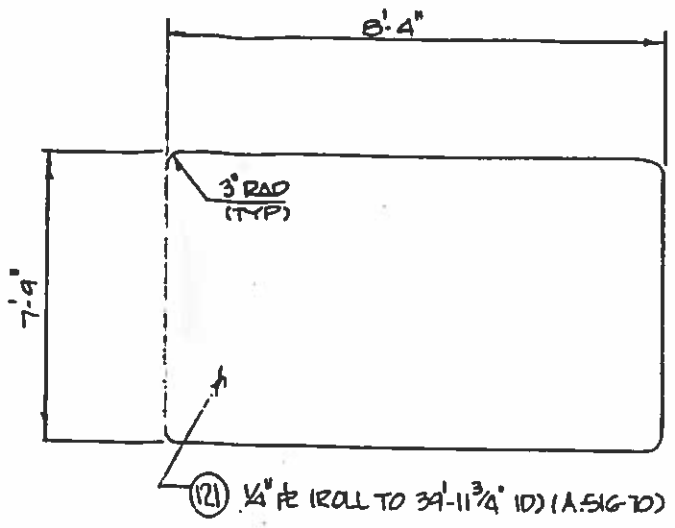
No. W-92-2472 A-23 REV. A



DETAIL OF 3'-150# NOZZLE MK '33'

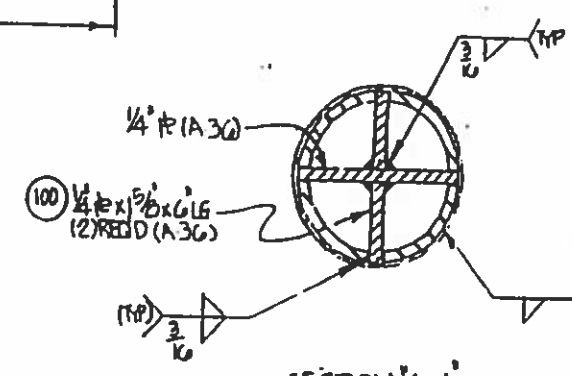
ONE (1) ASS'Y REQ'D

(95) — (20) 5/8"Ø x 3 3/4" LG STUDS W/ (2) HHN EA TOTAL REQ'D (A-193-B7) (A-194-2H)

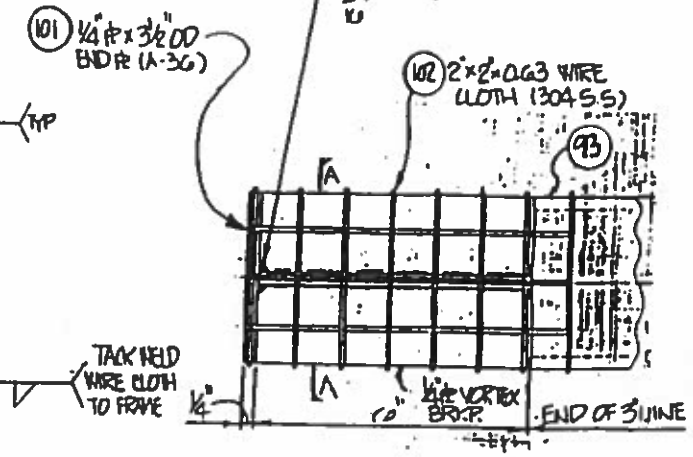


DETAIL OF DOOR PLATE

ONE (1) REQ'D



SECTION "A-A"



DETAIL - VORTEX BREAKER W/SCREEN

B	REV. AS NOTED	3-30-93	ODG	C.G.	
A	REV. PER CUST. APPROVAL	2-16-93	ODG	C.G.	
NO.	REVISION	DATE	BY	CHK'D	

SCALE:

CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 2/17/93
BY:

P.O.#: CHO-93-0001

S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'-0"Ø x 32'-0" HIGH TANK

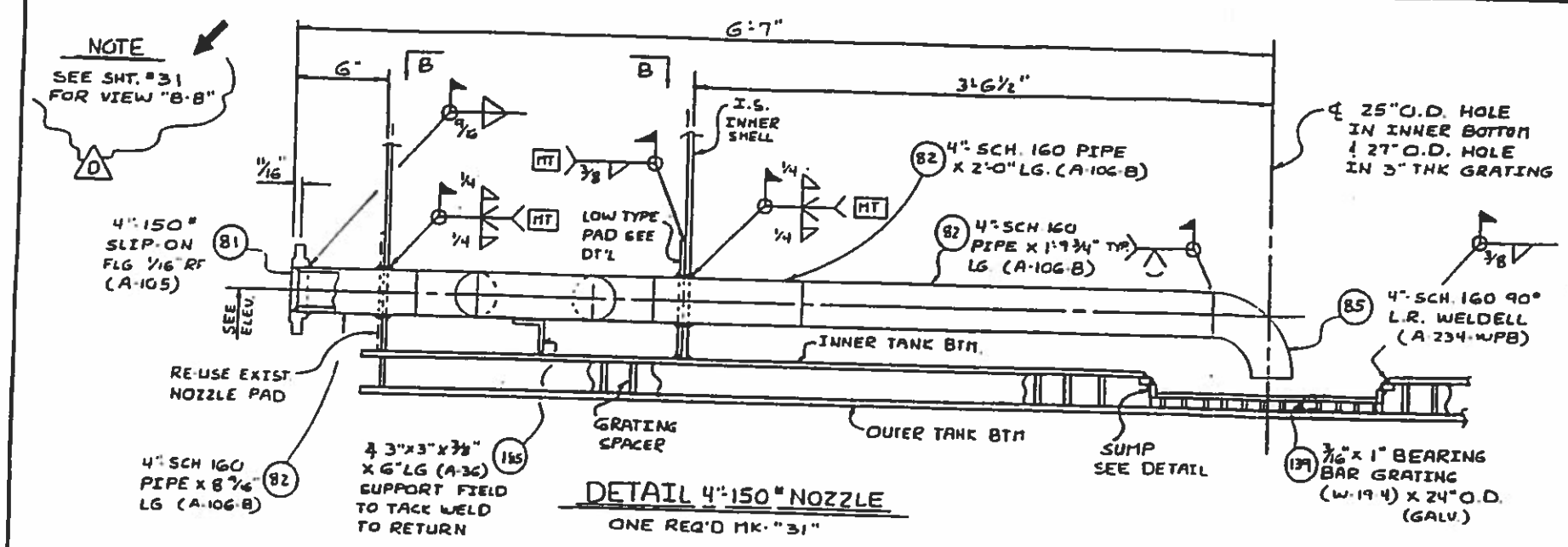
DETAIL OF NOZZLE MK '33' & SKIMMER

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: ODG DATE: 2-6-93

CHECKED: C.G. APPROVED:

NO. W-92-2472A-22 REV. B

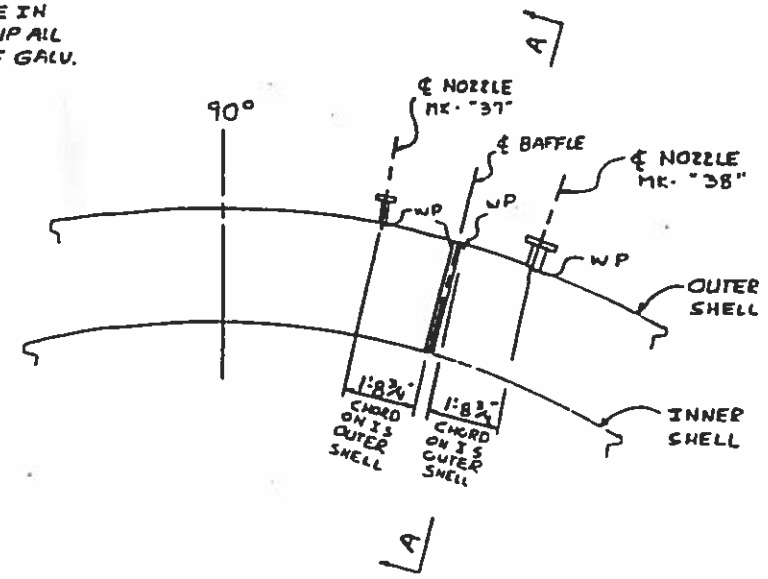


DETAIL 4"-150# NOZZLE

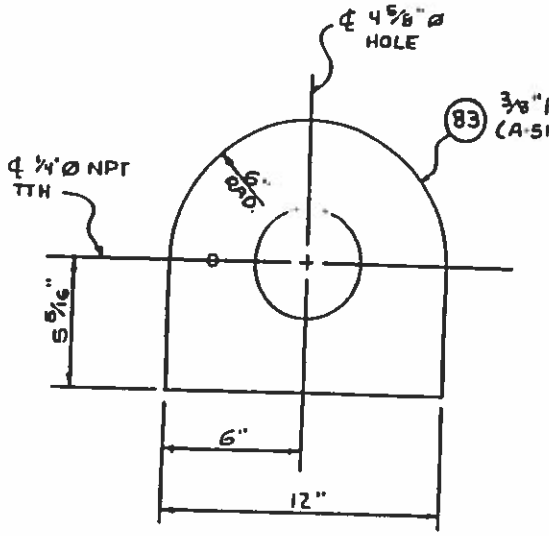
ONE REQ'D MK-"31"

FIELD NOTE

AFTER CUTTING HOLE IN 3" GRATING TOUCH-UP ALL DAMAGED AREAS OF GALV. WITH ZRC

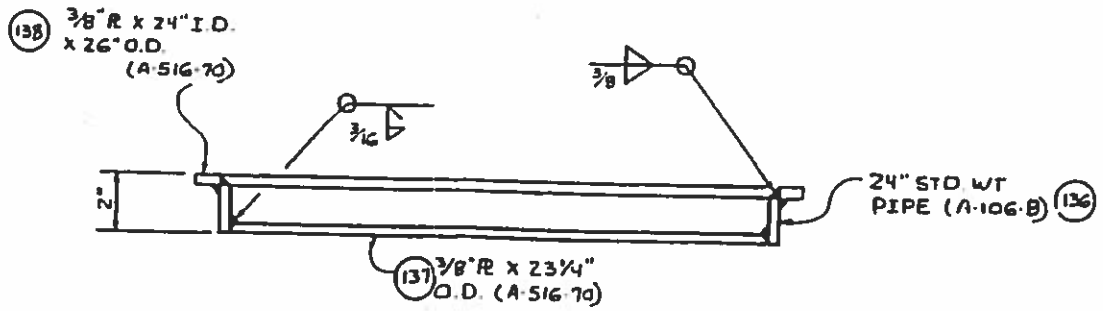


PLAN VIEW OF BAFFLE



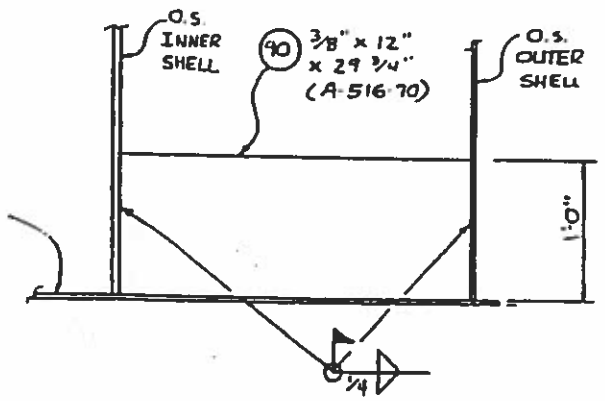
DETAIL LOW-TYPE PAD

ONE REQ'D MK-"31"



DETAIL OF SUMP

(ONE) REQUIRED



VIEW "A-A"

NOTES

1) MT SEE SHT. #2 FOR MAG. PART NOTE

2) SEE SHT. #2 FOR TESTING OF NOZZLE RE-PAD.

NO.	REVISION	DATE	BY	CHK'D
D	MOVED VIEW "B-B" TO SHT. #31 & REMOVE DT'L "C"	1-31-93	JKH	CC.
C	REV NOZZLE MK-"31" & ADD VIEW "B-B" & DETAIL "C"	1-19-93	JKH	CC
B	ADDED FIELD NOTE	1-6-93	JKH	CC.
A	REV. PER CUST. APPROVAL	1-2-93	JKH	CC.

SCALE:

CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY

DATE: 1/29/93

BY: Charles L. Perry

P.O.#: CHO-93-0001

S/O 2472 A | ITEM: TK-3456

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK

MISC. NOZZLE DETAILS

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-29-93

CHECKED: CC. APPROVED:

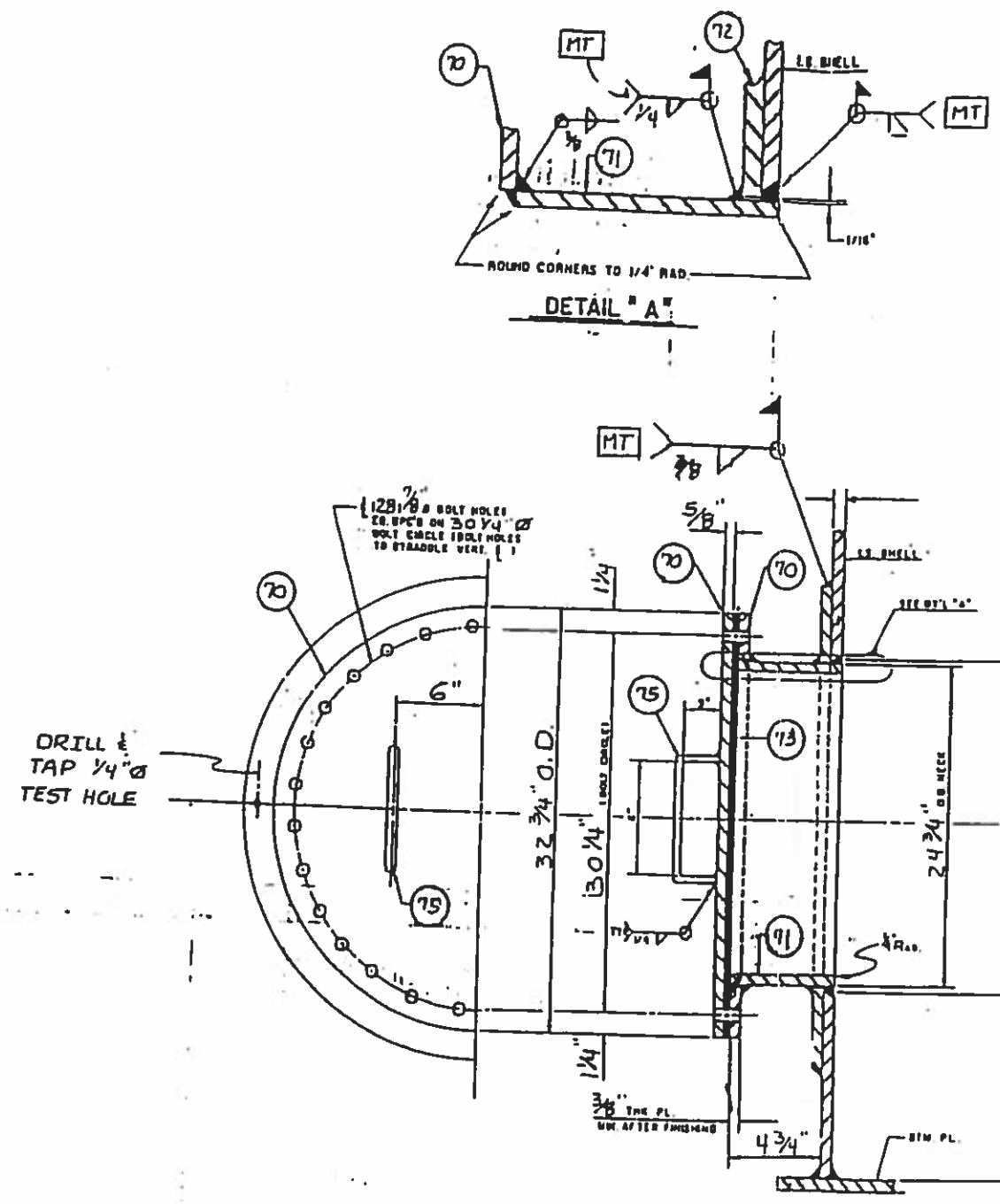
NO. W-92-2472A-21 REV: D

SHEET NO.

ORDER NO. Dwg. No.

ITEM	QUAN.	DESCRIPTION & SIZE	WEIGHT
	ONE	24"ø SHELL MANWAY	
70	ONE	5/8"R X 24 3/4" I.D. X 32 3/4" O.D.	
–	–	FLANGE A-516-70	
71	ONE	3/8"R X 8" X 76 9/16"LG. ROLL TO	
–	–	24"I.D. & CBW LG. SEAM. A-516-70	
72	ONE	3/8"R X 24 1/8"I.D. X 53 1/2"O.D.	
		A-516-70	
70	ONE	5/8"R X 32 3/4"O.D. COVER A-516-70	
75	2	3/8"ø ROD X 14"LG. HANDLES A-36	
73	ONE	1/8"THK-GASKET X 24 3/4"I.D. X 29 3/8"	
–	–	O.D. GARLOCK GYLON 3510 (OFF WHITE)	
74	28	3/4"ø X 3 1/2"LG. STUDS W/ (2) HN EA	
–	–	A-193-B7 A-194-2H	

B



24 "ø A.P.I. 650 SHELL MANWAY
ONE REQ'D MK-"18I"

NOTES

1) MT SEE SHT. # 2 FOR MAG. PART. NOTE

2) SEE SHT. # 2 FOR TESTING OF MANWAY REINF. PAD.

B	ADD GASKET MATERIAL	2-11-93	JKH	CG.	
A	REV. PER CUST. APPROVAL	2-1-93	JKH	CG.	
NO.	REVISION	DATE	BY	CK'D	

S/O 2472A | TANK NO. TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS FOR AN EXIST. 40'-0"ø x 32'-0" HIGH TANK

DETAIL 24" SHELL MANWAY

CUSTOMER: LYONDELL PETROCHEMICAL

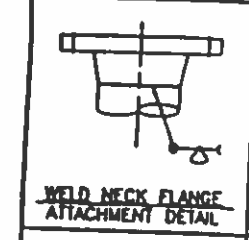
DRAWN: JKH | DATE: 1-23-93
CHECKED: C.C. | APPROVED:

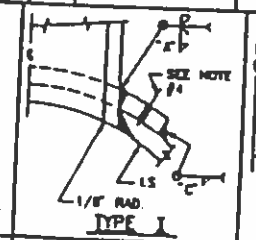
No. W-92-2472A-20 REV. B

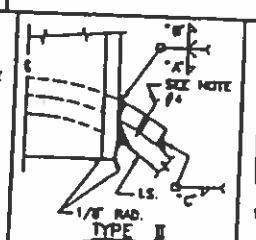
SCHEDULE OF OPENINGS

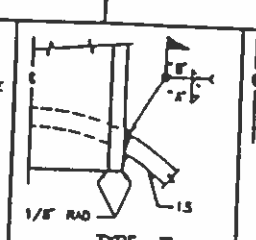
DETAIL OF OPENINGS

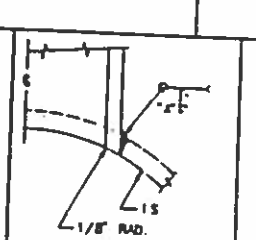
MARK NO.	NO. REQ'D	SIZE	FLANGE RATING	FACING	NOZZLE SERVICE	FLANGE TYPE	NECK TYPE	NECK O.D.	REINFORCING PAD	BLIND FLANGE	FLANGE BOLTING	GASKETS	NOZZLE PROJ. (SEE NOTE #1)	ATTACHMENTS TYPE	ATTACHMENTS O.S. FILLET "A"	ATTACHMENTS I.S. FILLET "B"	ATTACHMENTS PAD FILLET "C"	REMARKS
1A	ONE	24"	API 650	FF	MANWAY				RE-USE EXIST MANWAY									
8	ONE	8"	150#	RF	VENT				RE-USE EXIST NOZZLE									
2	ONE	24"	API 650	FF	MANWAY				SEE DETAIL ON SHT #23									
3	ONE	1½"	150#	RF		(115) 1½"-150# LONG WELD NECK x 9"LG. ⅛"RF (A-105)		2⅝"										
4	ONE	1"	150#	RF		(107) 1"-150# LONG WELD NECK x 9"LG ⅛"RF (A-105)		2"					6"	III	¼	¼	—	
													6"	III	¼	¼	—	
5	ONE	1½"	3600#	—	VAREC GAUGE				SEE DETAIL ON SHT #24	(1)								

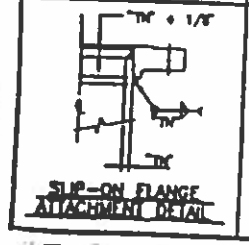


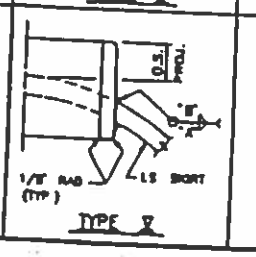












NOTES

1. ALL NOZZLE AND MANWAY FLANGE BOLT HOLES IN TANK SHELL ARE TO STRADDLE THE VERTICAL CENTERLINES (UNLESS OTHERWISE NOTED).
2. ALL NOZZLE AND MANWAY FLANGE BOLT HOLES IN TANK ROOF ARE TO STRADDLE THE NORTH/SOUTH CENTERLINES (UNLESS OTHERWISE NOTED).
3. NOZZLE PROJECTIONS ARE MEASURED FROM FACE OF FLANGE TO OUTSIDE OF ROOF AT THE NOZZLE OENTERLINE (UNLESS OTHERWISE NOTED).
4. ALL REINFORCEMENT PADS OR EACH SECTION (IF MADE IN SECTIONS) SHALL HAVE ONE (1) 1/4"NPT, TELL TALE HOLE AND SHALL BE TESTED WITH 15 PSIG AIR AND SOAP SUDS.

FILE NAME: SPEEDSHT

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/09/93
BY: Charlie Cagle

NO.	REVISION	DATE	BY	CHK'D
A	REV. PER CUST. APPROVAL	2-1-93	JKH	CC.

P.O.#: CHO-93-0001

S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK

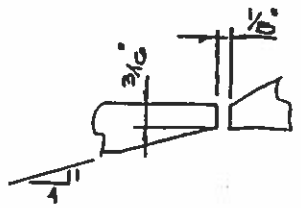
SCHEDULE OF OPENINGS (ROOF)

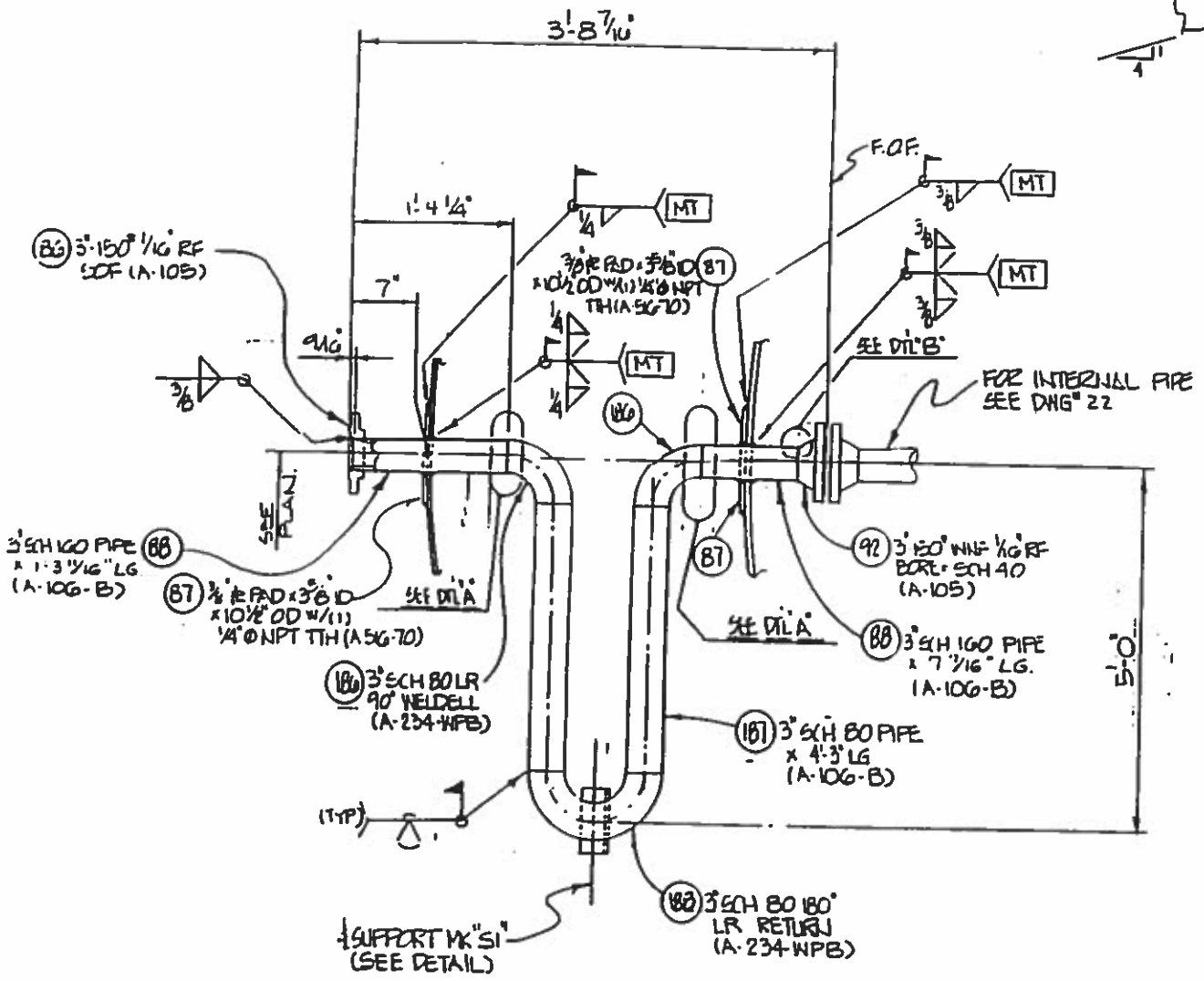
CUSTOMER: LYONDELL PETROCHEMICAL

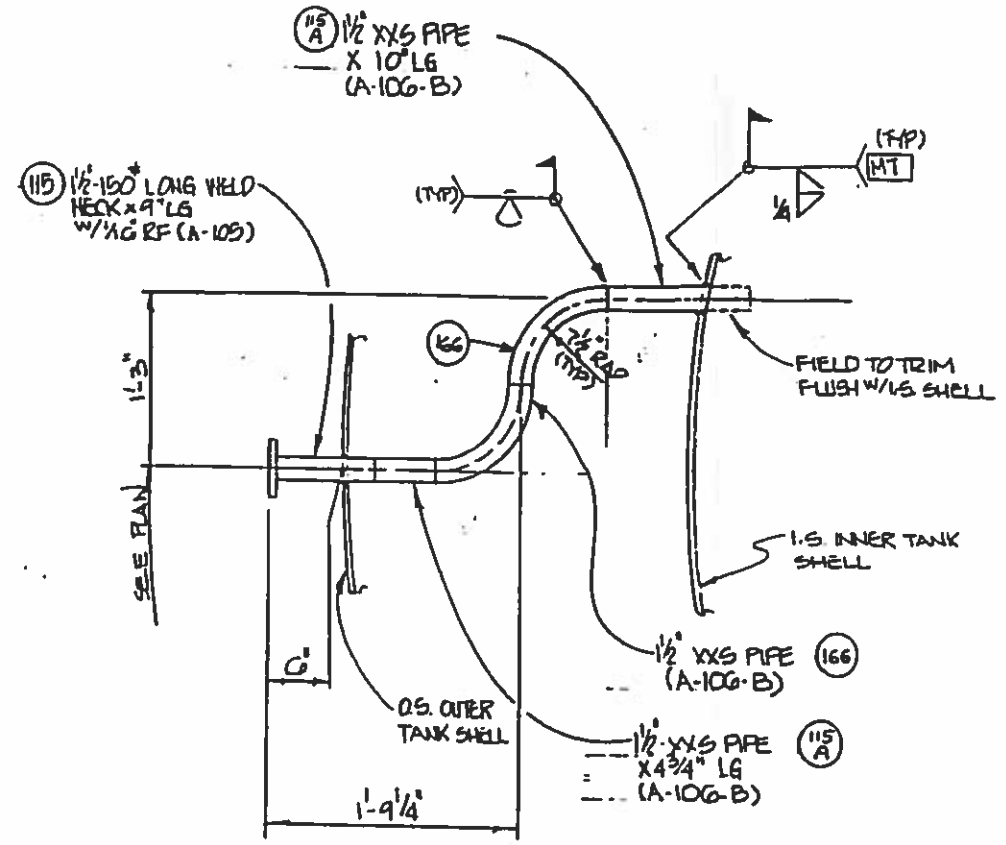
DRAWN: JKH DATE: 1-25-93

CHECKED: CC. APPROVED:

NO. W. - 92-2472A-19 REV. A

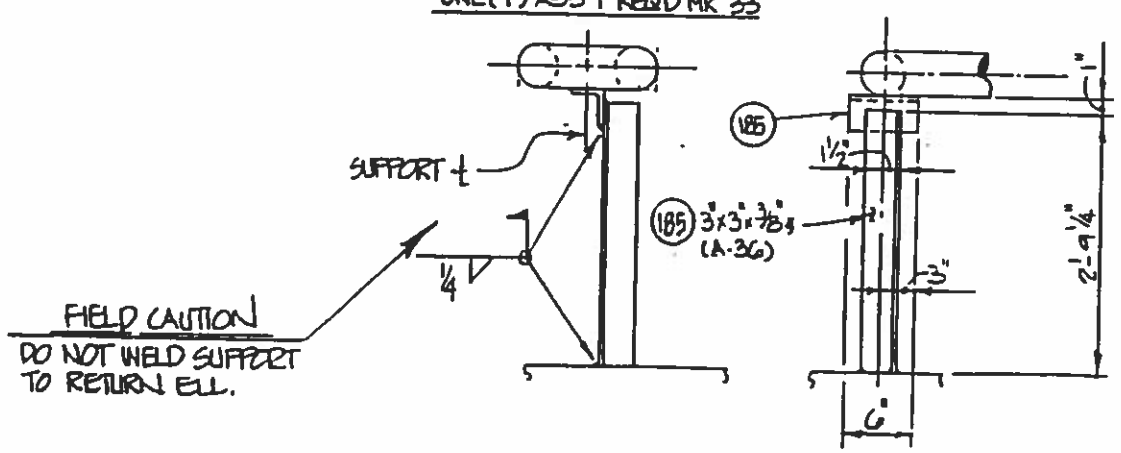




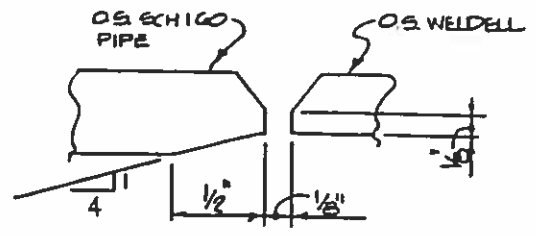


DETAIL OF 1 1/2"-150# SHELL NOZZLE
ONE (1) ASS'Y REQ'D MK "40"

DETAIL OF 3"-150# SHELL NOZZLE
ONE (1) ASS'Y REQ'D MK "33"



DETAIL OF SUPPORT
ONE (1) REQ'D MK "S1"



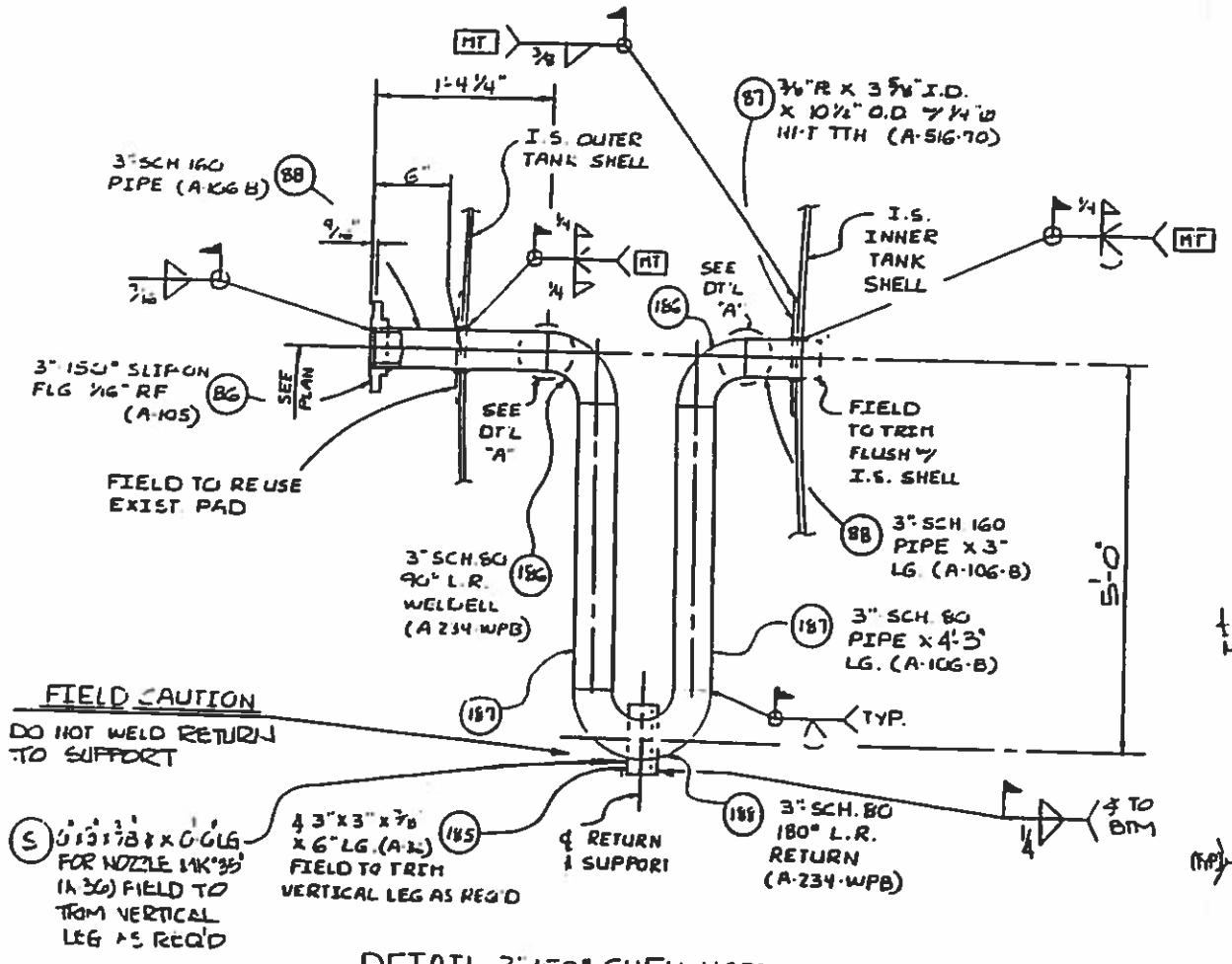
DETAIL "A"

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/30/93
BY:

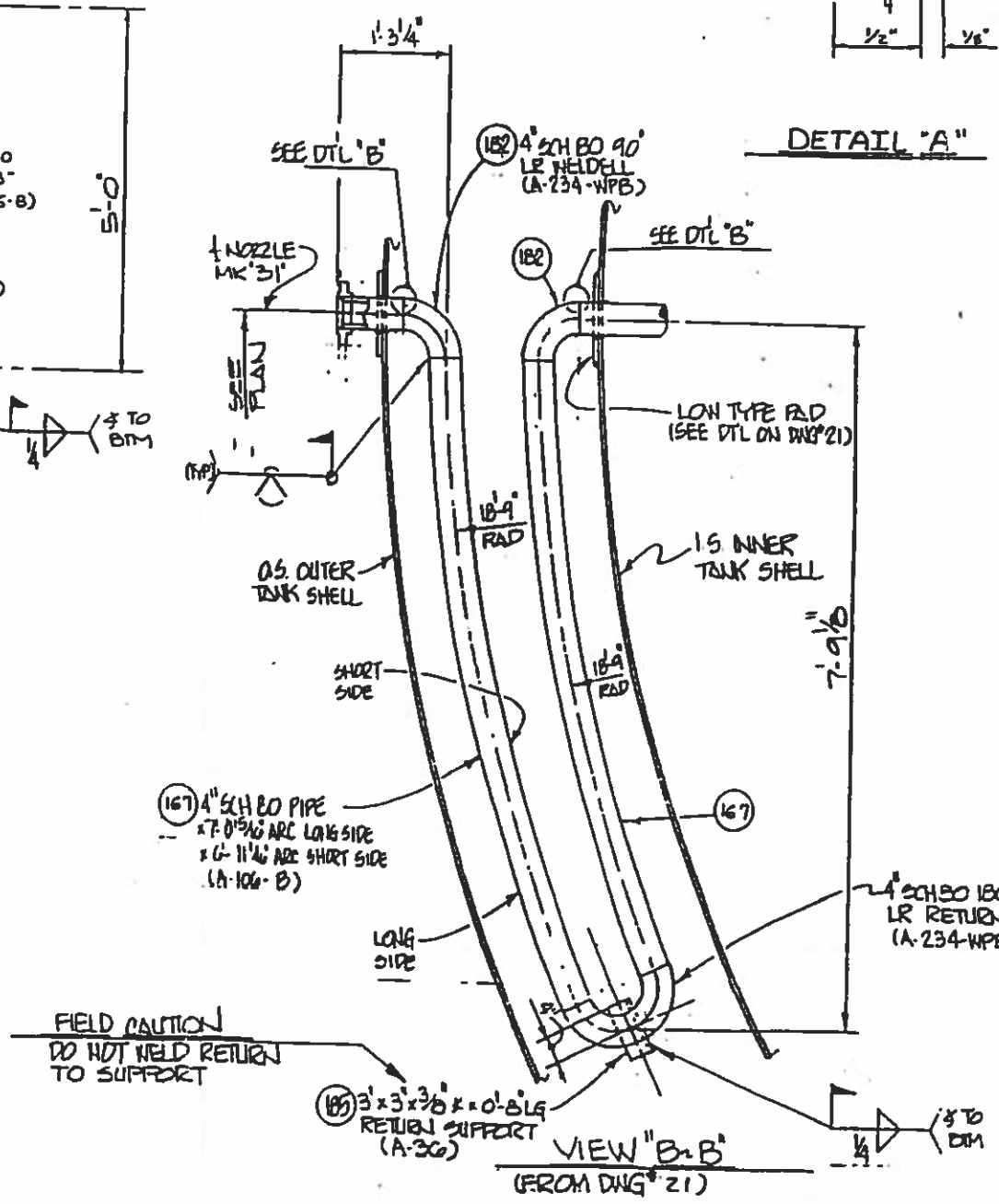
NO.	REVISION	DATE	BY	CHKD

P.O.#: CHO-93-0001
S/O 2472 A | ITEM: TK-3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0" ø x 32'-0" HIGH TANK
DETAIL OF NOZZLES MK "33" & "40"
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: CDG DATE:
CHECKED: C.E. APPROVED:
NO. W-92-2472A-32 REV.

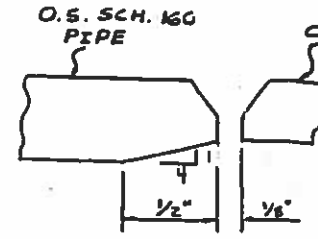


DETAIL 3"-150# SHELL NOZZLE

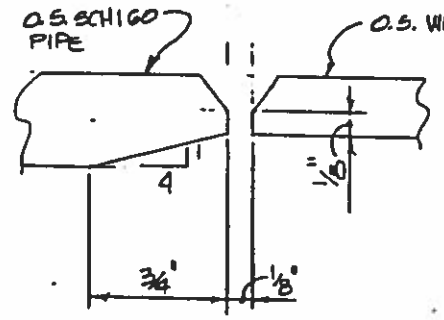
ONE ASS'Y REQ'D MK-"17"
ONE ASS'Y REQ'D MK-"35"



VIEW "B-B"
(FROM DWG # 21)



DETAIL "A"



DETAIL "B"

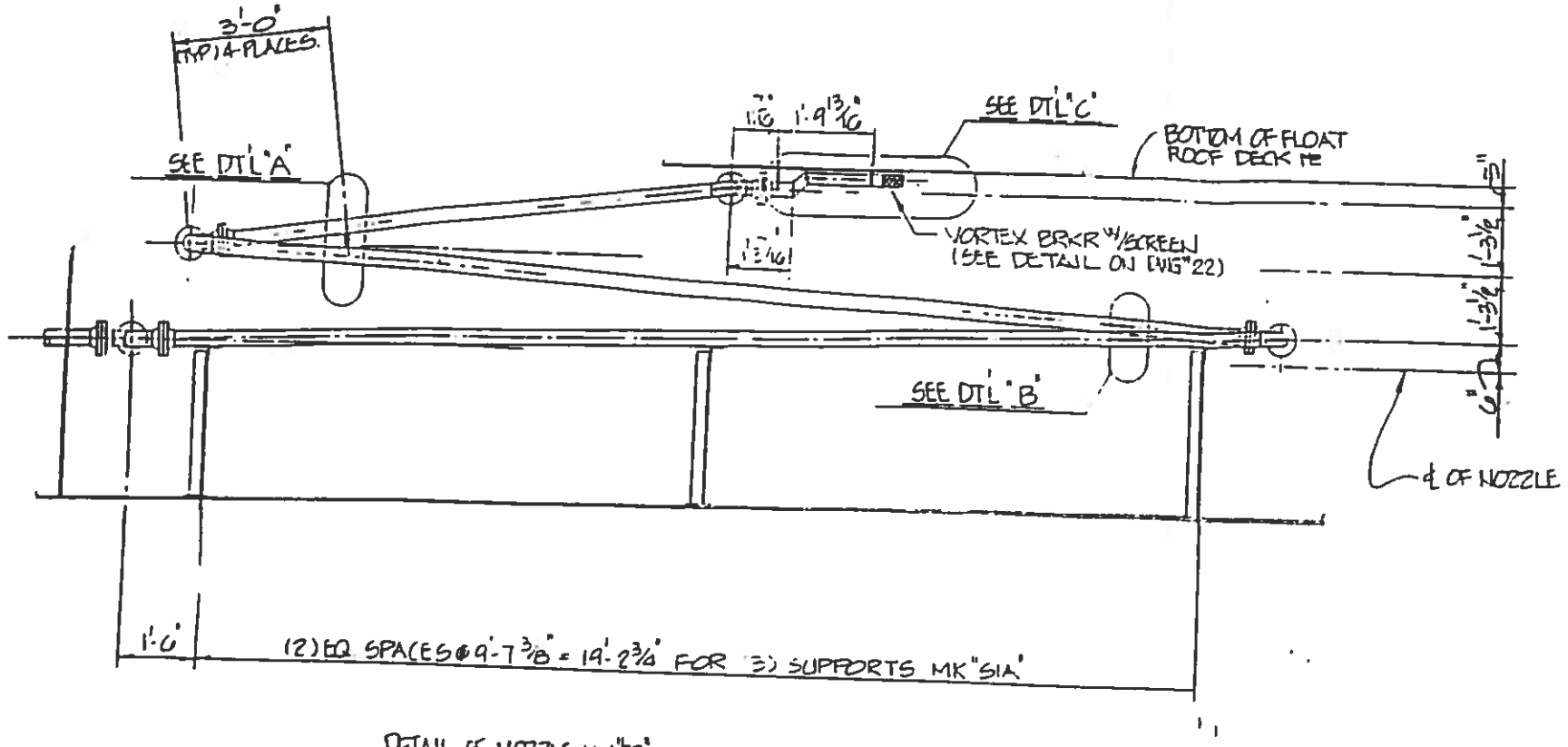
NOTES

1) MT SEE SHT. # 2 FOR MAG. PART NOTE
2) SEE SHT. # 2 FOR TESTING OF NOZZLE REINF. PAD.

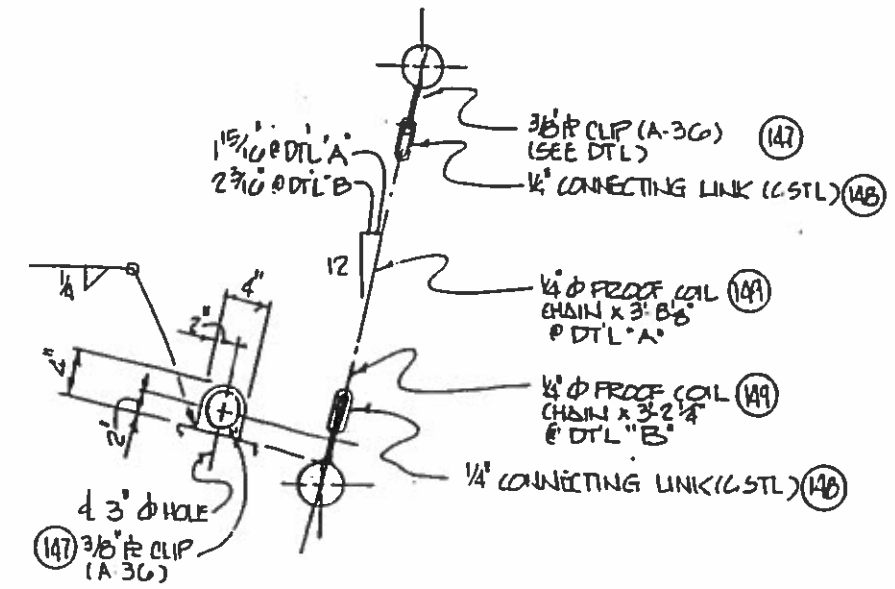
SCALE:
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 3/30/93
BY:

NO.	REVISION	DATE	BY	CHKD
A	REV. PER CUST APPROVAL	3-31-93	JDG	CE

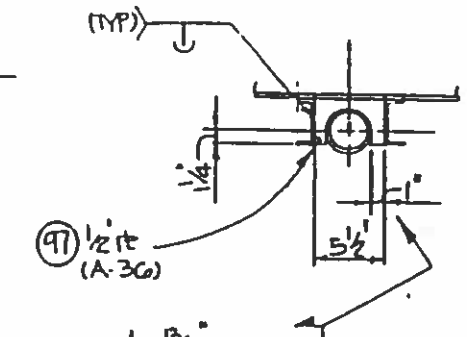
P.O.#: CHO-93-001
S/O 2472 A | ITEM: TK-3456
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0" ø x 32'-0" HIGH TANK
NOZZLE DETAILS
CUSTOMER: LYONDELL PETROCHEM
DRAWN: JKH DATE: 3-19-93
CHECKED: CE APPROVED:
NO. W-92-2472A-31 REV. A

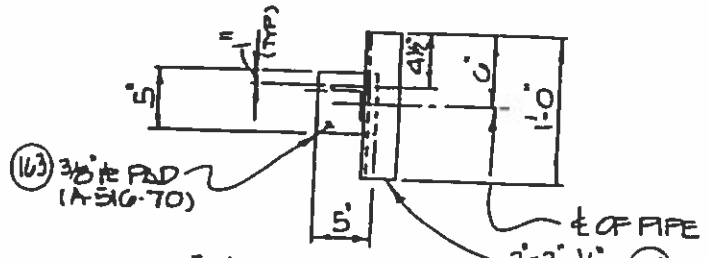


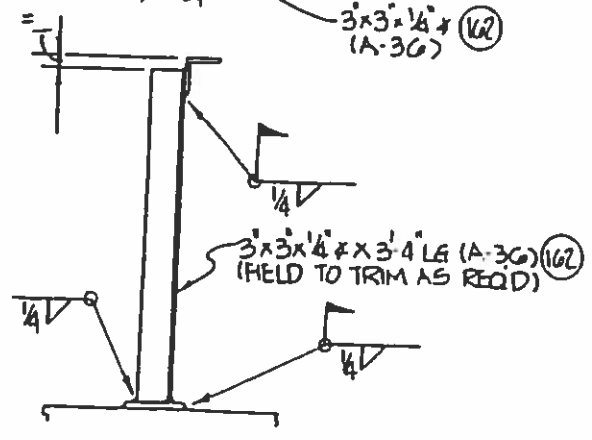
DETAIL OF NOZZLE MK "33" @ LOW POSITION OF ROOF



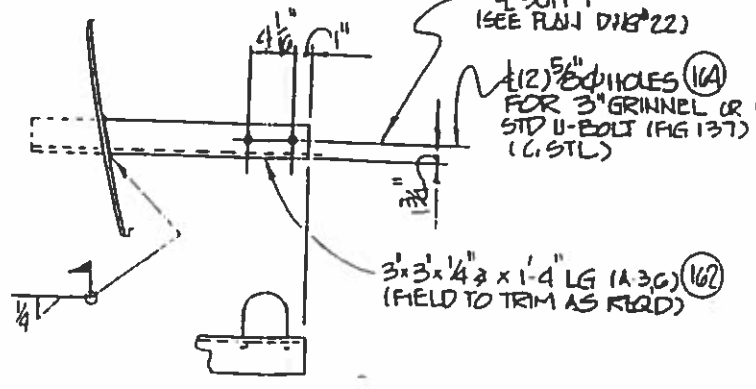
DETAIL "A"
DETAIL "B"



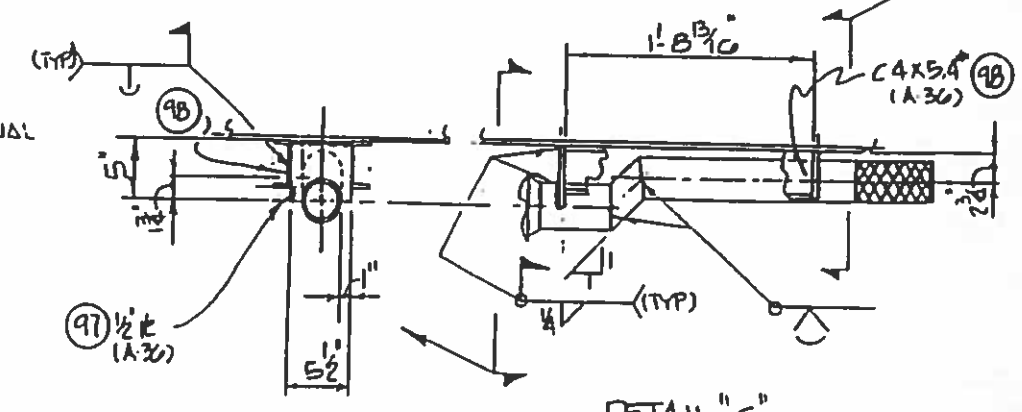




DETAIL OF SUPPORT
(3) REQ'D MK "S1A"



DETAIL OF SUPPORT
ONE (1) REQ'D MK "S1"



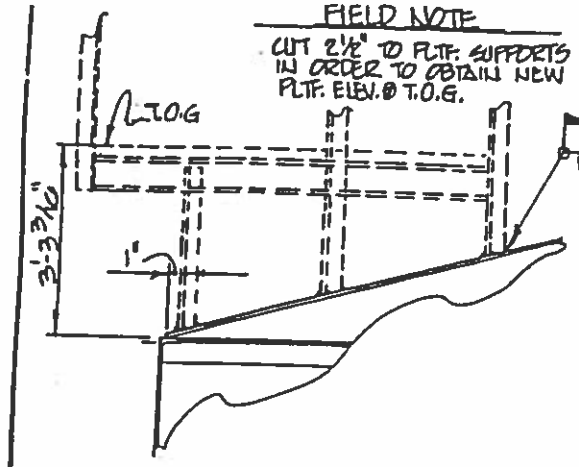
DETAIL "C"

A	REV. PER CUST. APPROVAL	2-16-93	CDG	C.C.
NO.	REVISION	DATE	BY	CHK'D

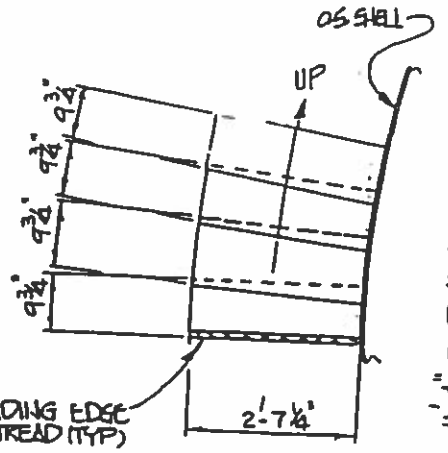
SCALE:
CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/17/93
BY:

P.O.#: CHO-93-0001
S/O 2472A | ITEM: TK-3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK
DETAIL OF NOZZLE MK "33" @ LOW POINT
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: CDG DATE: 2-10-93
CHECKED: C.C. APPROVED:
NO. W-92-2472A-30 REV. A

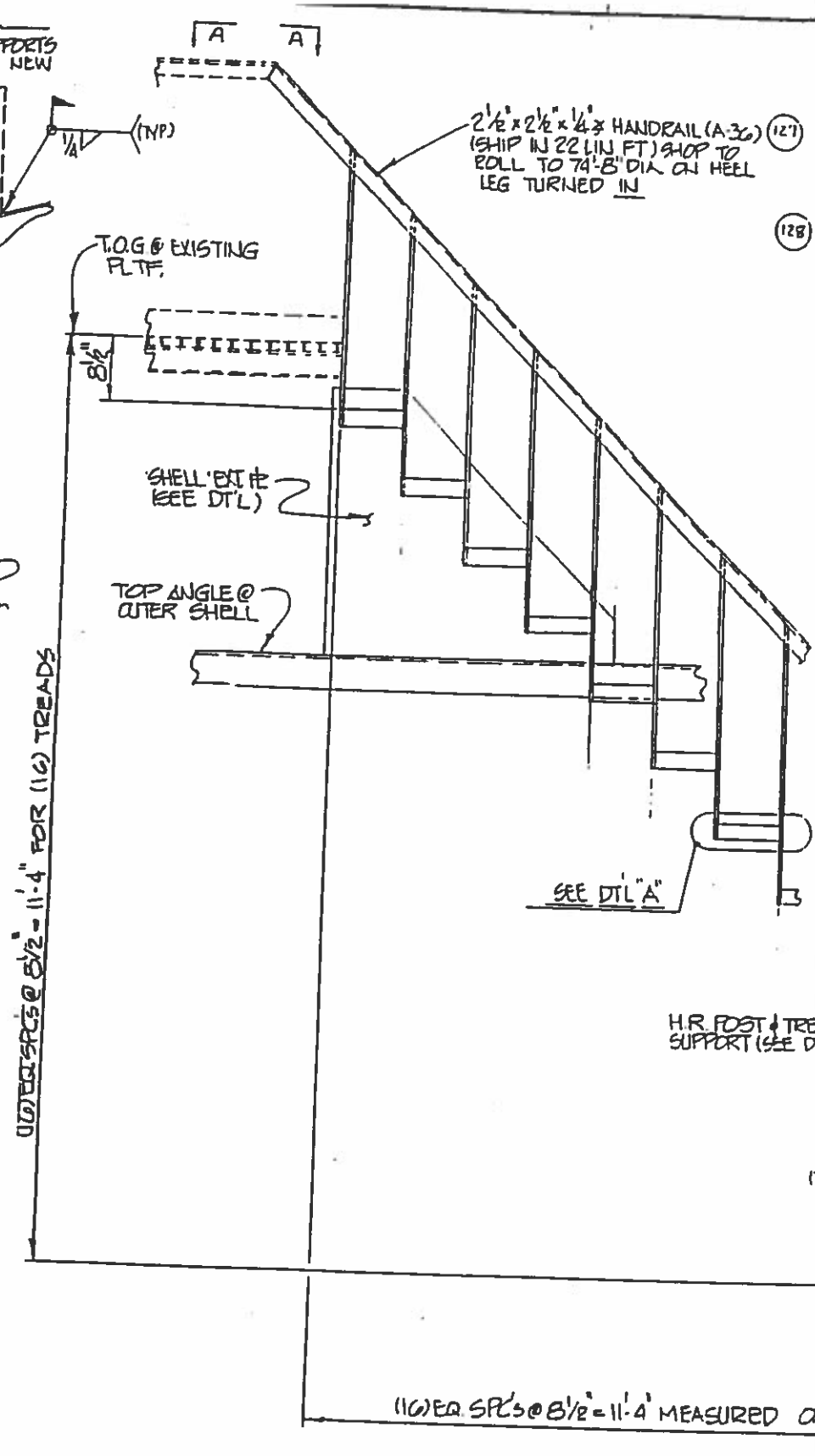
FIELD NOTE
CUT 2½" TO PLTF. SUPPORTS IN ORDER TO OBTAIN NEW PLTF. ELEV. @ T.O.G.



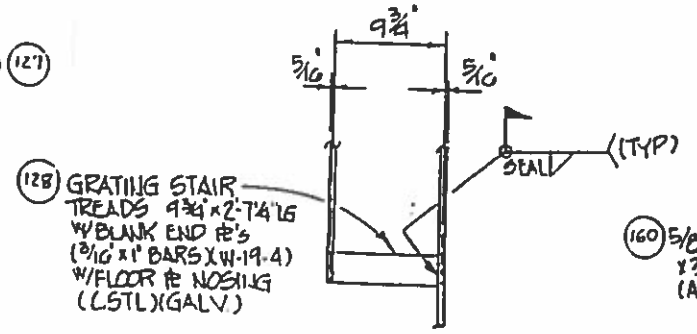
SECTION THRU PLATFORM



TYPICAL PLAN OF TREAD

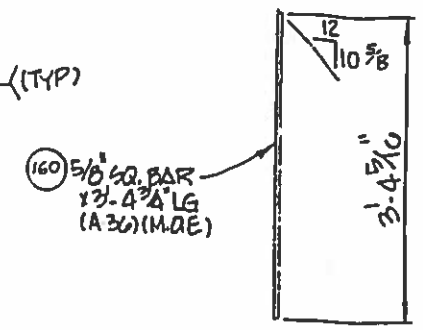


ELEVATION OF STAIRWAY



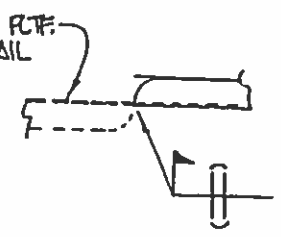
(128) GRATING STAIR TREADS 9¾"x2'-7¼" LG W/BLANK END PL'S (3/16"x1" BARS X W-19-4) W/FLOOR PL NOSING (CSTL) (GALV)

DETAIL "A"

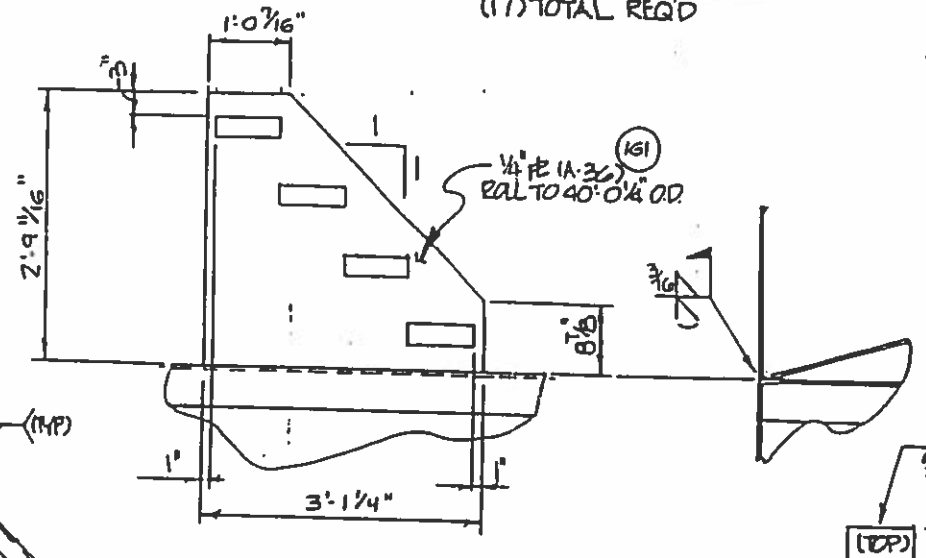


(160) 5/8" SQ. BAR x 3'-4 3/4" LG (A36) (M.O.E)

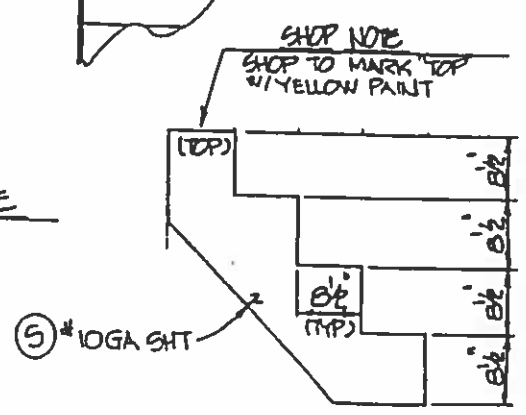
DETAIL OF HR POST & TREAD SUPPT (17) TOTAL REQ'D



VIEW "A-A"



DETAIL OF SHELL EXT. PLATE



SHOP NOTE
SHOP TO MARK "TOP" W/YELLOW PAINT

STAIRWAY TEMPLATE

NOTES
1. ALL WELDS TO BE CONTINUOUS FILLET/SEAL WELD UNLESS NOTED OTHERWISE
2. GALVANIZE PER ASTM A-123, A-143 & A-385 COVERAGE 2.0 TO 2.3 OZ PER SQ. FT.
3. ALL SHARP EDGES, BURRS, WELD SPATTER, GREASE, OIL & DIRT TO BE REMOVED PRIOR TO GALV.
4. AFTER INSTALLATION, FIELD TO TOUCH-UP ANY DAMAGED GALV. SURFACES BY CLEANING PER SSPC-SP-3 & COATING WITH ZRC.

SCALE:
CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/12/93
BY: Charles R. Bryan

NO.	REVISION	DATE	BY	CHK'D
A	REV. PER CUST. APPROVAL	2-10-93	JKH	CE

P.O.#: CHO-93-0001
S/O 2472 A | ITEM: T-3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0" Φ x 32'-0" HIGH TANK
ELEVATION OF STAIRWAY
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: ODG DATE: 2-3-93
CHECKED: C.E. APPROVED:
NO. W-92-2472A-29 REV. A

18'-7 1/8" (REF)

18'-2 1/8" (FIELD HOLD)

RAFTER CLIP MK 'RC' (SEE DT'L)

SEE DTL 'A'

RAFTER CLIP MK 'RC1' (SEE DT'L)

43'-6 5/16"

8'-0"

OMIT WELD @ DRAIN HOLE.

1/8 x 75

(23) 8" SCH 80 PIPE (A-53)

1/4

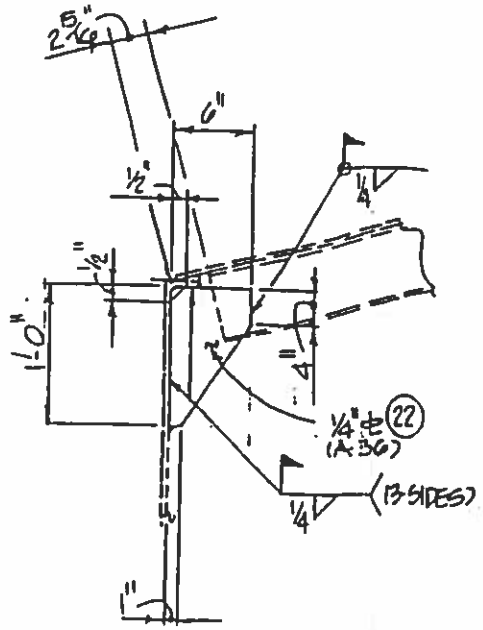
FIELD CAUTION
DO NOT WELD BASE PL TO BOTTOM PL

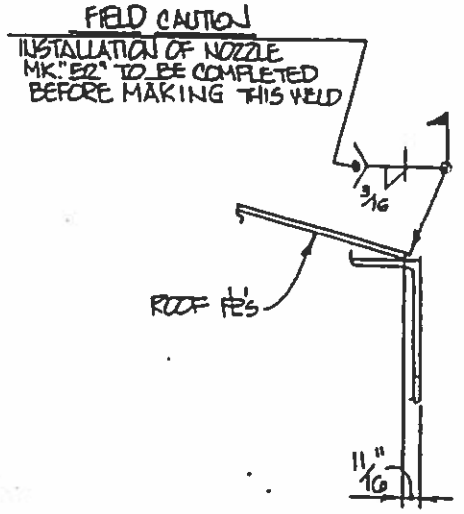
DO NOT WELD ANGLE TO BASE PL

3"x3"x1/2" x 0'-6" LG (S) (4) REQ'D EQ. SPCD (A-36)

SECTION THRU SHELL

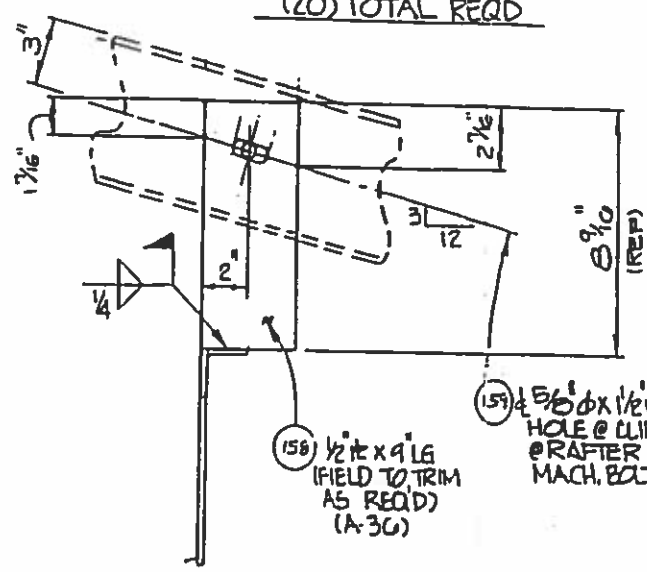
FIELD CAUTION
ECCENTRIC LOADS ON RAFTER SUPPORT PLATE AND COLUMN WILL CAUSE BENDING AND EXCESSIVE STRESS IN THE COLUMN AND SUPPORT PLATE BOLTS. SEVERAL RAFTERS SHOULD BE INSTALLED AT 120° INTERVALS IN ORDER TO BALANCE THE LOAD DURING RAFTER ERECTION.





DETAIL 'A'

DETAIL OF RAFTER CLIPS MK 'RC'
(20) TOTAL REQ'D



DETAIL OF RAFTER CLIP MK 'RC1'
(20) TOTAL REQ'D

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/12/93
BY:

NO.	REVISION	DATE	BY	CHK'D
A	REV. PER CUST. APPROVAL	2-10-93	JKH	

P.O.#: CHO-93-0001

S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'-0" ⌀ x 32'-0" HIGH TANK

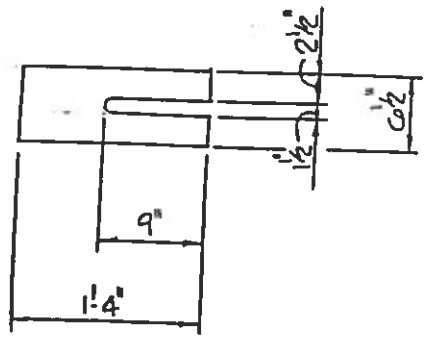
DT'L OF CENTER COLUMN & RAFTER CLIPS.

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: ODG DATE: 2-1-93

CHECKED: C.C. APPROVED:

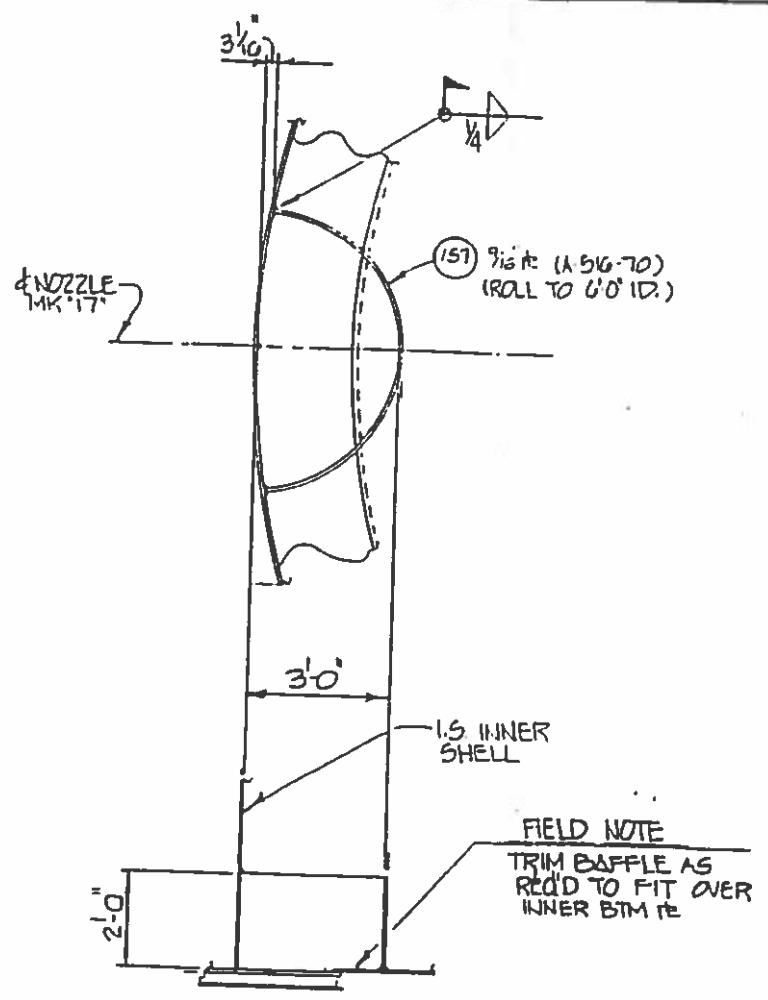
NO. W-92-2472A-28 REV. A



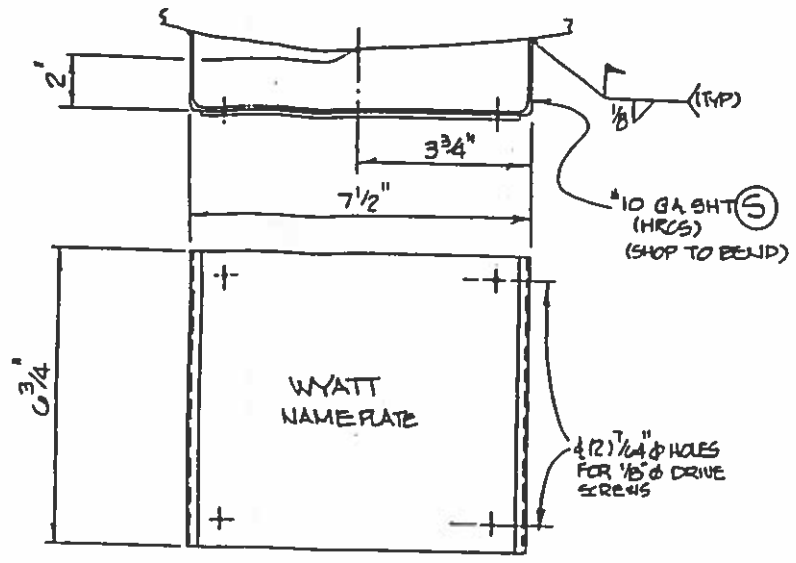
DETAIL OF ANCHOR CHAIR SHIMS

(5) — (30) REQ'D 9/16" PL (C. ST'L)
(5) — (24) REQ'D 1/4" PL (C. ST'L)
(5) — (24) REQ'D "10GA SHT (HRCS)
(154) — (16) REQ'D "16GA SHT (HRCS)

(94) TOTAL REQ'D



DETAIL OF BAFFLE @ NOZZLE MK '17'
ONE (1) REQ'D



DETAIL OF NAMEPLATE BRACKET
TWO (2) REQ'D

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/12/93
BY:

NO.	REVISION	DATE	BY	CHK'D
A	REV. PER CUST. APPROVAL	2-10-93	JKH	CC

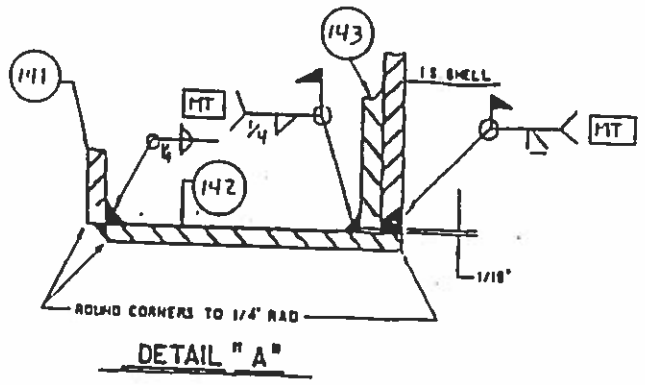
P.O.#: CHO-93-0001
S/O 2472A | ITEM: TK-3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0" ϕ x 32'-0" HIGH TANK
MISCELLANEOUS DETAILS
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: ODG DATE: 2-5-92
CHECKED: C.C. APPROVED:
NO. W-92-2472A-27 REV. A

SHEET NO.

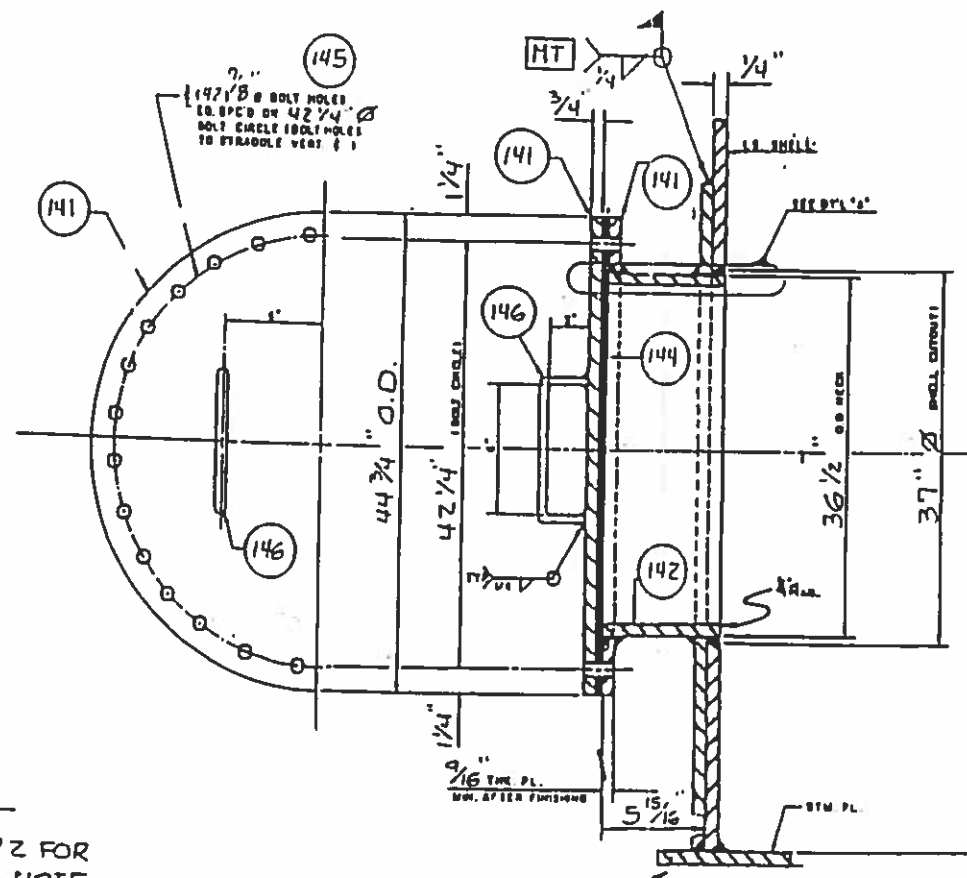
ORDER No. Dwg. No.

ITEM	QUAN.	DESCRIPTION & SIZE	WEIGHT
	ONE	36" API-650 MANWAY	
141	ONE	3/4"R x 36 1/2" I.D. x 44 3/4" O.D. FLANGE A-516-70 N	
142	ONE	1/4"R x 7 1/2" x 113 7/8" LG. ROLL TO 36" I.D. & CBW LG SEAM. A-516-70	
143	ONE	3/8"R LOW TYPE PAD - SEE DETAIL A-36	
141	ONE	3/4"R x 44 3/4" O.D. COVER A-516-70 N	
146	2	5/8"Ø ROD x 1'-1" LG. HANDLES A-36	
144	ONE	1/8" THK GSKT x 36 1/2" I.D. x 41 3/8" O.D. GARLOCK GYLON 3510 OFF-WHITE	
145	42	3/4"Ø x 3 1/2" LG. STUDS W/ (2) HHHN EA. A-193-B7 A-194-2H	
-	-		

A

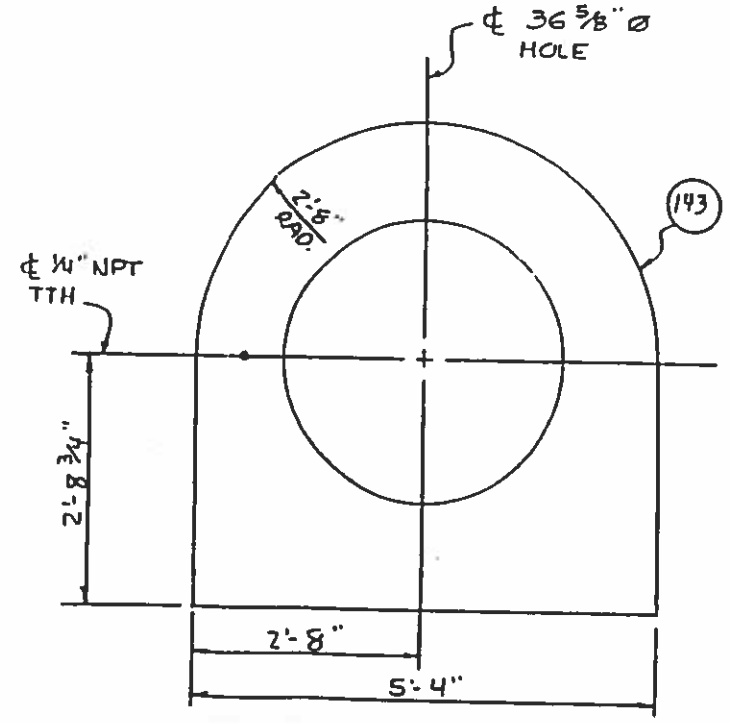


DETAIL "A"



FIELD TO NOTCH PAD TO CLEAR WELD

36"Ø A.P.I. 650 SHELL MANWAY
ONE REQ'D MK- "1B0"



DETAIL LOW-TYPE PAD

NOTES

1) MT SEE SHT. #2 FOR MAG. PART. NOTE
2) SEE SHT. #2 FOR TESTING OF MANWAY REINF. PAD

A	ADD GASKET MATERIAL	2-11-93	JKH	CG
	REVISION	DATE	BY	APP'D

S/O 2472A | TANK NO. TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

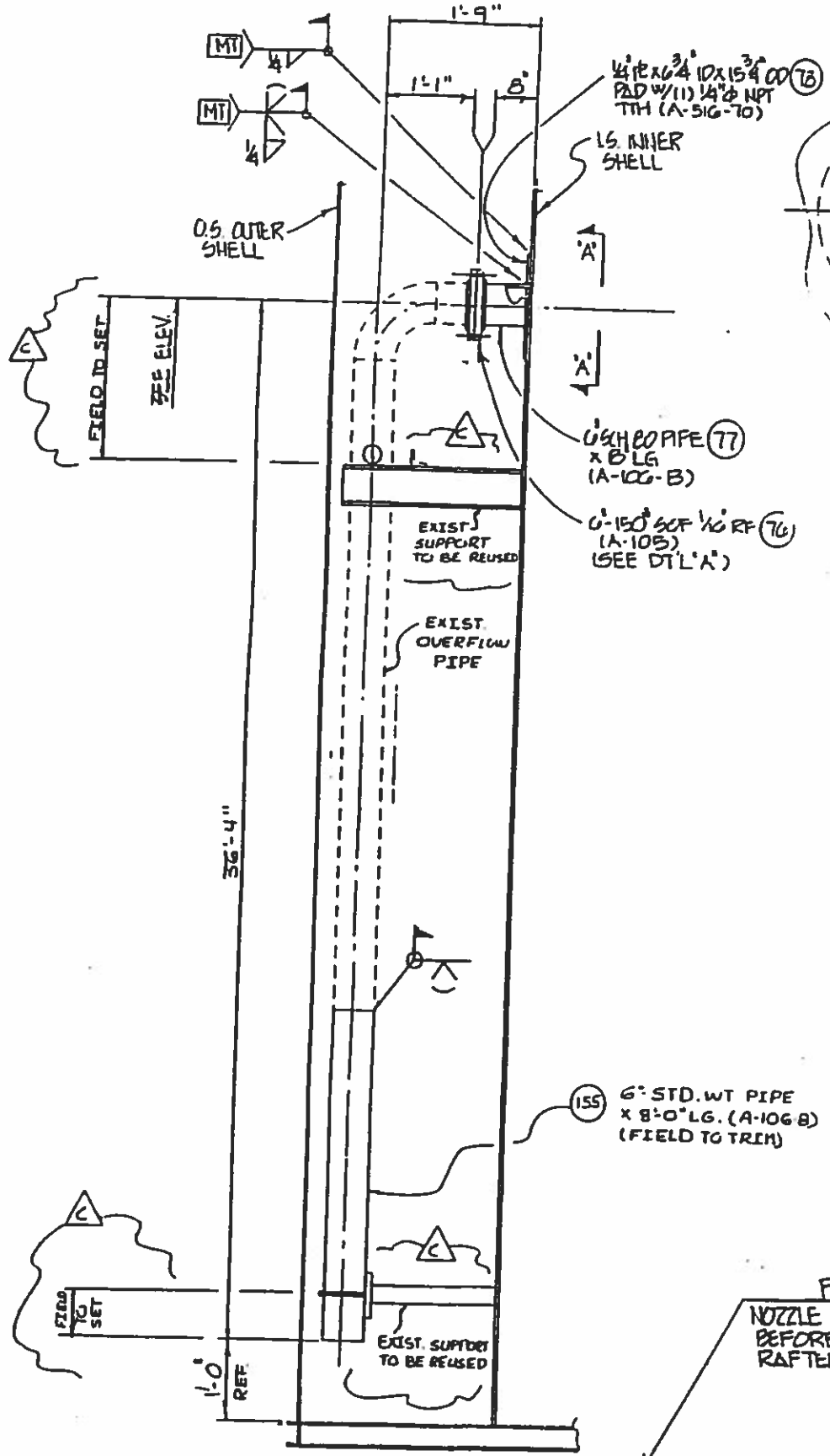
MISC. MODIFICATIONS FOR AN EXIST. 40'-0"Ø x 32'-0" HIGH TANK

DETAIL 36" SHELL MANWAY

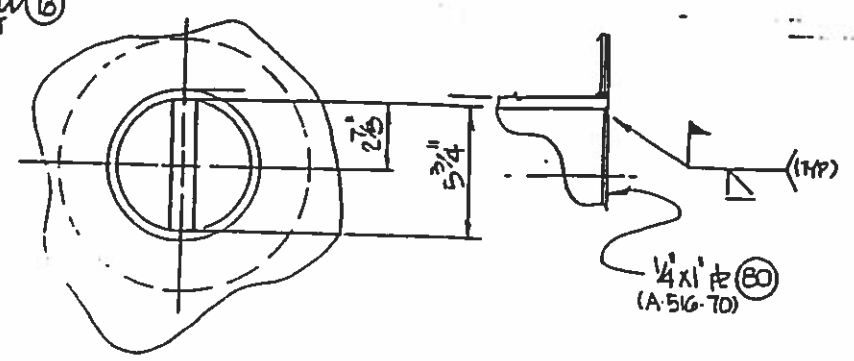
CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 2-4-93
CHECKED: C.G. APPROVED:

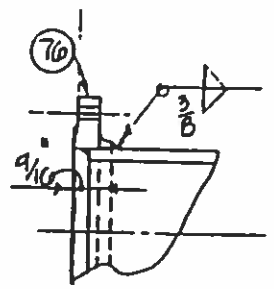
No. W-92-2472A-26 REV. A



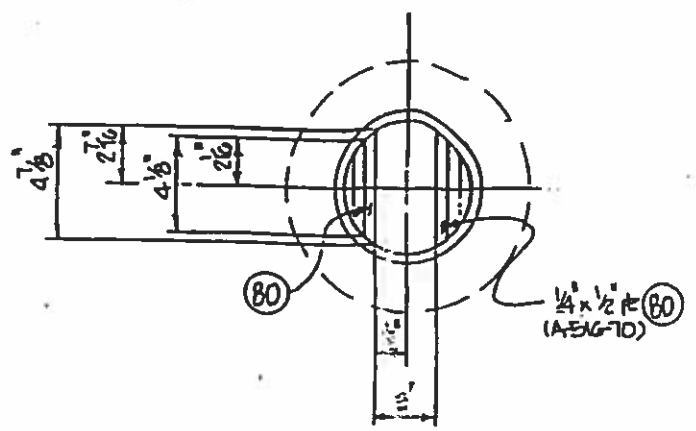
DETAIL OF 6"-150# OVERFLOW NOZZLE
ONE (1) ASSY REQ'D MK "52"

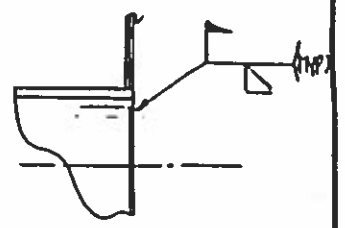


VIEW "A-A"



DTL 'A'





DETAIL OF SPACERS @ NOZZLE MK "51"

FIELD CAUTION
NOZZLE MK "52" TO BE INSTALLED BEFORE INSTALLATION OF RAFTERS & ROOF ℓ's

SCALE:	C	REV. PIPE SUPPORTS	4-26-93	JKH	CE.
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY	B	REV. NUMBER OF SUPPORTS & ADDED VIEW "B-B"	3-31-93	JKH	CE.
DATE: 2/8/93	A	REV. PER CUST. APPROVAL	2-10-93	JKH	CE.
BY:	NO.	REVISION	DATE	BY	CHK'D

P.O.#: CHO-93-0001
S/O 2472A ITEM: I-3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST 40'-0"ø x 32'-0" HIGH TANK
DETAIL OF 6"-150# NOZZLE MK "52"

CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: ODE DATE: 2-4-93
CHECKED: CE. APPROVED:
NO. W-92-2472A-25 REV. C

RADIOGRAPHIC STANDARDS

API - 650

10.2 RADIOGRAPHS

10.2.1 NUMBER AND LOCATION OF RADIOGRAPHS

The number and location of radiographs shall be in accordance with API Standard 650 and the following additional requirements:

10.2.1.1 For new or repaired shell vertical joints one radiograph shall be taken in every joint.

10.2.1.2 For new or repaired shell horizontal joints one radiograph shall be taken for each 50 feet of horizontal joint, not including those required at intersections of vertical and horizontal joints.

10.2.1.3 For each new or repaired intersection between shell vertical and horizontal joints one radiograph shall be taken.

10.2.1.4 For reconstructed tanks, each butt-welded annular plate joint shall be radiographed in accordance with API Standard 650.

10.2.1.5 New and replaced shell insert plate and door-sheet welds shall be radiographed. For circular replacement plates, a minimum of one radiograph shall be taken, regardless of thickness. For square or rectangular replacement plates, at least one radiograph shall be taken in a vertical joint and at least one in a horizontal joint, and one in each corner. All junctions between repair and existing welds shall be radiographed. If defects are found, 100% radiography shall be performed on the repaired weld.

10.2.1.6 The minimum diagnostic length of each radiograph shall be 8 inches.

NOTE:

FOR API-650 STANDARDS SEE SHT. # 2

RECONSTRUCTED BY

Wyatt WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

A SUBSIDIARY OF HOOVER CORPORATION

REPAIRED/ALTERED TO API 653 EDITION 1ST

DATE COMPLETED 1993 — ORIGINAL STANDARD API-650-73

SERIAL NO. 2472A — TANK NO. TK-3455

TANK DIA. 40'-0" HEIGHT 40'-0"

SHELL COURSE	ALLOW. STRESS	MAT'L
#5		A-516-70

SPECIFIC GRAVITY 1.05

DESIGN PRESSURE INT. 5"WC EXT. 1.75"WC

ORIG. CONSTR. DATE 1975

YEAR RECONSTRUCTED 1993

LIQUID LEVEL MAX. 31'-0"

CAPACITY 1,619 BBLS

MAX. OPERATING TEMP. 170°

DETAIL OF CODE NAMEPLATE

NOTES

1) NAME PLATE TO BE INSTALLED ADJACENT TO EXIST. NAME PLATE ON OUTER TANK
2) SEE SHT. #27 FOR DETAIL OF BRACKET.

HYDRO-TEST PROCEDURE

1) TANK BOTTOMS (INNER & OUTER) TO BE VACUUM BOX TESTED PER API-650 PARAGRAPH 5.3.3
2) BLANK OFF ALL SHELL NOZZLES FOR INNER TANK
3) FILL INNER TANK WITH POTABLE WATER WITH A MAXIMUM CHLORIDE CONTENT OF # PPM (FURNISHED BY CUSTOMER) TO THE BOTTOM OF OVERFLOW NOZZLE MK-"52"
4) THOROUGHLY CHECK THE TANK FOR LEAKS.

5A) DRAIN INNER TANK DOWN TO 31'-0" WATER LEVEL (APPROX. 6'-4" FROM BTM. OF OVERFLOW NOZZ. MK-"52"

5B) BLANK OFF ALL SHELL OPENINGS FOR OUTER TANK.

6) FILL THE OUTER TANK WITH POTABLE WATER (FURNISHED BY CUSTOMER) TO A MAXIMUM HEIGHT OF 31'-0" (DO NOT DRAIN INNER TANK.)
7) IF THE TANK HAS ANCHORAGE, CHECK FOR TIGHTNESS AFTER COMPLETION OF THE FILL OPERATION.
8) THOROUGHLY CHECK THE TANK FOR LEAKS.
9) BLANK OFF ALL ROOF OPENINGS. INSTALL THE SPECIAL TEST COVER ON NOZZLE MK-"3" W/ AIR LINES & MANOMETER. INSTALL PRESSURE/VACUUM RELIEF VALVE ON NOZZLE MK-"8"
10) SLOWLY INTRODUCE AIR UNTIL A PRESSURE OF 5" WC IS OBTAINED. HOLD THIS PRESSURE FOR 15 MINUTES. REDUCE AIR PRESSURE TO 2½" WC AND VISUALLY CHECK THE TANK FOR TIGHTNESS. IN ADDITION, ALL SEAMS ABOVE THE WATER LINE SHALL BE SOAPED FOR THE DETECTION OF LEAKS.
11) RELEASE THE INTERNAL PRESSURE BY OPENING THE RELIEF VALVE.
12) REMOVE ONE ROOF TEST COVER TO PROVIDE ADDITIONAL VENTING & DRAIN THE OUTER TANK.
13) AFTER OUTER TANK IS EMPTY, BEGIN DRAINING THE INNER TANK.
14) AFTER COMPLETION OF TEST, REMOVE ALL TEST MATERIAL & RETURN TO WYATT STOCK FOR FUTURE USE.

CAUTION:

UNLESS EXTREME CARE IS EXERCISED, THE ABOVE TEST CAN CAUSE DAMAGE TO THE TANK. DO NOT PERMIT PRESSURES TO EXCEED THE AMOUNTS STATED IN NOTE #10

Field Caution

PAINT NOTES

SEE SHT. #2

DESIGN DATA & GENERAL NOTES
(OUTER TANK)

DESIGN, FABRICATION, ERECTION & TESTING TO BE IN ACCORDANCE WITH API-653 1ST EDITION, JANUARY 1991 API 650 APP. A & F

CODE NAME & REQ'D. YES

DESIGN PRESSURE :
INT: 5"WC
EXT: 1.75" WC

DESIGN TEMPERATURE : 12°F - 170°F

SPECIFIC GRAVITY : 1.05

JOINT EFFICIENCY : 0.85

RADIOGRAPH : SEE STANDARD THIS SHT.

CORROSION ALLOWANCE: 1/16"

MAX. LIQUID LEVEL: 31'-0"

ROOF CONSTRUCTION : LAP WELD-SUPPORTED CONE

BOTTOM CONSTRUCTION: LAP WELD

HYDROTEST : SEE PROCEDURE THIS SHT.

WIND LOAD : 110 MPH

EARTHQUAKE ZONE : 0

NOMINAL CAPACITY : 1,619 BBLS.

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/12/93
BY:

NO.	REVISION	DATE	BY	CHK'D

P.O.#: CHO-93-0001

S/O 2472 A | ITEM: TK-3444

Wyatt WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST 40'-0" Ø x 32'-0" HIGH TANK

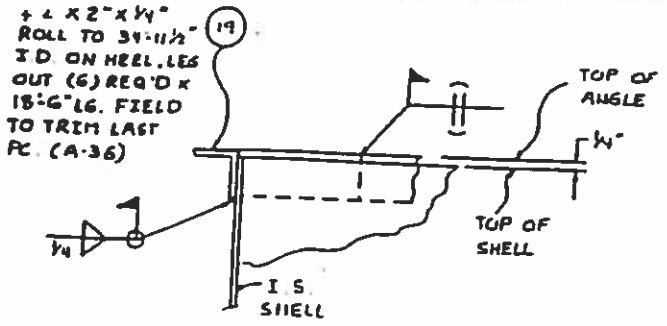
GENERAL NOTES #2

CUSTOMER: LYONDELL PETROCHEMICAL

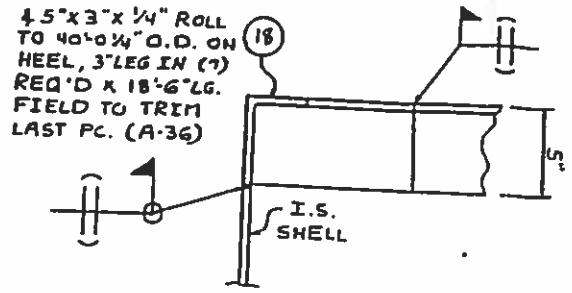
DRAWN: JKH DATE: 2-10-93

CHECKED: C.G. APPROVED:

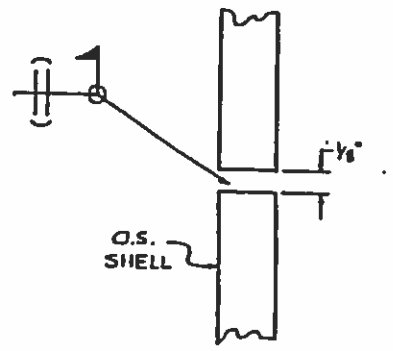
NO. W-92-2472A-2A REV.



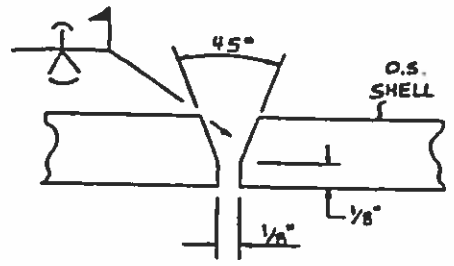
DETAIL "A"



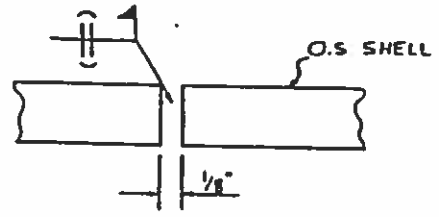
DETAIL "B"



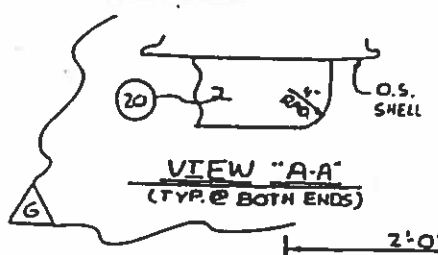
DETAIL "G1"



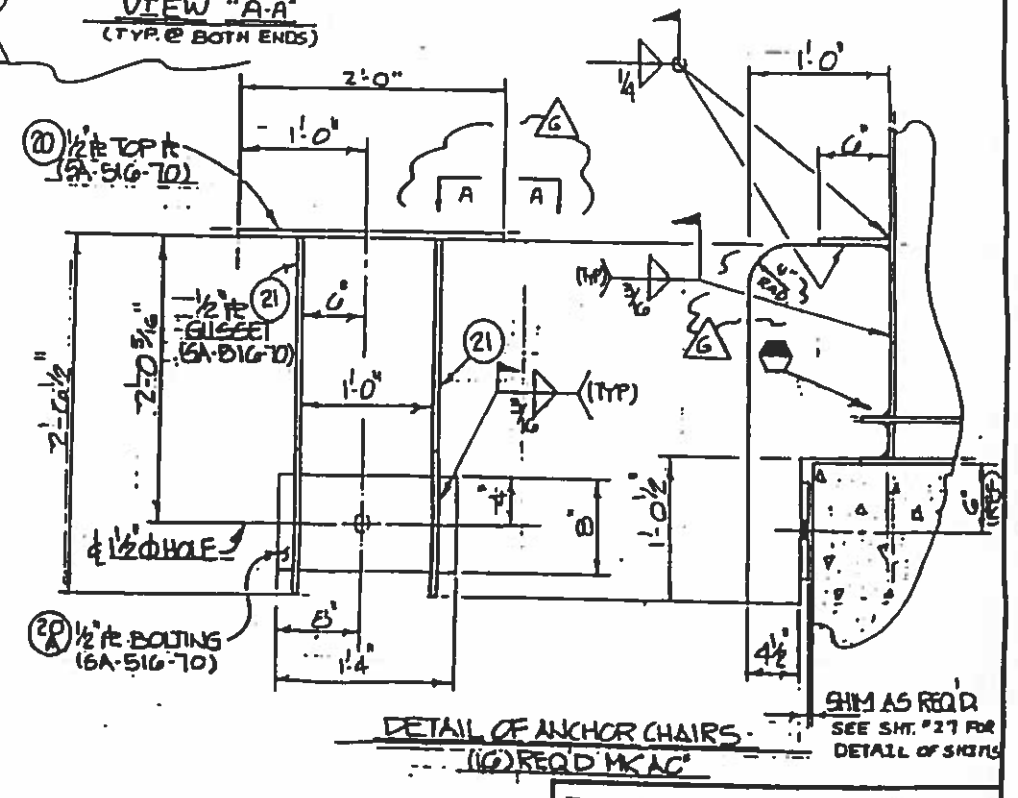
DETAIL "L1"



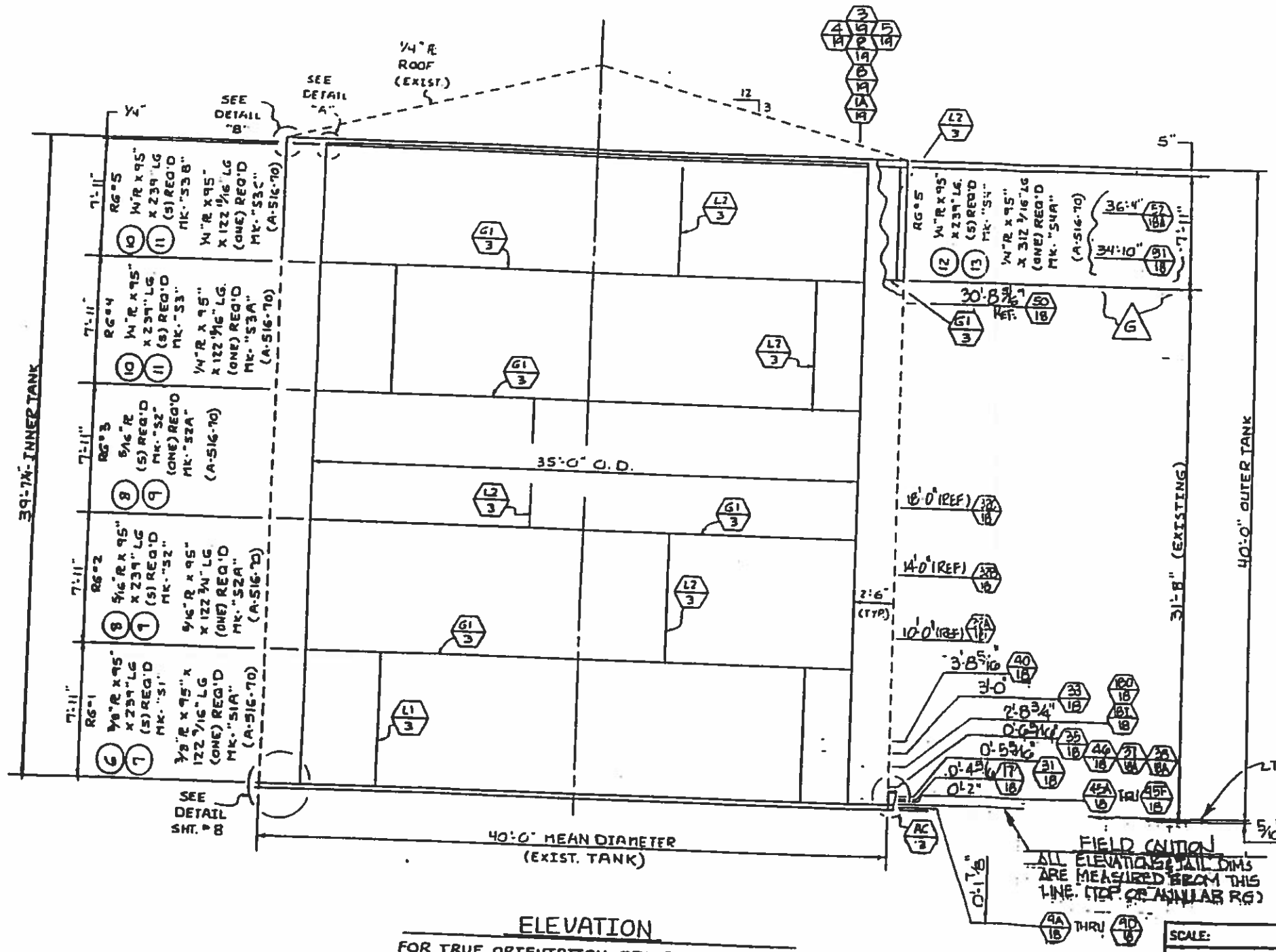
DETAIL "L2"



VIEW "A-A"
(TYP. @ BOTH ENDS)



DETAIL OF ANCHOR CHAIRS
(16) REQ'D MK "AC"



ELEVATION
FOR TRUE ORIENTATION - SEE PLANS SHTS. #4 & 5

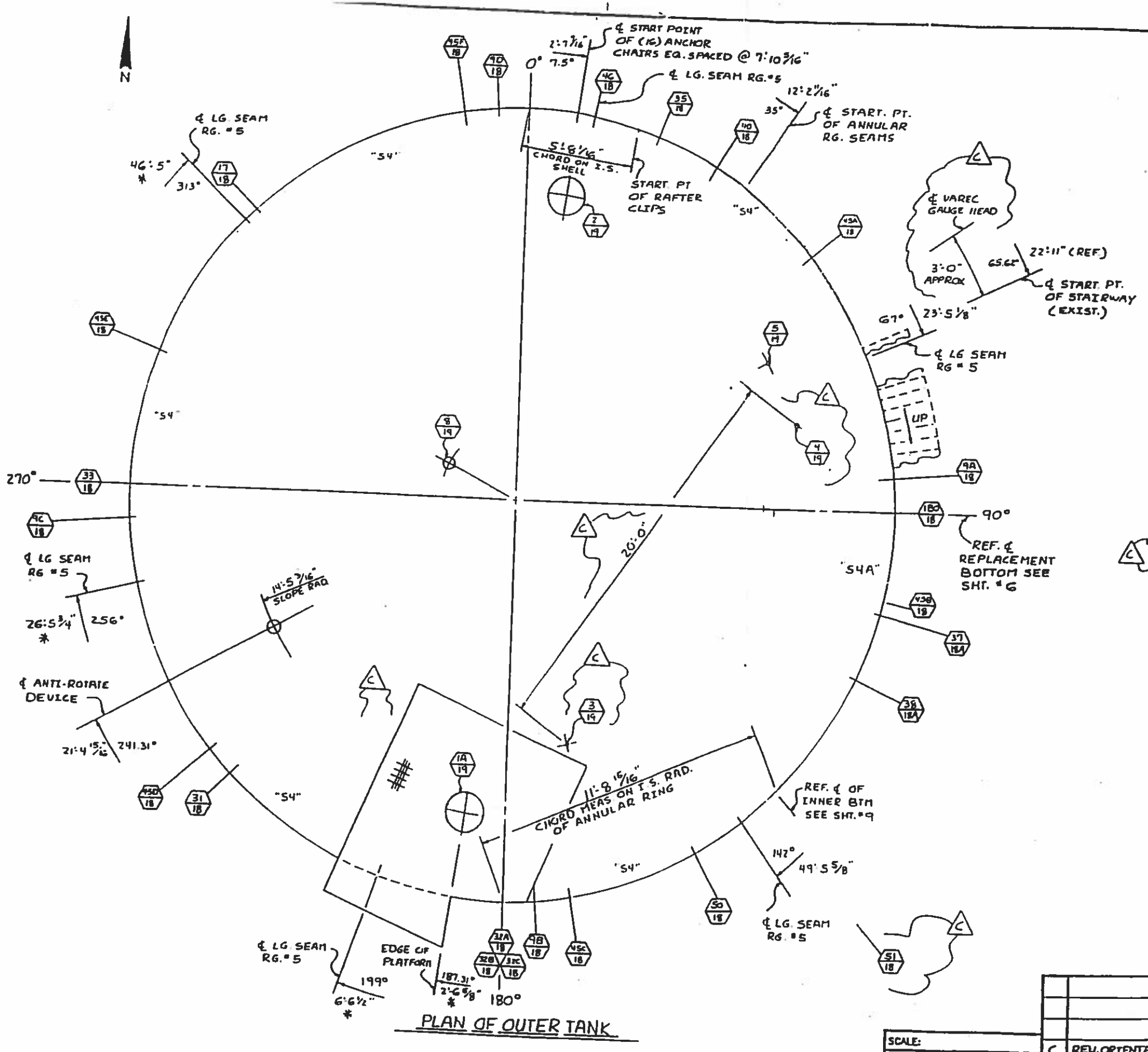
FIELD TO NOTCH GUSSETS AS REQ'D TO CLEAR BOTTOMS (SEAL WELD AFTER INSTALLATION)

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/10/93
BY:

NO.	REVISION	DATE	BY	CHKD
E	REV. DIMS @ ANCHOR CHAIR	2-10 93	JKH	C.E.
D	ADD ELEV. OF MK. "S1" & "S2"	2-8 93	JKH	C.E.
C	REV. AS NOTED	2-3 93	JKH	C.E.
G	REV. ELEV. OF MK. "S1" & "S1" REV. DTL OF ANCHOR CHAIRS	4-22 93	JKH	C.E.
F	REV. HT. OF TANK & DETAIL "A"	3-31 93	JKH	C.E.

P.O.#: CHO-93-0001
S/O 2472A | ITEM: TK-3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0"ø x 32'-0" HIGH TANK
ELEVATION
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: JKH DATE: 1-12-93
CHECKED: C.E. APPROVED:
NO. W-92-2472A-3 REV. G



PLAN OF OUTER TANK

NOZZLE DATA		45	ANGLE "E" ARC DIMENSION	SLOPE RADIUS
NOZZLE MARK	LOCATION			
46	SHELL RING #1	10°	3'-5 5/16"	
35	SHELL RING #1	20°	6'-11 9/16"	
40	SHELL RING #1	30°	10'-5 3/4"	
45A	SHELL RING #1	50°	17'-5 9/16"	
9A	SPACER RING BETWEEN BOTTOMS	85°	29'-8 1/4"	
180	SHELL RING #1	90°	31'-5 3/16"	
45B	SHELL RING #1	103°	35'-11 7/16"	
50	SHELL RING #4	150°	52'-4 5/8"	
45C	SHELL RING #1	170°	59'-4 7/16"	
9B	SPACER RING BETWEEN BOTTOMS	175°	61'-1 7/16"	
31	SHELL RING #1	225°	15'-8 9/16" *	
45D	SHELL RING #1	230°	17'-5 3/16" *	
9C	SPACER RING BETWEEN BOTTOMS	265°	29'-8 1/4" *	
33	SHELL RING #1	270°	31'-5 3/16" *	
45E	SHELL RING #1	290°	38'-5" *	
17	SHELL RING #1	315°	47'-1 3/4" *	
45F	SHELL RING #1	350°	59'-4 7/16" *	
9D	SPACER RING BETWEEN BOTTOMS	355°	61'-1 7/16" *	
32A	SHELL RING #1	180°	62'-10 3/8"	
32B	SHELL RING #2	180°	62'-10 3/8"	
32C	SHELL RING #3	180°	62'-10 3/8"	
37	SHELL RING #1	105°	36'-8 9/16"	
38	SHELL RING #1	115°	40'-1 15/16"	
51	SHELL RING #5	138.81°	48'-5 3/4"	
1A	ROOF	187.31°	2'-6 5/8" *	16'-5 15/16"
8	ROOF	292.31°	39'-2 11/16" *	4'-1 1/2"
2	ROOF	7.31°	2'-6 5/8"	16'-5 15/16"
3	ROOF	209°	10'-1 9/16" *	12'-4 7/16"
4	ROOF	165°	57'-7 1/2"	12'-10 5/8"
5	ROOF	60°	20'-11 7/16"	15'-5 1/4"

*-DENOTES ARC MEASURED FROM 180° ℄

NOTE

ALL ARC DIMENSIONS IN PLAN ARE MEASURED ON O.S. CIRCUMFERENCE OF SHELL RG. #1 FOR 0° TO 180° & 180° TO 0° CLOCKWISE

CIRCUMFERENCE = 125'-8 3/4"
1° = 4 5/16" (4.8097")

NO.	REVISION	DATE	BY	CHK'D
C	REV. ORIENTATIONS AS NOTED	9-22-93	JKH	CC
B	ADD. ROOF NOZZ. ORIENT.	2-5-93	JKH	CC
A	REV. PER CUST. APPROVAL	2-2-93	JKH	CC

SCALE:

CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 2/03/93
BY: Charles C. [illegible]

P.O.#: CHO-93-0001
S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'-0" ø x 32'-0" HIGH TANK

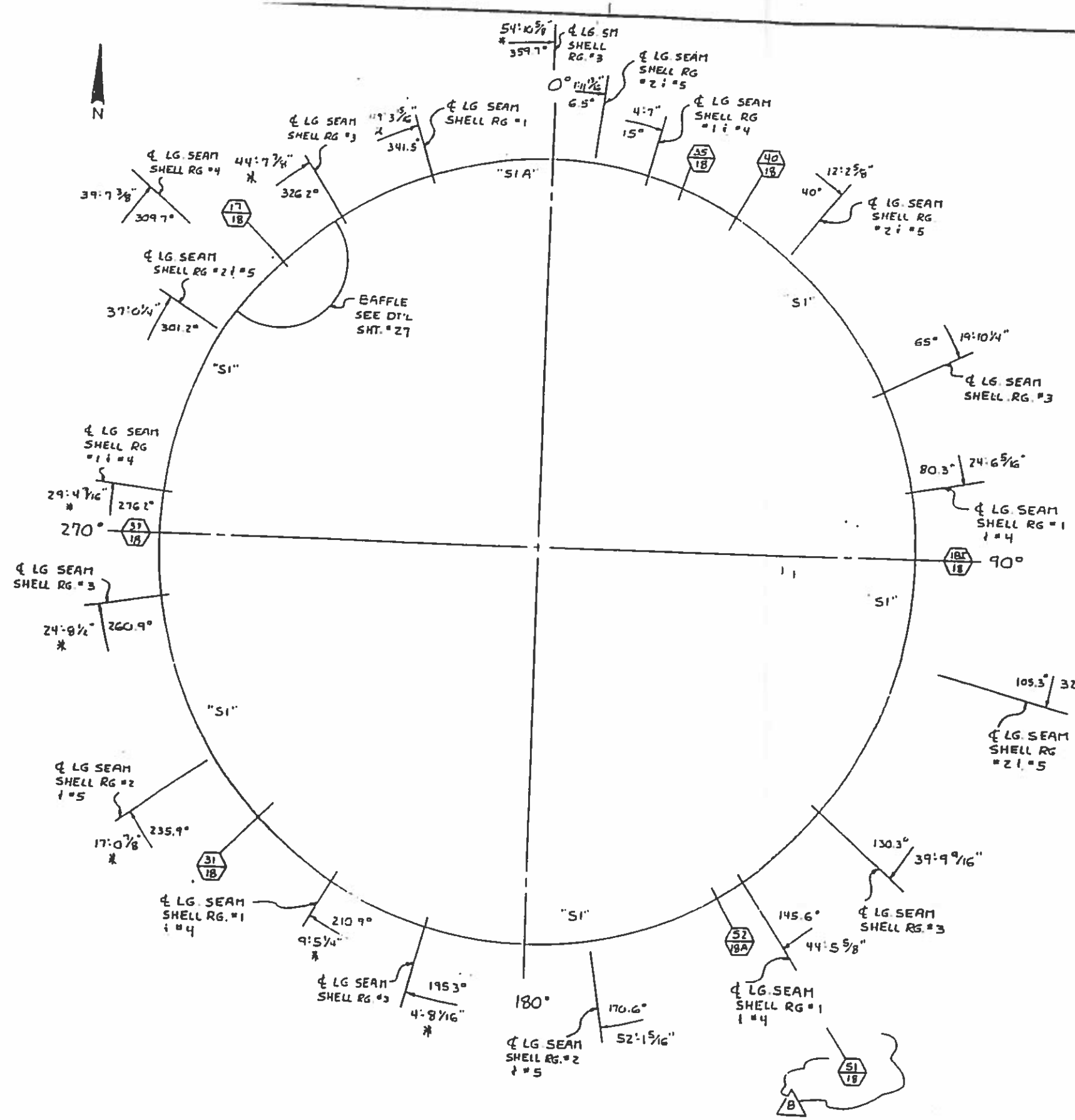
PLAN OF OUTER TANK

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-30-93
CHECKED: C.C. APPROVED:

NO. W-92-2472A-4 REV. C

FILE NAME: STR134



PLAN OF INNER TANK

NOZZLE DATA				
NOZZLE MARK	LOCATION		ANGLE "A" ARC DIMENSION	
181	SHELL RING #1	90°	27:5 7/8"	
52	SHELL RING #5	150°	45:9 3/4"	

*. DENOTES ARC MEASURED FROM 180° ℄

NOTES

1) ALL ARC DIMENSIONS IN PLAN ARE MEASURED ON O.S. CIRCUMFERENCE OF SHELL CLOCKWISE FROM 0° TO 180° & 180° TO 0°

CIRCUMFERENCE = 109'-11 1/2"
1° = 3 11/16" (3.6659')

2) CHORD DIMENSIONS FOR SHELL PLATES BASED ON 34'-11 1/4" I.D. CIRCLE:

"S1" - 18'-10 3/16"
"S1A" - 10'-0 13/16"

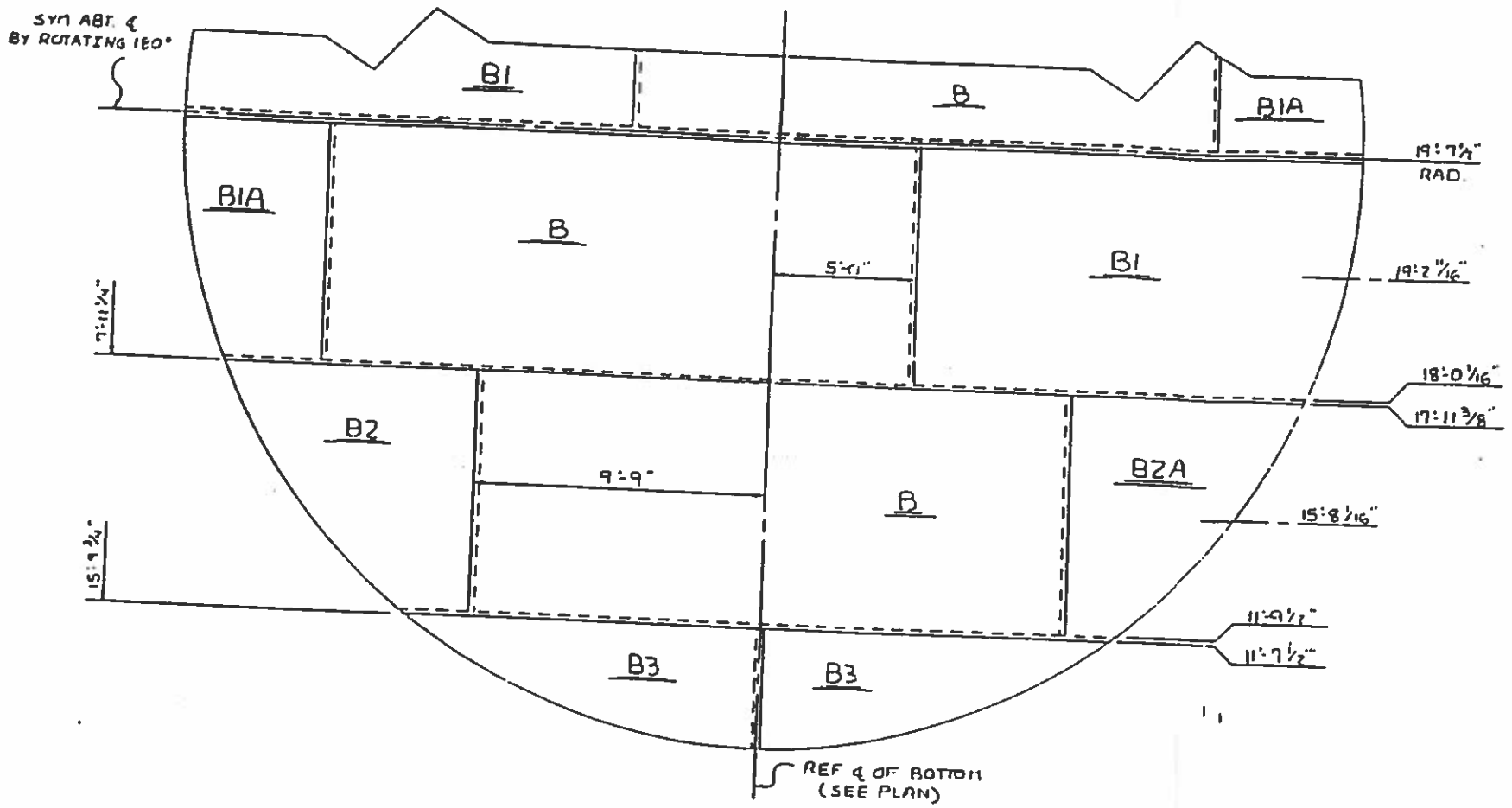
NO.	REVISION	DATE	BY	CHK'D
B	ADD ORIENT. OF NK-"S1"	2-5-93	JKH	CC
A	REV. PER CUST APPROVAL	2-2-93	JKH	CC

SCALE:

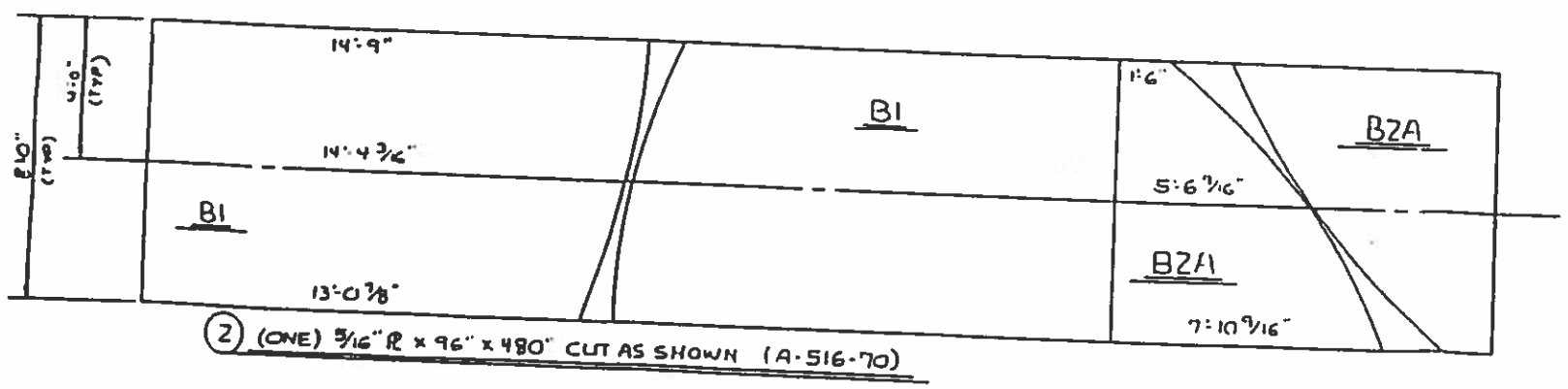
CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/02/93
BY: Charlie Cox

P.O.#: CHO-93-0001
S/O 2472A | ITEM: TK-3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø X 32'-0" HIGH TANK
PLAN OF INNER TANK
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: JKH | DATE: 1-30-93
CHECKED: CC | APPROVED:
NO. W-92-2472A-5 | REV. B

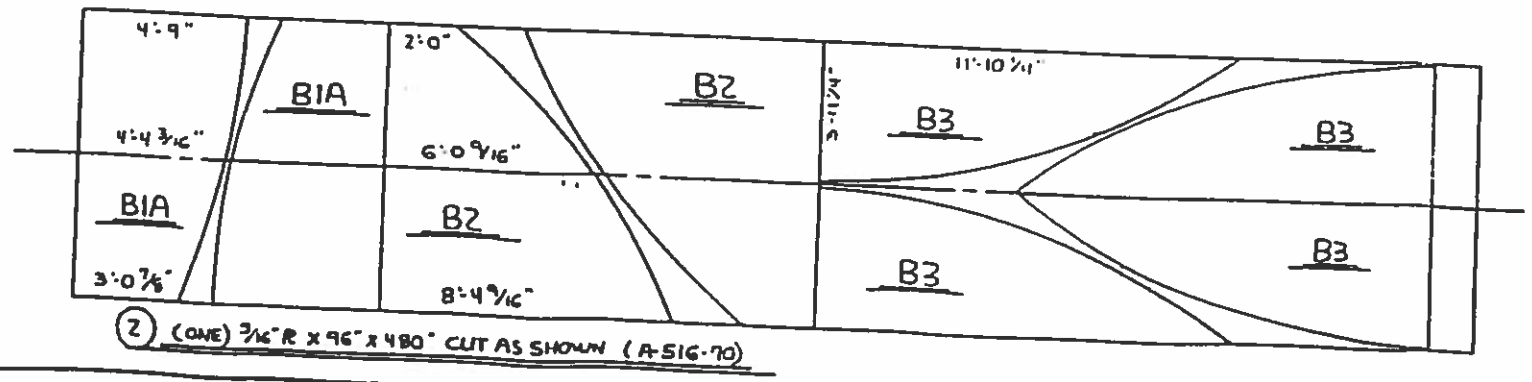
FILE NAME: STD124



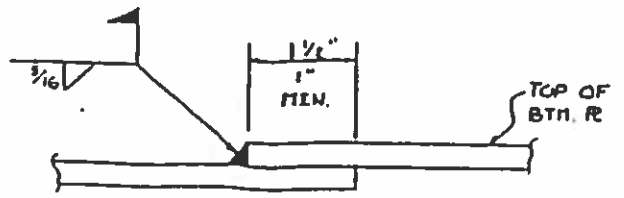
REPLACEMENT BOTTOM LAYOUT



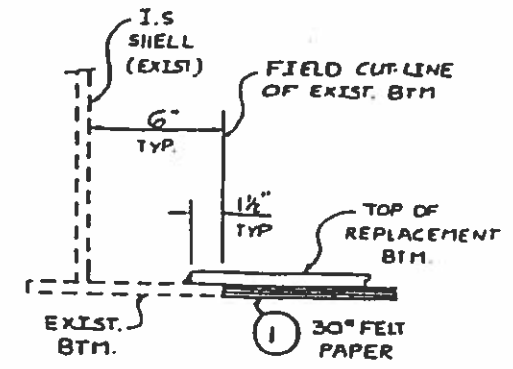
(2) (ONE) 5/16" R x 96" x 480" CUT AS SHOWN (A-516-70)



(2) (ONE) 5/16" R x 96" x 480" CUT AS SHOWN (A-516-70)



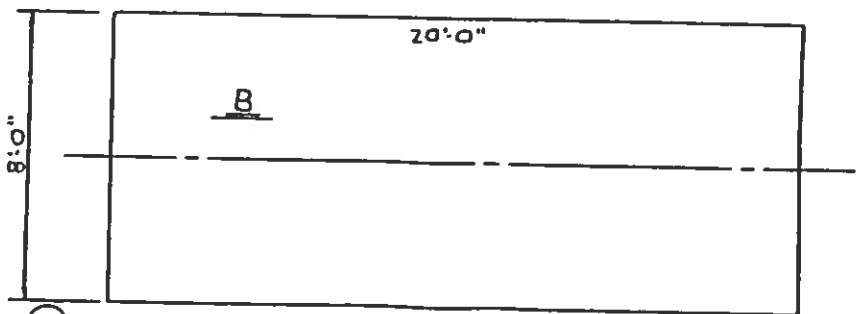
DETAIL OF LAP-WELD SEAM
(TYPICAL)



DETAIL OF BTM. REPLACEMENT

FIELD CAUTION

DO NOT INSTALL FELT PAPER & REPLACEMENT BOTTOM UNTIL CUST. HAS COMPLETED ALL WORK ON SAND PAD.



(2) (4) 5/16" R REQ'D AS SHOWN CUT FROM (2) PCS. 96" x 480" (A-516-70)

NOTE

ALL SKETCH PLATES TO BE CUT BY THE SHOP.

SCALE:				
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY DATE: 1/20/93 BY:	A	REV. PER CUST APPROVAL	1-20-93	JKH CC.
	NO.	REVISION	DATE	BY CHKD

P.O.#: C110-93-0001

S/O 2472A | ITEM: T-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK

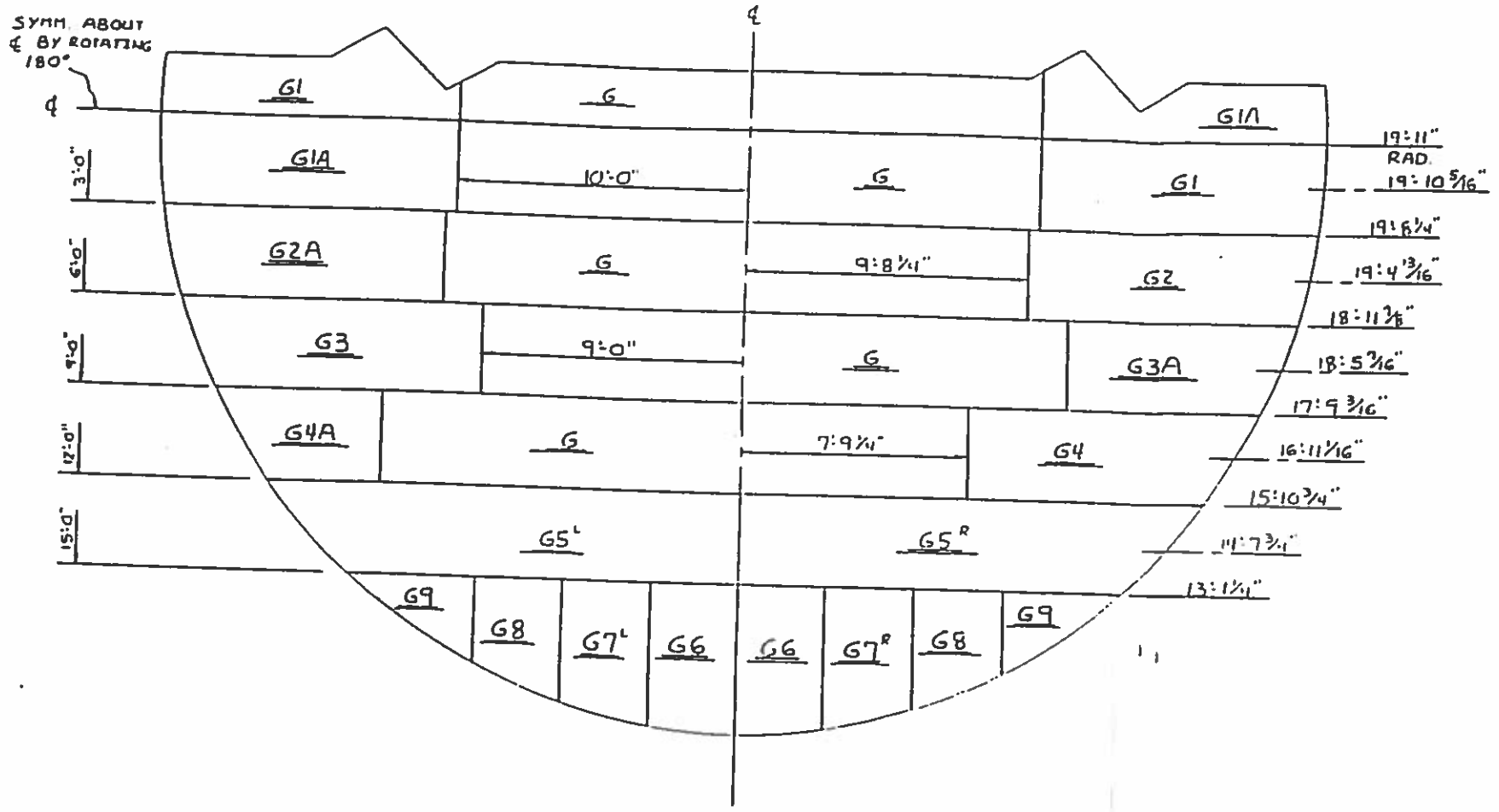
REPLACEMENT BOTTOM LAYOUT

CUSTOMER: LYONDELL PETROCHEMICAL

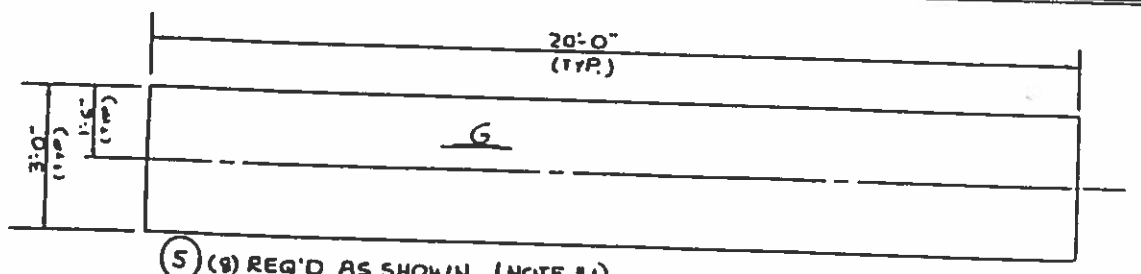
DRAWN: JKH DATE: 1-8-93

CHECKED: C.C. APPROVED:

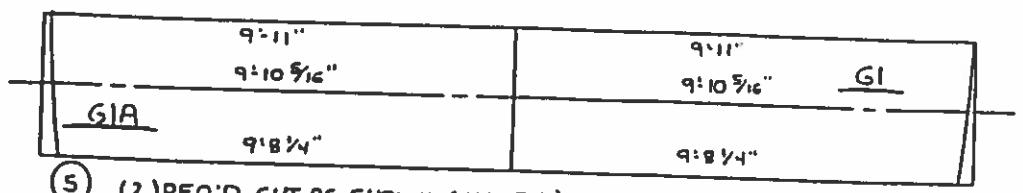
NO. W-92-2472A-6 REV. A



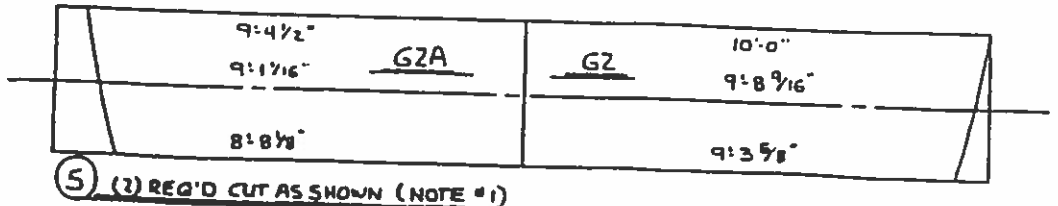
GRATING LAYOUT



(5) (8) REQ'D AS SHOWN (NOTE #1)



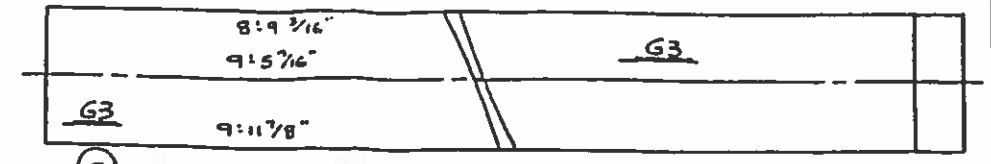
(5) (2) REQ'D CUT AS SHOWN (NOTE #1)



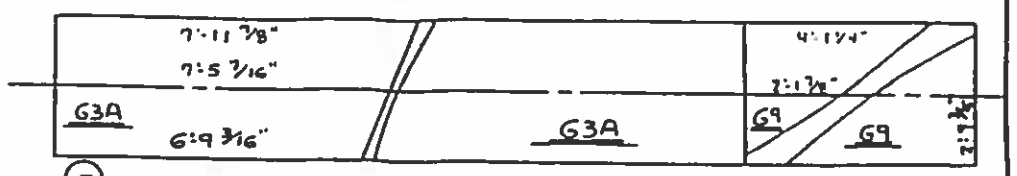
(5) (2) REQ'D CUT AS SHOWN (NOTE #1)

NOTES

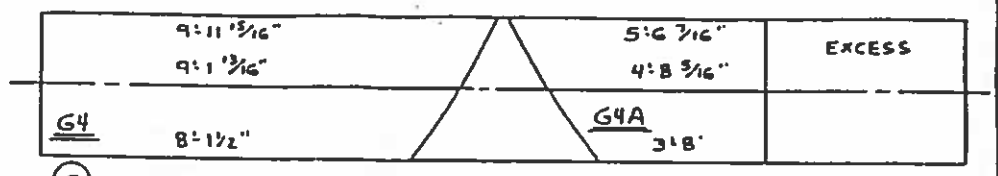
1) ALL SKETCH PLATES TO BE CUT FROM GRATING 1" 1/4" x 3" BEARING BARS (W 22 4) PLAIN MILL FINISH 36" x 240" (A 36)
2) ALL SKETCH PLATES TO BE CUT BY THE SHOP
3) ALL SKETCH PLATES ARE TO BE CUT & INSTALLED WITH THE CROSS BARS UP
4) ALL GRATING SKETCH PLATES TO BE HOT DIPPED GALVANIZED AFTER BURNING.



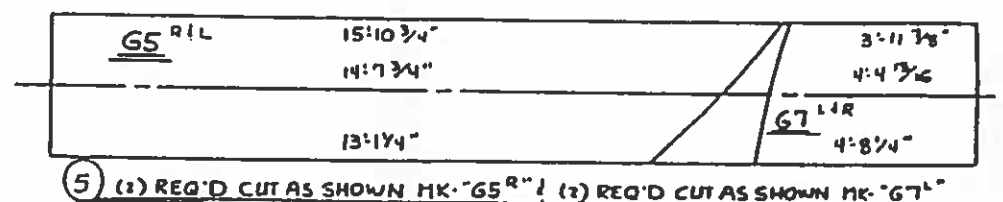
(5) (ONE) REQ'D CUT AS SHOWN (NOTE #1)



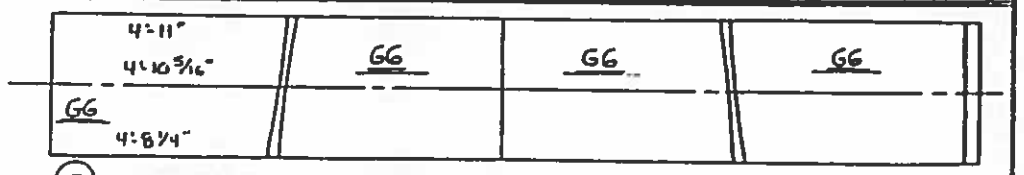
(5) (ONE) REQ'D CUT AS SHOWN (NOTE #1)



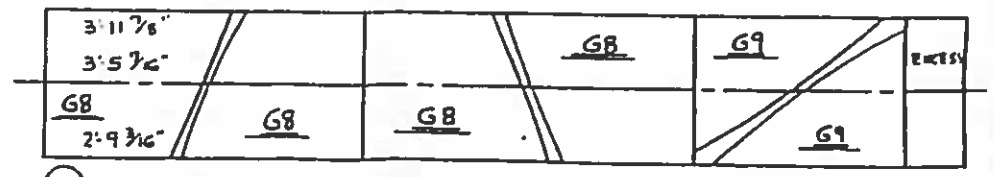
(5) (2) REQ'D CUT AS SHOWN (NOTE #1)



(5) (2) REQ'D CUT AS SHOWN MK. "G5R" & (2) REQ'D CUT AS SHOWN MK. "G7L"
(2) REQ'D CUT OPP. HAND MK. "G5L" & (2) REQ'D CUT OPP. HAND MK. "G7R" (NOTE #1)



(5) (ONE) REQ'D CUT AS SHOWN (NOTE #1)

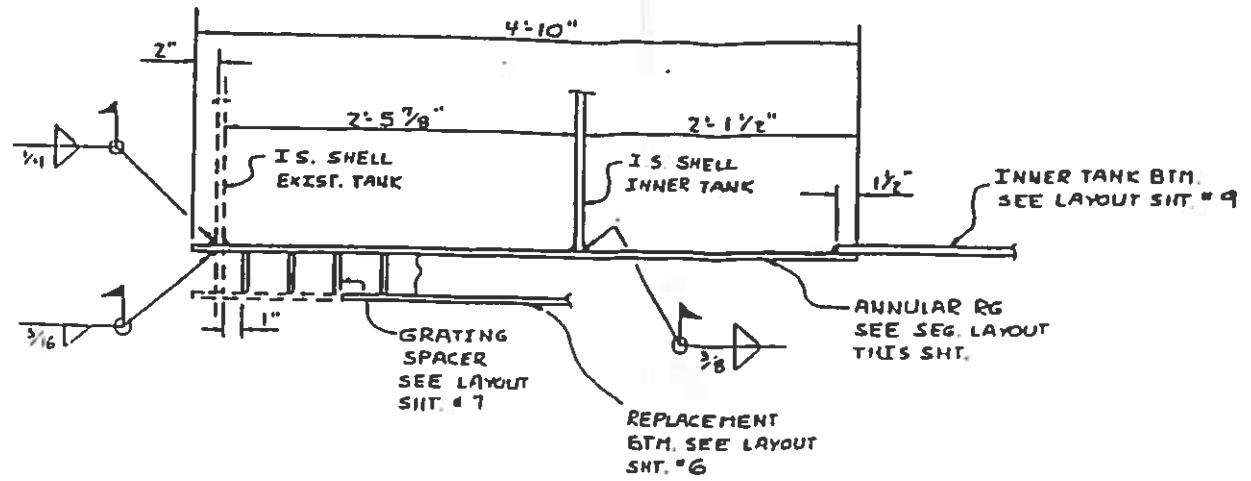


(5) (ONE) REQ'D CUT AS SHOWN (NOTE #1)

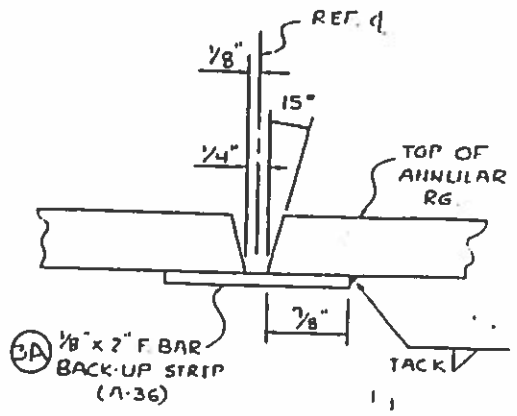
P.O.#: CHO-93-0001
S/O 2472A | ITEM: T-3455
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
MISC MODIFICATIONS TO AN EXIST. 40'0" ø x 37'-0" HIGH TANK E
GRATING LAYOUT
CUSTOMER: LYONDELL PETROCHEMICAL
DRAWN: JKH DATE: 1-7-93
CHECKED: C.G. APPROVED:
NO. W-92-2472A-7 REV. A

SCALE:
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 1/12/93
BY:

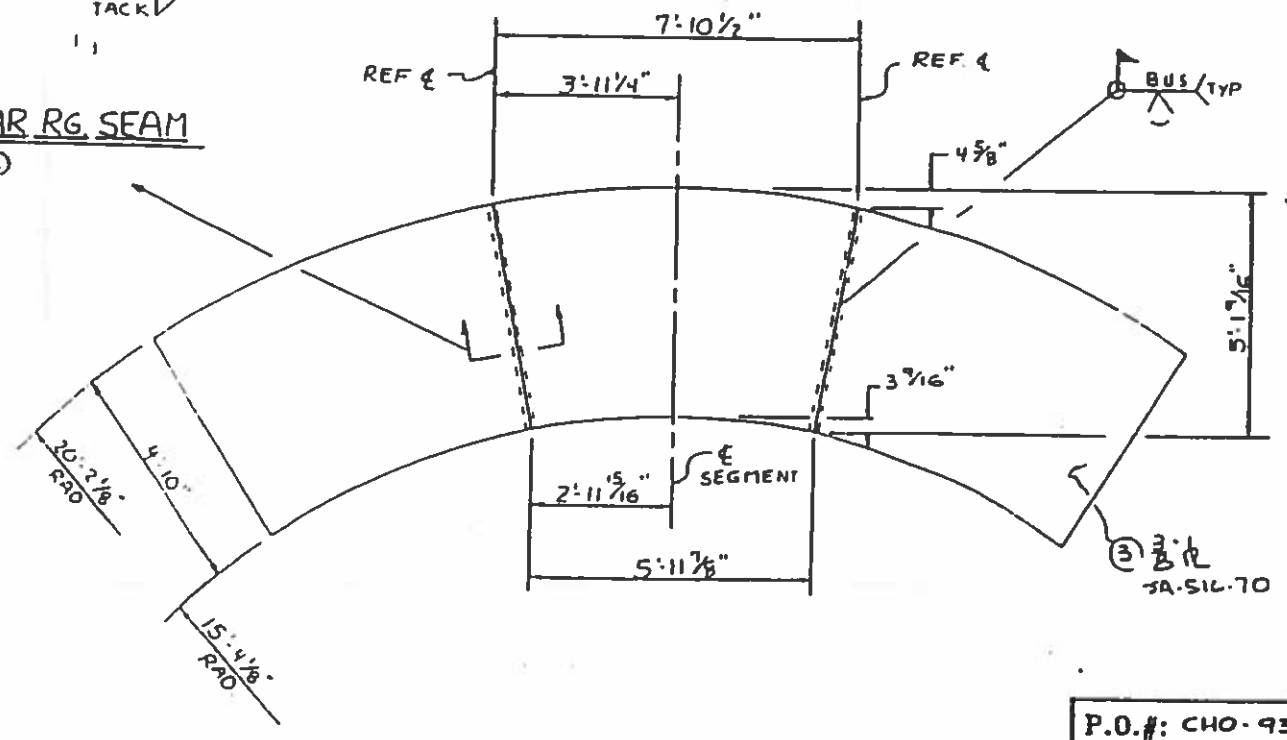
NO.	REVISION	DATE	BY	CHKD
A	REV. PER CUST. APPROVAL	1-20-93	JKH	CG.



DETAIL DOUBLE BOTTOM ASSEMBLY



DETAIL ANNULAR RG. SEAM
(TYPICAL)



DETAIL OF ANNULAR RG SEGMENT
(16) TOTAL REQUIRED

A	REV. PER CUST. APPROVAL	1-20-93	JKH	CE
NO.	REVISION	DATE	BY	CHKD

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/20/93
BY: Chas. E. Engr

P.O.#: CHO-93-0001

S/O 2472A | ITEM: T-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK

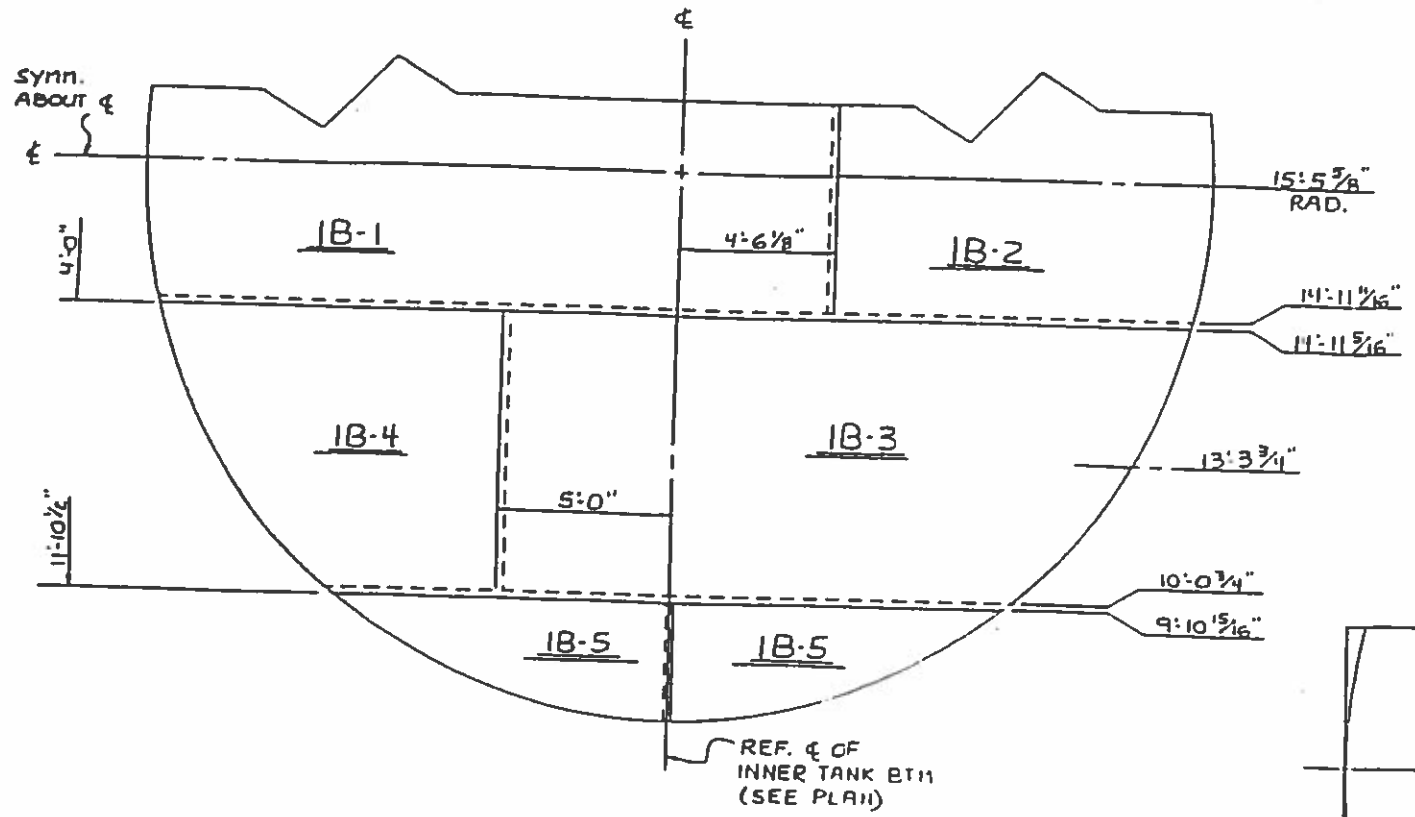
DETAIL OF ANNULAR RING

CUSTOMER: LYONDELL PETROCHEMICAL

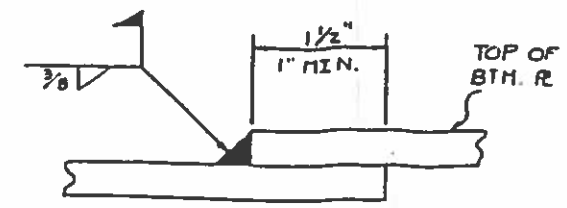
DRAWN: JKH DATE: 1-7-93

CHECKED: C.E. APPROVED:

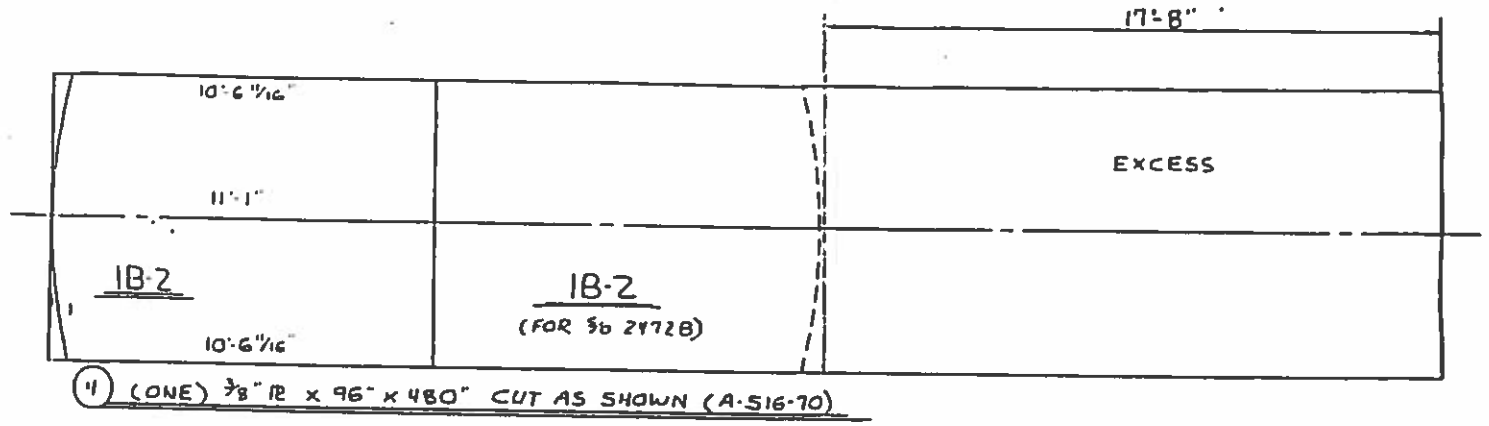
NO. W-92-2472A-8 REV. A



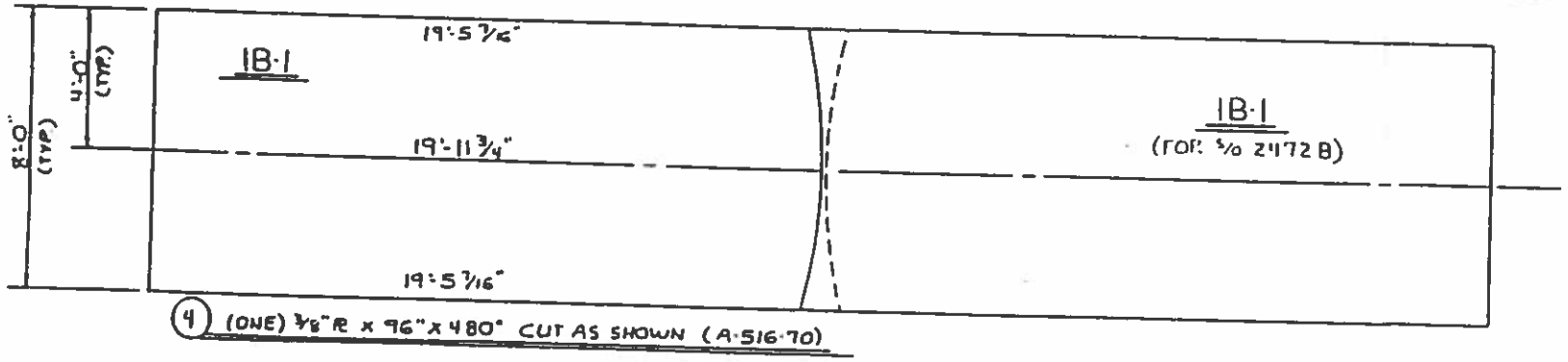
INNER TANK BOTTOM LAYOUT



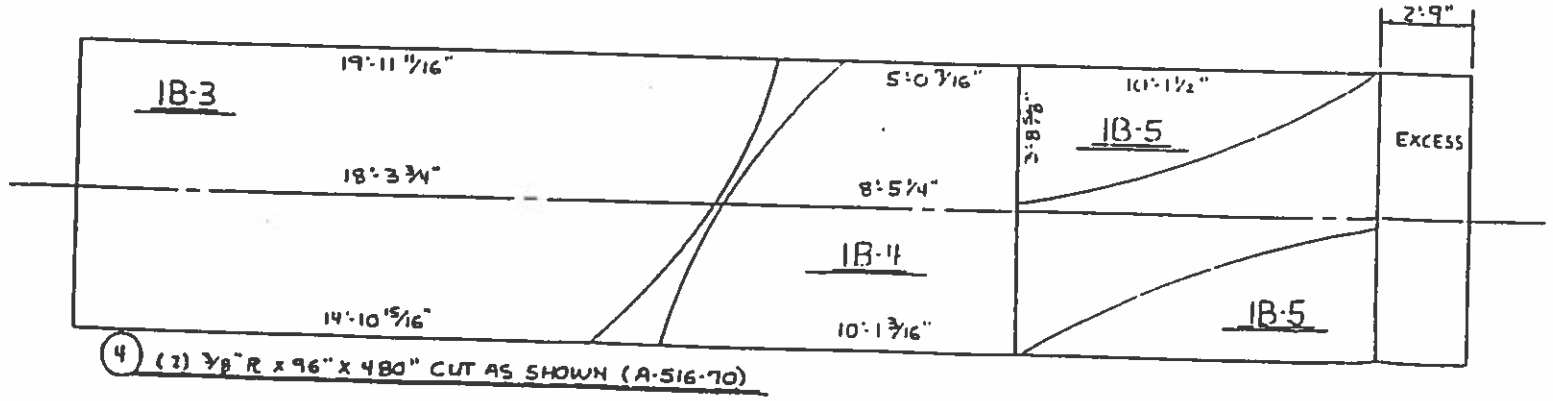
DETAIL LAP-WELD BOTTOM SEAM
(TYPICAL)



(1) (ONE) 3/8" PL x 96" x 480" CUT AS SHOWN (A-516-70)



(1) (ONE) 3/8" R x 96" x 480" CUT AS SHOWN (A-516-70)



(1) (2) 3/8" R x 96" x 480" CUT AS SHOWN (A-516-70)

NOTE

ALL SKETCH PLATES TO BE CUT BY THE SHOP.

A	REV. PER CUST. APPROVAL	1-20-93	JKH	CHKD
NO.	REVISION	DATE	BY	

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/20/93
BY:

P.O.#: CHO-93-0001

S/O 2472A | ITEM: T-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS TO AN EXIST. 40'-0" Ø X 32'-0" HIGH TANK

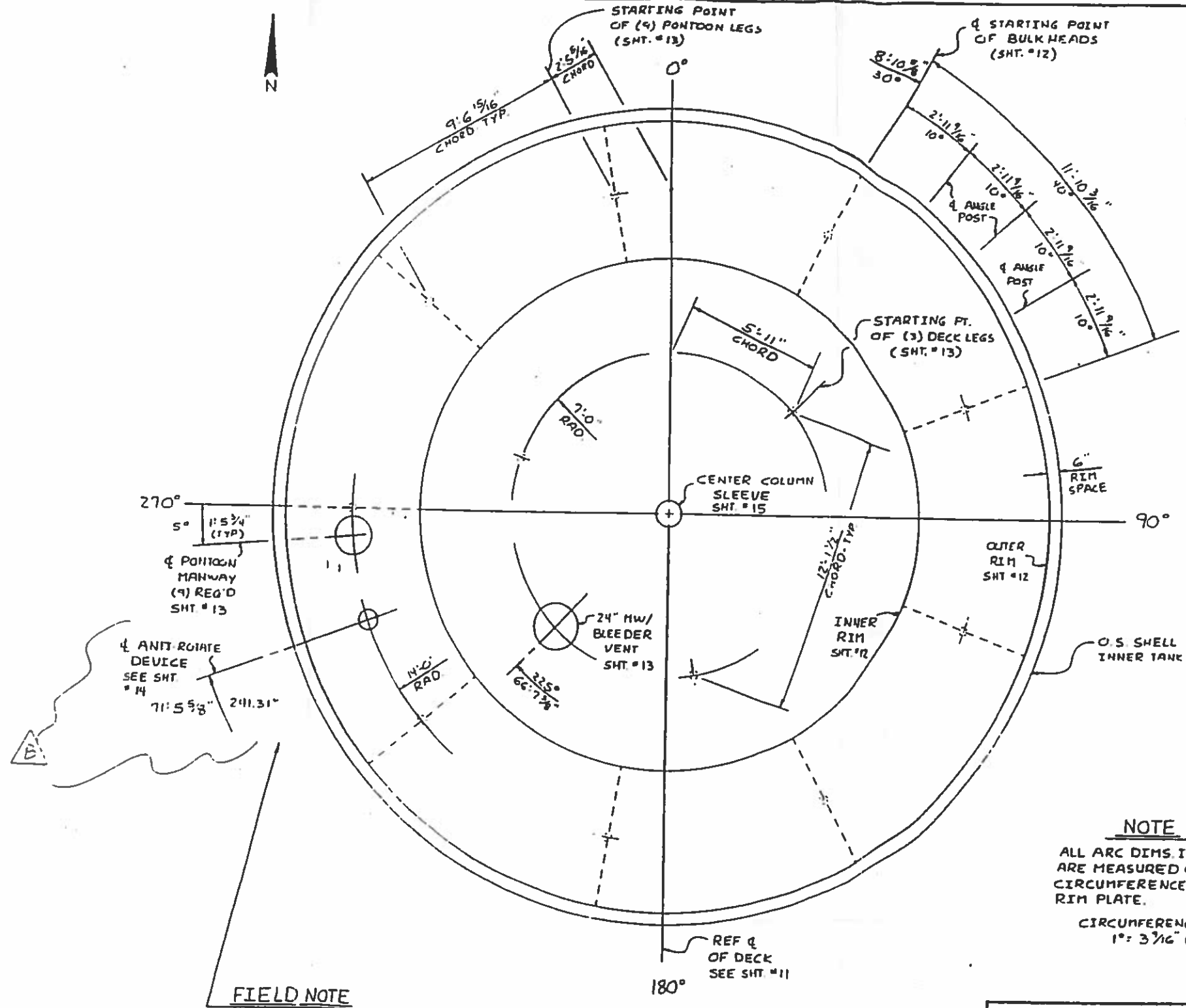
INNER TANK BOTTOM LAYOUT

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-12-93

CHECKED: C.G. APPROVED:

NO. W-92-2472A-9 REV. A



FIELD NOTE

OMIT ANGLE POST AT ANTI-ROTATE DEVICE

NOTE

ALL ARC DIMS. IN PLAN ARE MEASURED ON O.S. CIRCUMFERENCE OF OUTER RIM PLATE.

CIRCUMFERENCE = 106'-7 3/16"
1° = 3 5/16" (3.55395")

PLAN OF FLOATING ROOF

NO.	REVISION	DATE	BY	CHK'D
B	REV. ORIENT. OF ANTI-ROTATE	2-6 93	JKH	C.C.
A	REV. PER CUST. APPROVAL	1-29 93	JKH	C.C.

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/27/93
BY:

P.O.#: CHO-93-0001

S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

MISC. MODIFICATIONS FOR AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK

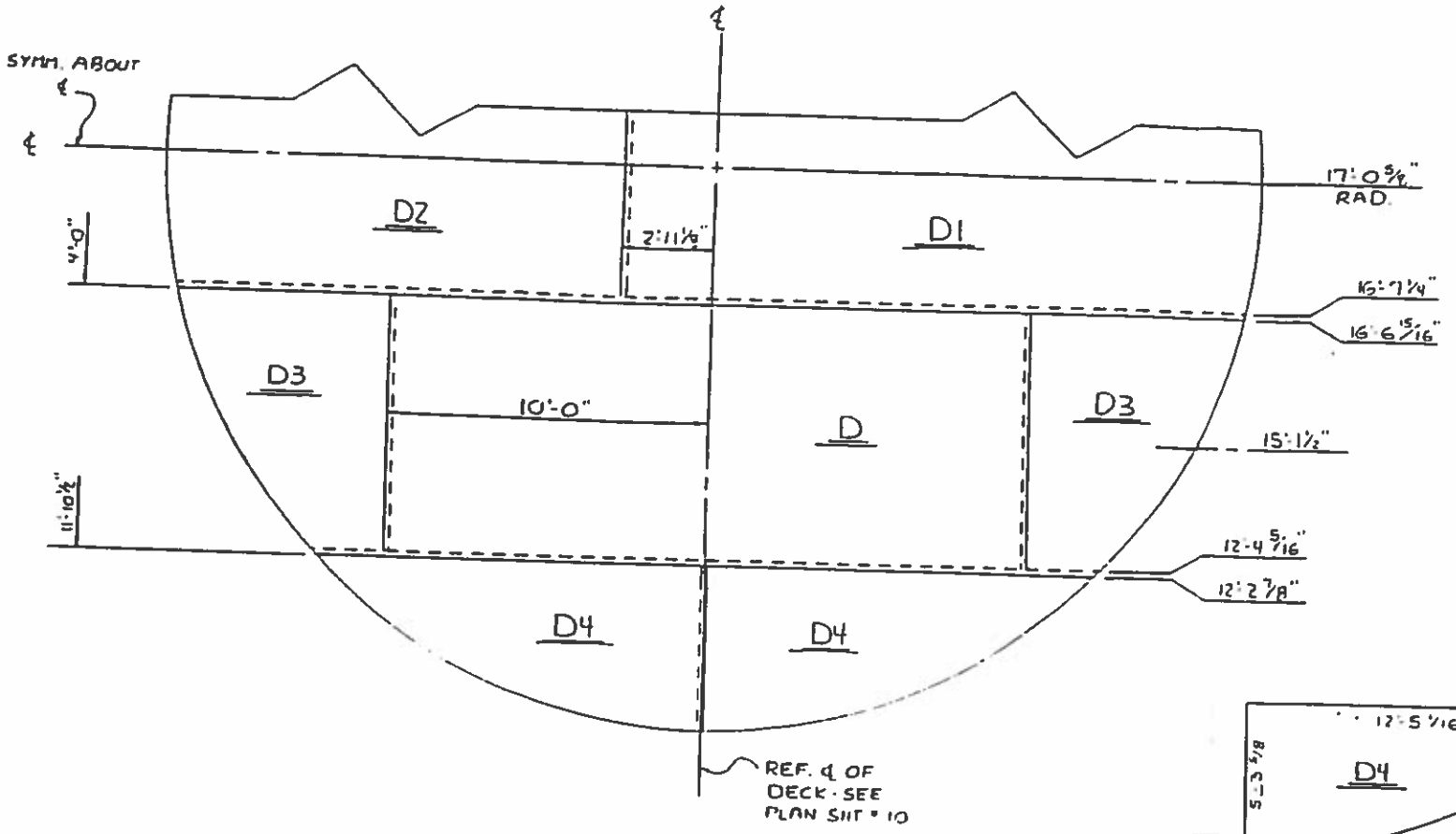
PLAN OF FLOATING ROOF

CUSTOMER: LYONDELL PETROCHEMICAL

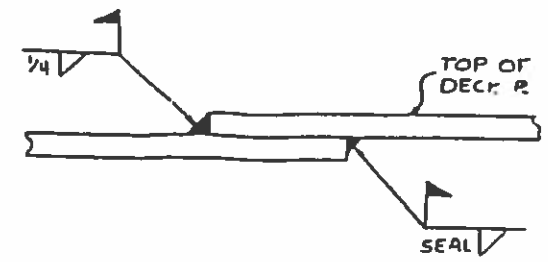
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CHECKED: C.C. APPROVED:

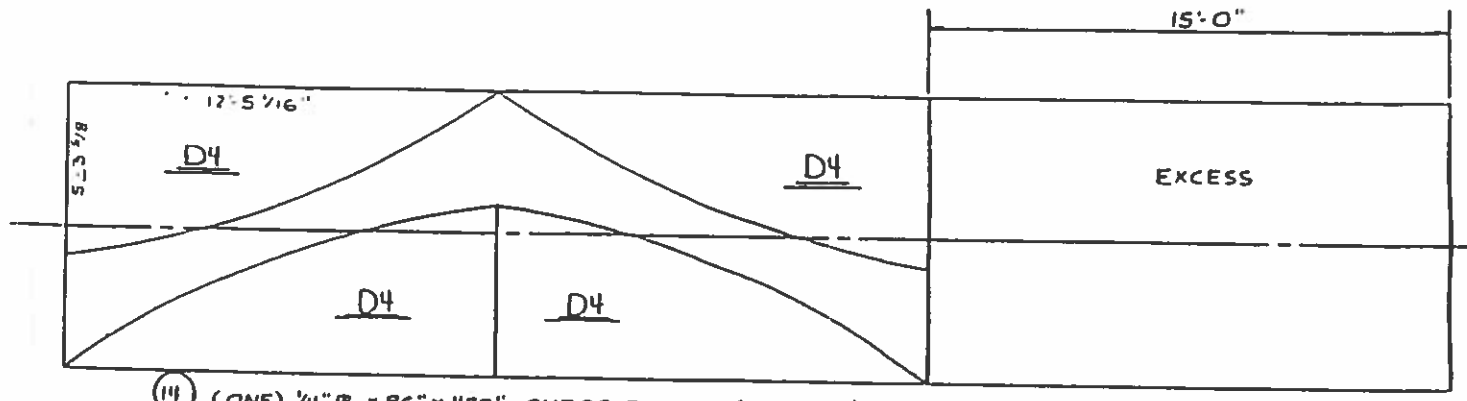
NO. W-92-2472A-10 REV. B



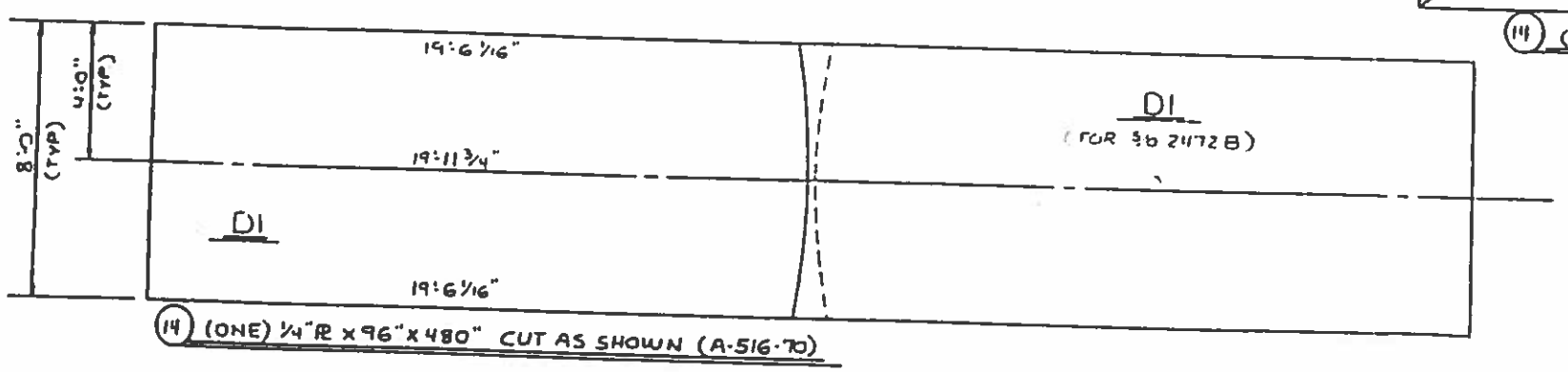
DECK LAYOUT



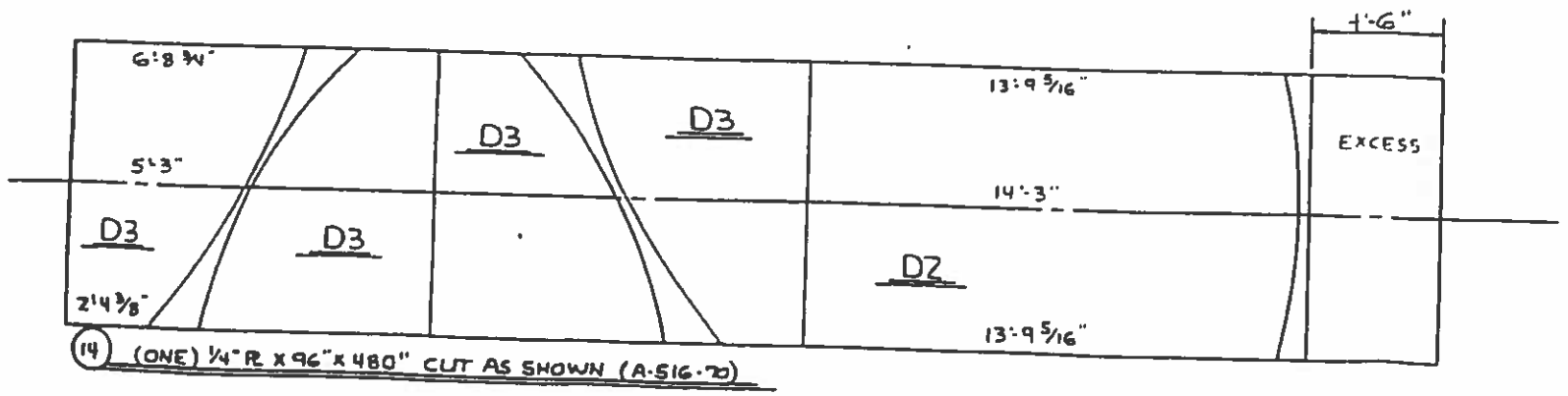
DETAIL DECK LAP WELD SEAM
(TYPICAL)



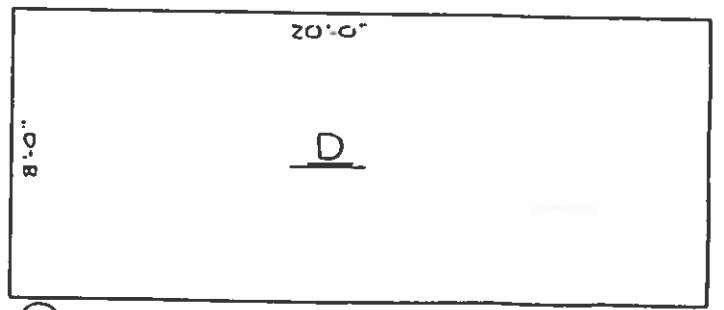
(14) (ONE) 1/4" R x 96" x 480" CUT AS SHOWN (A-516-70)



(14) (ONE) 1/4" R x 96" x 480" CUT AS SHOWN (A-516-70)



(14) (ONE) 1/4" R x 96" x 480" CUT AS SHOWN (A-516-70)



(14) (2) 1/4" R REQ'D AS SHOWN CUT FROM R 96" x 480" (A-516-70)

NOTE
SHOP TO CUT ALL SKETCH PLATES

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 1/21/93
BY:

NO.	REVISION	DATE	BY	CHK'D
A	REV. PER CUST APPROVAL	1-27-93	JKH	CC

P.O.#: CHO-93-001

S/O 2472A | ITEM: TK-3455

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

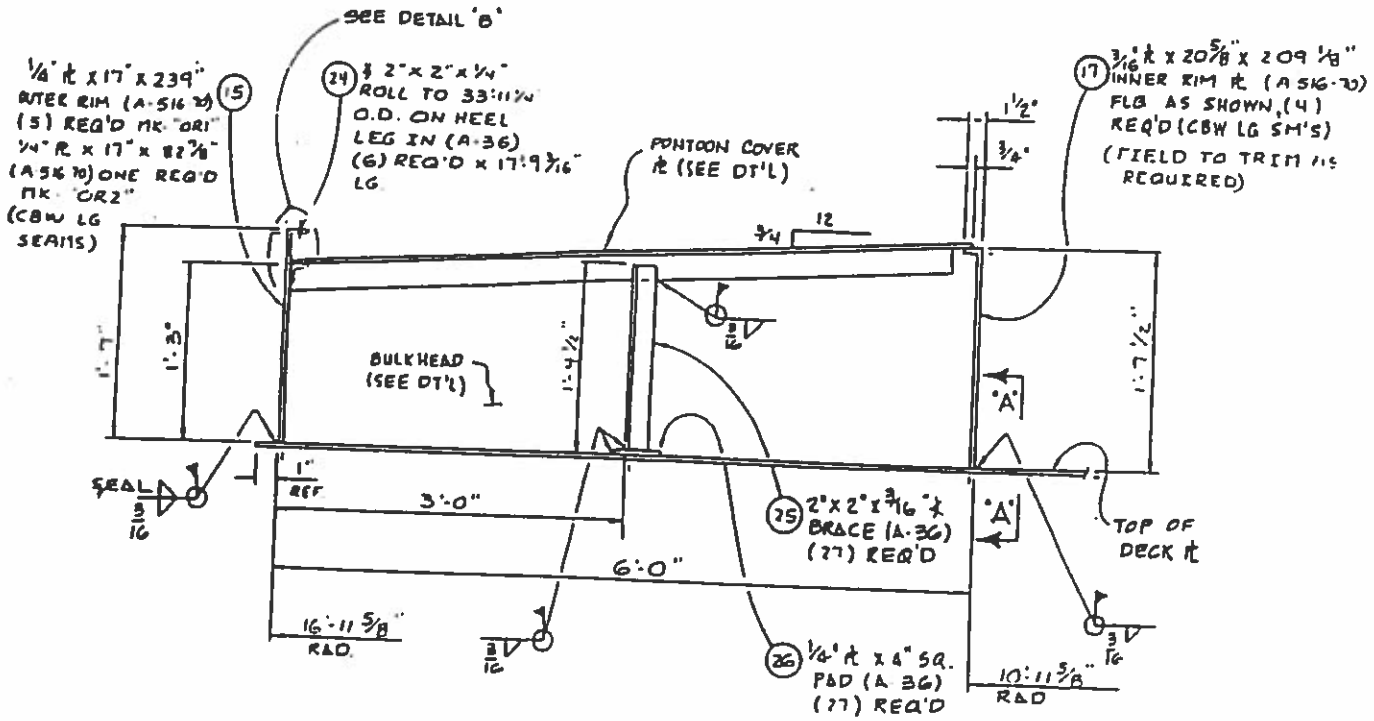
MISC. MODIFICATIONS FOR AN EXIST. 40'-0" Ø x 32'-0" HIGH TANK

DECK LAYOUT

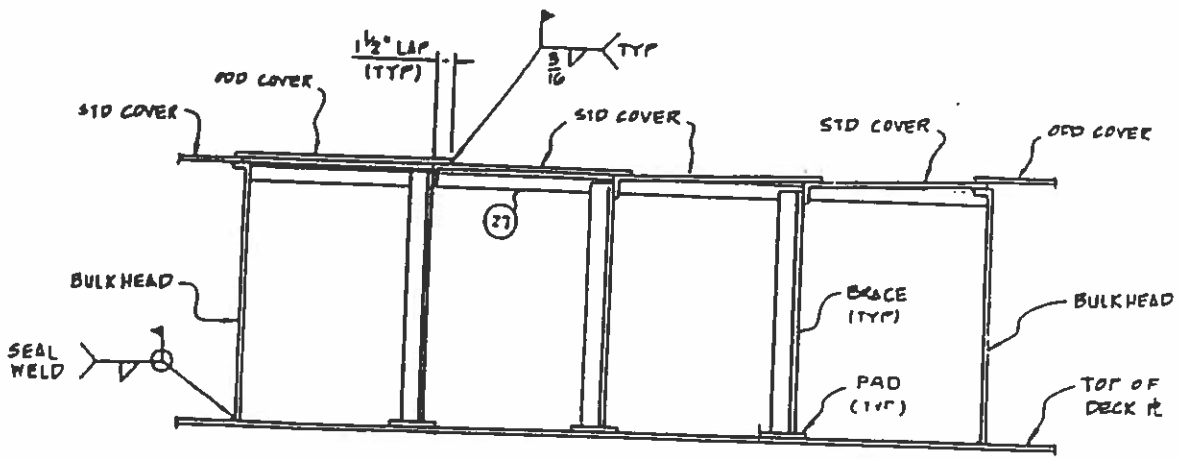
CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-13-93
CHECKED: C.C. APPROVED:

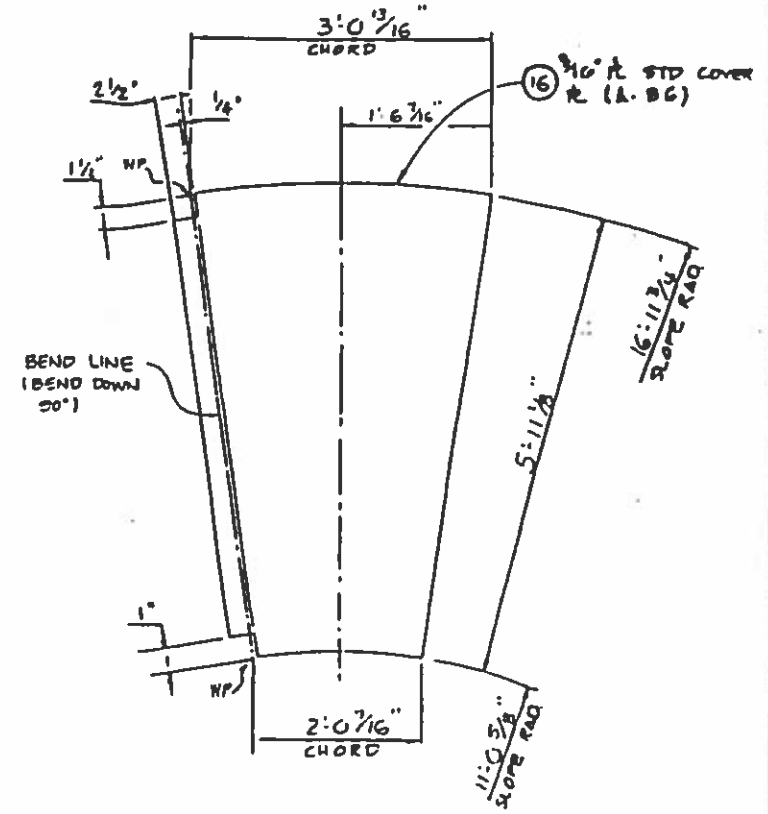
NO. W-92-2472A-11 REV. A



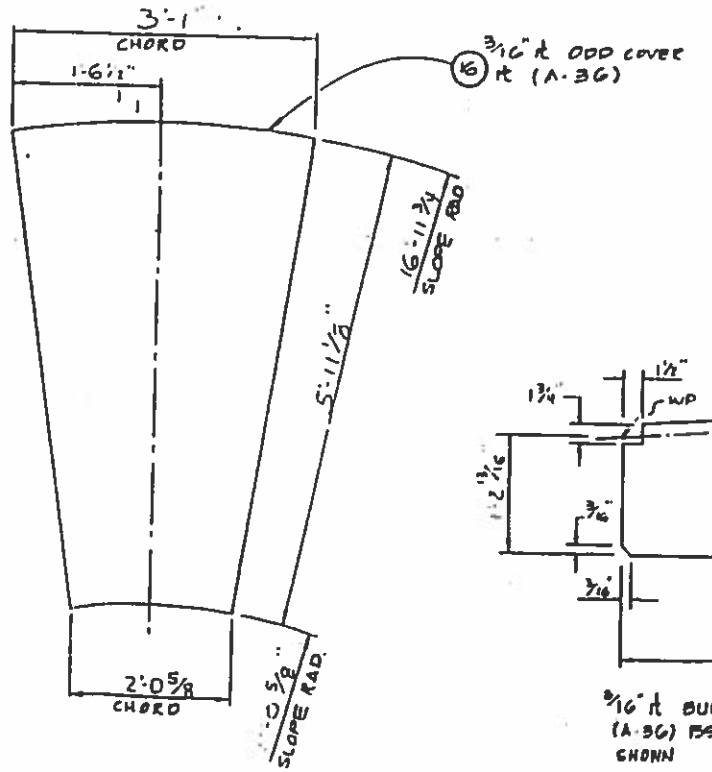
SECTION THRU PONTOON @ BULKHEAD
(TYP (9) PLACES)



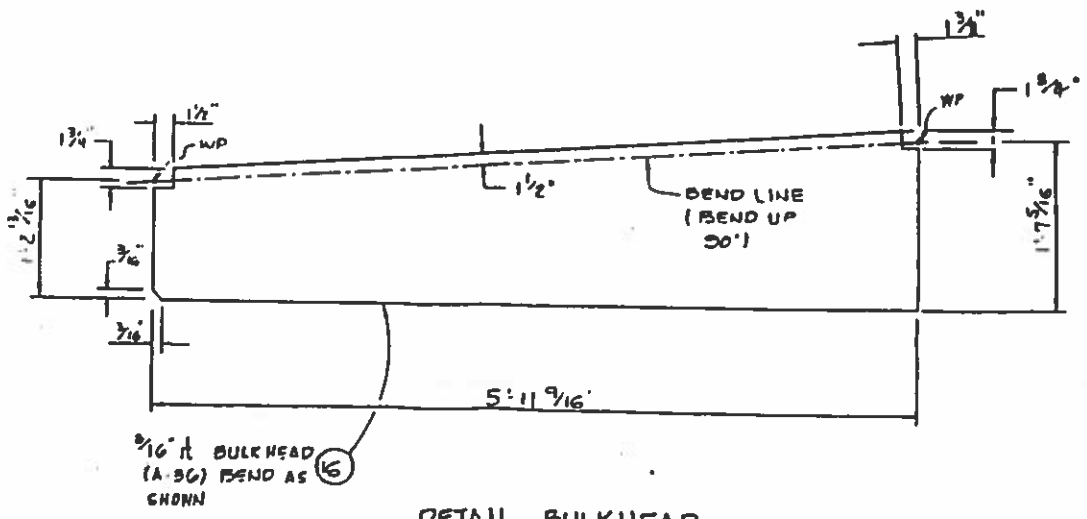
TYP COVER ℄ / BULKHEAD ARRANGEMENT



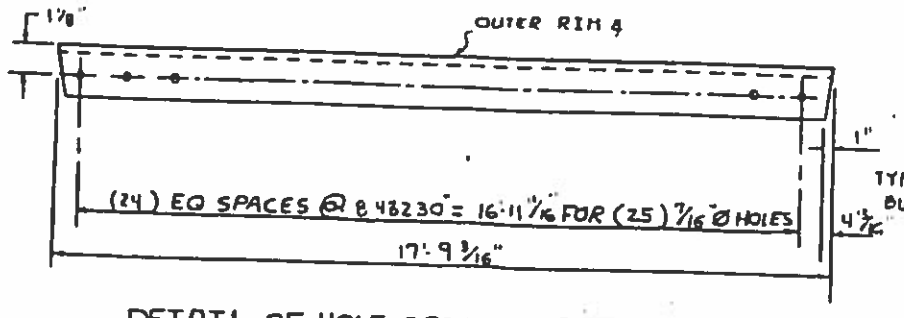
DT'L STD PONTOON COVER ℄
(27) REQ'D



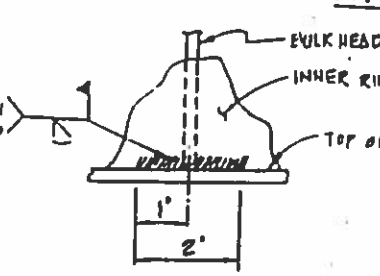
DT'L ODD PONTOON COVER ℄
(9) REQ'D



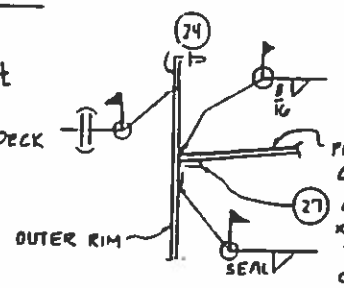
DETAIL BULKHEAD
(9) REQ'D



DETAIL OF HOLE SPACING @ OUTER RIM ∄



SECTION 'A-A'
(TYP WATER STOP @ BULKHEAD)



DETAIL "B"

NOTES

1. BULKHEADS ARE TO BE SEAL WELDED TO INSURE EACH PONTOON COMPARTMENT IS WATER TIGHT.
2. ALL WELDS TO BE 3/16" CONTINUOUS FILLET SEAL WELDS, UNLESS OTHERWISE NOTED.

A	REV. PER CUST. APPROVAL	1-27 93	JKH	CC
	REVISION			

S/O 2472A | TANK NO. TK-3455

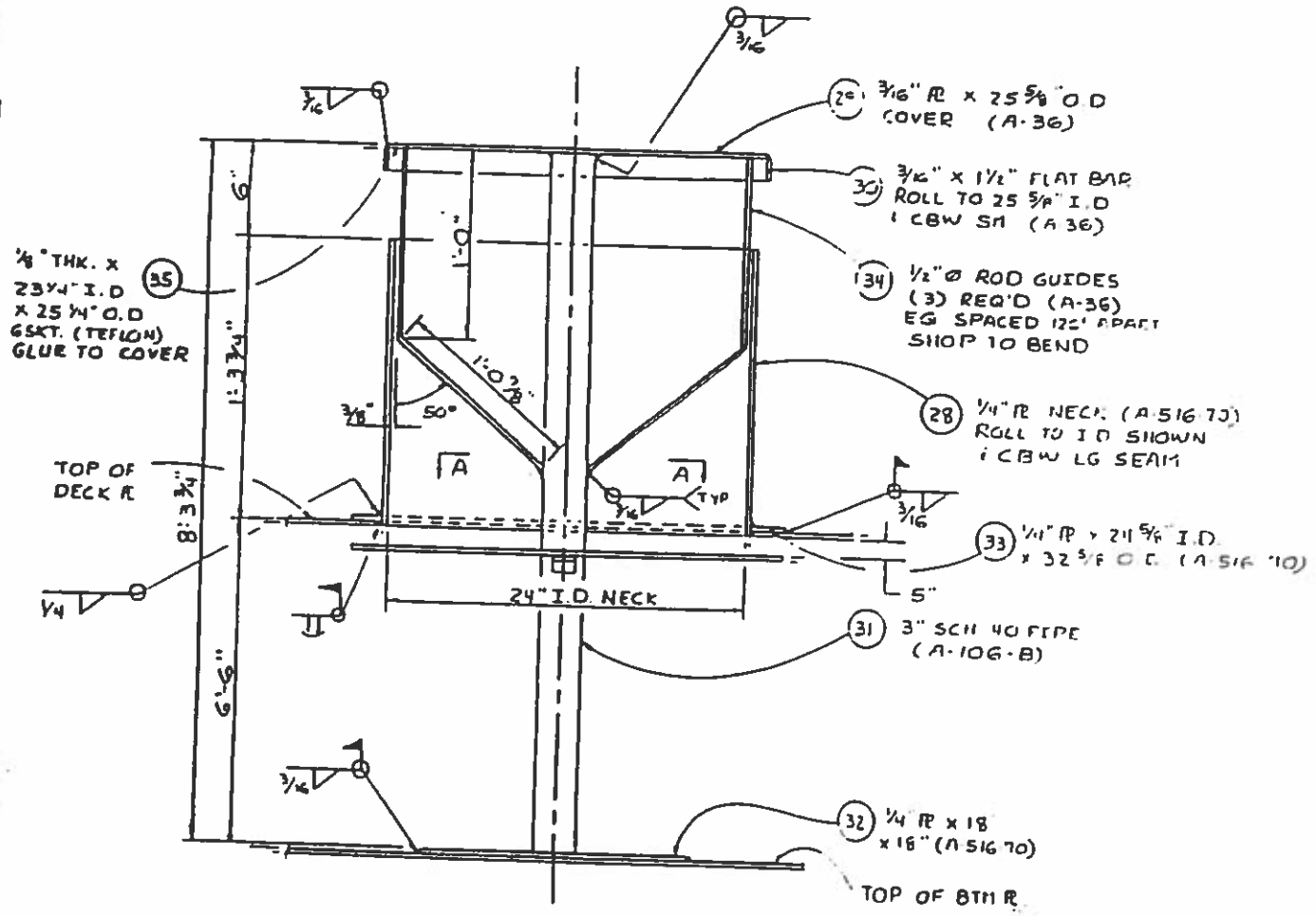
Wyatt WYATT FIELD SERVICE COMPANY

DETAIL FLOAT. ROOF PONTOON ASS'Y

CUSTOMER: LYONDELL PETROCHEMICAL

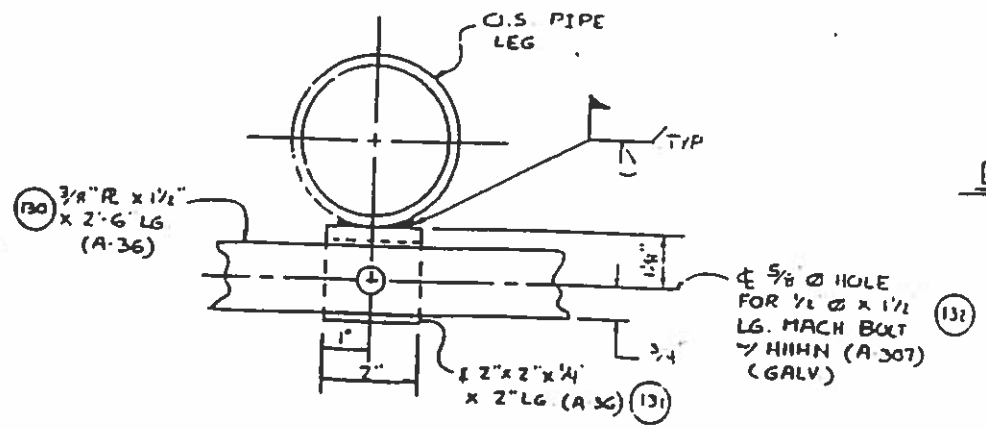
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CHECKED: C.C. APPROVED:

No W-92-2472A-12 REV. A

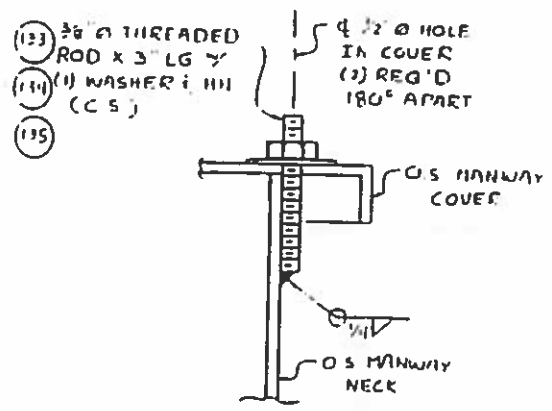


DETAIL 24" MANWAY / BLEEDER VENT

ONE ASSEMBLY REQ'D



VIEW "A-A"

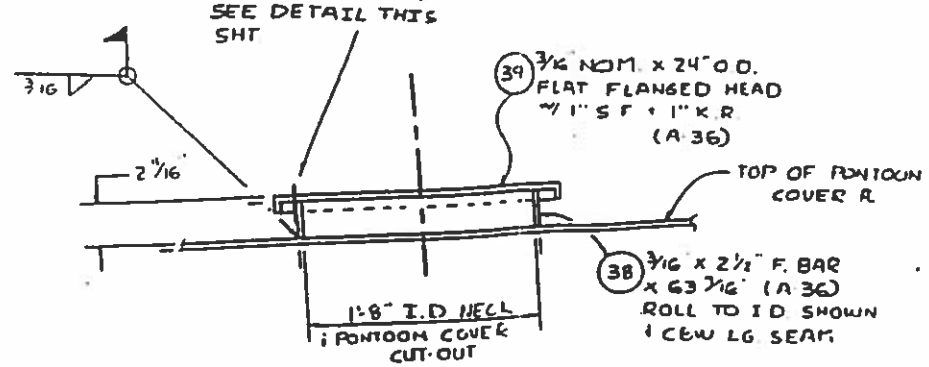


DETAIL HOLD DOWNS @ MANWAY

(2) REQ'D PER PONTOON IN W.

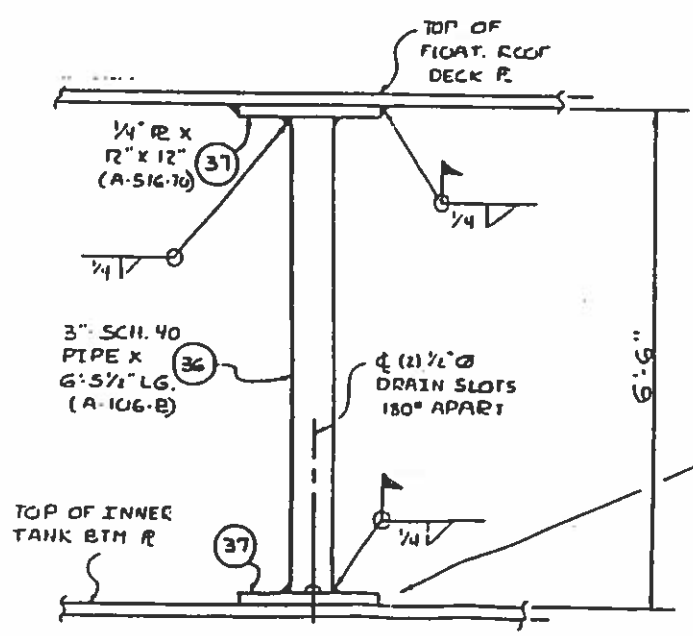
NOTE

FOR HOLD-DOWNS SEE DETAIL THIS SHT



DETAIL PONTOON MANWAY

ONE REQ'D PER PONTOON
(9) TOTAL REQUIRED



FIELD CAUTION

DO NOT WELD PAD TO INNER TANK BOTTOM

DETAIL DECK SUPPORT LEGS

(12) TOTAL REQ'D

A	REV. PER CUST. APPROVAL	1-29-93	JKH	CG.	
	REVISION				

S/O 2472 A | TANK NO. TK-3455

WYATT FIELD SERVICE COMPANY

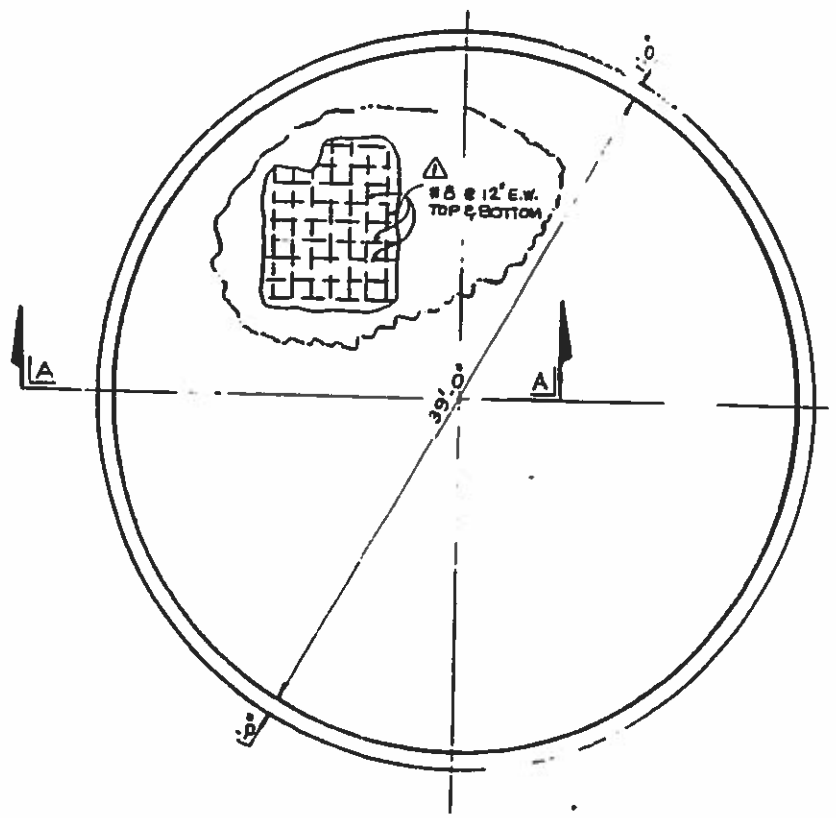
MISC. MODIFICATIONS FOR AN EXIST 40'-0" Ø x 32'-0" HIGH TANK

MISC. FLOAT ROOF COMPONENTS

CUSTOMER: LYONDELL PETROCHEMICAL

DRAWN: JKH DATE: 1-20-93
CHECKED: C.G. APPROVED:

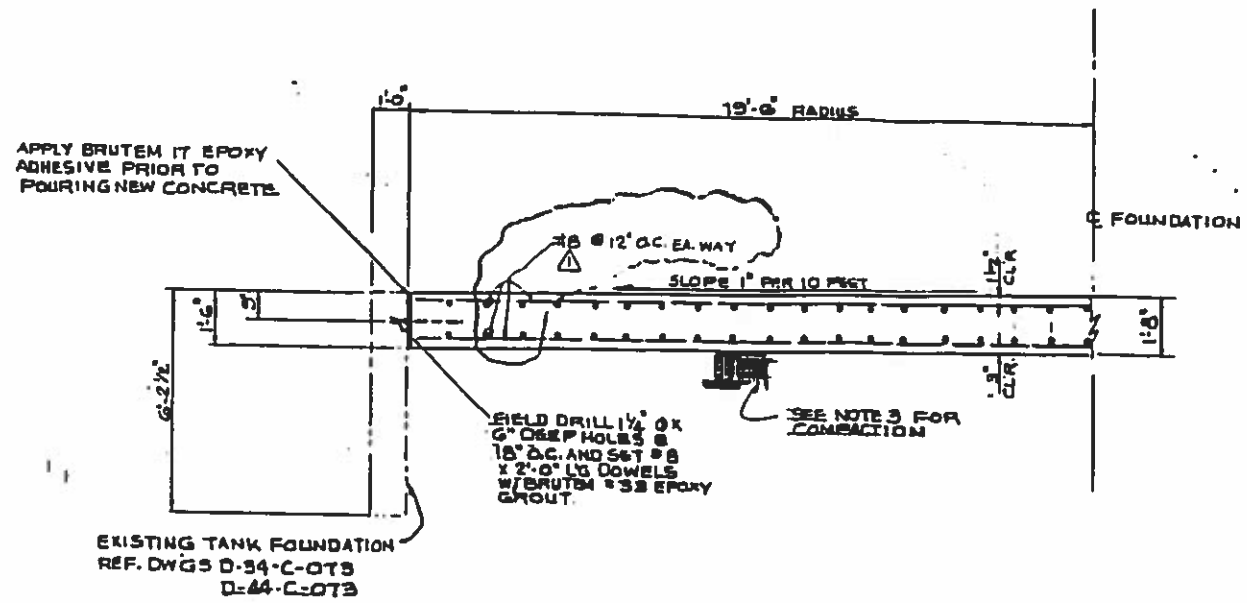
No. W-92-2472A-13 REV. A



PLAN

FOUNDATION FOR TK-3455 & TK-4455

SCALE: 3/16" = 1'-0"



SECTION "A-A"

SCALE: 3/16" = 1'-0"

NOTES:

1. CONCRETE SHALL BE 4000 PSI AT 28 DAYS. CONCRETE TO BE IN ACCORDANCE WITH ACI CODES 301 & 318
2. REINFORCING SHALL BE DEFORMED HIGH STRENGTH BARS, CONFORMING TO ASTM A615, GRADE 60
3. EXISTING SUBGRADE SHALL BE COMPACTED TO 95% OF MAXIMUM DRY DENSITY PER ASTM D1557
4. EXISTING CONCRETE SURFACE PREPARATION AND EPOXY APPLICATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

5. Acc

DWG. NO.	REFERENCE DRAWINGS
E-44-1-007	PLOT PLAN 4400 & 4700 AREAS
D-44-C-073	STORAGE TANK FOUNDATIONS
E-34-1-001	PLOT PLAN 3400 & 3700 AREAS
D-34-C-073	STORAGE TANK FOUNDATIONS

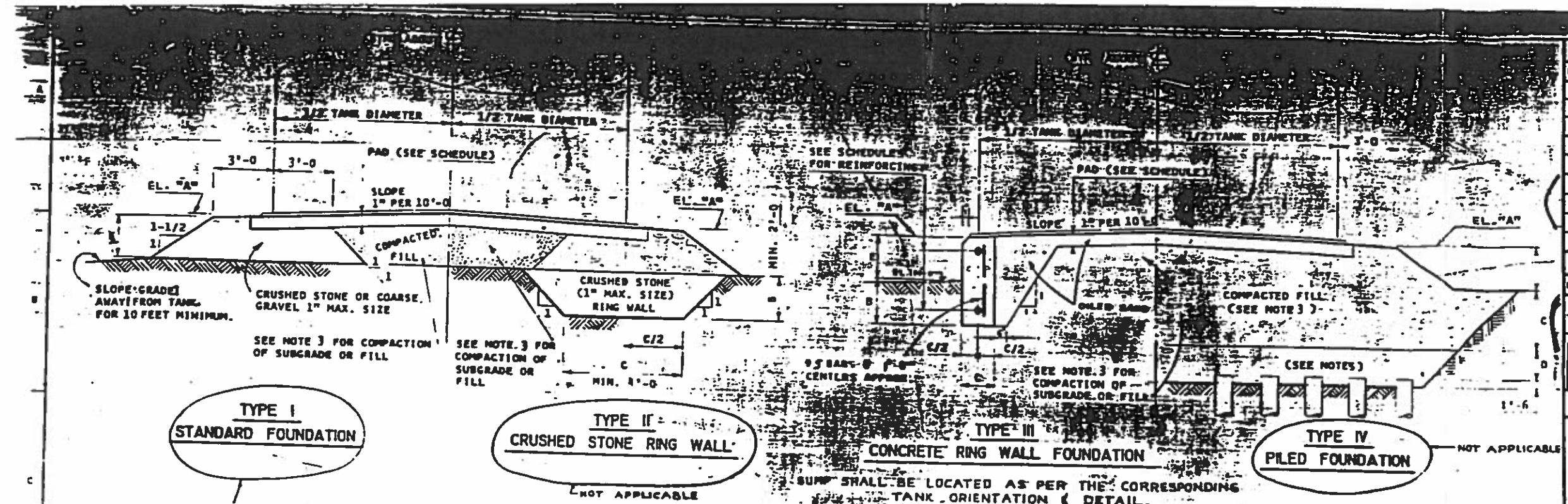
1 6-25-73 #10 DOWEL BARS FROM 9" T TO 14" B SJC

Lyondell Petrochemical Company

LOCATION: LYONDELL

TK-3455 & TK-4455
WASTE CAUSTIC SURGE TANK
FOUNDATION

DRWN SJC	DATE 12-12-72	SCALE AS SHOWN	DRAWING NUMBER E 34 C 127	REV. 1
CHK. MDB	DATE 1-11-73			



REV.	TANK DATA ITEM NO.	DIAMETER	HT.	℄ LOCATION COORD.	COORD.	FOUND. TYPE	ELEV. 'A'	B	C	D	E		PAD TYPE	PAD THICKNESS	REINFORCING	BERM PROTECTION (SEE NOTE 2)	QUANTITIES ASPHALT SEAL 1" TH'K	OILED SAND	CONCRETE RING WALL	FILL	CRUSHED STONE		REMARKS
	TK-3451	22'-0	22'-0	N1792	W1276	III	101'-1½"	5'-0	1'-3		1'-1½"		III	4"			S.Y.	15-2C.Y.	20-0 C.Y.	C.Y.	C.Y.		
A	TK-3453	40'-0	32'-0	N1792	W1207	III	101'-2½"	5'-0	1'-0		1'-2½"		III	4"				39-5 C.Y.	29.0 C.Y.				AFTER SETTLEMENT, EL. A' IS EXPECTED TO BE 101'-0"
B	TK-3459	21'-0	21'-0	N1792	W1248	III	101'-2"	5'-0	1'-0		1'-2"		III	4"				14-3 C.Y.	15.0 C.Y.				AFTER SETTLEMENT, EL. A' IS EXPECTED TO BE 101'-0"
A	TK-3701	18'-0"		N 1585-1	W 1030'	III	102'-0"	2'-6"	1'-0"		2'-0"		III	4"									SEE PLAN FOR A-B LOCATION
A																							ALLOW SPACE IN RING FDN. FOR DRAIN CONN. SEE CIVIL SPECIFICATION

LIST OF MATERIALS

REV.	QUANT.	UNIT	DESCRIPTION	REQ'MENTS
	----	S.Y.	ASPHALT SEAL 1" TH'K	
	69.0	C.Y.	OILED SAND	B & R
	64.0	C.Y.	CONCRETE-RING WALL	B & R
	5360	LBS	REINFORCING STEEL	T-7087-
	ALL	C.Y.	FILL COMPACTED	B & R
		C.Y.	CRUSHED STONE	
A	8	PCS.	12 B18 C 38 (ANCHOR BOLTS)	B & R

REFERENCE DRAWINGS

REV.	DRAWING NO.	TITLE
	E-34-L-007-2	PLOT PLAN 3400 & 3700 ARE
A	41-133	ANCHOR BOLT STANDARD

APPROX. QUANTITY OF REBARS REQ'D.

MARK NO.	SIZE	2	3	4	5	6	7	8	9	10	11	TOTAL
	7'8"				1670	1410		2280				5360

GENERAL NOTES

PAD TYPES – (THICKNESS AS SHOWN IN SCHEDULE MINIMUM 3 INCHES)

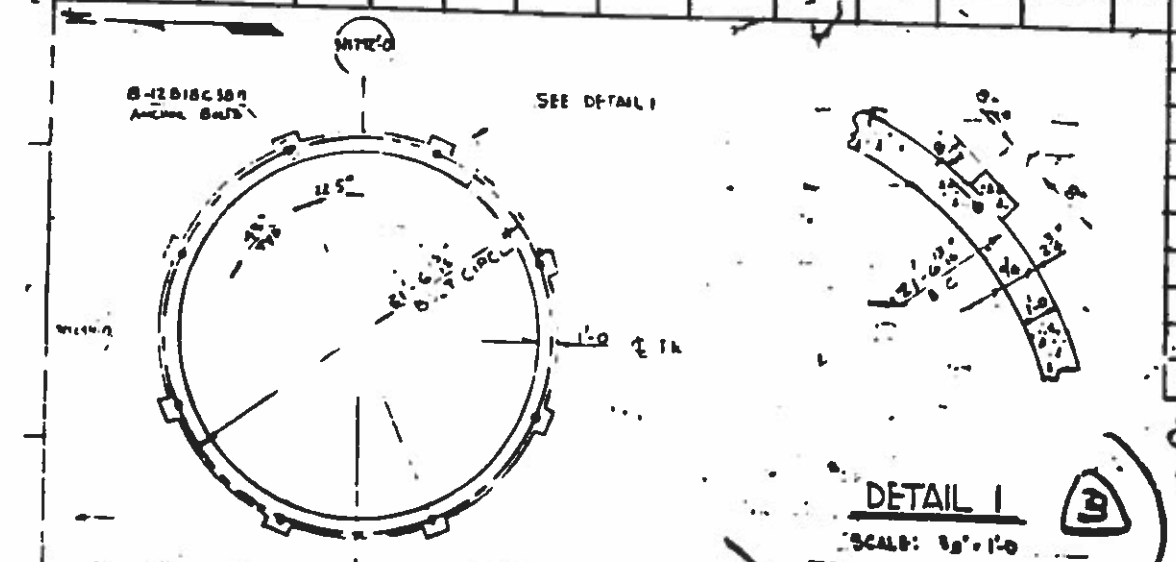
SAND & GRAVEL – COMPACTED CLEAN SAND, FINE GRAVEL SCREENINGS, CRUSHED STONE, OR SIMIL MATERIAL, NOT OVER 1 INCH MAXIMUM S FILL SURFACE VOIDS WITH FINES AND S LIGHTLY WITH OIL.

OILED SAND – CLEAN, COMMERCIAL SILICA SAND MIXED WITH A LOW CORROSIVITY OIL SUCH AS BUNKER "C" OR RAILROAD FUEL OIL. DETERMINE MIX BY TRIAL. COMPACT THOROUGHLY. ASPHALT EMULSIONS MAY BE SUBSTITUTED FOR OILED SAND PADS

NOTE 1 – SEE ENGINEERING SPECIFICATIONS FOR FOUNDATIONS & MISC. CIVIL CONSTRUCTION TOGETHER WITH SPECIFIC JOB REQUIREMENT

NOTE 2 – WHERE CALLED FOR IN THE SCHEDULE, CRUSHE STONE OR GRAVEL BEYOND THE TANK SHELL SHALL BE COVERED WITH A 1 INCH LAYI OF SAND-ASPHALT EXTENDING FROM THE OUTER TOE OF THE SLOPE TO 6 INCHES INSIDE THE SHELL. INSTALL AFTER TANK HAS BEEN WATE TESTED AND DRAINED.

NOTE 3 – COMPACTION OF SUBGRADE OR FILL. THE AREA OF THE TANK SHALL BE EXCA TO A DEPTH OF THREE FEET AND EXCAVATIONS EXTEND AT LEAST THREE FEET BEYOND THE TANK THE EXCAVATED AREA SHALL BE REPLACED WITH OR SAND SHELL FILL COMPACTED TO AT LEAST 90 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED AASHO TEST



ARCO CHEMICAL COMPANY
OLEFINS PROJECT
CHANNELVIEW, TEXAS — LUMMUS JOB NO. T
SUB JOB NO. T 7081 — CRACKING & QUENCH & TREATING — AREA

MARK	DESCRIPTION	BY	CHK	APP'D	DATE
A	ADDED TANK 3701	LAS			
A	ADDED CONC. FIREWALL, R.A.B., LOCATION FOR TK 3459	LAS			
A	REVISED EL. 'A' FOR TK 3459				
A	REVISED WEST COORD FOR ALL TANKS				
A	APPROVED FOR CONSTRUCTION	GN			

LUMMUS ELEVATION 100'-0" EQUALS PLANT ELEVATION 100'-0". PLANT ELEVATION SHALL BE BASED ON MONUMENT AT LOCATION N 0 + 30 AND W 20 + 62, DESIGNATED STAMPED ELEVATION 100.00'. USE CORRECT ELEVATION VALUE.

COORDINATE SYSTEM FOR THIS DRAWING BASED ON LUMMUS COORDINATES UNLESS NOTED OTHERWISE.

THE LUMMUS COMPANY
ELIZABETH, N. J.
LUMMUS JOB 102 CONTRACT ORDER

STORAGE TANK FOUNDATION
TANKS TK-34[illegible]

SCALE: NONE — DWG. NO. T7081-B-14-C-[illegible]

WYATT FIELD SERVICE COMPANY
P.O. BOX 3052 • HOUSTON, TEXAS 77253-3052
713/956-2020

(2)

Prepared by M. KOPECKY Date 1/6/93
Checked by P.V.B. Date 1-14-93
OMER LYONDELL
REFERENCE ITEM T-3455, T-4455 JOB NO 2472
SHEET 18 OF

COMBINED INNER AND OUTER TANK WEIGHTS

5. SHELL WEIGHTS

MAXIMUM WEIGHT OF SHELL

OUTER TANK	- Ws1	= 51,566 #
INNER TANK AND ROOF	- Ws1a	= +64,284
ROOF WT. ON SHELL	- Wr1.	= -10,940
Ws1 + Ws1a - Wr1	- Ws2	= 104,910 #

MINIMUM WEIGHT OF SHELL (ANCHOR BOLTS)

TANK SHELL	- Ws1	= 51,566 #
ROOF WT. ON SHELL	- Wr1	= 0
SHELL CORROSION	- Ws3	= 12,818
Ws1 - Wr1 - Ws3	- Ws4	= 38,748 #

6. TANK FOUNDATION LOADS

MAX. TANK COMPRESSION WITH ROOF LIVE LOAD + WIND

$P1 = [(Wr4 + Ws2) / \pi D] + w/w$

$= [(42,850 + 104,910) / \pi(40)] + 731$

$= 1176 + 731$

$= 1907$ LB / FT.

MAX. TANK UP LIFT

$P2 = [(Wr6 + Ws4) / \pi D] - Ww$

$= [(32,670 + 38,748) / \pi(40)] - 731$

$= 48 - 731$

$= -683$ LB / FT.

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713/956-2020

(2)

Prepared by M. KOPECKY Date 1/6/93
Checked by P.N.B Date 1-14-93
CUSTOMER LYONDELL
REFERENCE ITEM T-3455, T-4455 JOB NO. 2472
SHEET 9 OF

MAX. TANK COMPRESSION WITH ROOF LIVE LOAD

$P3 = [(W_{r4} + W_{s2}) / \pi D]$

$= [(42,850 + 104,910) / \pi(40)]$

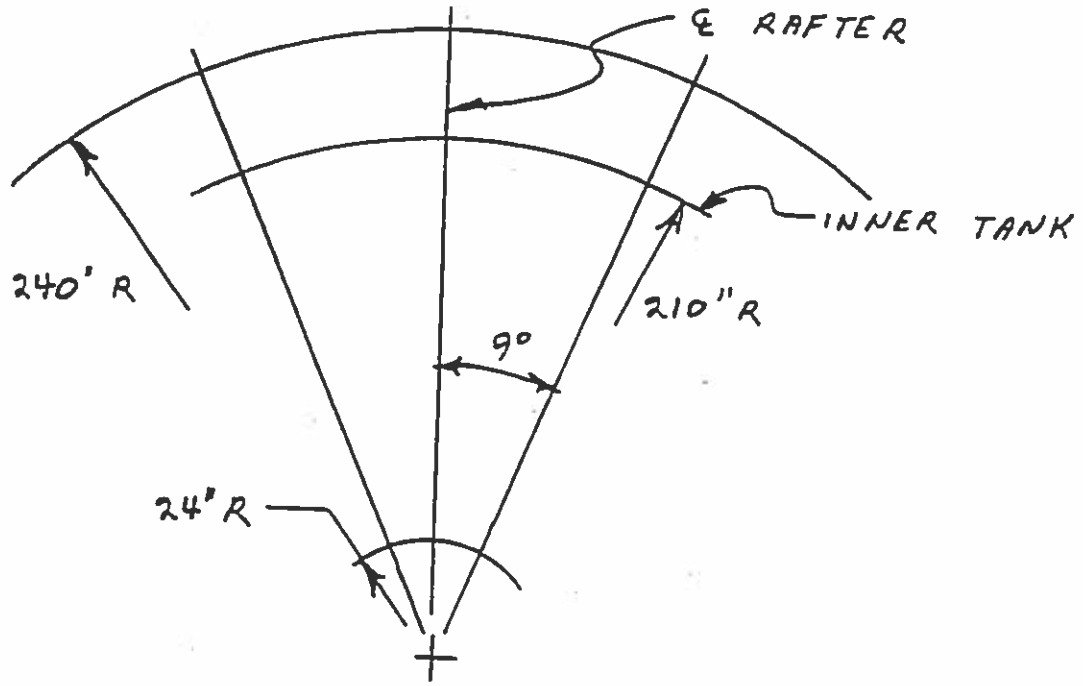
$= 1176$ LB / FT.

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713/956-2020

(2)

Prepared by M. KOPECKY Date 2/4/93
Checked by P.N.B Date 2-8-93
CUSTOMER LYONDELL
REFERENCE ITEM T-3455, T-4455 JOB NO. 2472
SHEET 20 OF

ROOF SUPPORT CALCULATIONS:



LOAD

EXTERNAL	-	9.10 LB/FT²	
DEAD	-	10.20 LB/FT²	
LIVE	-	25.00 LB/FT²	
TOTAL	-	44.30 LB/FT²	= 0.31 LB/IN²

BEAM - 10.50 LB/FT = 0.88 LB/IN.

$W_1 = 2R \sin\theta = 2(24) \sin 9° = 7.51$ IN.
$W_2 = 2R \sin\theta = 2(240) \sin 9° = 75.09$ IN.

BEAM LOADS

$F_1 = (0.31)(7.51) + 0.88 = 3.21$ LB/IN.
$F_2 = (0.31)(75.09) + 0.88 = 24.16$ LB/IN.

Company: Lyondell Petrochemical Co. File: 2472
Job Description: Item T-3455, T-4455 API-650

SBEAM (1.000) - Calculates the shear, moment, slope and deflection of a simply supported beam under various loading conditions

1. Beam Data:

Modulus of elasticity		- E	=	28800000	psi		
Moment of inertia		- I	=	9.2000	inch^4		
Length of span		- L	=	186.0000	inch		
Reaction at x =	0.0000 inch	- R1	=	802	pounds		
Reaction at x =	186.0000 inch	- R2	=	2154	pounds		
Maximum shear load		- V	=	1434	pounds	at	184.1400 inches
Maximum moment load		- M	=	47946	in.-lb.	at	108.4400 inches
Maximum deflection		- D	=	0.634148	inches	at	94.8600 inches

2. Beam Concentrated Loads:

Load Number	Amount pounds	Location inch
1	0.0000	0.0000
2	0.0000	0.0000
3	0.0000	0.0000
4	0.0000	0.0000
5	0.0000	0.0000
6	0.0000	0.0000
7	0.0000	0.0000
8	0.0000	0.0000
9	0.0000	0.0000

3. Beam Distributed Loads:

Load Number	Starting Amount pounds	Ending Amount pounds	Starting Location inch	Ending Location inch
1	3.2100	24.1600	0.0000	216.0000
2	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000	0.0000

4. Loads in Beam:

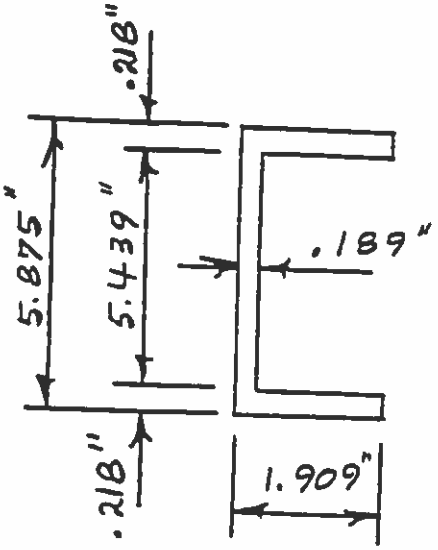
	Location inch x	Load pounds F	Shear pounds V	Moment in.-lb. M	Slope S	Deflec. D
COLUMN	0.0000	802	802	0	0.000000	0.000000
	18.6000	-9	725	14251	-0.010036	-0.192943
	37.2000	-13	615	26768	-0.008585	-0.367471
	55.8000	-16	472	36926	-0.006334	-0.507310
	74.4000	-19	294	44101	-0.003471	-0.599265
	93.0000	-23	84	47669	-0.000227	-0.634038
	111.6000	-26	-161	47006	0.003122	-0.607039
	130.2000	-29	-438	41487	0.006258	-0.519203
	148.8000	-33	-750	30489	0.008818	-0.377804
	167.4000	-36	-1095	13388	0.010396	-0.197273
CLIP	186.0000	2115	681	-10441	0.010540	-0.000008

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12

Prepared by M. KOPECKY Date 1/6/93
Checked by P.N.S Date 1-14-93
CUSTOMER LYONDELL
REFERENCE ITEM T-3455, T-4455 JOB NO 2472
SHEET 21 OF

PROPERTIES OF C6x10.50 WITH 1/16" CORROSION ON EACH SURFACE



$A = 1.86 \text{ IN}^2$
$I = 9.20 \text{ IN}^4$
$Z = 3.13 \text{ IN}^3$

$$S = \frac{M}{Z} = \frac{47,946}{3.13} = 15,318 \leq 20,000 \text{ PSI}$$

CHECK CENTER COLUMN PER API-650, 3.10.3.3.
8" X-STG PIPE WITH 1/16" CORROSION
$R_o = 4.25 \text{ IN.}$
$R_i = 3.8125 \text{ IN.}$
$t = 0.4375 \text{ IN.}$

$$I = \pi/4 (R_o^4 - R_i^4) = \pi/4 [(4.25)^4 - (3.8125)^4] = 90.31 \text{ IN}^4$$

$$A = \pi (R_o^2 - R_i^2) = \pi [(4.25)^2 - (3.8125)^2] = 11.08 \text{ IN}^4$$

$$r = \sqrt{\frac{I}{A}} = \sqrt{\frac{90.31}{11.08}} = 2.85 \text{ IN.}$$

$$\frac{t}{R_o} = \frac{.4375}{4.25} = 0.1029, \quad Y = 1.00$$

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12

Prepared by M. KOPECKY Date 1/6/93
Checked by P.N.B Date 1-14-93
CUSTOMER LYONDELL
REFERENCE ITEM T-3455, T-4455 JOB NO. 2472
SHEET 22 OF

SHELL ROOF BOTTOM

$$L = 40(12) + \frac{3}{12}\left(\frac{40}{2}\right)(12) - \frac{.1}{12}\left(\frac{40}{2}\right)(12)$$
$$= 480 + 60 - 2$$
$$= 538 \text{ INCH}$$

$$\frac{L}{r} = \frac{538}{2.85} = 189$$

$$Cm_e = \frac{149,000,000\ Y}{(L/r)^2[1.6 - (L/200r)]}$$
$$= \frac{149,000,000\ (1.00)}{(189)^2[1.6 - (189/200)]}$$
$$= 6369 \text{ PSI}$$

$F = \pi(24)^2(0.31) + 20(802) = 16,601$ LBS.

ROOF MAX. LOAD -	16,601 LBS.
PIPE & MISC. WT. -	2500
TOTAL	19,101 LBS.

$$S_c = \frac{F}{A} = \frac{19,101}{11.08} = 1724 \leq 6369 \text{ PSI}$$

LOAD ON SHELL (MINIMUM)

LOAD = 10.20 LB/FT^2 = 0.07 LB/IN^2

$F_2 = (0.07)(75.09) + 0.88 = 6.14$ LB/IN

$$R = \left(\frac{6.14}{24.16}\right)(2154) = 547 \text{ LBS.}$$

WT = 20(547) = 10,940 LBS. (ON INNER TANK)

Wyatt

WYATT FIELD SERVICE COMPANY

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TELECOMMUNICATION – PLEASE DELIVER TO:

NAME: PAT McDANIEL OFFICE: LYONDELL

FAX NUMBER: 452-8825 TOTAL PAGES: 1 DATE: 1-28-93

REFERENCE:

WEIGHT OF TANK W/NO CONTENTS.

OUTER TANK – 86000 #

INNER TANK – 66,000 #

GRATING – 21,600 #

FLOAT ROOF – 28,000 #

201,600 # TOTAL WT. ON FOUNDATION.

EXTERNAL TANK WILL NOT STAND .75" WC EXTERNAL PRESSURE DUE TO RAFTER CORROSION ALLOWANCE OF 1/16" ALL SIDES. WILL STAND 1" WC W/ 1/16" TOTAL CORROSION.

CC:

Henry Dalton
SIGNED

IF YOU DO NOT RECEIVE ALL THE PAGES,

PLEASE CALL BACK AS SOON AS POSSIBLE TO: (713)956-2020 – FAX 692-1558

By: M.J.K 2/ 4/93.11:54A Wyatt Field Service Co. Sheet No. 1
Chkd. By: [illegible] Date: 2-8-93 Houston, Texas Job No.: 2472

Company: Lyondell Petrochemical Company
Job Description: Item T-3455, T-4455

File: 2472

1. Summary of Revisions:

Rev.	By	Date	Pages	Description
0	M.J.K.	01/06/93	1 - 22	Tank Calculations
1	M.J.K.	01/22/93	1 - 2	Revised design pressure to 5" W.C.
			4 - 5	Revised anchor bolt chair design
			7 - 13A	Revised maximum liquid height to 31'
			16 - 17	Added normal floating depth of pontoon
2	M.J.K.	02/04/93	1 - 3	Revised external pressure to 1.75" W.C.
			8 - 22	Moved outer rafter supports to inner tank

2. Summary of Calculations:

Revision and Summary Sheet	1
Tank Data Sketches	2 - 3
Outer tank data sheet	
Detail of cone roof supports	
Detail of double tank bottom	
Detail of anchor bolt chairs	
Inner tank data sheet	
Detail of inner tank pontoon	
Outer Tank Calculations	8 - 11
Summary of material and thicknesses	
Minimum shell thickness calculations	
Shell stability for wind	
Tank wind shear and moment	
Tank weights	
Tank anchor bolt calculations	
Anchor bolt chair calculations	12 - 13A
Inner Tank Calculations	14 - 15
Summary of material and thicknesses	
Minimum shell thickness calculations	
Tank weights	
Foundation loading calculations	16 - 19
Tank roof and center column design	20 - 22

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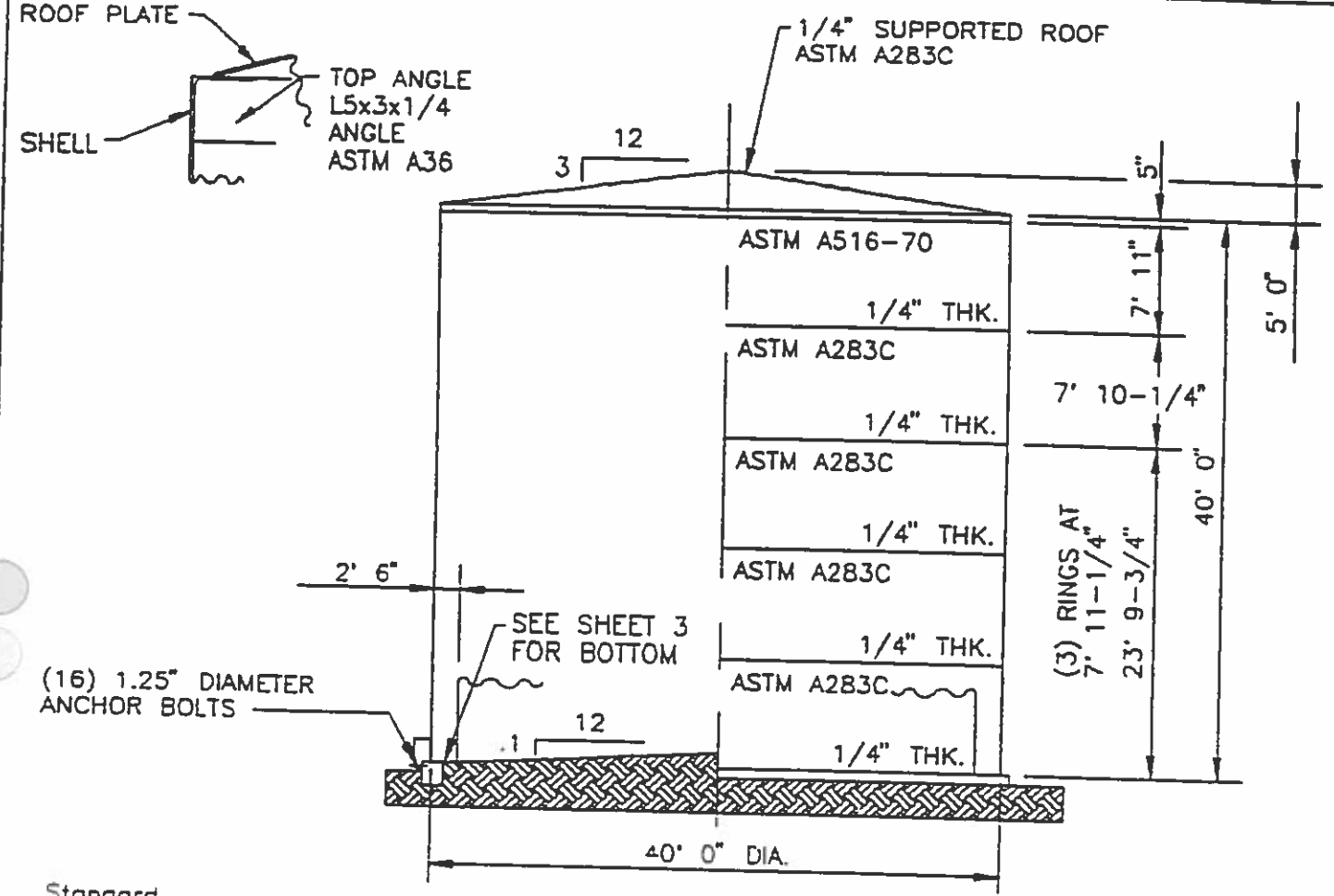
713/956-2020

Prepared by M. KOPECKY Date 02/03/93

Checked by P.V.B. Date 2-5-93

STOMER LYONDELL PETROCHEMICAL COMPANY JOB NO. 2472

REFERENCE ITEM T-3455, T-4455 (EXTERNAL TANK) SHEET 2



Standard	API-650, APPENDIX A, F	Roof Type	SUPPORTED CONE ROOF
Material – Pl	ASTM A283C, A516-70	Floater Type	NONE
– Str	ASTM A36	Bottom Type	DOUBLE SLOPED TO OUTSIDE
Product / S.G.	CAUSTIC / 1.05	Design Pressure	
Allowable Stress	21,000 PSI	Internal	5" W.C.
Joint Efficiency	0.85	External	1.75" W.C.
Corrosion Allowance		Operating	ATMOSPHERIC
Shell	.0625" ADDED TO DESIGN THK.	Wind Load	110 MPH
Roof	.0625" ADDED TO DESIGN THK.	Seismic Req.	ZONE 0
Bottom	.0625" ADDED TO MIN. THK.	Design Metal Temp. Low	12 DEG. F.
Radiography	PER A.S.3.	High	170 DEG. F.
		Anchorage	(16) 1.25" DIAMETER BOLTS
		Hydro-test in accordance with para. F.4.4.	
		* MAX. FILL HEIGHT = 31.00 FT.	

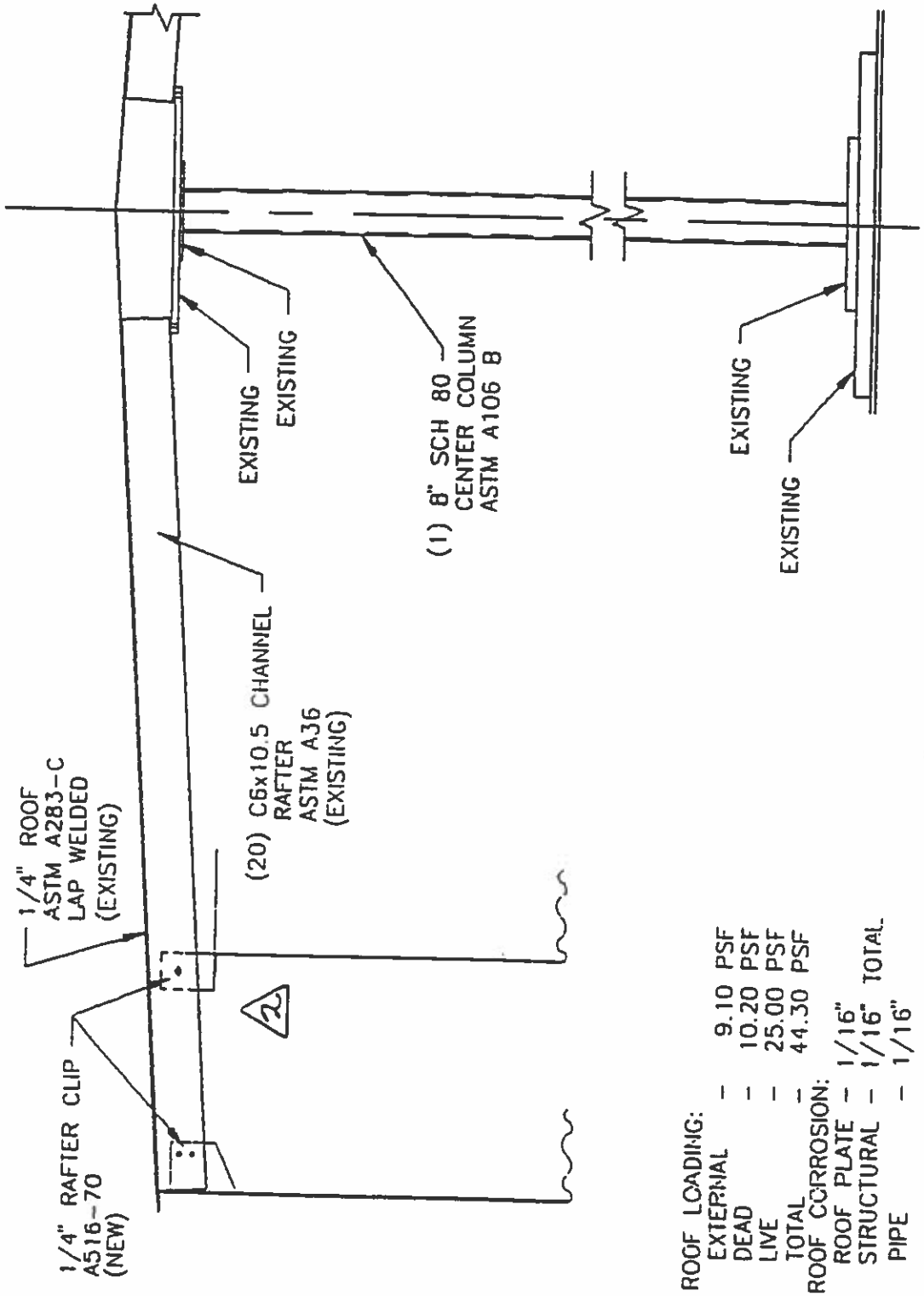
SCALE: NONE

WYATT FIELD SERVICE COMPANY
P.O. BOX 3052 • HOUSTON, TEXAS 77253-3052
713/956-2020

Prepared by M. KOPECKY Date 02/03/93
Checked by P.N.B Date 2-8-93

TOWER LYONDELL PETROCHEMICAL COMPANY JOB NO. 2472
REFERENCE ITEM T-3455, T-4455 SHEET 3

DETAIL OF CONE ROOF SUPPORTS



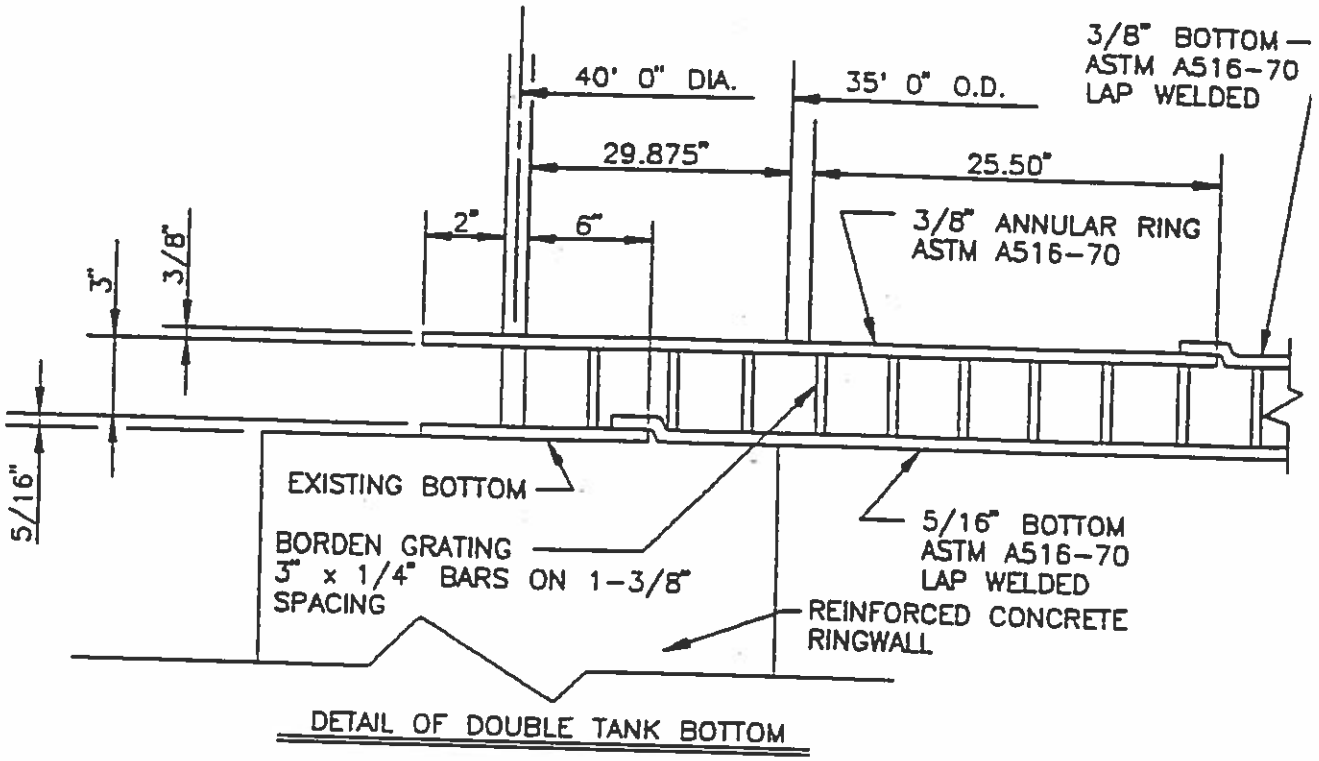
ROOF LOADING:
EXTERNAL – 9.10 PSF
DEAD – 10.20 PSF
LIVE – 25.00 PSF
TOTAL – 44.30 PSF

ROOF CORROSION:
ROOF PLATE – 1/16"
STRUCTURAL – 1/16" TOTAL
PIPE – 1/16"

WYATT FIELD SERVICE COMPANY
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713/956-2020

Prepared by M. KOPECKY Date 01/21/93
Checked by PNB SHL Date 1/22/93

CUSTOMER LYONDELL PETROCHEMICAL COMPANY
REFERENCE ITEM T-3455, T-4455 (EXTERNAL TANK)
JOB NO. 2472
SHEET 4



DETAIL OF DOUBLE TANK BOTTOM

SCALE: NONE

WYATT FIELD SERVICE COMPANY

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713/956-2020

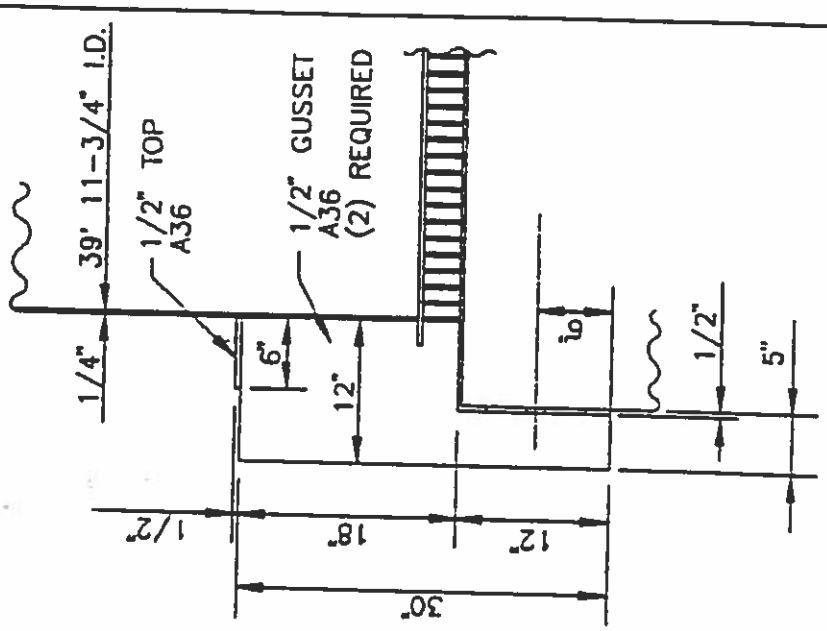
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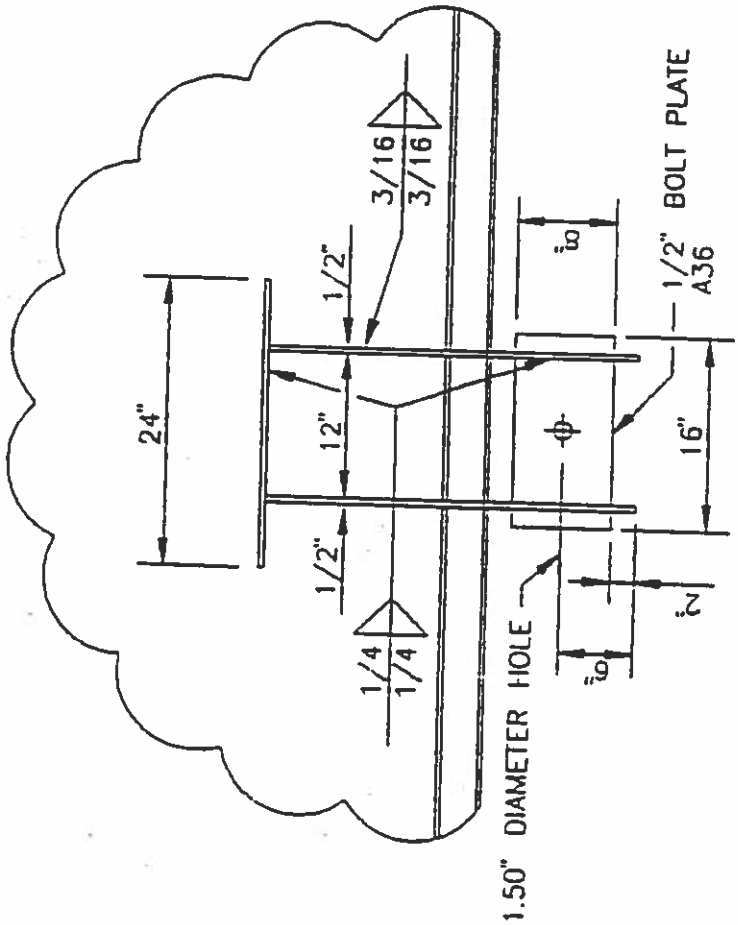
Prepared by M. KOPECKY Date 01/22/93

Checked by PNB JAK Date 1/22/93

CUSTOMER LYONDELL PETROCHEMICAL COMPANY JOB NO. 2472

REFERENCE ITEM T-3455, T-4455 (EXTERNAL TANK) SHEET 4A





DETAIL OF ANCHOR BOLT CHAIRS (16) REQUIRED

SCALE

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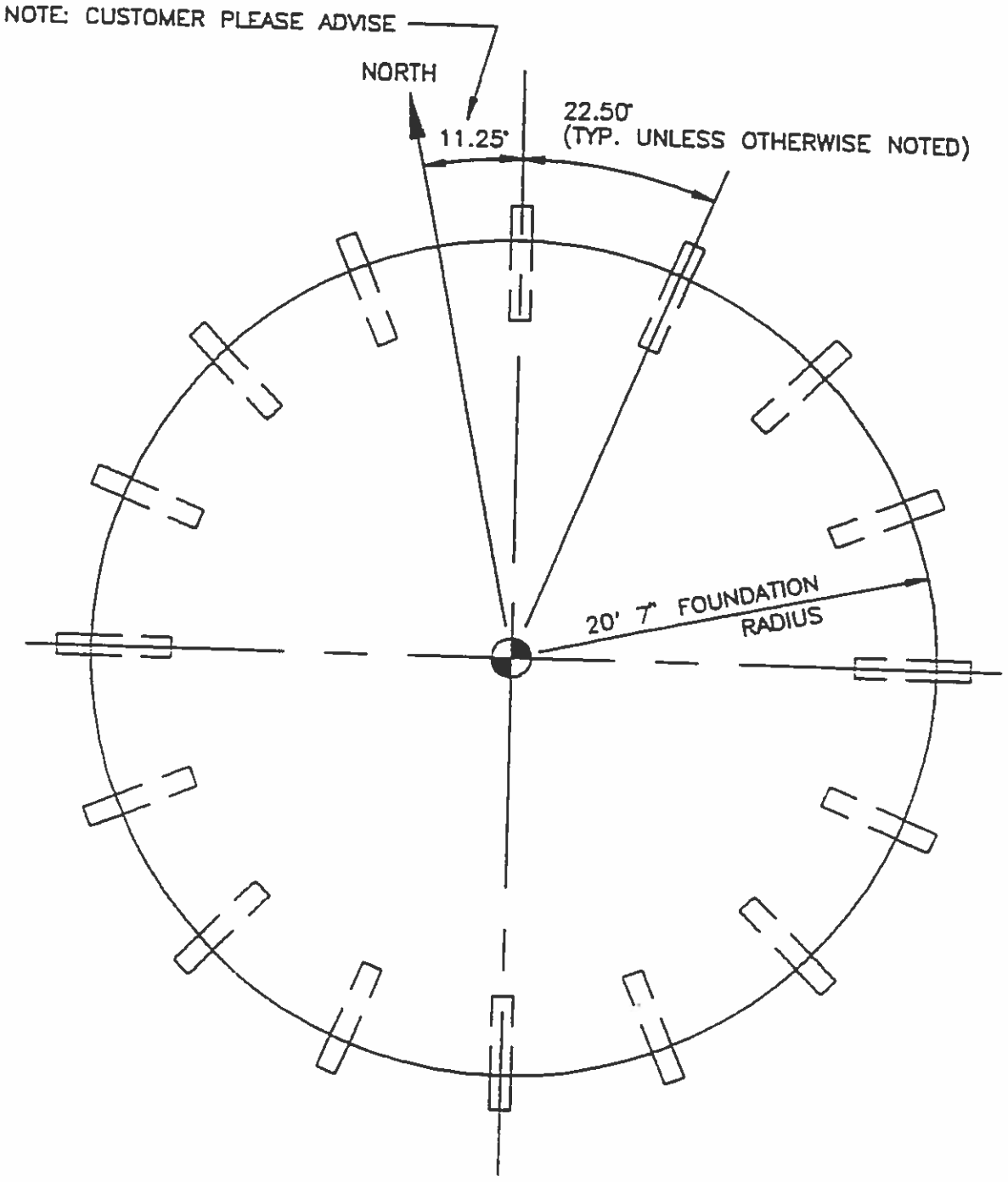
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Prepared by M. KOPECKY Date 01/22/93

Checked by PNB MK Date 1/22/93

STOMER LYONDELL PETROCHEMICAL COMPANY JOB NO. 2472

REFERENCE ITEM T-3455, T-4455 (EXTERNAL TANK) SHEET 5



TANK ANCHOR BOLT LAYOUT

SCALE

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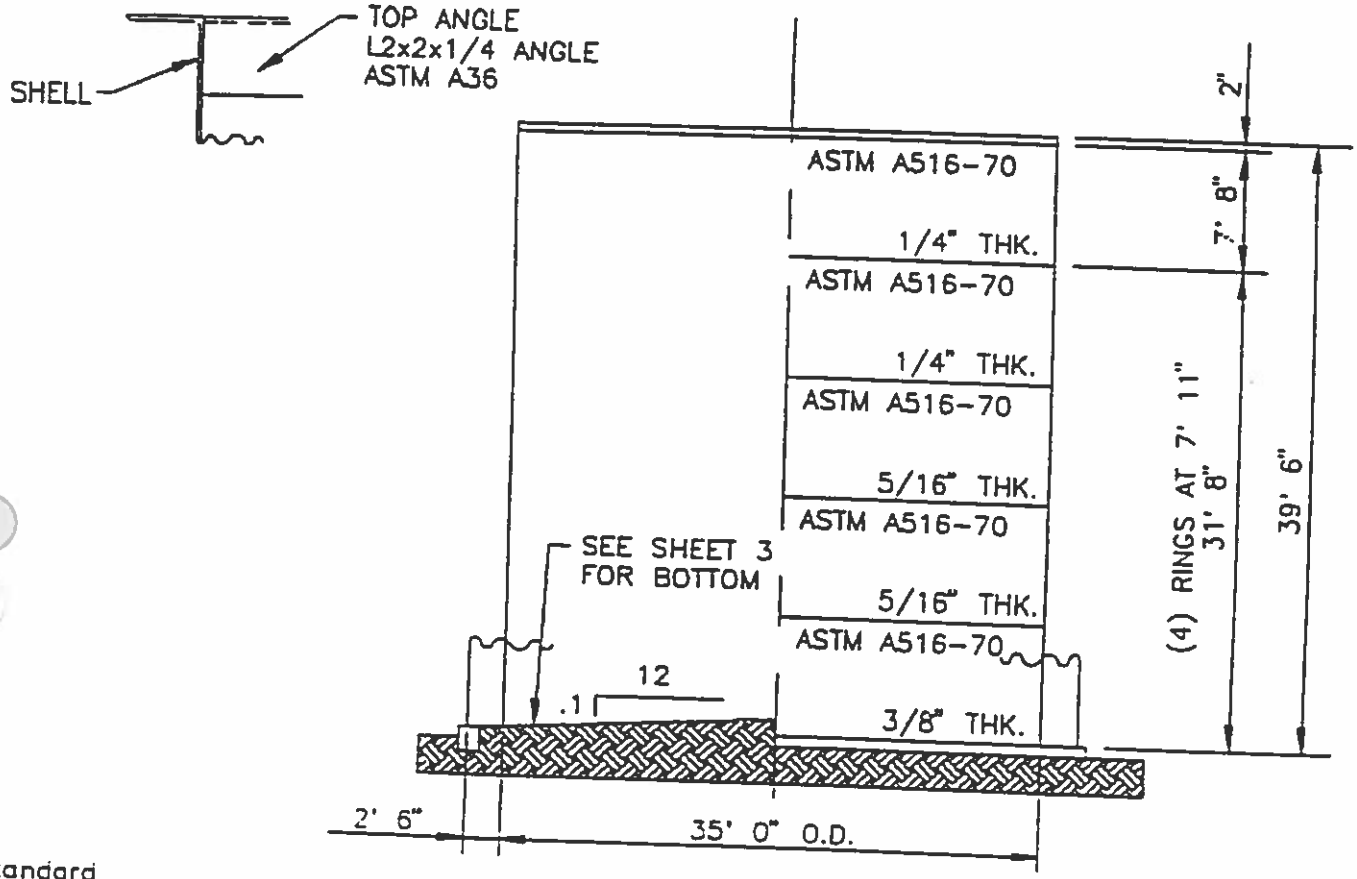
713/956-2020

Prepared by M. KOPECKY Date 01/13/93

Checked by P.V.B Date 1-14-93

MER LYONDELL PETROCHEMICAL COMPANY JOB NO. 2472

REFERENCE ITEM T-3455, T-4455 (INTERNAL TANK) SHEET 6



Standard API-650, APPENDIX A, H

Material - Pl ASTM A516-70

- Str ASTM A36

Product / S.G. CAUSTIC / 1.05

Allowable Stress 21,000 PSI

Joint Efficiency 0.85

Corrosion Allowance

Shell .1250" ADDED TO DESIGN THK.

N/A

ttom .1250" ADDED TO MIN. THK.

Radiography PER A.5.3.

Roof Type NONE

Floater Type PONTOON

Bottom Type DOUBLE SLOPED TO OUTSIDE

Design Pressure

Internal ATMOSPHERIC

External ATMOSPHERIC

Operating ATMOSPHERIC

Wind Load 110 MPH

Seismic Req. ZONE 0

Design Metal Temp. Low 12 DEG. F.

High 170 DEG. F.

Anchorage NONE

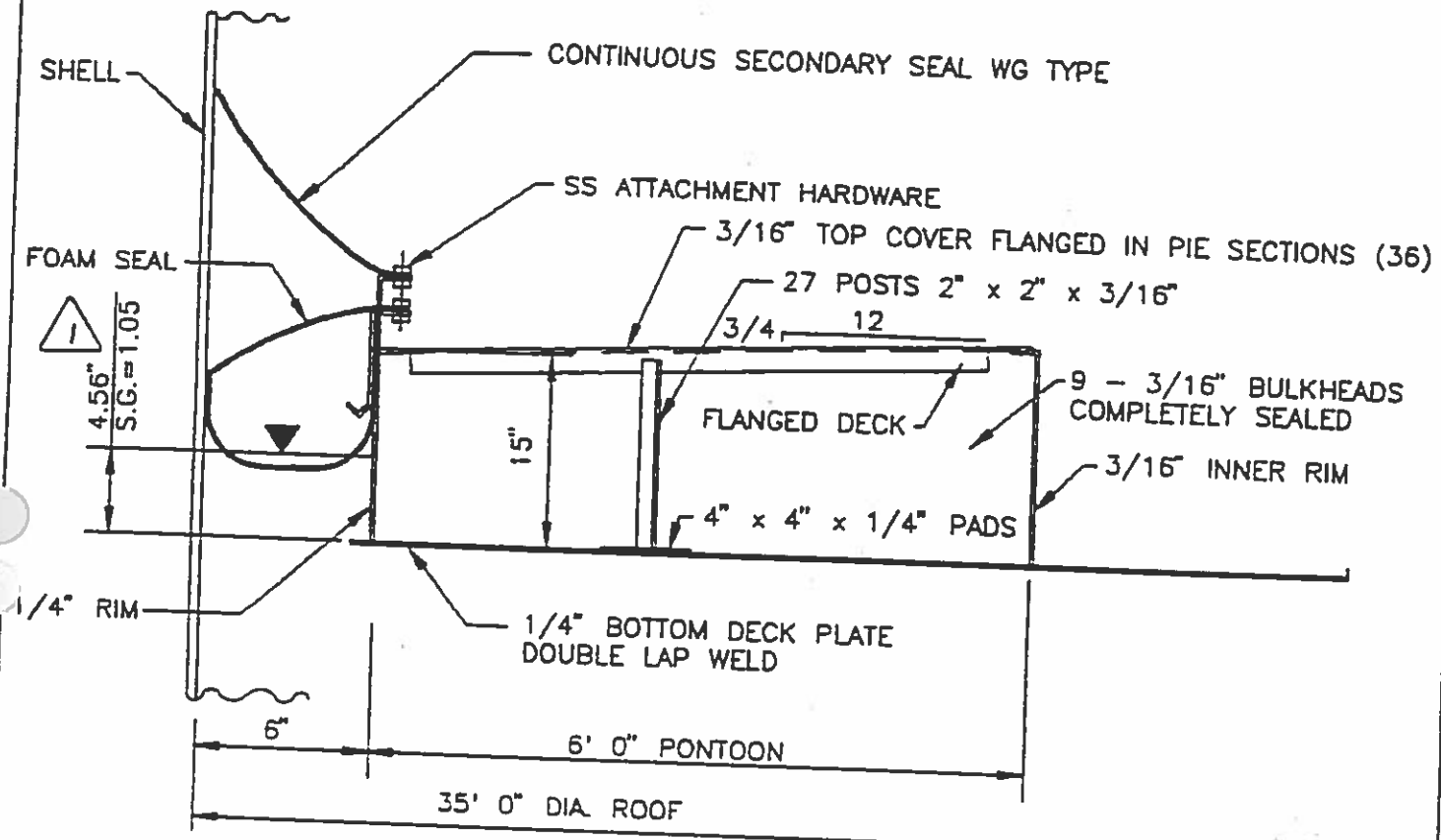
Hydro-test in accordance with para. 5.3.6.

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713/956-2020

Prepared by M. KOPECKY Date 01/22/93
Checked by [signature] Date 1/22/93

CUSTOMER LYONDELL PETROCHEMICAL COMPANY
REFERENCE ITEM T-3455, T-4455 (INTERNAL TANK)
JOB NO. 2472
SHEET 7

S.G. = 0.7
FOR FLOATATION ONLY



FLOATING ROOF ACCESSORIES:

1. (1) 20" MANHOLE IN SHELL (MINIMUM)
2. (1) 24" COMBINATION MANHOLE/BLEEDER VENT IN PAN DECK
3. (12) FIXED LEGS 2' 6". (9) AT OUTER RIM, (3) AT 20' 0"
4. (1) FOAM SEAL BY TST (OR EQUAL). PRIMARY SEAL FABRIC TO BE 10 MIL TEFLON. HARDWARE TO BE SS.
5. (1) INTERNAL ANTI-ROTATION DEVICE.

SCALE: NONE

Company: Lyondell Petrochemical Co. File: 2472b
Job Description: Item T-3455, T-4455 (Outside) API-650, Appendix A, F

API650 (1.000) - Calculations of tanks per API 650 Standard

1. Design Data:

Tank height	- Ht =	48.0000	feet
Tank diameter	- D =	48.0000	feet
Operating pressure	- Po =	0.000	inch W.C.
Design pressure - internal	- Pd =	5.000	inch W.C.
Design pressure - external	- Pe =	1.750	inch W.C.
Design metal temperature - low	=	12	deg. F.
Design metal temperature - high	=	170	deg. F.
Roof corrosion allowance	- CAr =	0.0625	inch
Shell corrosion allowance: 0.0000 ft. to 48.0000 ft.	- CAs =	0.0625	inch
Bottom corrosion allowance	- CAb =	0.0625	inch
Anchor bolt corrosion on diameter	- CAa =	0.2500	inch
Product specific gravity	- Gp =	1.0500	
Design specific gravity	- G =	1.0500	
Wind load	- V =	110	M.P.H.
Wind correction factor (V/100)²	- Fw =	1.2100	

2. Tank Material Data:

Part	Material	Thickness Group Inch	Sd psi	Corr. Factor for Elast. Fmod	Yield Fyld	
Roof	A283C	0.2500 I	21000	1.000	1.000	
Rg. #6	A36	0.2500 I	21000	1.000	1.000	
Rg. #5	A51670	0.2500 III*	21000	1.000	1.000	*Changed to group III since design stress was reduced per Appendix A
Rg. #4	A283C	0.2500 I	21000	1.000	1.000	
Rg. #3	A283C	0.2500 I	21000	1.000	1.000	
Rg. #2	A283C	0.2500 I	21000	1.000	1.000	
Rg. #1	A283C	0.2500 I	21000	1.000	1.000	
Bottom	A51670	0.3125 III*	21000	1.000	1.000	

3. Minimum Bottom Thickness Per 5.4

Minimum = 0.2500 + CAb = 0.3125 inch
Thickness used = 0.3125 inch

H = (Pe - 9tb) / Gp
= [1.75 - (8 x 0.3125)] / 1.05
= 0.00 inches liquid must remain in tank for ext. pressure

4. Minimum Shell Thickness Using the 1-Foot Method Per Appendix A
Specific gravity per A.4.1 - G = 1.0500
Height to overflow slots = 31.0000 feet

$$td = \frac{2.6 \times D \times (H-1) \times G}{E \times Sd \times Fyld} + CAs$$

Shell Top	Elev. feet	Width feet	H feet	E	Sd x Fyld psi	CAs inch	td inch	Use inch
Rg #6	39.5833	8.4167	-8.5833	0.85	21000	0.0625	0.0000	0.2500
Rg #5	31.6667	7.9167	-0.6667	0.85	21000	0.0625	0.0000	0.2500
Rg #4	23.8125	7.8542	7.1875	0.85	21000			

Company: Lyondell Petrochemical Co. File: 2472b
Job Description: Item T-3455, T-4455 (Outside) API-650, Appendix A, F

API650 (1.000) - Calculations of tanks per API 650 Standard

Rg #1	0.0000	7.9375	31.0000	0.85	21000	0.0625	0.2460	0.2500

5. Maximum Shell External Pressure Design per "Stability of API Standard 650 Tank Shells", Proceedings of the American Petroleum Institute, Section III -- Refining. American Petroleum Institute, New York, 1963, Volume 43, pages 458 - 469. Also methods in "Useful Information on the Design of Plate Structures", Steel Plate Fabricators Association, Inc.

Modulus of Elasticity - E = 28800000 psi
Max. allowable external pressure - Pet = 0.2278 psi

Maximum Allowable External Pressure:

$$Pet = \frac{2.60 \times E \times \left[\frac{tav}{12 \times D}\right]^{2.5} \times Fmod}{\frac{Ls}{D} - 0.45 \times \left[\frac{tav}{12 \times D}\right]^{1/2}}$$

(2)

Top	Elevation feet	t used Inch	W Feet
Rg. #6	39.5833	0.1875	0.4167
Rg. #5	31.6667	0.1875	7.9167
Rg. #4	23.8125	0.1875	7.8542
Rg. #3	15.8750	0.1875	7.9375
Rg. #2	7.9375	0.1875	7.9375
Rg. #1	0.0000	0.1875	7.9375
Bottom		0.1875	

tav = 0.1875 Ls = 40.0000 Pet = 0.2278 psi

Maximum Allowable External Shell Design Pressure:
Pet = Pew + Pe
Pew = (1/3) x 30 x Fw
= (1/3) x 30 x 1.2100
= 12.10 psf = 0.0840 psi
Pe = Pet - Pew
= 0.2278 - 0.0840
= 0.1438 psi = 3.98 " W.C.

6. Shell Stability for Wind Per 3.9.7.1
Maximum unstiffened shell length - H1 = 41.2528 feet
Maximum allowable wind speed - Vmax = 136 M.P.H.

$$H1 = 6 \times 100 \times t \times \left[\frac{100 \times t}{D}\right]^{3/2} \times \frac{1}{Fw} \times Fmod$$

$$Wtr = W \times \left[\frac{t\ uniform}{t\ actual}\right]^{.5/2}$$

Company: Lyondell Petrochemical Co. File: 2472b
Job Descr: Item T-3455, T-4455 (Outside) API-650, Appendix A, F

API650 ( ) - Calculations of tanks per API 650 Standard

$$V_{max} = \left[\frac{(6 \times 10^6) \times t}{\Sigma Wtr}\right]^{1/2} \times \left[\frac{100 \times t}{D}\right]^{3/4} \times \left[F_{mod}\right]^{1/2}$$

Top	Elevation feet	t used Inch	W Feet	Wtr Feet	ΣWtr Feet	Vmax MPH
Rg.	39.5833	0.2500	0.4167	0.4167	0.4167	1333.71
Rg.	31.6667	0.2500	7.9167	7.9167	8.3333	298.23
Rg.	23.8125	0.2500	7.8542	7.8542	16.1875	213.98
Rg.	15.8750	0.2500	7.9375	7.9375	24.1250	175.28
Rg.	7.9375	0.2500	7.9375	7.9375	32.0625	152.04
Rg.	0.0000	0.2500	7.9375	7.9375	40.0000	136.12

7. Tank Loads per ASCE 7-88, 1990 Edition:

Wind load diameter - V = 110 MPH
Tank coefficient - Do = 41.0000 feet
Wind city exposure - Cf = 0.6000
Wind tance factor = C
Wind factor - I = 1.0500
- Gh = 1.2267

Ele	Kz	q PSF
0	0.80	33.51
15	0.87	36.45
20	0.93	38.96
25	0.98	41.05
30	1.06	44.41
40	1.13	47.34

Area x Height
Shear x q x Area
Moment ear x Centroid

Elevat ft	Height feet	q lb/ft²	Area ft²	Centroid feet	Shear lbs	Moment ft-lb
41.67		47.3376	100.00	41.6700	2940	118354
30.00	10.0000	44.4052	410.00	35.0000	10924	382329
25.00	5.0000	41.0539	205.00	27.5000	5050	138865
20.00	5.0000	38.9593	205.00	22.5000	4792	107820
15.00	5.0000	36.4458	205.00	17.5000	4483	78450
0.00	15.0000	33.5134	615.00	7.5000	12366	92748
				Total	40455	918565

8. Tank We :

Top and - (π)(40.0000)(6.60) = 829 lbs.
Top wir der - (π)(40.0000)(0.00) = 0 lbs.
Inter. girder - (0)(π)(40.0000)(0.00) = 0 lbs.
Roof p eight - = 0 lbs.
Roof fr wt. - = 0 lbs.
Ring #5 :(40.0000)(7.9167)(0.2500)(40.00) = 0 lbs.

Company: Lyondell Petrochemical Co. File: 2472b
Job Description: Item T-3455, T-4455 (Outside) API-650, Appendix A, F

API650 (1.000) - Calculations of tanks per API 650 Standard

Ring #3 - (π)(40.0000)(7.9375)(0.2500)(40.80)	=	10174 lbs.
Ring #2 - (π)(40.0000)(7.9375)(0.2500)(40.80)	=	10174 lbs.
Ring #1 - (π)(40.0000)(7.9375)(0.2500)(40.80)	=	10174 lbs.
Total for tank shell	=	51566 lbs.
Shell corr. - (π)(40.0000)(40.0000)(0.0625)(40.80)	=	12818 lbs.
Bottom weight - (π/4)(40.0000)²(0.3125)(40.80)(1.03)	=	16583 lbs.
Contents:		
Volume - (π/4)(40.0000)²(40.0000)	=	50265 cu. ft.
- Volume / 5.614583	=	8953 Barrels
- Volume x 7.4805195	=	376012 Gallons
Weight of liquid - Volume x 62.4 x Gp	=	3293394 lbs.
Weight of water - Volume x 62.4	=	3136566 lbs.

9. Tank Anchor Bolt Requirements for Wind:
W = Ws - Wcorr = 51566 - 12818 = 38748 pounds
M = 918565 ft.-lbs.
N = 16 bolts, 1.2500 inch diameter (corr. area = 0.5510 sq. in.)
d = 41.1667 feet anchor bolt circle
P1 = 0.4333 x (Pd/12) x 144 = 26.00 PSF
Pu = (π/4) x D² x P1 = 32670 pounds
(4 x M) / dN = 5578 pounds

Overturning Stability per 3.11

$$Mmax = \frac{2}{3} \times \left[\frac{W \times D}{2} \right] = \frac{2}{3} \times \left[\frac{38748 \times 40.0000}{2} \right]$$

$$= 516645 \text{ ft.-lbs.}$$

Maximum Design Pressure for Unachored Tanks per F.4.2

$$Pmax = \frac{0.245 \times (W - Wr)}{D^2} + (8 \times th)$$

$$= \frac{0.245 \times (38748 - 0)}{(40.0000)^2} + (8 \times 0.2500)$$

$$= 7.93 \text{ " W.C.}$$

Uplift from Design Pressure per 3.11
tB = (4 x M)/dN - W/N
= 0 - (We - Pu)/N
= 0 - (38748 - 32670)/ 16
= -380 pounds
Ab = -380 / 15000 = -0.0253 sq. inch (No bolt load)

(2)

By: MJK 2/ 3/93, 4:04P Wyatt Field Service Co. Sheet No. 11A
Chkd. By: P.N.B. Date: 2-8-93 Houston, Texas Job No.: 2472

Company: Lyondell Petrochemical Co. File: 2472b
Job Description: Item T-3455, T-4455 (Outside) API-650, Appendix A, F

API650 (1.000) - Calculations of tanks per API 650 Standard

Uplift from Design Pressure + Wind per 3.11

tB = (4 x M)/dN - W/N
= (4 x M)/dN - (We - Pu)/N
= 5578 - (38748 - 32670)/ 16
= 5198 pounds

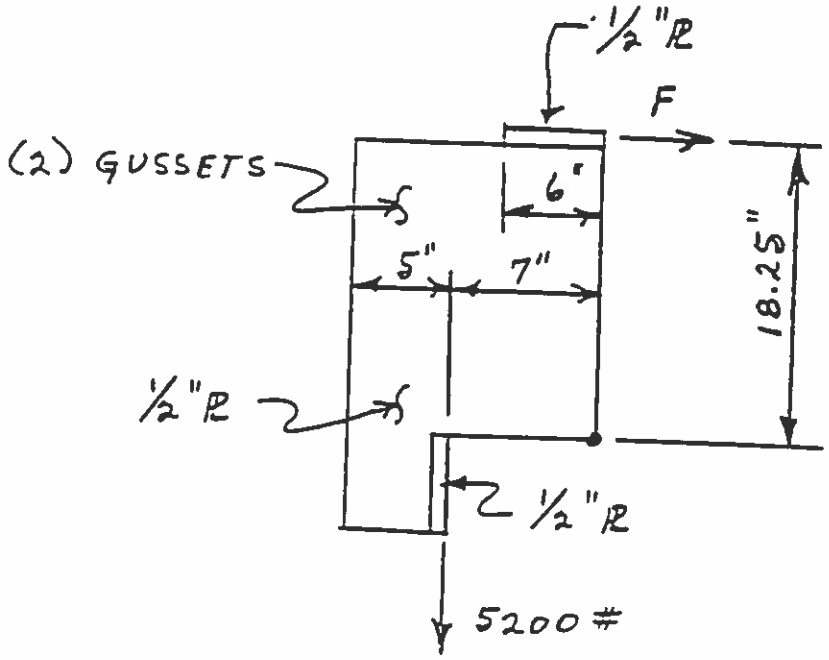
Ab = 5198 / 20000 = 0.2599 sq. inch

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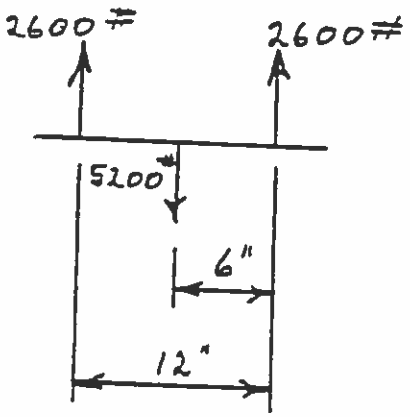
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Prepared by M. KOPECKY Date 1/21/93
Checked by [illegible] Date 1/22/93
TOMER LYONDELL JOB NO. 2472
ERENCE ITEM T-3455, T-4455 SHEET 12 OF

ANCHOR BOLT CHAIR CALCULATIONS
LOAD = 5198 LBS. PER SHEET 11
USE 5200 LBS.



STRESS IN BOLT PLATE



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(2)

Prepared by M. KOPECKY Date 1/6/93
Checked by P.V.B. Date 1-14-93
OMER LYONDELL JOB NO. 2472
REFERENCE ITEM T-3455, T-4455 SHEET 18 OF

COMBINED INNER AND OUTER TANK WEIGHTS

5. SHELL WEIGHTS

MAXIMUM WEIGHT OF SHELL

OUTER TANK	- W_{s1}	= 51,566 #
INNER TANK AND ROOF	- W_{s1a}	= +64,284
ROOF WT. ON SHELL	- W_{r1}	= -10,940
$W_{s1} + W_{s1a} - W_{r1}$	- W_{s2}	= 104,910 #

MINIMUM WEIGHT OF SHELL (ANCHOR BOLTS)

TANK SHELL	- W_{s1}	= 51,566 #
ROOF WT. ON SHELL	- W_{r1}	= 0
SHELL CORROSION	- W_{s3}	= 12,818
$W_{s1} - W_{r1} - W_{s3}$	- W_{s4}	= 38,748 #

6. TANK FOUNDATION LOADS

MAX. TANK COMPRESSION WITH ROOF LIVE LOAD + WIND

$P_1 = [(W_{r4} + W_{s2}) / \pi D] + W_w$

$= [(42,850 + 104,910) / \pi(40)] + 731$

$= 1176 + 731$

$= 1907$ LB / FT.

MAX. TANK UP LIFT

$P_2 = [(W_{r6} + W_{s4}) / \pi D] - W_w$

$= [(32,670 + 38,748) / \pi(40)] - 731$

$= 48 - 731$

$= -683$ LB / FT.

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(2)

Prepared by M. KOPECKY Date 1/6/93
Checked by P.N.B Date 1-14-93

STOMER LYONDELL JOB NO. 2472
REFERENCE ITEM T-3455, T-4455 SHEET 19 OF

MAX. TANK COMPRESSION WITH ROOF LIVE LOAD

$P3 = [(W_{r4} + W_{s2}) / \pi D]$

$= [(42,850 + 104,910) / \pi(40)]$

$= 1176$ LB / FT.

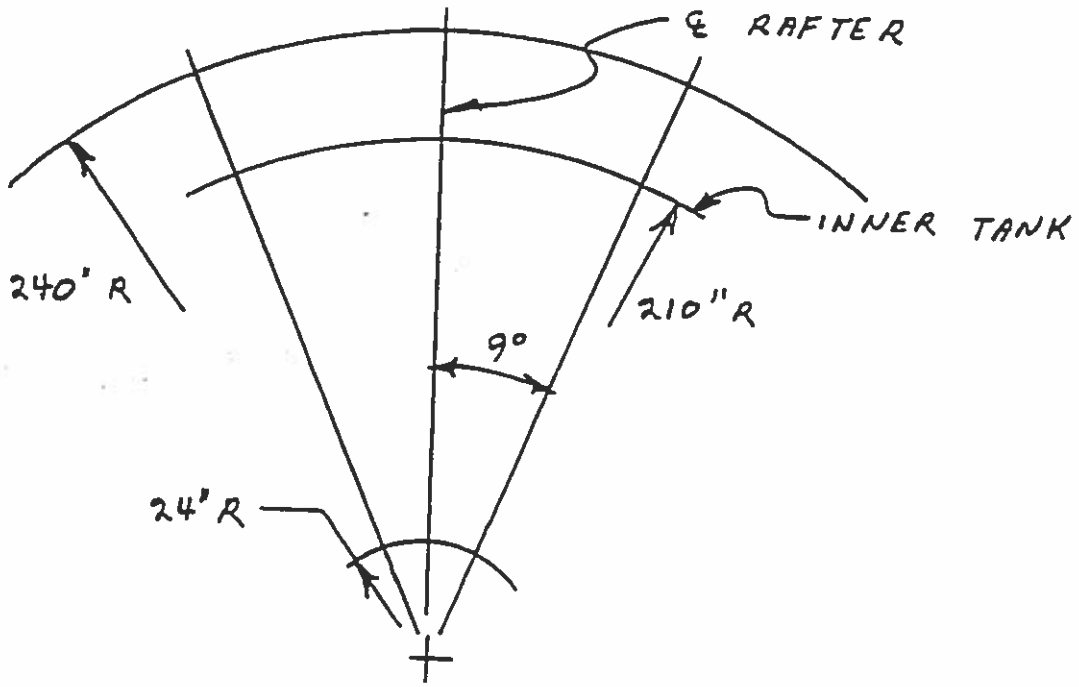
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2

Prepared by M. KOPECKY Date 2/4/93
Checked by P.N.B Date 2-8-93

CUSTOMER LYONDELL
REFERENCE ITEM T-3455, T-4455 JOB NO. 2472
SHEET 20 OF

ROOF SUPPORT CALCULATIONS:



LOAD

EXTERNAL	-	9.10	LB/FT²
DEAD	-	10.20	LB/FT²
LIVE	-	25.00	LB/FT²
TOTAL	-	44.30	LB/FT² = 0.31 LB/IN²

BEAM - 10.50 LB/FT = 0.88 LB/IN.

$W_1 = 2R \sin\theta = 2(24) \sin 9° = 7.51$ IN.
$W_2 = 2R \sin\theta = 2(240) \sin 9° = 75.09$ IN.

BEAM LOADS

$F_1 = (0.31)(7.51) + 0.88 = 3.21$ LB/IN.
$F_2 = (0.31)(75.09) + 0.88 = 24.16$ LB/IN.

By: MJK 2/ 4/93. 9:48A Wyatt Field Service Co. Sheet No. 20A
Chkd. By: F.M.S. Date: 2-8-93 Houston. Texas Job No.: 2472

Company: Lyondell Petrochemical Co. File: 2472
Job Description: Item T-3455, T-4455 API-650

SBEAM (1.000) - Calculates the shear, moment, slope and deflection of a simply supported beam under various loading conditions

1. Beam Data:

Modulus of elasticity		- E	=	28800000	psi	
Moment of inertia		- I	=	9.2000	inch^4	
Length of span		- L	=	186.0000	inch	
Reaction at x =	0.0000 inch	- R1	=	802	pounds	
Reaction at x =	186.0000 inch	- R2	=	2154	pounds	
Maximum shear load		- V	=	1434	pounds at	184.1400 inches
Maximum moment load		- M	=	47946	in.-lb. at	100.4400 inches
Maximum deflection		- D	=	0.634148	inches at	94.8600 inches

2. Beam Concentrated Loads:

Load Number	Amount pounds	Location inch
1	0.0000	0.0000
2	0.0000	0.0000
3	0.0000	0.0000
4	0.0000	0.0000
5	0.0000	0.0000
6	0.0000	0.0000
7	0.0000	0.0000
8	0.0000	0.0000
9	0.0000	0.0000

3. Beam Distributed Loads:

Load Number	Starting Amount pounds	Ending Amount pounds	Starting Location inch	Ending Location inch
1	3.2100	24.1600	0.0000	216.0000
2	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000	0.0000

4. Loads in Beam:

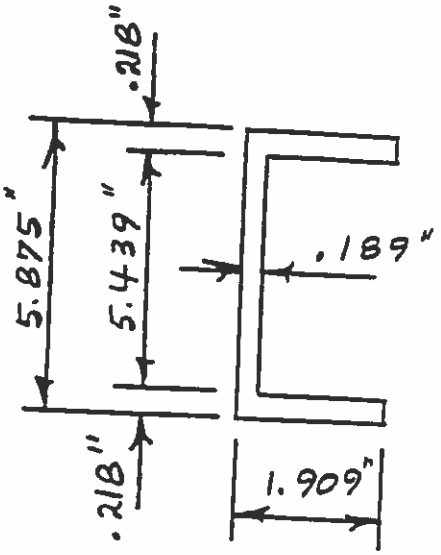
	Location inch x	Load pounds F	Shear pounds V	Moment in.-lb. M	Slope S	Deflec. D
COLUMN	0.0000	802	802	0	0.000000	0.000000
	18.6000	-9	725	14251	-0.010036	-0.192943
	37.2000	-13	615	26768	-0.008585	-0.367471
	55.8000	-16	472	36926	-0.006334	-0.507310
	74.4000	-19	294	44101	-0.003471	-0.599265
	93.0000	-23	84	47669	-0.000227	-0.634038
	111.6000	-26	-161	47006	0.003122	-0.607039
	130.2000	-29	-438	41487	0.006256	-0.519203
	148.8000	-33	-750	30489	0.008818	-0.377804
	167.4000	-36	-1095	13388	0.010396	-0.197273
CLIP	186.0000	2115	681	-10441	0.010540	-0.000000

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Prepared by M. KOPECKY Date 1/6/93
Checked by P.N.B Date 1-14-93
CUSTOMER LYONDELL
REFERENCE ITEM T-3455, T-4455 JOB NO. 2472
SHEET 21 OF

PROPERTIES OF C6x10.50 WITH 1/16" CORROSION ON EACH SURFACE



$A = 1.86 \text{ IN}^2$
$I = 9.20 \text{ IN}^4$
$Z = 3.13 \text{ IN}^3$

$$S = \frac{M}{Z} = \frac{47,946}{3.13} = 15,318 \leq 20,000 \text{ PSI}$$

CHECK CENTER COLUMN PER API-650, 3.10.3.3.
8" X-STG PIPE WITH 1/16" CORROSION

$R_o = 4.25 \text{ IN.}$
$R_i = 3.8125 \text{ IN.}$
$t = 0.4375 \text{ IN.}$

$$I = \pi/4 (R_o^4 - R_i^4) = \pi/4 [(4.25)^4 - (3.8125)^4] = 90.31 \text{ IN}^4$$

$$A = \pi (R_o^2 - R_i^2) = \pi [(4.25)^2 - (3.8125)^2] = 11.08 \text{ IN}^4$$

$$r = \sqrt{\frac{I}{A}} = \sqrt{\frac{90.31}{11.08}} = 2.85 \text{ IN.}$$

$$\frac{t}{R_o} = \frac{.4375}{4.25} = 0.1029, \quad Y = 1.00$$

WYATT FIELD SERVICE COMPANY
P.O. BOX 3052 • HOUSTON, TEXAS 77253-3052
713/956-2020

12

Prepared by M. KOPECKY Date 1/6/93
Checked by P.N.B Date 1-14-93
CUSTOMER LYONDELL
REFERENCE ITEM T-3455, T-4455 JOB NO. 2472
SHEET 22 OF

SHELL ROOF BOTTOM

$$L = 40(12) + \frac{3}{12}\left(\frac{40}{2}\right)(12) - \frac{1}{12}\left(\frac{40}{2}\right)(12)$$
$$= 480 + 60 - 2$$
$$= 538 \text{ INCH}$$

$$\frac{L}{r} = \frac{538}{2.85} = 189$$

$$Cmc = \frac{149{,}000{,}000\ Y}{(L/r)^2\,[1.6 - (L/200r)]}$$
$$= \frac{149{,}000{,}000\ (1.00)}{(189)^2\,[1.6 - (189/200)]}$$
$$= 6369 \text{ PSI}$$

$F = \pi(24)^2(0.31) + 20(802) = 16{,}601$ LBS.

ROOF MAX. LOAD -	16,601 LBS.
PIPE & MISC. WT. -	2500
TOTAL	19,101 LBS.

$$Sc = \frac{F}{A} = \frac{19{,}101}{11.08} = 1724 \leq 6369 \text{ PSI}$$

LOAD ON SHELL (MINIMUM)

LOAD = 10.20 LB/FT^2 = 0.07 LB/IN^2

$F_2 = (0.07)(75.09) + 0.88 = 6.14$ LB/IN

$$R = \left(\frac{6.14}{24.16}\right)(2154) = 547 \text{ LBS.}$$

WT = 20(547) = 10,940 LBS. (ON INNER TANK)

Lyondell Petrochemical Company

Calculations Chart

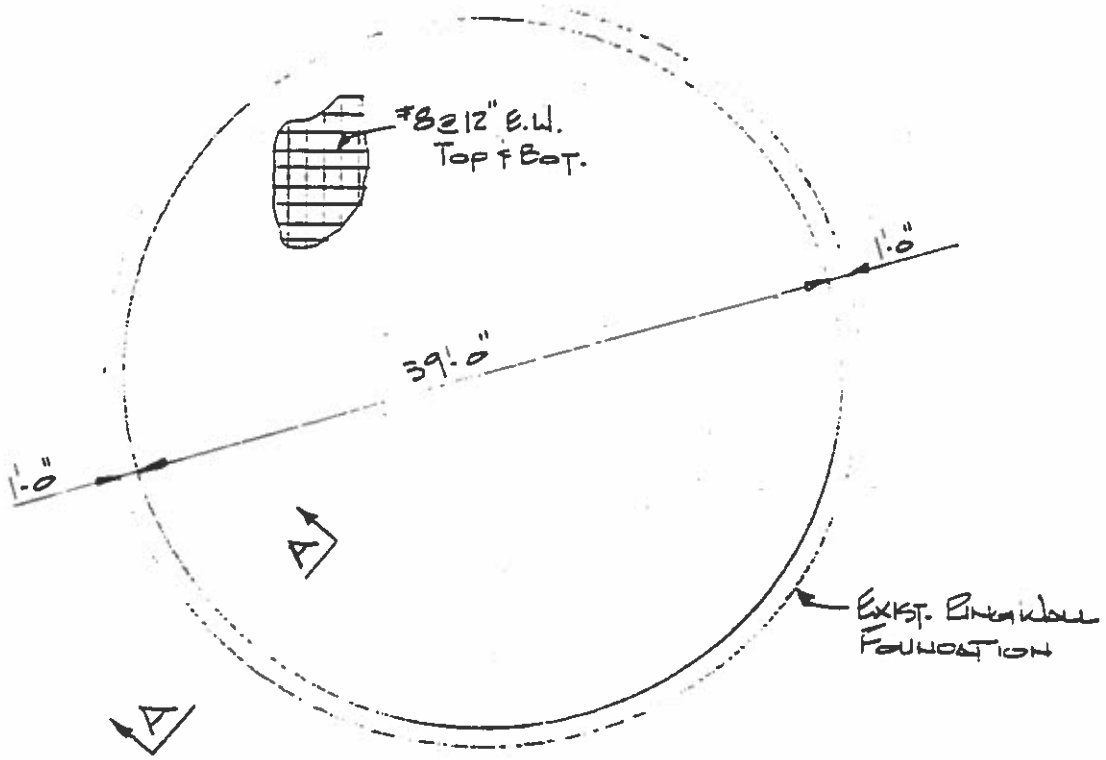
Sheet SK-1 of SK-2

File

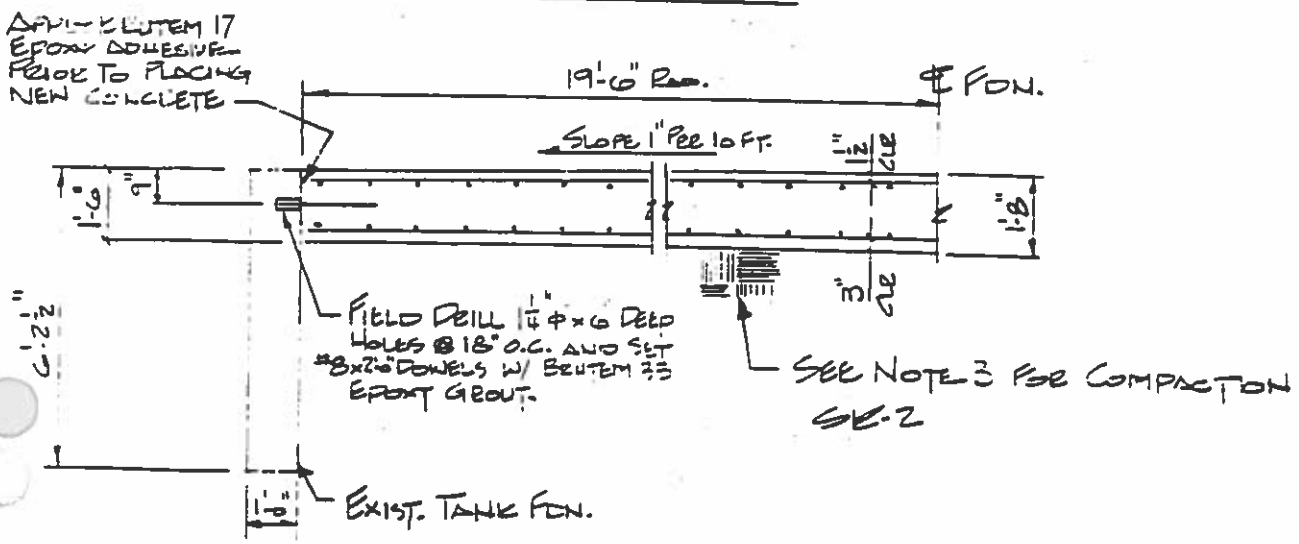
Date 1-11-93

By KMS

Subject: FOUNDATION FOR TANK T-455 & T-1455



PLAN



SECTION "A-A"

Lyondell Petrochemical Company

Calculations Chart

Sheet SK-2 of SK-2

File

Date 1-11-93

By KAS

FOUNDATION FOR TANK 3455 + 3455

NOTES:

1. CONCRETE SHALL BE 4000 PSI AT 28 DAYS. CONCRETE TO BE IN ACCORDANCE WITH ACI CODES 301 + 318.

2. REINFORCING SHALL BE DEFORMED HIGH STRENGTH BARS, CONFORMING TO ASTM A615, GRADE 60.

3. EXISTING SUBGRADE SHALL BE COMPACTED TO 95% OF MAXIMUM DRY DENSITY PER ASTM D 1557.

4. EXISTING CONCRETE SURFACE PREPARATION AND EPOXY APPLICATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

Lyondell Petrochemical Company

Calculations Chart

Sheet 1 of 7

File

Tank 3155

Date 1-29-93

By KCB

Design Criteria

Weights: Outer Tk Wt = 80,000# Per Wyatt 1/29/93
Inner Tk Wt = 66,000# " " "
Grating Wt = 21,000# " " "
Floating Roof Wt = 28,000# " " "

Specific Gravity of Liquid = 1.05

Tank Dimensions:

Outer Tank: Height = 40'-0"
Diameter = 40'-0"
Max. Fill Height = 31'-6"

Inner Tank: Height = 40'-0"
Diameter = 35'-0"
Max. Fill Height = 37'-6"

Soil Data:

Allowable Net Bearing Pressure = 3500 psf Per Soil Report, P.5
Allow. Net Bearing Pressure (Wind + Test) = 4200 psf " " " "

Subject: TANK FDN

CHECK REINFORCING IN EXISTING RING WALL

(REF. SUMMIT JOB #7351, ADD'N = 2-24'-0" I.D. FOR EXISTING TANK FOR DETAILS)

RADIAL FORCE ON RINGWALL

$F = K_a \gamma (qH + \text{SHELL WT (PSF)} + \text{FLOAT ROOF (PSF)} + \text{INNER TANK WT (PSF)} + (1/2)\gamma_s h)$

$= 0.3(6.21\text{ FT})[62.4^{\#}/\text{FT}^3(1.05)(31.5\text{ FT}) + \frac{31600^{\#}}{1256.6\text{ FT}^2} + \frac{18000^{\#}}{962.1\text{ FT}^2} + \frac{66000^{\#}}{1099.6\text{ FT}(3\text{ FT})} + 1/2(120^{\#}/\text{FT}^3)(6.21\text{ FT})]$

$= 0.3(6.21\text{ FT})[214^{\#}/\text{FT}^2 + 17.2^{\#}/\text{FT}^2 + 29.1^{\#}/\text{FT}^2 + 20.0^{\#}/\text{FT}^2 + 372.6^{\#}/\text{FT}^2]$

$= 0.3(6.21\text{ FT})(307.9^{\#}/\text{FT}^2) = 5728.5^{\#}/\text{FT}$

HOOP TENSION IN RINGWALL

$T = (1/2)FD = 1/2(5728.5^{\#}/\text{FT})(40\text{ FT}) = 114570^{\#}$

$T_{REQ'D} = 114570^{\#}$

$A_s = \frac{114570^{\#}}{.9(60000\text{ psi})} = 2.12\text{ IN}^2$

6-#8 PROVIDED IN EXIST. FDN. = $4.74\text{ IN}^2 > 2.12\text{ IN}^2$

∴ EXISTING FDN. IS OK

ndell Petrochemical Company
:ulations Chart

Sheet 3 of 7
File
Date 1.29.93
By KCS

[illegible] Under Ringwall vs. Pressure Under Main Portion of Tank

Soil Pressure Under Main Portion of Tank (psf)

$P_o = \gamma_s H + \text{Bottom Wt (psf)} + \text{Floor Load (psf)} - \text{Inner Tk Wt (psf)} + \gamma_{sh}$

$= 62.4^{\#}/ft^3 (1.05)(37.5\,ft) + \frac{21600^{\#}}{1194.6\,ft^2} + \frac{28000^{\#}}{1194.6\,ft^2} + \frac{66000^{\#}}{1194.6\,ft^2} + 120^{\#}/ft^3 (6.21\,ft)$

$= 2457^{\#}/ft^2 + 18.1^{\#}/ft^2 + 23.4^{\#}/ft^2 + 55.2^{\#}/ft^2 + 745.2^{\#}/ft^2$

↑ Gross Pressure ↑ Net Pressure (Per Soil Report p.5) ↑ Allow.

$= 3298.9\ psf < 3500\ psf + 120^{\#}/ft^3 (6.21\,ft) = 4245\ psf$ OK

↑ Gross Pressure ↑ Allow.

Soil Pressure Under Ringwall (psf)

$P_o = \text{Wt of Outer Circum.}/2 + 9^{\#}H/2 + \frac{\text{Bottom Wt}}{2} + \frac{\text{Floor Load (psf)}}{2} + \frac{\text{Inner Tk Wt psf}}{2} + \gamma_{sh}$

$= \frac{36000^{\#}}{125.66\,ft}/1.0\,ft + \frac{24^{\#}/ft^2}{2} + \frac{18.1^{\#}/ft^2}{2} + \frac{23.4^{\#}/ft^2}{2} - \frac{225^{\#}/ft^2}{2} + 150^{\#}/ft^3 (6.21\,ft)$

$= 286.5^{\#}/ft^2 + 1218.5^{\#}/ft^2 + 9^{\#}/ft^2 + 12^{\#}/ft^2 - 112.5^{\#}/ft^2 + 931.5^{\#}/ft^2$

$= 2977.6\ psf$

Differential Settlement Possible Due to Unequal Soil Pressures

∴ Provide Concrete Slab inside Existing Ringwall Fdn, Doweled to Inside Face to Distribute Load

Check Sealing Pressure w/ Wind Load Under Ringwall

$P_o = 2977.6\ psf + 731^{\#}/ft/1\,ft\ \text{Footing Width} = 3708.6\ psf < 4200\ psf + 120^{\#}/ft(6.21')$

↑ From Wyatt p.17 ↑ Gross Pressure ↑ Net Allow Pressure

$= 4945\ psf$

↑ Gross Allow Press.

OK

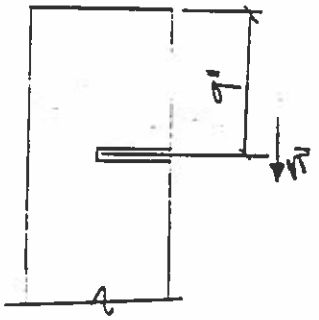
TITLE TANK 5DN

Provide Dowels to Transfer Load Between Concrete Slab and Ringwall

Shear Transfer: $V = (3298.9\ psf - 2977.6\ psf)\ 1\ ft\ (1.5\ ft) = 482^{\#}$

(1.5 ft = Width Ringwall; 1 ft = Dowel Spacing)

$S_u = 1.4\ (482^{\#}) = 675.^{\#}$



$$\phi S_n = \frac{4\,\phi_s \sqrt{f'_c}\ A_{sc}}{1000}$$

Where: ϕS_n = Design Shear Resistance, kips

ϕ_s = Shear Embedment Resistance Factor, 0.85

A_{sc} = Effective Projected Area of Shear Cone

$$A_{sc} = \pi L_s^2 (f_3 + f_4)$$

Where: L_s = Shear Embedment

f_3, f_4 = Edge Factors

$A_{sc} = \pi (9)^2 (0.25 + 0.25) = 127.2\ in^2$

$\phi S_n = \frac{4\,(0.85)(\sqrt{3000})(127.2)}{1000} = 23.7^{k} > 0.675^{k}$

Use #8 Dwl Set into 1¼" ϕ Hole w/ Bentem 33

Lyondell Petrochemical Company

Calculations Chart

Sheet 5 of 7

File

Date 1-30-93

By KGS

T-2155 TANK FDN

BASE MAT

TANK PROPERTIES (INNER TANK)

DIA. = 35'-0"
LIQUID LEVEL = 37'-6"

WT OF PRODUCT = $62.4^{\#}/ft^3 (1.05)(37.5ft)(962.1ft^2) = 2,363,879.7^{\#}$
USE $2,363,380^{\#}$

WT OF TANK = $66,000^{\#}$
W_{wall}/ft of Circum = $15.3^{\#}/(7.85' + 12.8^{\#}/(7.85')(2) + 10.2^{\#}/(7.85')(2) = 481.2^{\#}/$ of Circum.
$W_{ALL} = 66,000^{\#} - 481.2^{\#}/(\pi)(35) = 13089^{\#}$

WT of ROOF = $28,000^{\#}$
WT of GIRDER = $21,000^{\#}$

MAT DESIGN (TANK FDN DESIGN BASED ON PROCEDURE PRESENTED IN OCT. 1974 HYDROCARBON PROCESSING BY ANDREW A. BROWN, P.E.)

MAX. Y OF ℄ CENTER OF MAT

$$M_1 = \frac{P}{4\pi}\left[(1+\mu)\ln\frac{E}{b} + 1 - \frac{(1-\mu)b^2}{4E^2}\right]$$

$P = 2,363,380^{\#} + 13089^{\#} + 28,000^{\#} + 21,600^{\#} = 2,426,069^{\#}$

$$M_1 = \frac{2,426,069^{\#}}{4\pi}\left[(1+0.25)\ln\frac{19.5}{17.5} - 1 - \frac{(1-0.25)(17.5)^2}{4(19.5)^2}\right]$$

$= 190,060^{\#}$

BASE MAT (CONT.)

$$M_2 = \frac{\rho c}{4}\left[\frac{E^2-c^2}{E^2}(1-\mu) + 2(1+\mu)\ln\frac{E}{c}\right]$$

$$= \frac{481.2(17.5)}{4}\left[\frac{(19.5)^2-(17.5)^2}{(19.5)^2}(1+0.25) + 2(1+0.25)\ln\left(\frac{19.5}{17.5}\right)\right]$$

$$= 876.7^{\#}$$

$$M_3 = -\frac{q E^2}{16}(3+\mu)$$

$$q = \frac{2{,}363{,}880^{\#} + 66{,}000^{\#} + 28{,}000^{\#} + 21{,}600^{\#}}{\pi(19.5)^2} = 2075.6 \text{ psf}$$

$$M_3 = -\frac{2075.6(19.5)^2}{16}(3+0.25) = -160{,}316^{\#}$$

$$M_{TOTAL} = 190{,}060^{\#} + 876.7^{\#} - 160{,}316^{\#} = 30620.7^{\#}$$

$$M_U = 30.62^{K}(1.4) = 42.9^{K}$$

$t = 18"$ $\quad d = 18" - 3" - 1" - 0.5" = 13.5'$

$$F = \frac{12(13.5)^2}{12000} = 0.182 \qquad K_U = \frac{42.9}{0.182} = 235.7 \qquad a_u = 4.31$$

$$A_s = \frac{42.9}{13.5(4.31)} = 0.74 \text{ IN}^2/\text{FT} \qquad \underline{\text{USE \#8 @ 12"}} \quad A_s = 0.79 \text{ IN}^2/\text{FT}$$

E, W, T, B

Lyondell Petrochemical Company

Calculations Chart

Sheet 7 of 7

File

Date 1-30-93

By KGS

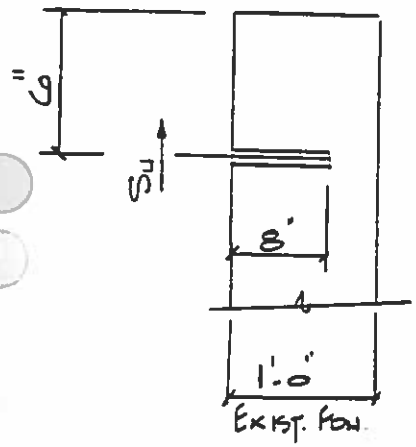
Subject T-3455 TANK FDN

ANCHOR BOLT DESIGN

DESIGN LOAD = 4887# USE 5000# FROM WYATT p. 11

USE 1"ϕ ANCHOR BOLT $A_s = 0.6060\ in^2 > 0.2444\ in^2$ REQ'D FROM WYATT, p. 11

CHECK SHEAR EMBEDMENT



S_u = FACTORED SHEAR FORCE, KIPS
$= 1.7(0.75)(5^K) = 6.375^K$

$$\phi S_n = \frac{4\,\phi_s \sqrt{f'_c}\ A_{sc}}{1000}$$

WHERE: ϕS_n = DESIGN SHEAR RESISTANCE, KIPS
ϕ_s = SHEAR EMBEDMENT RESISTANCE FACTOR, 0.85
A_{sc} = EFFECTIVE PROJECTED AREA OF SHEAR CONE, IN^2

$$A_{sc} = \pi L_s^2 (f_3 + f_4)$$

WHERE: L_s = SHEAR EMBEDMENT, IN
f_3, f_4 = EDGE FACTORS

$A_{sc} = \pi(6)^2(0.25+0.25) = 56.55$

$$\phi S_n = \frac{4(0.85)(\sqrt{3000})(56.55)}{1000} = 10.53^K > 6.375^K$$

USE 1"ϕ THREADED ROD (A36) SET INTO 1¼"ϕ HOLE W/ BEN-EM 33

REPORT

FOUNDATION INVESTIGATION

PROPOSED LYONDELL PLANT EXPANSION

CHANNELVIEW, TEXAS

FOR

ARCO CHEMICAL COMPANY

INTRODUCTION

General

This report presents the results of our soils and foundation investigation for a proposed expansion to the ARCO Chemical Company plant in Channelview, Texas. The proposed addition will manufacture olefins and consist of a process area, utilities area, holding pond, liquid bulk storage consisting of several large steel tanks, and a flare stack. The proposed expansion is shown on the Area Plan, Plate 1, and the siting of the proposed structure is shown on the Site Plan, Plate 2.

Purpose and Scope

The purpose of our investigation was to explore the subsurface soil and groundwater conditions at the site and to provide recommendation for both foundation support of the proposed structures and earthwork criteria.

The scope of our work included:

1) Drilling 24 borings to depths of between 25 to 110.5 feet and obtaining relatively undisturbed soil samples.
2) Digging four shallow test pits with a backhoe to obtain bulk samples of near-surface soils.

3) Performing laboratory tests on selected soil samples to determine their engineering characteristics.

4) Performing engineering analysis to evaluate various foundation types.

The detailed results of our field and laboratory investigations are presented in the Appendix.

Design Considerations

The major structures are to be constructed in the process area and consist of a quench tower, a gasoline fractionator, heaters and compressor supports. Extremely heavy test and operating loads will be imposed on several structures. Some typical loads are shown in the table below:

LOADS (KIPS)

Structure	Test	Operating	Overturning Moment FT-KIPS
Gasoline Fractionator	8,630	2600	13610
Quench Tower	10,830	6080	12500
Ethylene Fractionator	3,780	1825	19100
Propylene Fractionator	3,325	1550	15500
Deethanizer	1,654	866	6184

We understand settlement will be controlling factor in design of the foundations. Total settlement must be less than two inches and differential settlement held to 1/4 inch within each area except the compressor

to extend below a depth of 11 feet and evidence of crayfish burrows were found in samples taken as deep as 20 feet. Since crayfish usually burrow down until they reach groundwater, at some time the groundwater level must have been considerably lower than its current elevation.

DISCUSSION AND RECOMMENDATIONS

General

It is our opinion that the subsurface conditions at the site are suitable for support of the proposed structures. Several types of foundations are feasible such as shallow spread footings, mats, and underreamed drilled shafts. Selection of the foundation type for each structure will probably depend upon settlement and economic criteria.

We recommend that foundations be designed for a maximum net bearing pressure under long term loading of 3,500 pounds per square foot at a minimum depth of three feet. This maximum net pressure may be increased to 4,200 pounds per square foot under short term loadings such as test or wind loadings. The net bearing pressure is the pressure imposed by the footing in excess of the adjacent soil overburden pressure. This pressure applies to spread, mat and belled footings above a depth of 35 feet. Below a depth of 35 feet a net bearing pressure of 4,300

pounds per square foot may be used for long term loads and 5,000 pounds per square foot for short term loading.

Due to the existence of a softer layer of silty sand and sand silt in the areas of Borings B, C, D, E, L, and U, we recommend special bearing criteria in the upper 14 feet in these areas. Footings founded between depths of three and six feet can be designed for the bearing pressure given above. Footings founded between 6 and 14 feet should be designed for a maximum net bearing pressure of 2,000 pounds per square foot under long term loads and 2,500 pounds per square foot under short term loadings.

This same layer is present in the southern portion of the site under the tanks and sphere areas. The same bearing values should be applied in these areas for footing founded between six and 16 feet.

Footings founded above, or in this layer, will experience settlements greater than those in the adjacent areas. This is discussed in the "Settlement" section of this report.

We understand that a major portion of the area in the process area will be covered with concrete paving and that many smaller pieces of equipment will be supported directly on this pavement. We recommend

a maximum bearing pressure of 4,000 pounds per square foot be used for loads supported directly upon the pavement. It should be noted that, if these loads are concentrated in small areas, their combined effect could influence the settlement behavior of adjacent structures.

Settlements

Settlement of foundations will depend upon their size, applied load, and embedment depth. The most compressible soils at the site are the upper clay layers and foundations placed above them will, size and pressure being equal, experience more settlement than foundations founded below these clay layers.

We have estimated settlements for some of the major structures assuming their foundations to be at various depths. These estimated settlements are presented in Plate 4 for the quench and gasoline fractionator towers, the heaters, and the compressors. These settlements were estimated assuming each structure was supported on a rigid mat. For the deeper depths, the mat was assumed to be supported on drilled and belled footings or piles. Estimated settlements of various sized mats and individual belled footings are presented in Plate 5.

Footings founded above the silty sand layer which exists between the 8 and 14-foot depth will experience additional settlement due to the

Uplift capacities for spread footing or mats may be calculated using the total buoyant weight of the footing and the soil above it. If the footings are poured neat, an additional force of 500 pounds per square foot may be applied to vertical planes projected upward from the footing base. The upper two feet of soil should be ignored.

Tanks

We recommend that the steel tanks be placed on a well compacted sand or sand-shell base. The area of the tank should be over-excavated to a depth of three feet and excavations should extend at least three feet beyond the tank edge. The excavated area should be replaced with a sand or sand shell fill compacted to at least 90 percent of the maximum dry density as determined by the Modified AASHO* test (T-180).

Belled Footings

Some difficulty may be encountered in installing drilled and belled footings below silt and sand layers. Water from these could enter the shaft during drilling. It is anticipated that small pumps could handle the water but some sloughing and caving should be expected. This problem could be minimized by drilling a straight shaft to the proposed foundation depth and then casing the shaft to the top level of the proposed bell. In this manner, sloughing could be reduced; however, unless the casing fits

*American Association of State Highway Officials

CONCRETE POUR SLIP

FOUNDATION No.: JK 3455 PROJECT No.: 2015

APPLICABLE DWGS.: B 34-C-127 REV 1

CLASS OF CONCRETE: 5,000 lb PSI

VOLUME: 72 yds TYPE OF FINISH: BROOM

FORMWORK (alignment & elevation) CHECKED: _____ BY: NA

REINFORCED STEEL (size, spacing) CHECKED: TOP & BOTTOM #8 12" OC BY: [illegible]

ANCHOR BOLTS (size, location, projection, length & sleeves) CHECKED: _____ BY: NA

PIPE OR PIPING REQUIRED? _____ BY: NA

CONDUIT REQUIRED? _____ BY: NA

GROUND WIRE SLEEVE REQUIRED? _____ NA

OTHER PENETRATIONS? NA

FOLLOW UP DATA

TEST CYLINDERS REFERENCE No.: _____

DATE CYLINDERS TAKEN: 2-2-93

CYLINDERS TAKEN BY: RANDY SHAFFER

NUMBER CYLINDERS TAKEN: 6 SLUMP: 5"

7 DAY BREAK: YES 28 DAY BREAK: YES

REMARKS: ALSO WANT 3 DAY BREAK

APPROVAL TO POUR

INSPECTOR
NAME (print): James Huntley

SIGNATURE: James Huntley

DATE: 2-2-93

CONTRACTOR

NAME (print): AUSTIN INDUSTRIAL

SIGNATURE: Louis H. Wright

DATE: 2-2-93

ENGINEER
NAME (print): _____

SIGNATURE: _____

DATE: _____

4

COASTAL TESTING LABORATORIES, INC.

PASADENA 477-0121 • P. O. BOX 87653 • HOUSTON, TEXAS 77287-7653

PROJECT NO. 93-520
REPORT NO. 0202-010
DATE: 2/3/93
P.O. OR JOB NO. 340117-24

DAILY CONCRETE REPORT AND TEST RESULTS

PROJECT: Lyondell Petrochemical
CONTRACTOR Austin Industrial OWNER:
ENGINEER: ARCHITECT:
PRODUCER: FOR CONCRETE DESIGN MIX: 5000 PSI
COURSE AGGR: FINE AGGR: CEMENT:
DESIGN WATER: GALS. WATER ADDED: GALS. WATER IN AGGR:
SLUMP, (ASTM C-143) 5" ADMIXTURES
SPECIMENS MADE (ASTM C-172, C-31) 6 cyl MIX TEMP. AMB. TEMP.
CONCRETE PLACED 72 CU. YDS SQ. YDS AIR CONTENT (ASTM C-173, C-231)
TECHNICIAN TIME: TECHNICIAN:
LOCATION: LPA-2-2> FDN ~~PK~~ JK 3455 ,

6 cylinders pickup on 2/3/93

MARKS	DATE POURED	DATE TESTED	AGE DAYS	X-SECTION AREA	TOTAL LOAD	POUNDS SQ. IN	LOCATION ON JOB
LPA22	2/2	2|5	3	28.27	85	3010	
LPA22	2|2	2|5	3	28.27	86	3040	
LPA22	2|2	2/9	7	28.27	141	4990	
LPA22	2/2	2.9	7	28.27	143	5060	
LPA22	2/2	3/2	28	28.27			
LPA22	2/2	3/2	28	28.27			

OMPRESSIVE STRENGTH: ASTM C-39
LEX. STRENGTH (CENTER PT): ASTM C-293
LEX. STRENGTH (THIRD PT) ASTM C-78

COASTAL TESTING LABORATORIES, INC.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE APPROVAL OF THIS LABORATORY

mcc

CTL-37 (REV 11/90)

Wyatt Field Service Company

RECORD OF TEST

CUSTOMER: LyONDell Job No. 2472-A

DESCRIPTION OF ITEM(S) TESTED: Vacuum test of replacement bottom, 5-7 lb

TYPE OF TEST: Vacuum

TESTED AT 8 P.S.I.

(✓) ACCEPTED

( ) REJECTED

Michael P. Williams
WYATT INSPECTOR OR SUPERVISOR

February 18, 1993
DATE

CUSTOMER INSPECTOR

2-18-93
DATE

2-18-93 LPC

Wyatt Field Service Company

RECORD OF TEST

CUSTOMER: Lyondell Job No. 2472-A

DESCRIPTION OF ITEM(S) TESTED: Vacuum test of Annular Rg. 5-71b

TYPE OF TEST: Vacuum Test

TESTED AT 8 P.S.I.

✓ ACCEPTED

REJECTED

WYATT INSPECTOR OR SUPERVISOR

2-26-93
DATE

CUSTOMER INSPECTOR

DATE

2-26-93. LPC

Wyatt Field Service Company

RECORD OF TEST

CUSTOMER: Lyondell Job No. 2472-A

DESCRIPTION OF ITEM(S) TESTED: Inner Tank Bottom.

TYPE OF TEST: Vacuum Test

TESTED AT 8 P.S.I.

✓ ACCEPTED

REJECTED

C. V. Chambless
WYATT INSPECTOR OR SUPERVISOR

3-3-93
DATE

James C. Hamilton
CUSTOMER INSPECTOR

3-3-93
DATE

James Pike 3-3-93 LRC

Wyatt Field Service Company

RECORD OF TEST

USTOMER: Lyondell Job No. 3472-A

ESCRIPTION OF ITEM(S) TESTED: Floating Roof Deck

YPE OF TEST: Vacuum Test

ESTED AT 8 P.S.I.

✓ ACCEPTED

REJECTED

C. V. Chapman
WYATT INSPECTOR OR SUPERVISOR

3-10-93
DATE

CUSTOMER INSPECTOR

3-10-93
DATE

Wyatt Field Service Company

RECORD OF TEST

CUSTOMER: LYONDELL CHEMICAL Job No. 2472A

DESCRIPTION OF ITEM(S) TESTED: TANK ITEM T-3455 INNER & OUTER TANK.

TYPE OF TEST: Hydro tested per procedure ON WYATT DRAWING W-92-2472A-2A

TESTED AT 2 1/2" & 5" W.C. [redacted].

(V) ACCEPTED

( ) REJECTED

Andy Searle
WYATT INSPECTOR OR SUPERVISOR

4/13/93
DATE

[signature]
CUSTOMER INSPECTOR

4/13/93
DATE

"YATT FIELD SERVICE COMPAN"

REPAD PNEUMATIC LEAK TESTS

: 2472-A Customer: LyONDell

Test Pressure: 15 PSI (15 PSI max. for API 650)

Nozzle #	Approved By	Date	Remarks
"52"	C.V.C. / JH	3-25-93	OK
51"	C.V.C / JH	4-1-93	ok
37	A.S / JH	4-5-93	ok
38	A.S. / JH	4-5-93	ok
18I	A.S. / JH	4-5-93	ok
180	A.S. / JH	4-5-93	ok
17	A.S. / JH	4-7-93	OK
31	A.S / JH	4-7-93	OK
3	A.S. / JH	4-7-93	OK
35	A.S / JH	4-7-93	OK
51	A.S JH	4/15/93	AFTER NOZZLES were MOVED
52	A.S JH	4/15/93	Completed welds were Rechecked

Form #463 Rev.0

REPORT OF ULTRASONIC THICKNESS EXAMINATION OF STRUCTUAL STEEL

PROJECT: CAUSTIC SURGE TANK

AREA: OP 1

EQUIPMENT NO.: TK 3455

DRAWING NO.: N/A

TYPE OF TEST EQUIPMENT: PANAMETRICS UT THICKNESS GAGE MODEL 26DL

READINGS		
NO.	READING	LOCATION
1	.248	VARIOUS LOCATIONS ROOF PANELS
2	.238	" " " "
3	.244	" " " "
4	.246	" " " "
5	.253	" " " "
6	.248	" " " "
7	.242	" " " "
8	.243	" " " "
9	.260	" " " "
		* Original roof plate design thickness = 0.250"
		per Chicago Bridge + Iron Co. Doug. 74-2892
		(Re-used water tank Roof plates)
		DEH 6/22/93

INSPECTOR: James C. Wilson

CWI #91120901

REPORT OF ULTRASONIC THICKNESS EXAMINATION
OF STRUCTUAL STEEL

PROJECT: CAUSTIC SURGE TANK

AREA: OP 1

EQUIPMENT NO.: TK 3455

DRAWING NO.: N/A

TYPE OF TEST EQUIPMENT: PANAMETRICS UT THICKNESS GAGE MODEL 26DL

READINGS		
NO.	READING	LOCATION
1	.354	TOP PLATE ASSEMBLY
2	.351	" " "
3	.354	" " "
4	.353	" " "
5	.355	" " "
6	.353	" " "
7	.352	" " "
8	.351	" " "

INSPECTOR: [signature]

CWI #91120901

REPORT OF ULTRASONIC THICKNESS EXAMINATION
OF STRUCTUAL STEEL

PROJECT: CAUSTIC SURGE TANK

AREA: OP 1

EQUIPMENT NO.: TK 3455

DRAWING NO.: N/A

TYPE OF TEST EQUIPMENT: PANAMETRICS UT THICKNESS GAGE MODEL 26DL

READINGS		
NO.	READING	LOCATION
1	.329	RANDOM READINGS ROOF CHANNELS (WEB OF CHANNEL)
2	.335	" " " " "
3	.339	" " " " "
4	.331	" " " " "
5	.330	" " " " "
6	.344	" " " " "
7	.333	" " " " "
8	.333	" " " " "
9	.340	" " " " "
10	.330	" " " " "
	0.314 →	New C6x10.5 channel web.
		* Re-used Rafters Web thickness exceeds that
		Required for A C 6x10.5 channel (Per Chicago
		Bridge + Iron Dwg. 74-2892). No significant
		general or localized corrosion observed. DEA 6/24/98

INSPECTOR: James C. Hunter

CWI #91120901

WIATT FIELD SERVICE COMPANY

MT REPORT

'N: 2472-A Customer: LyONDELL

'roc. #WQAS 209-5: Prod: _____ Yoke: ✓ A.C.: ✓ D.C.: _____

Seam # or Plate #	Mfgr. Stage	Defects*	Operator	Date
9A	Completed Weld OUTSIDE	None	L.D.M.	2-23-93
9A	Completed Weld Inside	None	L.D.M.	"
9B	Completed Weld OUTSIDE	None	L.D.M.	"
9B	Completed Weld INSIDE	None	L.D.M.	"
9C	Completed Weld OUTSIDE	None	L.D.M.	"
9C	Completed Weld Inside	None	L.D.M.	"
9D	Completed Weld OUTSIDE	None	L.D.M.	"
9D	Completed Weld INSide	None	L.D.M.	"
Sump	Completed Weld to Inner TK Bottom	None	C.V.C./JH	3-3-93
"52"	Completed weld OUTSIDE	None	W.C.B./JH	3-25-93
"52"	Completed weld Inside	None	W.C.B./JH	"
"51"	Completed WELDS Both side INNER shell	NONE	W.C.B JH	4-1-93
"51"	Completed weld outside outer shell	NONE	W.C.B. JH	4-1-93
"1A"	Completed WELDS outside shell	NONE	W.C.B JH	4-1-93
8	" "	NONE	W.C.B. JH	4-1-93
2	" "	NONE	W.C.B. JH	4-1-93
3	" "	NONE	W.C.B JH	4-1-93
4	" "	NONE	W.C.B JH	4-1-93
5	" "	NONE	W.C.B JH	4-1-93
1BI	Completed WELDS Both Sides	None	A.S JH	4-5-93
1BO	" "	NONE	A.S. JH	4-5-93
37	" "	NONE	A.S JH	4-5-93
38	" "	NONE	A.S. JH	4-5-93
40	" "	NONE	A.S. JH	4-5-93

*Attach Sketch of Defects if "

WYATT FIELD SERVICE CO. ANY

MT REPORT

JN: 2472A Customer: LYONDELL

Proc. #WQAS 209-5: Prod: _____ Yoke: ✓ A.C.: ✓ D.C.: _____

Seam # or Plate #	Mfgr. Stage	Defects*	Operator		Date
45A	Completed welds Both sides	NONE	A.S	JH	4/5/93
45B	" "	"	"	JH	"
45C	" "	"	"	JH	"
45D	" "	"	"	JH	"
45E	" "	"	"	JH	"
45F	" "	"	"	JH	"
17	" "	NONE	A.S	JH	4/7/93
31	" "	"	A.S	JH	4/7/93
33	" "	"	A.S	JH	4/7/93
35	" "	"	A.S	JH	4/7/93
51	Completed welds AFTER Rewelding	NONE	A.S	JH	4/13/93
52	" "	"	A.S	JH	4/13/93

*Attach Sketch of Defect

WYATT FIELD SERVICE COMPANY

CONTENTS

WQAS-209-5 MAGNETIC PARTICLE EXAMINATION OF WELDS AND SURFACES

PARAGRAPH

1. Scope
2. General
3. Responsibility
4. Qualifications
5. Equipment
6. Materials
7. Surface Preparation
8. Procedure
9. Evaluation of Indications
10. Acceptance Standards
11. Repair Requirements
12. Demagnetization
13. Reports

EXHIBIT

1. MT Report, Form #405

WQAS-209-5 MAGNETIC PARTICLE EXAMINATION OF WELDS AND SURFACES

1. Scope (Not For Use With ASME Section 1)

1.1 This procedure establishes the method and technique applicable to the dry powder magnetic particle examination of welds and surfaces. Either the prod technique or the yoke technique may be used. The prod technique shall be utilized, using direct or rectified magnetizing current and shall not be used after machining, final heat treatment, hydrostatic testing or when the areas of interest requiring magnetic particle examinations are impractical or inaccessible to prod application.

2. General

2.1 Magnetic particle examination is a method of nondestructive examination which provides for surface and limited subsurface detection of discontinuities in ferrous material. Requirements expressed in this magnetic particle procedure are intended to control the quality and reliability of the magnetic particle examination and the material being examined.

3. Responsibility

3.1 The Superintendent shall be responsible for assuring that MT procedures are readily available to all nondestructive examination personnel for reference and use. In addition, he shall assure that personnel are qualified to implement a procedure prior to making work assignments.

4. Qualifications

4.1 Personnel performing MT examinations will be certified as to their competency in the techniques of the MT examination method by the Q.A. Manager or the Inspector.

4.2 This procedure is certified to be in accordance with the requirements of Sec.VIII, Div. 1, Appendix 6; Sec. VIII, Div.2, Appendix 9; Sec.V, T-150 and the applicable parts of Sec.V, Article 7.

5. Equipment

5.1 Prods: Direct current (DC) obtained from DC generators or rectifiers shall be used to induce the magnetic flux field. In general, half-wave direct current shall be utilized as a magnetic field source due to the function of pulsation and powder mobility response. If rectified current is not half-wave, it must be three phase, full-wave rectified.

5.1.1 Note: For DC prod application, the open circuit voltage of the magnetizing equipment shall not exceed 25 volts.

5.2 Yokes: Fixed or articulated leg type Portable Electromagnetic (AC-DC) Yokes may be used as a magnetizing apparatus. Yokes shall have a lifting power of at least 10 lbs. at the maximum pole spacing that will be used for the alternating current electromagnetic yoke and a lifting power of at least 40 lbs. for the direct current electromagnetic yoke. Yokes shall be checked at least once a year in accordance with ASME Sec. V, T-746.3.

5.2.1 Note: Except for materials 1/4 inch or less in thickness, alternating current yokes are superior to direct current magnetic yokes of equal lifting power for the detection of surface discontinuities.

5.3 Magnetic Particle Application and Removal Equipment Magnetic particles shall be applied by mechanical shakers, bulb blowers or mechanical blowers. A commercial powder blower manufactured by Magnaflux Corporation or equivalent is considered an acceptable means of removing excess magnetic particles.

5.4 Lighting: The testing area shall be adequately illuminated for proper evaluation of the indications revealed on the examined surface.

5.5 Magnetizing equipment with an ammeter must be calibrated at least once a year in accordance with ASME Sec. V, T-731.

6. Materials

6.1 Magnetic Particles: The magnetic particles shall be those manufactured by Magnaflux Corporation or equivalent. Red, black or gray may be used as needed to provide contrast, however, red is universal and is acceptable for most surfaces.

7. Surface Preparation

7.1 The surface to be examined may be in the as welded condition; however, surface preparation by grinding or machining may be necessary where surface irregularities could mask indications.

7.2 Prior to magnetic particle examination, the surface to be examined and all areas within 1" of the surface to be examined shall be dry and free of all dirt, grease, lint, scale, welding flux and spatter, or other extraneous matter that could interfere with the examination.

7.3 Cleaning may be accomplished by sand or grit blasting, wire brushing, grinding or machining.

7.4 Back chipped welds shall be sufficiently ground to prevent nonrelevant indications. Root passes or subsequent layers of welds may be examined in the as welded condition provided there is no interfering rollover or undercutting.

8. Procedure

8.1 Pre-Examination: Prior to magnetic particle examination, the surface shall be examined to determine its compliance to paragraph 7. All unacceptable conditions must be corrected prior to magnetic particle examination. The temperature of the material to be examined shall not exceed 600 F.

8.2.1 Magnetizing Technique (Prods): Magnetize the area to be inspected by means of contact prods. Care shall be taken to prevent local over heating, arcing, or burning of the surface being inspected. To avoid these conditions, place the prods on the material to be examined before applying the current and turn off the current before the prods are removed.

8.2.2 Magnetizing Current: Direct or rectified magnetizing current shall be used at a minimum of 100 and a maximum of 125 AMP/In. of prod spacing for sections 3/4 inch thick or greater. For sections less than 3/4 inch thick, amperage shall be 90 to 110 AMP/In. of prod spacing.

8.2.3 Prod Spacing: Prod spacing shall be a maximum of 8 inches. Shorter spacing may be used to meet the geometric limitations of dimensions at the area being examined, or to increase the sensitivity; but prod spacing less than 3 inches is not usually feasible due to banding of the particles around the prods. The prod tips shall be kept clean and dressed and the contact areas of the test surface free from dirt, scale, oil etc. to minimize electrical arcing.

8.3.1 Magnetizing Technique [Yoke Method]: Magnetization shall be accomplished by a Portable Electromagnetic Yoke provided with an on-off switch for convenience in applying and removing the yoke from the material. Direct or alternating current may be used subject to code or customer specifications.

8.3.2 Pole Spacing: Pole spacing shall be limited to 3 to 6 inches when using a fixed current device in order to comply with the yoke qualification specified in SA-275.

8.4 Direction of Magnetization: At least two separate examinations shall be performed on each area, with the prods placed so the lines of flux in one examination are approximately perpendicular to the lines of flux in the other.

8.5 Examination Coverage: Examinations shall be conducted with sufficient overlap to assure 100% coverage.

8.6 Application of Magnetic Particles: Magnetic particles shall be applied in such a manner that a light, dust-like coating settles upon the metal surface under examination. The magnetic field induction shall be in process during the application.

8.7 Removal of Magnetic Particles: The excess Ferro-magnetic Particles shall be removed by means of dry air current of sufficient force to remove excess particles without disturbing those particles which are indicative of discontinuities. This removal may be accomplished by bulb blowers or air of an approx-imately equal pressure. The magnetizing current shall remain on while the magnetic particles are being applied and while the excess particles are being removed.

8.7 Examination and Evaluation: Each area shall be examined immediately upon removal of excess particles and prior to application of the magnetic field in another direction or location. Indications will appear as collections of magnetic particles which cannot be removed by a properly directed air current.

9. Evaluation of Indications

9.1 Indications are the retention of magnetic particles. All such indications are not necessarily imperfections since excessive surface roughness and magnetic permeability variations, such as the edge of heat affected zones, etc., may produce similar indications.

9.2 Only indications which have a dimension greater than 1/16 inch shall be considered relevant. Any questionable or doubtful indications shall be re-examined to determine if they are relevant.

9.3 Any indication which is believed to be nonrelevant shall be regarded as an imperfection unless it is shown by reexamination and/or by surface conditioning that no unacceptable imperfection is present.

10. Acceptance Standards

10.1 Base Materials

Unless specified otherwise, all linear discontinuities, having length not parallel to the material surface, shall be removed. Discontinuities parallel to the surface, such as inclusions, shall be evaluated in accordance with the applicable Code and material specification.

10.2 Welds

Acceptance standards for welds shall be as specified in the code.

11. Repair Requirements

11.1 Unacceptable imperfections shall be removed and reexamination made to assure complete removal. Whenever an imperfection is removed and subsequent repair by welding is not required, the excavated area shall be blended into the surrounding surface so as to avoid sharp notches, crevices, or corners. Where welding is required after removal of an imperfection, the area shall be cleaned and welding performed in accordance with a qualified welding procedure.

11.2 Reexamination of Repaired Areas

After repairs have been made, the repaired area shall be blended into the surrounding surface so as to avoid sharp notches, crevices, or corners and reexamined by the magnetic particle method and by all other methods of examination that were originally required for the affected area, except that, when the depth of repair is less than the radiographic sensitivity required, reradiography may be omitted.

12. Demagnetization: Demagnetization is not normally required.

13. Reports

13.1 Examination results shall be reported on Form #405 (see exhibit 1).

TO: MANAGER - QUALITY ASSURANCE

SUBJECT: CERTIFICATION OF N.D.E. PERSONNEL

THIS IS TO CERTIFY THAT ON 8/20/92 (DATE), W.C. Baker (NAME)
(S.S.# 450-15-7285) WAS CERTIFIED AS A MT & PT (TYPE OF NDE)
EXAMINER IN ACCORDANCE WITH ASME SECTION VIII DIVISION I, SECTION V.
AS APPLICABLE, AND COMPANY PROCEDURES. I PERSONALLY OBSERVED THE
PRACTICAL EXAMINATION FOR THE MT & PT (TYPE OF NDE) EXAMINER
CLASSIFICATION AND PERFORMED THE CODE REQUIRED VISION TESTING.
VISION TEST EXPIRES: 8/20/93 (DATE).

Andy Searle
INSPECTOR

EXAMINATION: VISION

DATE						
BY						
EXPIRES						

DATE						
BY						
EXPIRES						

FORM #844-1

TO: MANAGER - QUALITY ASSURANCE

SUBJECT: CERTIFICATION OF N.D.E. PERSONNEL

THIS IS TO CERTIFY THAT ON 1/8/92 (Date) C. Chapman (Name)

(S.S. # 458-90-0330) WAS CERTIFIED AS A MT, PT, & WMT (Type of NDE) EXAMINER

IN ACCORDANCE WITH ASME SECTION VIII DIVISION I, SECTION V, AS APPLICABLE, AND COMPANY PROCEDURES. I PERSONALLY OBSERVED THE PRACTICAL EXAMINATION FOR THE MT, PT, & WMT (Type of NDE) EXAMINER CLASSIFICATION AND PERFORMED THE CODE REQUIRED VISION TESTING.

VISION TEST EXPIRES: 1/8/93 (Date)

Andy Searle
INSPECTOR

Re-examination: Vision

Date	1-6-93								
By	A.S.								
Expires	1-6-94								

Date									
By									
Expires									

Form 844-1, Rev. 1

TO: MANAGER - QUALITY ASSURANCE

SUBJECT: CERTIFICATION OF N.D.E. PERSONNEL

THIS IS TO CERTIFY THAT ON 5/9/92 (DATE), Bruce Hendrix (NAME) (S.S.# 527-19-3357) WAS CERTIFIED AS A MT & PT (TYPE OF NDE) EXAMINER IN ACCORDANCE WITH ASME SECTION VIII DIVISION I, SECTION V, AS APPLICABLE, AND COMPANY PROCEDURES. I PERSONALLY OBSERVED THE PRACTICAL EXAMINATION FOR THE MT & PT (TYPE OF NDE) EXAMINER CLASSIFICATION AND PERFORMED THE CODE REQUIRED VISION TESTING.

VISION TEST EXPIRES: 5/9/93 (DATE).

Andy Searle
INSPECTOR

RE-EXAMINATION: VISION

DATE						
BY						
EXPIRES						

DATE						
BY						
EXPIRES						

FORM #844-1

TO: MANAGER - QUALITY ASSURANCE

SUBJECT: CERTIFICATION OF N.D.E. PERSONNEL

THIS IS TO CERTIFY THAT ON 8/20/92 (DATE), L.D. McClure (NAME)
(S.S.# 233-74-7030) WAS CERTIFIED AS A MT & PT (TYPE OF NDE)
EXAMINER IN ACCORDANCE WITH ASME SECTION VIII DIVISION I. SECTION V. AS APPLICABLE, AND COMPANY PROCEDURES. I PERSONALLY OBSERVED THE PRACTICAL EXAMINATION FOR THE MT & PT (TYPE OF NDE) EXAMINER CLASSIFICATION AND PERFORMED THE CODE REQUIRED VISION TESTING.

VISION TEST EXPIRES: 8/20/93 (DATE).

Andy Soule
INSPECTOR

-EXAMINATION: VISION

DATE						
BY						
EXPIRES						

DATE						
BY						
EXPIRES						

FORM #844-1

TO: MANAGER - QUALITY ASSURANCE

SUBJECT: CERTIFICATION OF N.D.E. PERSONNEL

THIS IS TO CERTIFY THAT ON 3/2/93 (DATE), Carl Turpin (NAME) (S.S.# 457-13-6325) WAS CERTIFIED AS A MT & PT (TYPE OF NDE) EXAMINER IN ACCORDANCE WITH ASME SECTION VIII DIVISION I. SECTION V. AS APPLICABLE, AND COMPANY PROCEDURES. I PERSONALLY OBSERVED THE PRACTICAL EXAMINATION FOR THE MT & PT (TYPE OF NDE) EXAMINER CLASSIFICATION AND PERFORMED THE CODE REQUIRED VISION TESTING.

VISION TEST EXPIRES: 3/2/94 (DATE).

Andy Searle
INSPECTOR

EXAMINATION: VISION

DATE						
BY						
EXPIRES						

DATE						
BY						
EXPIRES						

FORM #844-1

C CT INSPECTION, ..NC.

1403 Illinois Ave.
South Houston, Texas 77587
Telephone: (713) 943-1760

RADIATION SURVEY AND WELD RADIOGRAPHIC REPORT

PAGE 1 OF 1

DATE 3-29-93 PO # FW-23599 JOB NO 2472A

CUSTOMER Wyatt Field Services JOB LOCATION Lyondell Channelview

IT X UT ☐ ASME SEC I ☐ V ☐ VIII ☐ IX ☐ OFFICE USE ONLY

T ☐ MT ☐ API 1104 ☐ AWS D1.1 ☐ ST

H ☐ V ☐ ANSI B31.3 ☐ ANSI B31.1 ☐ OT

THER OTHER API 653 ST/TT

RAVEL TO JOB N/A ARRIVE JOB 4:30 PM 30 MIN OT/TT

RAVEL TO SHOP 45 MINS LEAVE JOB 7:15 PM LUNCH IS THIS YOUR ONLY TICKET FOR THIS COMPANY TODAY? JOB #

OTAL HOURS TRAVELED 45 MINS TOTAL HOURS AT JOB 2 3/4 hrs ☐ YES NO X X YES NO ☐

VEL II Terry Torgerson 4½ x 10 5 TOTAL WELDS 5 4½ x 10

VEL I Robert Ford 4½ x 17 ACCEPTED 5 4½ x 17

VEL I OTHER REPAIR OTHER

WELD NUMBER	ACCEPT	REPAIR	CUTOUT	DEFECT TYPE	WELD PASS	FROM	TO	COMMENTS
OS - V-1	✓							TK-3455
OS - C-1	✓							
OS - C-2	✓			Slag				
OS - H-1	✓							
OS - J-1	✓							

ACC[illegible]ULATION OF DISCONTINUITIES
[illegible]TE PENETRATION
[illegible]ATE PENETRATION DUE TO
[illegible]OW
[illegible] CONCAVITY
[illegible]TE FUSION
[illegible]ETE FUSION DUE TO COLD LAP

BT-BURN THROUGH
ESI-ELONGATED SLAG INCLUSIONS
ISI-ISOLATED SLAG INCLUSIONS
GP-GAS POCKET
SP-SPHERICAL POROSITY
CP-CLUSTER POROSITY
WP-WORMHOLE POROSITY

HB-HOLLOW BEAD
C-CRACK
CC-CRATER CRACK
IU-INTERNAL UNDERCUT
EU-EXTERNAL UNDERCUT
LS-LONG SEAM ALIGNMENT
AB-ARC BURN

R-ROOT PASS OR ADJACENT PIPEWALL
H-HOT PASS
F-FILLER PASS
C-COVER PASS OR ADJACENT PIPEWALL
B-BETWEEN ROOT AND HOT PASS

NOTE RADIOGRAPHY PRODUCES TWO DIMENSIONAL IMAGES ONLY. DEPTH OF DEFECTS REPORTED ARE GOOD FAITH OPINIONS ONLY

OMER APPROVAL C. V. Ellyson DATE 3-30-93

igning this report the client representative is [illegible]

GCT INSPECTION, INC.

1403 Illinois Ave.
South Houston, Texas 77587
Telephone: (713) 943-1780

RADIATION SURVEY AND WELD RADIOGRAPHIC REPORT

DATE 3-20-93 | P.O. FW-[redacted] 23594 | JOB NO Job# 2472 A | PAGE 1 OF 1

CUSTOMER Wyatt Field Services | JOB LOCATION Channelview Lyondell

RT [X] UT [ ] | ASME SEC I [ ] V [ ] VIII [ ] IX [ ] | OFFICE USE ONLY

PT [ ] MT [ ] | API 1104 [ ] AWS D1.1 [ ]

BH [ ] V [ ] | ANSI B31.3 [ ] ANSI B31.4 [ ]

OTHER | OTHER API 650, API 653 | ST

TRAVEL TO JOB N/A | ARRIVE JOB 4:30 PM | 30 MIN LUNCH | IS THIS YOUR ONLY TICKET FOR THIS COMPANY TODAY? | OT

TRAVEL TO SHOP 45 mins | LEAVE JOB 8:30 PM | [ ] YES NO [X] | [X] YES NO [ ] | ST/TT

TOTAL HOURS TRAVELED 45 mins | TOTAL HOURS AT JOB 4 hrs | JOB #

LEVEL II Terry Torgersen | 4½ x 10 13 | TOTAL WELDS 12 | 4½ x 10

LEVEL I Robert Ford | 4½ x 17 | ACCEPTED 12 | 4½ x 17

LEVEL I | OTHER | REPAIR | OTHER

WELD NUMBER	ACCEPT	REPAIR	CUTOUT	DEFECT TYPE	WELD PASS	FROM	TO	COMMENTS
J2 - G1	✓				1	2		TK# 3455 API 650
H1 - G4	✓				1	2		
H2 - G4	✓				1	2		
J-1 - G40	✓				1	2		API 653
J-2 - G40	✓				1	2		
J-3 - G40	✓			Por	1	2		
J-4 - G40	✓				1	2		
J-5 - G40	✓				1	2		
J-6 - G40	✓			Por	1	2		
H-1 - G40	✓				1	2		
H2 - G40	✓				1	2		
H3 - G40	✓				1	2		

[illegible]LATION OF DISCONTINUITIES
[illegible]DEQUATE PENETRATION
[illegible]QUATE PENETRATION DUE TO
[illegible] CONCAVITY
INCOMPLETE FUSION
INCOMPLETE FUSION DUE TO COLD LAP

BT-BURN THROUGH
ESI-ELONGATED SLAG INCLUSIONS
ISI-ISOLATED SLAG INCLUSIONS
GP-GAS POCKET
SP-SPHERICAL POROSITY
CP-CLUSTER POROSITY
WP-WORMHOLE POROSITY

HB-HOLLOW BEAD
C-CRACK
CC-CRATER CRACK
IU-INTERNAL UNDERCUT
EU-EXTERNAL UNDERCUT
LS-LONG SEAM ALIGNMENT
AB-ARC BURN

R-ROOT PASS OR ADJACENT PIPEWALL
H-HOT PASS
F-FILLER PASS
C-COVER PASS OR ADJACENT PIPEWALL
B-BETWEEN ROOT AND HOT PASS

NOTE RADIOGRAPHY PRODUCES TWO DIMENSIONAL IMAGES ONLY. DEPTH OF DEFECTS REPORTED ARE GOOD FAITH OPINIONS ONLY

OMER APPROVAL C. V. Clay | DATE 3-20-93

GCT INSPECTION, INC.

1403 Illinois Ave.
South Houston, Texas 77587
Telephone: (713) 943-1760

RADIATION SURVEY AND WELD RADIOGRAPHIC REPORT

DATE: 3-1-93 | PO #: 23590 | JOB NO: 2472-A TK 3455 | PAGE 1 OF 1

CUSTOMER: Wyatt Field Services | JOB LOCATION: Lyondell chemical co.

RT ☐ UT ☐ | ASME SEC. I ☐ V ☐ VIII ☐ IX ☐ | OFFICE USE ONLY

PT ☐ MT ☐ | API 1104 ☐ AWS D1.1 ☐

MT ☐ VT ☐ | ANSI-B31.3 ☐ ANSI B31.4 ☐

OTHER: | OTHER: API 650

TRAVEL TO JOB: 45 min	ARRIVE JOB: 4:30 PM	30 MIN. LUNCH: ☐ YES NO ☑	IS THIS YOUR ONLY TICKET FOR THIS COMPANY TODAY? ☑ YES NO ☐
TRAVEL TO SHOP: 45 min	LEAVE JOB: 7:45 PM		
TOTAL HOURS TRAVELED: 1½ hr	TOTAL HOURS AT JOB: 3 1/4 hrs		
TECH II: Terry Torgerson	4½ x 10: 9	TOTAL WELDS: 9	4½ x 10
TECH I: Robert Ford	4½ x 17	ACCEPTED: 9	4½ x 17
TECH I:	OTHER	REPAIR	OTHER

OFFICE USE ONLY: ST | OT | ST/TT | OT/TT | JOB #

WELD NUMBER	ACCEPT	REPAIR	CUTOUT	DEFECT TYPE	WELD PASS	FROM	TO	COMMENTS
G-1, H-1	✓				1	2		
G-1, H-2	✓				1	2		
G-1 J-1	✓				1	2		
R-1 V-3	✓				1	2		
R-1 V-4	✓				1	2		
R-1 V-2	✓				1	2		
R-1 V-6	✓				1	2		
R-2 V-7	✓				1	2		
R-2 V-5	✓				1	2		

...ATION OF DISCONTINUITIES
...TE PENETRATION
...ATE PENETRATION DUE TO
...CONCAVITY
...MPLETE FUSION
...OMPLETE FUSION DUE TO COLD LAP

BT-BURN THROUGH
ESI-ELONGATED SLAG INCLUSIONS
ISI-ISOLATED SLAG INCLUSIONS
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SP-SPHERICAL POROSITY
CP-CLUSTER POROSITY
WP-WORMHOLE POROSITY

HB-HOLLOW BEAD
C-CRACK
CC-CRATER CRACK
IU-INTERNAL UNDERCUT
EU-EXTERNAL UNDERCUT
LS-LONG SEAM ALIGNMENT
AB-ARC BURN

R-ROOT PASS OR ADJACENT PIPEWALL
H-HOT PASS
F-FILLER PASS
C-COVER PASS OR ADJACENT PIPEWALL
B-BETWEEN ROOT AND HOT PASS

NOTE: RADIOGRAPHY PRODUCES TWO DIMENSIONAL IMAGES ONLY. DEPTH OF DEFECTS REPORTED ARE GOOD FAITH OPINIONS ONLY

...MER APPROVAL: C ... | DATE: 3-1-93

GCT INSPECTION, INC.

1403 Illinois Ave.
South Houston, Texas 77587
Telephone: (713) 943-1760

RADIATION SURVEY AND WELD RADIOGRAPHIC REPORT

PAGE 1 OF

P.O. FW 26312 — JOB NO

TOMER Wyatt Field — JOB LOCATION Lyondell Chelsea Pl.

UT ☐ MT ☐ V ☐ — ASME SEC I ☐ V ☐ VIII ☐ IX ☐ — API 1104 ☐ — AWS D1.1 ☐ — ANSI B31.3 ✓ — ANSI B31.4 ☐ — OTHER

OFFICE USE ONLY: ST 1 — OT — ST/TT — OT/TT — JOB #

EL TO JOB 20 min — ARRIVE JOB 1:15 — 30 MIN LUNCH — YES ☐ NO ☑ — IS THIS YOUR ONLY TICKET FOR THIS COMPANY TODAY? ☑ YES ☐ NO

EL TO SHOP 30 min — LEAVE JOB 1:15

L HOURS TRAVELED 1 hour — TOTAL HOURS AT JOB 4 hrs.

S. Ettel

11.11 Inch

4½ x 10 7 — 4½ x 17 — OTHER

TOTAL WELDS 2 — ACCEPTED 2 — REPAIR

4½ x 10 — 4½ x 17 — OTHER

WELD NUMBER	ACCEPT	REPAIR	CUTOUT	DEFECT TYPE	WELD PASS	FROM	TO	COMMENTS
								Tank 455 Unit #3
W-1	✓							
	✓				2	3		
	✓				3			
W-2	✓				1	2	3	Sch 30
	✓				2	3		
	✓				3	1		

...TION OF DISCONTINUITIES
...E PENETRATION
...E PENETRATION DUE TO
...ONCAVITY
...PLETE FUSION
...MPLETE FUSION DUE TO COLD LAP

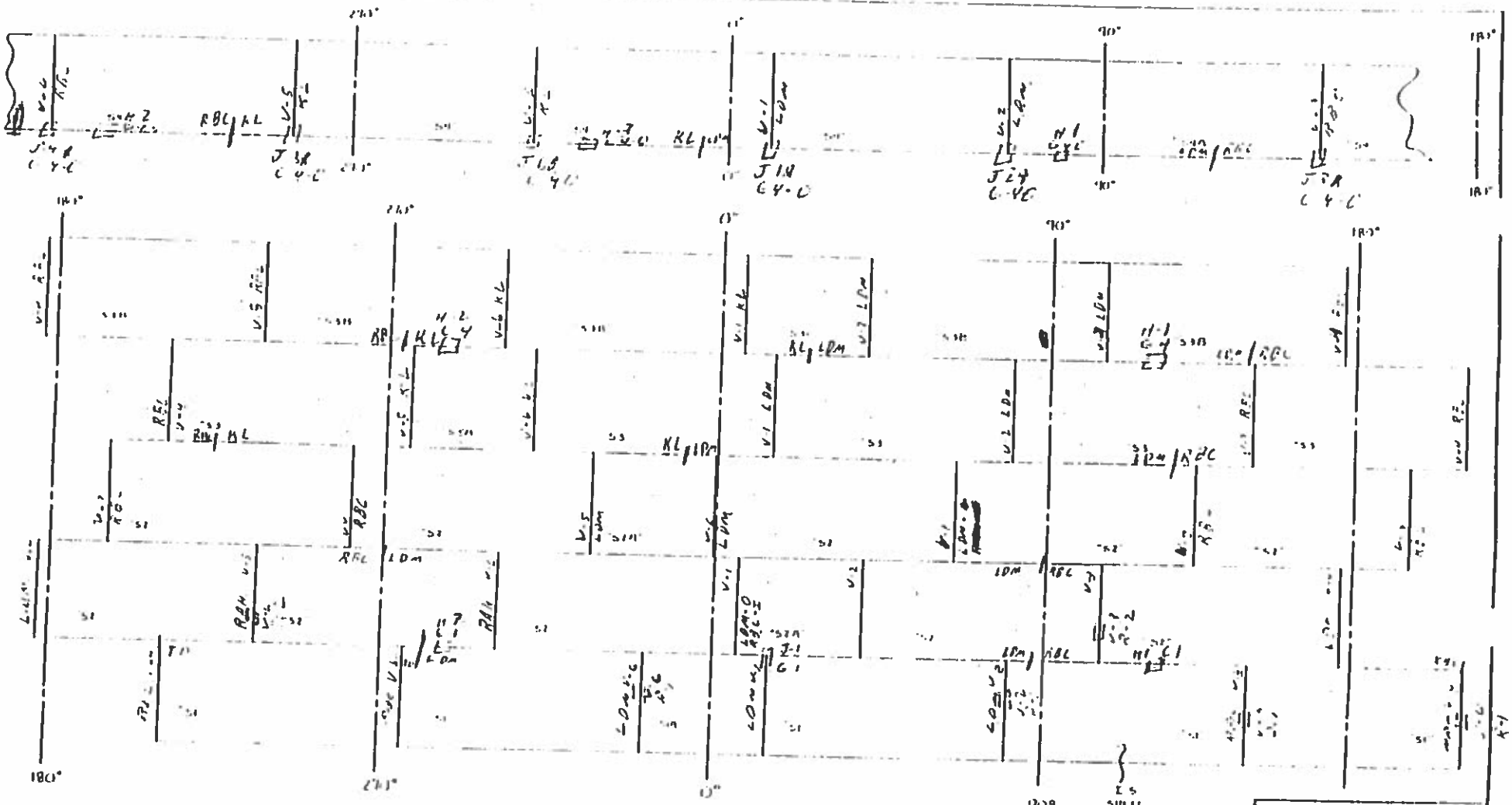
BT BURN THROUGH
ES ELONGATED SLAG INCLUSIONS
IS ISOLATED SLAG INCLUSIONS
GP GAS POCKET
SP SPHERICAL POROSITY
CP CLUSTER POROSITY
WP WORMHOLE POROSITY

HB HOLLOW BEAD
C CRACK
CC CRATER CRACK
IU INTERNAL UNDERCUT
EU EXTERNAL UNDERCUT
LS LONG SEAM ALIGNMENT
AB ARC BURN

R ROOT PASS OR ADJACENT PIPEWALL
H HOT PASS
F FILLER PASS
C COVER PASS OR ADJACENT PIPEWALL
B BETWEEN ROOT AND HOT PASS

NOTE: RADIOGRAPHY PRODUCES TWO DIMENSIONAL IMAGES ONLY. DEPTH OF DEFECTS REPORTED ARE GOOD FAITH OPINIONS ONLY

ER APPROVAL — DATE



X RAY / WELD MAP

P.O. #: [illegible]

S/O 24720 | ITEM: 1K 3455

WESTATE WYATT FIELD SERVICE COMPANY
HOUSTON TEXAS

MISC MODIFICATIONS TO AN EXIST 90'-0" x 32'-0" HEIGHT TANK

X RAY / WELD MAP

CUSTOMER: HOWDELL PETROCHEMICAL

DRAWN: JKH | DATE: 2-2-92

CHECKED: CC | APPROVED

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 2/25/92

GENEVA ...

Metallurgical Test Report

B880

JOB. CONTRACT NO.

P.O. DATE	PURCHASE ORDER NO.		
	60-6312/MH114312		
SHIPPERS NO.		MILL ORDER NO.	INVOICE NO.
GP56452A 06-21-92		EA43590	GP56452A
VEHICLE IDENTITY	SSU87950		

GENEVA STEEL
P.O. BOX 2500
PROVO, UTAH 84603

MANNESMANN PIPE&STEEL CORP
1990 POST OAK BLVD
HOUSTON TX 77056-3311

63012

SHIP TO
DELTA STEEL
7355 ROUNDHOUSE LANE
SPRR SPIN 2432
HOUSTON, TX

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

Larry D. Clinger
MANAGER - QUALITY ASSURANCE
DATE 06-21-92

PLATE ASTM A516-96 GRADE 70 AND ASME SA516-1989 EDITION
0 ADDENDA GRADE 70 SECTION II PRESSURE VESSEL QUALITY NORMALIZED
CHARPY V-NOTCH LONGITUDINAL IMPACT TESTS EACH PLATE AS HEAT TREATED
15FT/LBS MIN AVERAGE 12FT/LBS MIN AT MINUS 50 DEG. F.FREQUENCY P.
01 MILL CERTIFIED T/R

MATERIAL DESCRIPTION: THICKNESS OR SECTION	WIDTH, DIA. OR FT. WT.	LENGTH	QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	YIELD PT. *KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED. OF AREA	BEND
.2500"	96.0000"	480.0000"	1	32674	1C1109	08-04	58.3	81.4	23.0			
2 SIZE LONG CHARPY V-NOTCH IMPACT TESTS 05X10 MM TESTED AT -50 DEG F							32	35	37	FOOT LBS		
AVERAGE IMPACT STRENGTH 34 FT LBS ACTUAL GAGE TESTED .2500												
.2500"	96.0000"	480.0000"	1	32671	1C1109	08-05	55.0	79.6	24.0			
2 SIZE LONG CHARPY V-NOTCH IMPACT TESTS 05X10 MM TESTED AT -50 DEG F							37	29	31	FOOT LBS		
AVERAGE IMPACT STRENGTH 32 FT LBS ACTUAL GAGE TESTED .2500												
.2500"	96.0000"	480.0000"	2	6534#	1C1159	08-03	61.5	83.0	24.0			DA
2 SIZE LONG CHARPY V-NOTCH IMPACT TESTS 05X10 MM TESTED AT -50 DEG F							30	30	30	FOOT LBS		P.O
AVERAGE IMPACT STRENGTH 30 FT LBS ACTUAL GAGE TESTED .2500												
.3750"	96.0000"	480.0000"	2	9802#	2C5813	04-03	56.5	81.9	23.0			JOE
4 SIZE LONG CHARPY V-NOTCH IMPACT TESTS 7.5X10MM TESTED AT -50 DEG F							51	59	39	FOOT LBS		
AVERAGE IMPACT STRENGTH 49 FT LBS ACTUAL GAGE TESTED .3750												

HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO	
1109	HEAT	23	1.20	006	020	19	02	03	03	009		045		004			004		FINE GRAIN
1159	HEAT	24	1.17	008	026	20	02	03	03	004		021		018			004		FINE GRAIN
5813	HEAT	24	1.18	009	013	22	03	03	03	004		056		004			004		FINE GRAIN

GENEVA STEEL COMPANY CERTIFIES ALL SMELTING, MELTING AND MANUFACTURING PROCESSES OCCURRED IN THE USA.

END OF DATA ****

1.107 DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED

P.O. Box 2760, Portland, Oregon 97208 · (503) 265-9651 TWX 910 464 1549

CERTIFICATE NO.	152051
DATE	DEC 30,19
MILL ORDER NO.	FM-15735-02
DATE	11/
CUSTOMER ORDER NO.	0701-410-033
JOB/REQ. NO.	
SHIPPING NO.	F152051
DATE	12/
CARRIER	UP
CAR/TRUCK NO.	UP259591

SOLD TO:
54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

SHIP TO:
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSH CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

PHYSICAL PROPERTIES

DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8"	% ELONG 2"	% RA	HARDNESS BHN	BEND TEST	IMPACTS
** CONTINUED FROM PREVIOUS PAGE ** 5/16 X 96 X 480	VC0023	A69	570	795	23					
	VC0023	A70	575	790	22					
	VC0023	B66	560	790	26					
	VC0023	B67	550	785	23					
	VC0023	B68	555	790	25					
	VC0023	B71	555	790	25					
	VC0023	B73	575	810	24					
	VC0023	B74	575	800	22					
	VC0044	A22	555	785	24					
	VC0046	A32	575	810	22					
	VC0046	A33	590	820	22					
	VC0046	A34	590	820	23					

RECEIVED
DATE 1-18-93
P.O. # W56849
JOB # 2472

CHEMICAL ANALYSIS

HEAT NO.	%C	%Mn	%P	%S	%Si	%Cu	%Ni	%Cr	%Mo	%Al	%Sn	%V	%B	%Nb	%Ca	%Pb	CE
VC0044	.19	1.07	.024	.009	.21	.01	.02	<.02	<.002	.033	.02	.01					
VC0046	.21	1.04	.025	.008	.20	.01	.02	<.02	<.002	.044	.02	.01					

TEST REPORT APPROVED DATE 1-15-
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

We hereby certify the above results to be correct as contained in the records of OREGON STEEL MILLS

By Angie McCleland TEST REPORT CLERK

OREGON STEEL MILLS

P.O. Box 2760, Portland, Oregon 97208 : (503) 286-9551 TWX 910-464-1549

REPORT OF CHEMICAL/PHYSICAL T

CERTIFICATE NO	DATE
230115F	Oct 07, 1992

MILL ORDER NO.	DATE
21662	

CUSTOMER ORDER NO.
0701-410-121

JOB/REQ. NO.

SHIPPING NO.	DATE
230115	10/07/19

CARRIER
SOUTHERN PACIFIC

CAR/TRUCK NO.
SSW87725

SOLD TO

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

HIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS
OSM CARBON PRESSURE VESSEL QUALITY ASTM A516-65 GRADE 70 ASME SA516 GRADE 70.

5/16 x 96 x 480

PHYSICAL PROPERTIES

ITEM NO	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8" 2"	% RA	HARDNESS BHN	BEND TEST	IMPACTS
2	0.2500 X 120.000 X 480.000									
	1 PC 4084 LBS	VC0008	A62	585	780	23				
	1 PC 4054 LBS	VC0015	B62	595	805	22				
3	0.3125 X 96.000 X 480.000 ✓									
	1 PC 4084 LBS	VC0026	B25	660	800	19				
	3 PCS 12252 LBS TOTALS									

RECEIVED
DATE 1-18-93
P.O. # W56849
JOB # 2477

Certified a true copy of th
original retained in our fil
AMERICAN ALLOY STEEL,

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Cb	Al	Cr	Mo	Ti	B	N	Ca	CE	MnCuNi
VC0008	.21	1.15	.023	.008	.23	.01	.01	K.01	K.002	.039	.02	.01						
VC0015	.21	1.07	.021	.008	.20	.01	.01	K.01	K.002	.039	.02	.01						
VC0026	.20	1.01	.018	.009	.21	.01	.02	K.01	K.002	.039	.01	.01						

******* END OF REPORT *******

TEST REPORT APPROVED DATE 10-15-92
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

I certify the above results to be correct as contained in the records of OREGON STEEL MILLS By Angie McCasland TEST REPORT CLERK

P.O Box 2760, Portland, Oregon 97208 · (503) 286-9651 TWX 910 464 1549

CERTIFICATE NO.	DATE
152051	DEC 30, 19
MILL ORDER NO.	DATE
PM-15735-02	11/
CUSTOMER ORDER NO.	
0701-410-033	
JOB/REQ. NO.	
SHIPPING NO.	DATE
P152051	12/
CARRIER	
UP	
CAR/TRUCK NO.	
UP259591	

SOLD TO:
54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

SHIP TO:
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

1/4 X 96 X 480

PHYSICAL PROPERTIES

ITEM	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI (X 1000)	TENSILE PSI (X 1000)	% ELONG	% R.A.	HARDNESS BHN	BEND TEST	IMPACTS
1	1/4 X 96 X 480	VC0023	B47	615	800	23				
		VC0023	B49	575	750	33				
		VC0023	B51	605	815	25				
		VC0023	B52	595	795	27				
		VC0023	B53	600	815	23				
		VC0023	B55	585	785	22				
		VC0023	B56	590	790	24				
		VC0023	B57	590	800	26				
		VC0023	B58	600	805	26				
		VC0023	B60	600	810	23				
		VC0023	B61	600	820	22				
		VC0024	A48	600	810	25				
		VC0024	A54	610	810	23				

RECEIVE
DATE 1-18-9
P.O. # W568
JOB # 247

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Cb	Al	Sn	Ti	B	N	Ca	V	Zr
VC0023	.20	1.10	.024	.008	.20	.01	.01	<.02	<.002	.036	.01	.01						

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.
TEST REPORT CLERK

We certify the above results to be correct as contained in the records of OREGON STEEL MILLS By Angie McCulloch

P.O. Box 2750, Portland, Oregon 97208 · (503) 286-9651 TWX 910 464 1549

SOLD TO:
54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056 F

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

1

CERTIFICATE NO. 152051 DATE DEC 30, 1
MILL ORDER NO. PM-15735-02 DAT 11
CUSTOMER ORDER NO. 0701-410-033
JOB/REQ. NO.
SHIPPING NO. F152051 DAT 12
CARRIER UP
CAR/TRUCK NO. UP259591

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARSON PRESSURE VESSEL PLATE
ASTM A516-86 GRADE 70
ASME SA516 GRADE 70

5/16 x 96 x 480

STORAGE PROC

R 713 476 1233

'93 01/15 16:43

PHYSICAL PROPERTIES

DESCRIPTION	HEAT NO	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8"	% RA	HARDNESS BHN	BEND TEST	CHARPY IMPACTS
## CONTINUED FROM PREVIOUS PAGE ## 1/4 X 96 X 480									
	VC0024	B74	575	785	22				
	VC0024	B75	580	790	22				
	VC0024	B76	580	795	25				
	VC0024	B77	585	800	22				
2 5/16 X 96 X 480 ✓									
	VC0022	B46	595	825	24				
	VC0022	B47	585	810	26				
	VC0022	B48	585	810	25				
	VC0022	B49	595	815	21				
	VC0023	A67	580	800	24				
	VC0023	A68	560	780	22				

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	B	Al	Cr	Mo	B	N	Ca	Ce
VC0022	.22	1.04	.022	.010	.19	.01	.01	<02	<002	.042	.01	.01				

RECEIVED
DATE 1-18-9
P.O. # W56894
JOB # 2472

Certified a true c
original retained
AMERICAN ALLOY

TEST REPORT APPROVED DATE 1-15-9
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

I certify the above results to be correct as contained in the records of OREGON STEEL MILLS BY Angie McCasland
CLERK

P.O. Box 2760, Portland, Oregon 97208 · (503) 286-9651 TWX 910 464 1549

SOLD TO:
54232
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD,SUITE 1625
HOUSTON, TX 77056

1

CERTIFICATE NO	DATE
152051	DEC 30, 19
MILL ORDER NO.	DATE
PM-15735-02	11/0
CUSTOMER ORDER NO.	
0701-410-033	
JOB/REQ NO.	
SHIPPING NO.	DATE
P152051	12/
CARRIER	
UP	
CAR/TRUCK NO.	
UP259591	

S MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSH CARBON PRESSURE VESSEL PLATE
ASTM A516-88 GRADE 70
ASME SA516 GRADE 70

STORAGE PROD

713 676 1233

'93 01/13 15:10

MTR	DESCRIPTION	HEAT NO.	SLAB	PHYSICAL PROPERTIES YIELD PSI x 100	TENSILE PSI x 100	% ELONG	% RA	HARDNESS BHN	BEND TEST	IMPACTS
	** CONTINUED FROM PREVIOUS PAGE ** 5/16 X 96 X 420									
		VC0023	A69	570	795	23				
		VC0023	A70	575	790	22				
		VC0023	B66	560	790	26				
		VC0023	B67	550	785	23				
		VC0023	B68	555	790	25				
		VC0023	B71	555	790	25				
		VC0023	B73	575	810	24				
		VC0023	B74	575	800	22				
		VC0046	A32	575	810	22				
		VC0046	A33	590	820	22				
		VC0046	A34	590	820	23				

RECEIVE
DATE 1-18-9
P.O. # W576
JOB # 2477

Certified a true cop
original, retained in
AMERICAN ALLOY S

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al	Co	Nb	Ti	B	N	Ca	Sn	Ce
VC0041	.19	1.07	.024	.009	.21	.01	.02	<.02	<.002	.033	.02	.01						
VC0046	.21	1.08	.025	.009	.20	.01	.02	<.02	<.002	.046	.02	.01						

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

I certify the above results to be correct as contained in the records of OREGON STEEL MILLS By Angie McCasland TEST REPORT CLERK

OREGON STEEL MILLS

P.O. Box 2760, Portland, Oregon 97208 · (503) 286-9651 TWX 910 464 1549

REPORT OF CHEMICAL/PHYSICAL TEST

CERTIFICATE NO.	DATE	PAGE
221602F	Jul 20, 1992	1

MILL ORDER NO.	DATE
21682	

CUSTOMER ORDER NO.: 0701-410-121

JOB/REL. NO.:

SHIPPING NO.	DATE
221602	07/20/1992

CARRIER: SOUTHERN PACIFIC

CAR/TRUCK NO.: SP565576

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS
SM CARBON PRESSURE VESSEL QUALITY ASTM A516-88 GRADE 70 ASME SA516 GRADE 70.

5/16 X 96 X 480

PHYSICAL PROPERTIES

DESCRIPTION	HEAT NO.	SLAB	YIELD PSI X 100	TENSILE PSI X 100	%ELONG IN 2"	%RA	HARDNESS BHN	BEND TEST	IMPACTS
0.3125 X 96.000 X 480.000 V									
1 PC 408# LBS	VC0026	A6#	500	745	21				
1 PC 408# LBS	VC0026	B2#	525	765	21				
0.3750 X 96.000 X 480.000									
1 PC 901 LBS	3#2170	A8	540	815	20				
1 PC 901 LBS	VC0008	A27	530	755	27				
1 PC 901 LBS	VC0028	B#0	530	755	22				
1 PC 901 LBS	VC0036	B#1	530	750	23				
1 PC 901 LBS	VC0038	B#2	525	755	24				
1 PC 901 LBS	VC0028	B#3	520	750	25				
1 PC 901 LBS	VC0038	B#4	530	750	27				
1 PC 901 LBS	VC0034	B31	545	780	24				
10 PCS 7376 LBS TOTALS									

RECEIVED
DATE 1-18-93
P.O. # 176-849
JOB # 2472

...by the ... in the Pla... STEEL, INC.

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Cb	B	N	Ca	CE	CE (IIW)
VC0026	.20	1.01	.015	.009	.21	.01	.02	<.01	<.002	.039	.01	.01				
3#2170	.21	1.15	.023	.008	.20	.01	.01	<.01	<.002	.039	.02	.01				
VC0008	.20	1.03	.027	.010	.21	.01	.03	<.01	<.002	.040	.01	.01				
VC0028	.21	1.03	.028	.008	.20	.01	.01	<.01	<.002	.037	.01	.01				

TEST REPORT APPROVED DATE 1-15-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

******* END OF REPORT *******

Angie McCasland TEST REPORT CLERK

Gulf States Steel, Inc

GADSDEN, AL 35904-1935

32-D702-01

PURCHASE ORDER DATE: 11 13 92 | PURCHASE ORDER NO: 5635 | RELEASE:

CERTIFICATE OF TESTS

CUSTOMER IDENTIFICATION:

GSS ORDER NO: DIST G | NUMBER 27574 | MFG 742 | ITEM NO.

LB / KG | OFFICE DIST SLS | INVOICE DATE: | INVOICE NUMBER: 742-22602

LE | ACCOUNT NUMBER: 38080003 | TERMS: 30-3/4-10

SOLD TO:
INTSEL SOUTHWEST
DIV PECHINEY WORLD TRADE
PO BOX 41041
HOUSTON TX 77240104

SHIP TO:
INTSEL SOUTHWEST
DIV PECHINEY WRLD TRD USA
SPIN NBR 4038
MELENDY TX

DATE SHIPPED	FROM	ROUTE/VEHICLE IDENTIFICATION	SHEET NO.
12 14 92	ALA CITY	SOU 115796	

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS.

C. F. BEARDEN, JR.
MGR, TECHNOLOGY AND QUALITY - PLATE PROD.

ITEM NO	MATERIAL DESCRIPTION	P/C	QUANTITY SHIPPED
	PLATE CARBON ASME SA-516 UTD 07/01/89 GRD 70 ASTM A-516-86 GRD 70 FVQ P243000A		
01	.2500 X 96.0000 SHEARED EDGE X 180.0000 IN P243000A	A	39204
	HT 7425367 T 8273 1PCS		
	HT 7425367 T 8274 1PCS		
	HT 7425367 T 8275 1PCS		
	HT 7425367 T 8276 1PCS		
	HT 7425367 T 8277 1PCS		
	HT 7425367 T 8278 1PCS		
	HT 7425367 T 8279 1PCS		
	HT 7425367 T 8280 1PCS		
	HT 7425367 T 8281 1PCS		
	HT 7425367 T 8282 1PCS		
	HT 7425367 T 8284 1PCS		

CH C 27MX MN 85/1.20 P 035MX S 040MX SI 15/40 AL 020MIN CU 40MX NI 40MX

RECEIVED
DATE 1-18-93
P.O. # 056845
JOB # 2-477

ANALYSIS

ITEM NO.	HEAT NO	GRAIN	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL
01	7425367		.21	1.05	.006	.016	.220	0.02	0.01	0.03	01	000	004	.034

TEST RESULTS

ITEM NO.	HEAT NUMBER	TESTOR PIECE IDENTITY NO	YIELD KSI	TENSILE STGTH KSI	ELONG %	GALV COATING	BEND TEST	HARD	CHARPY IMPACT V NOTCH FT. LBS. AT °F	TEST NO	SPEC SIZE	1	2	3	AVG.
01	7425367	8273	58	78	23										
	"	8274	58	77	25										
	"	8275	59	78	22										
	"	8276	58	77	24										
	"	8277	58	77	23										
	"	8278	58	78	22										
	"	8279	57	77	25										
	"	8280													

BETHLEHEM STEEL CORPORATION
QUALITY ASSURANCE DEPARTMENT
REPORT OF TESTS AND ANALYSES

BURNS HARBOR PLANT

003-11981

DATE SHIPPED: 7-14-92

CAR OR VEHICLE NO: CSS-CHGO-MP

PHNE 000650

PAGE

SOLD TO:
DELTA STEEL INC
PO BOX 2289
HOUSTON TX 77252

200810

SHIP TO:
DELTA STEEL INC
SPOT 0275400
9217 S FREEWAY
FORT WORTH TX 76140

SERIAL NUMBER	PAT NO	HEAT NUMBER	PCS PER	SIZE AND QUANTITY: THICKNESS INCHES	WIDTH OR DIA INCHES	LENGTH INCHES	WEIGHT POUNDS	YIELD POINT PSI	TENSILE STRENGTH PSI	ELO IN
QUALITY STEEL MELTED & MANUFACTURED IN THE U.S.A.										
PLATES - ASTM A516-96 GR 70 PVQ										
MFST - LIFT MAX 10 TON-SIZES SEP UNLDG 04-PLATE HOOK										
CO# DF115808 GH 024-4541										
YIELD STRENGTH @ .5% E.U.L.										
42319		803X73660	2	1/4	96	480	6534	61300	81900	8
42320		803X73660	2	1/4	96	480	6534	56700	80700	8
42321		803X73660	2	1/4	96	480	6534	56900	80200	8
42322		803X73660	1	1/4	96	480	3267	45200	77700	8

RECEIVED
DATE 1-19-93
P.O. # W56727-Axc
JOB # 2-477

Q—QUENCH TEMPERATURE
T—TEMPER TEMPERATURE
N—NORMALIZE TEMPERATURE

HEAT NUMBER	PAT NO	HEAT NUMBER	HEAD	BEND	THICKNESS INCHES	TYPE	SIZE	DIR	TEST TEMP °F	CHARPY IMPACT ENERGY FT-LBS 1	2	3	SHEAR (%) 1	2	3	LAT. EXP. 1	2

CHEMICAL ANALYSIS

HEAT NUMBER	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Ti	Al	B	Ca	N
803X73660	.23	1.00	.017	.014	.21	.015	.02	.04	.006	.004		.036		.002	

SUBSCRIBED AND SWORN TO BEFORE ME
THIS 15 DAY OF JAN 19 93

NOTARY PUBLIC
PORTER COUNTY INDIANA
MY COMMISSION EXPIRES JULY 31, 1992

AT THE ABOVE RESULTS ARE A TRUE AND CORRECT COPY
PREPARED AND MAINTAINED BY BETHLEHEM STEEL
THE REQUIREMENTS OF THE SPECIFICATION CITED ABOVE

10-22-92 11:37 T-GULF STATE STEEL1514 #172 P05

Gulf States Steel, Inc.

GADSDEN, AL 35904-1935

32 459-01

07/21/92 20A 9855

CERTIFICATE OF TESTS

CUSTOMER IDENTIFICATION

DIST. C | GSS ORDER NO. 26182 | REL. 748

TAM A | AL | OFF DIST | CL EC | INVOICE DATE | INVOICE NUMBER 742-18180

LS | ACCOUNT NUMBER 65240202 | TERMS 30-3/4-10

SOLD TO:
RYERSON CENTRAL, JOSEPH T.
MERCHANDISING SERVICES
P O BOX 8000
CHICAGO IL 60680

SHIP TO:
RYERSON CENTRAL, JOSEPH T.
1211 KRESS STREET
HOUSTON TX 77020

DATE SHIPPED	FROM	ROUTE/VEHICLE IDENTIFICATION	SHEET NO.
09 29 92	ALA CITY	85W87860	

HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS.

LEONARD A. TROMAN
DIR. QUALITY ASSURANCE AND METALLURGY

ITM NO.	MATERIAL DESCRIPTION	PVC	QUANTITY SHIPPED
	PLATE CARBON J T RYERSON SPEC 3449-P DTD 04/25/91 ASTM A-516-90 GRD 70 ASME-SA 516 GRD 70 1989 EDITION 1991 ADDENDA PVQ BLUE & PINK DOMESTIC STEEL ONLY CUST ID: 343786		
01	.2500 X 96.0000 SHEARED EDGE X 980.0000 IN	A	19602
	HT 7417643 T 8853 1PCS HT 7417643 T 8855 1PCS HT 7417643 T 8856 1PCS HT 7417643 T 8857 1PCS HT 7417643 T 8858 1PCS HT 7417643 T 8859 1PCS		
CH	C 27MX MN 85/1.20 P 035MX S 035MX SI 15/40 AL 020MIN CU 40MX NI 40MX CR 30MX MO 12MX CB 02MX V 03MX		
MR	YLD 38000 MIN TEN 70/90000 X ELONG MIN 2 IN 21 OR 8 IN 17		
TI	S TR WITHIN 24 HRS OF SHIPMENT TO SA 1 TR PO BOX 2606		

RECEIVED
DATE 1-18-93
P.O. # 156797-B
JOB # 2472

Mbo

ITM NO.	HEAT NO.	GRAIN	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL
01	7417643		.18	1.09	.012	.013	.220	0.06	0.02	0.15	.04	.000	.006	.034

ITM NO.	HEAT NUMBER	MILL PLATE IDENTITY NO.	YIELD KSI	TENSILE STRENGTH KSI	ELONG %	QUALITY COATING	BEND TEST	HARD.	CHARPY IMPACT V NOTCH FT.LBS. AT TEST NO.	SPEC SIZE	1	2	3	AVG
1	7417643	8853	60	75	25									
	"	8855	61	76	24									
	"	8856	57	75	26									
	"	8857	58	76	21									
	"	8858	61	76	24									

GENEVA STEEL

Test Report

2017

CUSTOMER JOB CONTRACT NO	P.O. DATE	PURCHASE ORDER NO.
		60-8244/W56200

SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.
GP624208 11-23-92	EA53570	GP624208

VEHICLE IDENTITY SSU87777

VENDOR
GENEVA STEEL
P.O. BOX 2500
PROVO, UTAH 84603

SOLD TO
MANNESMANN PIPEASTEEL CORP
1990 POST OAK BLVD
HOUSTON TX 77056-3811

SHIP TO
UYATT FIELD SERVICE COMPANY
GREENSPORT INDUSTRIAL PARK
13609 INDUSTRIAL ROAD
HOUSTON, TEXAS 77015

THIS IS TO CERTIFY THA
PRODUCT DESCRIBED HERE
MANUFACTURED, SAMPLED,
ED AND/OR INSPECTED IN
ACCORDANCE WITH THE SP
CATION AND FULFILLS RE
MENTS IN SUCH RESPECTS

Larry D. Cle
MANAGER - QUALITY ASSUI

RECEIVED

DATE 12-30-92

P.O. # W56200

JOB # 5206.5222

SPEC & DESC: PLATE ASTM A36-91 AND ASME SA36-1989 EDITION 1990 ADDENDA
KILLED FINE GRAIN LONGITUDINAL CHARPY V NOTCH IMPACT TEST
15/10FT/LBS AT PLUS 10 DEG F FREQUENCY

01 MILL CERTIFIED T/R

ITEM NO	MATERIAL DESCRIPTION: THICKNESS OR SECTION	WIDTH, DIA. OR FT WT	LENGTH	QUANTITY	WEIGHT	HEAT NO	TEST OR PIECE IDENTITY	YIELD PT KSI	TENSILE STR KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% R OF AREA
01	.3750"	96.0000"	480.0000"	2	98028	2C8070	.3750"	44.7	67.0	27.0		
	3/8 SEE LONG TRANSVERSE CHARPY V-NOTCH IMPACT AVERAGE IMPACT STRENGTH 69 FT LBS		TESTS 7.5X10MM TESTED AT +10 DEG F 68 ACTUAL GAGE TESTED .3750									
	.3750"	96.0000"	480.0000"	2	98028	2C8070	.3750"	45.5	68.9	28.0		
	3/8 SEE LONG TRANSVERSE CHARPY V-NOTCH IMPACT AVERAGE IMPACT STRENGTH 72 FT LBS		TESTS 7.5X10MM TESTED AT +10 DEG F 70 ACTUAL GAGE TESTED .3750									
	.3125"	96.0000"	240.0000"	1	20424	2C8094	.3125"	45.4	64.1	30.0		
	SEE LONG TRANSVERSE CHARPY V-NOTCH IMPACT AVERAGE IMPACT STRENGTH 70 FT LBS		TESTS 6.6X10MM TESTED AT +10 DEG F 71 ACTUAL GAGE TESTED .3125									
							END OF DATA					

HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
2C8070	HEAT	19	73	014	020	20												
2C8094	HEAT	16	83	010	016	23												

"GENEVA STEEL COMPANY CERTIFIES ALL SMELTING, MELTING AND MANUFACTURING PROCESSES OCCURRED IN THE USA.

END OF DATA

015123 (2 C A A) 01

V

P 302 – A
Rev 3

Customer

REPUBLIC OF SOUTH AFRICA

Reg. No 89/02164/06

TEST AND ANALYSIS CERTIFICATE

SABS 0157 Listing no. LS 0208

Order no.	Cert No
MPX 20706G2	A

Gross Mass	26990 kg 59502 Lbs	Invoice Mass	244 538

Description of material	Specification	Edition	Exp Permit no.	Transport	Pg
STEEL PLATES TO SPECIFICATION	ASTM A36/ABS SHIP PLATE GR A	1992	6000	RAIL	1

Material supplied: AS ROLLED

Test pieces tested: AS ROLLED

Dimensions: 12192 X 2438 X 005,76 mm
480" X 96" X 3/16"

Cast no. / Lift card	Serial / Qty.	Impact tests: Test piece Dimensions mm (in) With	Thk	Test Piece Position	Temp °C °F	Results Decimals Ft.lbs 1	2	3	Avrg	Lat. Exp mm in	Tensile tests: Test Piece Position	YS (MPa) (KSI)	TS (MPa) (KSI)	Yield / Tensile Ratio	EL 200 mm %	RA %	Hardness Test	Hot Test °C (MPa) °F (KSI)	Analysis	Chemical analysis: C MO %	MN ALT %	P %	S %	SI %	CU %	NI %	CR %
Y204694 VPC88905											TA	348 050	475 0069	073 072	25	00			L	0,1400 0,0110	1,0400 0,0450	0,0110	0,0160	0,2310	0,0300	0,0100	0,01
Y204694 VPC88904											TA	348 050	475 0068	073 074	24	00			L	0,1400 0,0110	1,0400 0,0450	0,0110	0,0160	0,2310	0,0300	0,0100	0,01
194 V..88906											TA	348 050	475 0069	073 072	25	00			L	0,1400 0,0110	1,0400 0,0450	0,0110	0,0160	0,2310	0,0300	0,0100	0,01

RECEIVED

DATE 10-27-92

P.O.# 456441

JOB # 5206 - 5212

Customer's representative

Additional test results

All other requirements in accordance with the supplier's official order acceptance

DESTINATION: NGA

Ultrasonic test

Inspection

Cast no. prefix denotes

LADLE FURNACE CONCAST(ARC)

Test piece position

TA = TOP TRANSVERSE

Analysis

L = LADLE ANALYSIS

Date 1992-07-27

For Dir. Manager Product Technology

P 302 - A
Rev 1

REPUBLIC OF SOUTH AFRICA
Reg. No 89/02164/06

TEST AND ANALYSIS CERTIFICATE
SABS 0157 Listing no. LS 0208

Order no. MPX 2070662 | Cert B

Gross Mass 5200 Kg 11463 Lbs | Invoice Mass

Exp Permit no. 6000 | Transport RAIL

Dimensions 12192 X 2438 X 004,76 480" X 96" X 3/16"

Description of material: STEEL PLATES TO SPECIFICATION

Specification: ASTM A36/A36 STEEL PLATE GR A 8778 | Edition 1992

Material supplied: AS ROLLED

Test pieces tested: AS ROLLED

Cast no / Lot card	Steel Qty.	Impact tests: Test Piece Dimensions mm (in) Wid.	Thk.	Test Piece Position	Temp °C °F	Results Decajoules Ft.lbs 1	2	3	Avg.	Lat. Exp. mm ins	Tensile tests: Test Piece Position	YS (MPa) (PSI)	TS (MPa) (PSI)	Yield / Tensile Ratio	EL 200 mm %	RA %	Hardness Test	Hot Test °C (MPa) °F (PSI)	Anal-ysis	Chemical analysis: C MO %	MN ALT %	P %	S %	SI %	CU %	NI %
1204857 VPC89831											TX	346 050	485 0070	071 071	27	60			L	0,1600 0,0110	1,0400 0,0490	0,0070	0,0160	0,2780	0,0100	0,0100

RECEIVED
DATE 10 27 92
[illegible] 1056441
92-06-5412

Customer's reference nos

Additional test results

All other requirements in accordance with the supplier's official order acceptance

DESTINATION : MGA

Ultrasonic test

Inspection

Cast or parts samples: ARGON STIRRED CONCAST(ARC)

Test piece position: TX - TOP TRANSVERSE

Analysis: L - LADLE ANALYSIS

Date 1992-08-03

For Dir. Manager Product Technology

Stor Åkarven

INSPECTION CERTIFICATE
(DIN 50049-3.1B)

DATE : 1992-04-22 51670 -50117
NO : 24976-002 PAGE : 1/ 2

PURCHASER ORDER NO:
420.424 (PART 1)

ORDER DATE: 1992-02-17
OUR ORDER NO: 35321-90-357

PRODUCT:
PRESSURE VESSEL STEEL PLATE

CONSIGNEE:
KLÖCKNER & CO
STAHL INTERNATIONAL
POSTFACH 10 08 51
W-4100 DUISBURG 1
FORBUNDSREP TYSKLAND

PURCHASER:
KLÖCKNER & CO
STAHL INTERNATIONAL

B578

STANDARD/RULES STEEL GRADE:
ASME-ASTM SA /A 51670 MTLTV

MARKING (STAMPING):
STEEL GRADE
TRADE MARK HEAT NO. PLATE N

1 1/8 x 120 x 480

MILL SHEET

ITEM	WORKS-NO.	DIMENSIONS T	W	L	NO.	WEIGHT (KG)	MARKS	DELIV. COND.	STEEL PROD.	HEAT NO.	PLATE NO.	NOTE
0003	15562-003	1/2X96X480			2	5928		NORM	BOF	625041	61-2	
0003	15562-003	1/2X96X480			2	5928		NORM	BOF	625401	11-0	
0004	15562-004	1/2X120X480			1	3705		NORM	BOF	625411	02-0	
0005	15562-005	5/8X96X480			1	3705		NORM	BOF	625401	04-0	
0006	15562-006	5/8X120X480			1	4631		NORM	BOF	625051	61-5	
0008	15562-008	3/4X120X480			1	5559		NORM	BOF	624581	61-5	
0010	15562-010	1 X120X480			1	7410		NORM	BOF	623521	01-1	
0011	15558-001	1 1/8X120X480			1	8336		NORM	BOF	626201	01-0	
					10	45201						

THE MATERIAL HAS BEEN NORMALIZED AT 900+-15 DEGREES C/2 MIN PER MM/COOLED IN STILL AIR.
ALL REQUIREMENTS IN ACCORDANCE TO THE ORDER AND ASME SA20 ARE FULFILLED.
THE DIMENSION AND SURFACE INSPECTION IS CARRIED OUT WITHOUT OBJECTIONS.
INSPECTION MILL TEST CERTIFICATE.

IT IS HEREBY CERTIFIED THAT THE ABOVE DESCRIBED MATERIAL IS TESTED WITH SATISFACTORY RESULTS IN ACCORDANCE WITH THE REQUIREMENTS OF THE ORDER.

QUALITY INSPECTION
JOSEFSSON/LAGERKRANZ
SUNDELL / IVARSSON

RECEIVED
DATE 8-28-92
P.O. # 1055953
JOB # 5195

Address
SSAB Oxelösund AB
Box 1000
S 613 01 OXELÖSUND
Sweden

Telephone
Natl 0155-540 00
Intl +46 155 540 00

Telex
80850
ssab s

Telefax
Natl 0155-540 73
Intl +46 155 540 73

Bank
Skandinaviska Enskilda Banken
STOCKHOLM

Bankgiro 807-6466
Postgiro 37 78 44-2
Org nr 04-556313-7933

Please effect payment through
Skandinaviska Enskilda Banken
STOCKHOLM
SWIFT-address: ESSESE

TRADE MARK:

INSPECTION CERTIFICATE
(DIN 50049-3.1B)

DATE : 1992-04-22 51670 -
NO : 24976-002 PAGE :

* * * CHEMICAL COMPOSITION * * *

OBTAINED LADLE ANALYSIS (%):

HEAT NO.	C	SI	MN	P	S	CR	NI	MO	V	TI	CU	AL	NB	B	N
623621	.20	.30	1.10	.011	.002	.01	.02	.002	.005		.01	.051	.020		
624581	.20	.28	1.09	.011	.002	.02	.02	.002	.016		.02	.040	.018		
625041	.21	.30	1.09	.009	.002	.02	.03	.002	.005		.02	.043	.019		
625051	.20	.32	1.11	.009	.002	.02	.02	.002	.010		.01	.033	.021		
625401	.20	.31	1.11	.012	.002	.03	.03	.003	.010		.02	.033	.017		
625411	.20	.30	1.09	.010	.002	.02	.03	.003	.007		.01	.048	.018		
628201	.20	.27	1.10	.018	.007	.03	.03	.015	.010		.01	.033	.017		

* * * MECHANICAL TESTING * * *

TEST RESULTS:

TENSILE TEST

HEAT	PLATE	MILL CODE	T(MM)	TREAT-MENT:0	SPECIMEN POS.	SPECIMEN TYPE	REH (KSI)	RM KSI	ELONG. AX	(%)
623621	01-1	405382	25.4		4	1	56	78	A200	28
624581	61-5	403236	19.1		4	1	57	79	A200	26
625041	61-2	377946	12.7		4	1	58	80	A200	25
625051	61-5	378116	15.9		4	1	58	80	A200	26
625401	11-0	378512	12.7		4	1	56	80	A200	24
625401	04-0	378611	15.9		4	1	59	79	A200	27
625411	02-0	378765	12.7		4	1	57	79	A200	23
628201	01-0	421197	28.6		4	1	54	78	A200	29

IMPACT TEST

TREAT-MENT:0	SPECIMEN POS.	SPECIMEN TYPE	TEMP DEG.F	N.TOUGHN. IND.	N.TOUGHN. VALI
	3	A	-51	43	30
	3	A	-51	64	63
	3	A	-51	78	85
	3	A	-51	51	74
	3	A	-51	65	60
	3	A	-51	64	55
	3	A	-51	104	71
	3	A	-40	53	74

RECEIVED
DATE 8-28-92
P.O.# 455953
JOB# 5195

TREATMENT : 0=DELIVERY CONDITION
SPECIMEN POSITION: 3=TOP LONG., 4=TOP TRANSV.
SPECIMEN TYPE : A: CHARPY-V 10X10, 1: RECTANGULAR

Address
SSAB Oxelösund AB
Box 1000
S 613 01 OXELÖSUND
Sweden

Telephone
Nat 0155-540 00
Int +46 155 540 00

Telex
50950
ssab s

Telefax
Nat 0155-540 73
Int +46 155 540 73

Bank
Skandinaviska Enskilda Banken
STOCKHOLM

Bankgiro 897-8408
Postgiro 37 76 44-2
Org nr 04-556313-7833

Please effect payment through
Skandinaviska Enskilda Banken
STOCKHOLM
SWIFT-address: ESSESESS

鋼管検査証明書 INSPECTION CERTIFICATE

51522

1 OF 3

1971

新日本製鐵株式會社
Nippon Steel Corporation

本社・〒100 東京都千代田区大手町二丁目6番3号
HEAD OFFICE • 6-3, OTEMACHI, CHIYODA-KU, TOKYO 100, JAPAN
八幡製鐵所・〒805 北九州市戸畑区飛幡町1番1号
YAWATA WORKS • 1-1 TOBIHATACHO TOBATA-KU KITAKYUSHU-CITY 804 JAPAN

名 : MITSUI & CO., LTD.
注文番号 : 17512 -E291211
番 号 : I-843-N3-5-5-G11S-G6
名 : SEAMLESS STEEL LINEPIPE
格 : API SPEC 5L GRADE B/API SPEC 5L GRADE X42/ASTM A106 GRADE B/ASME SA106 GRADE B
記 : CONTRACT NO.: 18C1C5

CLIENT :
需要家 :
CUSTOMER : PIPE EXCHANGE INTERNATIONAL, INC.
需要家管理番号 :
CUSTOMERS CONTRO. No : J2447

証明書番号 :
CERTIFICATE No : 00000C2730
頁 :
PAGE : 1
発行年月日 :
DATE OF ISSUE : 1991-05-22

品名 Quantity	重量 TOTAL Weight KG	製品番号 Heat No.	化学成分 Chemical Composition (%) C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	Ti	Ca	CE	管理番号 Control No. MILL LOT NO. 試験番号 (Test Piece No.)	引張試験 Tensile Test 降伏点 YS	引張強さ TS	EL	YR	硬さ試験 Hardness Test	衝撃試験 Impact Test 試験温度 Test Temp.	吸収エネルギー Impact Value Energy	側方膨出 Lateral Expansion	水圧試験 Hydrostatic Test	記事
	SPEC	MIN															SPEC MAX	MIN 42000	60000	21						MIN 3000 PSI MIN 5 SECONDS	
		MAX	27		100	2525	40	40	40																		
			15	8												1000											
	SPEC	MIN			16	29																					
		MAX	30		120	5060																					
EC.2 to 8"ø60*																											
178	24,564	7252H	21	17	64	18	6	2	2	4	46518						LH	52600	72700	360							
			0	3				33			110	4367CE1															
		H	21	17	64	19	6																				
		P	21	17	64	17	6																				

CONTINUED

外観・寸法 Visual & Dimensions	ドリフト試験 Drift Test
GOOD	

Q.C. APPROVED
1-23-92
DATE
SIGNATURE

THESE MILL TEST REPORTS APPLY TO YOUR ORDER NO. _____

GL: 標点距離 Gage Length A 56mm B 28mm C 2inch D 8inch E 565.56-F 4.56 YR 降伏比 Yield Ratio
Heat Analysis P: 製品分析 Product Analysis C エルコントロール分析 Control Analysis
T: 横断方向 Transverse Z: 厚さ断面方向 Through-Thickness C エルコントロール引張試験 Control Tensile Test
No.1 No.11 A No.14A B No.14B C No.12C Shear Strength H Round bar F Full Section S Strip Specimen
U: 2mmU B: 5mmU C: 4mmU D: 5mmU E: 2mmUフェースノッチ Face Notch F: 2mmVフェースノッチ Face Notch
7: 10×7.5mm 6: 10×6.7mm 5: 10×5mm 3: 10×2.5mm 2: 10×2mm
Each Value A: 平均値 Average Value
UT: 超音波探傷試験 Ultrasonic Test MT: 磁粉探傷試験 Magnetic Particle Test ET: 渦流探傷試験 Eddy-Current Test
SA: 破面率 Shear Fracture CF: 結晶粒度 Crystallinity Fracture G: 結晶粒度 Grain

上記注文品は、御指定の規格または仕様に従って製造され、その要求事項を満足していることを証明します。
WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE RULES OF THE CONTRACT.

TO BE CONTINUED

八幡製鐵所 試験分析室長
MANAGER, INSPECTION
YAWATA WORKS

鋼管検査証明書
INSPECTION CERTIFICATE

2 OF 3

新日本製鐵株式會社
Nippon Steel Corporation

本　　社・〒100 東京都千代田区大手町二丁目6番3号
HEAD OFFICE・6-3-2, OTEMACHI, CHIYODA-KU, TOKYO 100, JAPAN
八幡製鐵所・〒804 北九州市戸畑区飛幡町1番1号
YAWATA WORKS・1-1 TOBIHATACHO TOBATA-KU KITAKYUSHU 804 JAPAN

MITSUI & CO., LTD.

12512 -E291211

1-H43-N3-5-5-G119-C6

SEAMLESS STEEL LINEPIPE

API SPEC 5L GRADE B/API SPEC 5L GRADE X42/ASTM A106 GRADE B/ASME SA106 GRADE B

CLIENT :
CUSTOMER : PIPE EXCHANGE INTERNATIONAL, INC.
CUSTOMER'S CONTRO. No : J2447

CERTIFICATE No : 000002730
DATE OF ISSUE : 1991-05-22

PAGE : 2

注文番号 Quantity	数量 TOTAL Weight KG	試験番号 Heat No.	化学成分 Chemical Composition (%) C	Si	Mn	P	S	Cu	Ni	Cr	管理番号 Control No. MILL LOT NO. 試験番号 (Test Piece No.)	引張試験 Tensile Test 降伏点 YS	引張強さ TB	EL (%)	YR	RA (%)	硬さ試験 Hardness Test	衝撃試験 Impact Test 試験温度 Test Temp.	吸収エネルギー Impact Value	破面率 Fracture	横膨出 Lateral Expansion	水圧試験 Hydrostatic Test PSI MIN SECONDS
C-2 (6"x40')																						
177	24,420	72528	H 21	17	64	18	6	2	2	4	46516	LH 52600	72700	36								G
			0	3			33			110	(4367C5)											
			P 21	17	64	18	6															
			P 21	17	63	18	6															
145	20,012	72528	H 21	17	64	18	6	2	2	4	46516	LH 52700	73600	36								G
			C	3			33			112	(4367C1)											
			P 21	17	65	18	6															

CONTINUED

外観・寸法 Visual & Dimensions: CCCC

ドリフト試験 Drift Test

Q. C. APPROVED 1-23-92 DATE

SIGNATURE

THESE MILL TEST REPORTS APPLY TO YOUR ORDER NO. _____

GL: Gage Length A: 50mm B: 38mm C: 25mm D: 8mm E: 565.5G F: 4.5G YR: Yield Ratio RA: Reduction of Area SF: Shear Fracture CF: Crystallinity Fracture G: As Gage
Heat Analysis P: Product Analysis C: コントロール分析 Control Analysis
L: Longitudinal T: Transverse Z: Through-Thickness C: コントロール引張試験 Control Tensile Test
S: No.5 1 No.11 A: No.12A B: No.12B C: No.12C Small D: 5 in H: Half J: In K: Insert R: Round Sp: Full Section S: Strip Specimen
2mmU B: 3mmU C: 4mmU D: 5mmU E: 2mmUフェースノッチ Face Notch F: 2mmVフェースノッチ Face Notch
7: 19×25mm 6: 19×19mm 5: 19×13mm 3: 19×10mm 2: 19×7.5mm
Av: Value A: 平均値 Average Value
UT: 超音波探傷試験 Ultrasonic Test MT: 磁粉探傷試験 Magnetic Particle Test FT: 漏洩磁束探傷試験 Flux Leakage Test(Electric-Magnetic Test) ET: 渦流探傷試験 Eddy-Current Test

上記注文品は、御指定の規格または仕様に従って製造され、その要求事項を満足していることを証明します。
WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE RULES OF THE CONTRACT.

TO BE CONTINUED

八幡製鐵所　試験分析室長
MANAGER, INSPECTION
YAWATA WORKS

鋼管検査証明書
INSPECTION CERTIFICATE

3 of 3

新日本製鐵株式會社
Nippon Steel Corporation

本社・〒100 東京都千代田区大手町二丁目6番3号
HEAD OFFICE • 6-3, OTEMACHI, 2-CHOME, CHIYODA-KU, TOKYO, 100, JAPAN
八幡製鐵所・〒806 北九州市戸畑区飛幡町1番1号
YAWATA WORKS • 1-1 TOBIHATACHO, TOBATA-KU, KITAKYUSHU-CITY, 804 JAPAN

名： --MITSUI & CO., LTD.
番号： 17512 -E291211
号： No. 1-843-A3-5-5-G115-06
名： TY: SEAMLESS STEEL LINEPIPE
格： ON: API SPEC 5L GRADE B/API SPEC 5L GRADE X52/ASTM A106 GRADE B/ASME SA106 GRADE B
記：

CLIENT :
需要家：
CUSTOMER : PIPE EXCHANGE INTERNATIONAL,INC.
注文主管理番号：
CUSTOMERS CONTROL No. : J2447

証明書番号：
CERTIFICATE No. : PEC030027J0
発行年月日：
DATE OF ISSUE : 1991-05-22

頁：
PAGE: 3

注	員数 Quantity	TOTAL 重量 Weight KG	試験番号 Heat No.	化学成分 Chemical Composition (%) C	Si	Mn	P	S	CU	NI	CR	MO	V	CB	TE3	管理番号 Control No.	引張試験 Tensile Test 降伏点又は耐力 YS	引張強さ TS	伸び EL (%)	絞り RA (%)	曲げ試験 Bend Test	衝撃試験 Impact Test 試験温度 Test Temp.	吸収エネルギー Impact Value	破面率 Fracture	側方膨出比 Lateral Expansion	水圧試験 Hydrostatic Test
																MILL										
																LOT NO.										
																試験番号 (Test Piece No.)										
1C.2"X40'																										
			P 21 17 64 1P 6																							
TOTAL																										
F PIPES			SCO PIPES																							
T			65,000 KG																							

TENSILE TEST SPECIMEN: LONGITUDINAL:---STRIP
TE3 FORMULA---CR+CU+MO+NI+V
CES FORMULA---C+MN/6+(CR+MO+V)/5+(CU+NI)/15

外観・寸法 Visual & Dimensions	ドリフト試験 Drift Test
COLD	

Q. C. APPROVED
1-13-92
DATE
SIGNATURE

THESE MILL TEST REPORTS APPLY TO YOUR ORDER NO. _____

G: 標点間距離 Gage Length A: 1inch B: 2inch C: 2inch D: 8inch E: SES.56 F: 降伏比 Yield Ratio
Heat: Analysis P: 製品分析 Product Analysis C: ミルコントロール分析 Control Analysis
L: Longitudinal T: 直径方向 Transverse Z: 厚さ方向 Through-Thickness C: ミルコントロール引張試験 Control Tensile Test
1: No.5 1No.11 A: No.12A B: No.12B C: No.12C Strip 5: 4in H: 4in Strip K: 1inch R: Round Bar F: Full Section S: Size Specimen
1: 2mmU B: 3mmU C: 4mmU D: 5mmU E: 2mmUフェースノッチ Face Notch F: 2mmVフェースノッチ Face Notch
T: 10×7.5mm 6: 10×6.1mm 5: 10×5mm 3: 10×3.3mm 2: 10×2.5mm
Each Value A: 平均値 Average Value
UT: 超音波探傷試験 Ultrasonic Test MT: 磁粉探傷試験 Magnetic Particle Test FT: 漏洩磁束探傷試験 Flux Leakage Test(Electric-Magnetic Test) ET: 渦流探傷試験 Eddy-Current Test

上記注文品は、御指定の規格または仕様に従って製造され、その要求事項を満足していることを証明します。
WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE RULES OF THE CONTRACT.

八幡製鐵所 試験分析室長
MANAGER, INSPECTION
YAWATA WORKS

RECEIVING CHECKLIST

Page # 1

: 2472A Customer: LyonDell Pet. Co.

DESCRIPTION	BM#	MATL.	MARKING	DIM.	P.DATA	MTR	INSPT BY	DAT
40' Bottom Replacement	2	SA 516-70	VC0026-AG1 VC0025-BG1 344367-B27	5/16	W56849	✓	C.V.C.	2-15
Annular Ring	3	516-70	M48345-73-5 112836	3/8	W56845	✓	C.V.C.	2-15
35' Bottom	4	516-70	M48345-74-2 474-5	3/8	W56845	✓	C.V.C.	2-15
Shell Rg S-1	6	516-70	112781 M48345-74-3 M48345-74-3	3/8"	W56845	B846	Tube C.V.C.	2-22
Shell Rg MK S-1A	7	516-70	M48345	3/8	W56845	✓	C.V.C.	2-22
Shell Rg MK S-2	8	516-70	VC0023 VC0026	5/16	W56849	✓ ✓	Shell Rg 2+3 C.V.C	3-1
Shell Rg MK S-2A	9	516-70	VC0023	5/16	W56849	✓	Shell Rg 2+3 C.V.C Sheet	3-1
Shell Rg MK S-3, S-3B	10	516-70	7425351 7425367 803X73660	1/4	W56845 W56797 W56797B	— — —	Rg 4 S-3 S-3A C.V.C.	3-3 3-8
Shell Rg MK S-3A, S-3C	11	516-70	7425351 803X73660	1/4	D.H.O	— ✓	Rg 5 S-3B S-3C C.V.C.	3-3 3-8
Shell Rg MK S-4	12	516-70	803X73660	1/4	D.H.O	✓	Shell 5 outer wall C.V.C	3-3 3-10
Shell Rg MK S-4A	13	516-70	7425367 7417643	1/4	D.H.O	✓ ✓	Shell 5 outer Tank shell C.V.C	3-3 3-10
Floating Roof Deck	14 (D)	516-70	898 G7424460	1/4	(1) W56797A (2) W56797C	✓	C.V.C.	3-1
Outer Rim Pl	15	516-70	803X73660 7417643	1/4"	(1) W56797B	✓ B840	C.V.C.	3-1
Pontoon Cover BKHD	16	A-36	1D0068	3/16"	W57492	✓	C.V.C	3-1
Side Rim Pl	17	A-36	1D0068	3/16	W57492	✓	C.V.C	3-1
40'-0 Dia Bottom	1	A-36	324-2335	5/16 X	W57488	✓	C.V.C.	3-10
-0 Dia	18	"	"	2x2x1/4"		✓	C.V.C	3-8

E ÖSUND

0701-41 215

Stan Skogan, v KH

INSPECTION CERTIFICATE

DATE : 1991-10-22 51670 -10041
NO : 30255-009 PAGE : 1(2

ASER ORDER NO:
A

ORDER DATE: OUR ORDER NO:
1991-07-22 65121-00-193

PRODUCT:
PRESSURE VESSEL STEEL PLATE

GNEE:
EN STEEL GROUP
ENAISSANCE CENTER
700
IT, MICHIGAN 48243

PURCHASER:
THYSSEN STEEL GROUP

STANDARD/RULES STEEL GRADE:
ASME-ASTM SA 516-70

MARKING (STAMPING):
STEEL GRADE
TRADE MARK HEAT NO. PLATE NO.

9/16 X 120 X 480

M I L L S H E E T * * *

WORKS-NO.	DIMENSIONS T	W	L	NO.	WEIGHT (KG)	MARKS	DELIV. COND.	STEEL PROC.	HEAT NO.	PLATE NO.	NOTES
2523-005	1/2	X120	X480	2	7410	LOT AA		BOF	583121	61-6	
2523-005	1/2	X120	X480	2	7410	LOT AA		BOF	583131	12-0	
2523-006	9/16	X120	X480 ✓	1	4169	LOT AA		BOF	583131	50-2	
2523-006	9/16	X120	X480	1	4169	LOT AA		BOF	583131	60-4	
2523-006	9/16	X120	X480	1	4169	LOT AA		BOF	583141	50-4	
2523-006	9/16	X120	X480	1	4169	LOT AA		BOF	583141	60-6	
2523-006	9/16	X120	X480	1	4169	LOT AA		BOF	583141	60-8	
2523-006	9/16	X120	X480	1	4169	LOT AA		BOF	583141	61-0	
2523-006	9/16	X120	X480	1	4169	LOT AA		BOF	583141	61-2	
2523-007	5/8	X120	X480	1	4631	LOT AA		BOF	583121	04-0	
				12	45634						

QUIREMENTS IN ACCORDANCE TO THE ORDER AND ASME SA20 ARE FULFILLED.
MENSION AND SURFACE INSPECTION IS CARRIED OUT WITHOUT OBJECTIONS
TERIAL IS PRODUCED TO FINE GRAIN PRACTICE.

EREBY CERTIFIED THAT THE ABOVE QUALITY INSPECTION
ED MATERIAL IS TESTED WITH
CTORY RESULTS IN ACCORDANCE
E REQUIREMENTS OF THE ORDER.

Ulf Lagerkranz

JOSEFSSON/LAGERKRANZ
SUNDELL / IVARSSON

RECEIVED
DATE 1-23-92
P.O. # W 53326
JOB # 2326

RECORD OF FIT UP

ner: LYONDELL Job No. 2472-A

LONGITUDINAL SEAMS

em	Approved	Date	LYON-DELL	Approved	Date
1	C.V.C.	2-26		JH	2-26
2	C.V.C.	3-3		JH	3-3
3	C.V.C.	3-5		JH	3-5
4	C.V.C.	3/9/93		JH	3/9/93
5	C.V.C.	3/15/93		J.H.	3/15/93
Shell	C.V.C	3/17/93		J.H	3/17/93

GIRTH SEAMS

Item	Approved	Date	LYON-DELL	Approved	Date
INNER TANK					
Ring # 1 to Ring # 2	C.V.C.	3-3		JH	3-3
Ring # 2 to Ring # 3	C.V.C.	3-6		JH	3-6
Ring # 3 to Ring # 4	C.V.C.	3/10/93		JH	3/10/93
Ring # 4 to Ring # 5	C.V.C.	3/17/93		JH	3/17/93
outer shell RG#5	C.V.C.	3/19/93		JH	3/19

RECEIVING CHECKLIST

Page # 3.

: 2472 Customer: Lyondell Pet Co

DESCRIPTION	BM#	MATL. SA	MARKING	Dim.	P.DATA	MTR	INSPT BY	DAT
"52" Neck	79	A106-B	U41898	6"	57490	✓	C.V.C.	3-1
31" Flg.	81	A-105	—	4"	W57489	cert	C.V.C.	2-2
Neck	82	A-106-B	X46547	4"	W57593	✓	C.V.C	2-2
Pad	83	516-70	M48345	3/8"	Item=7	✓	C.V.C.	2-2
ELL Bow	85	A234	—	4"	W57597	cert	C.V.C.	3-1
17, 35, 33 Flg.	86	A-105	—	3"	(6) W57489 (4) W57597	CerT	C.V.C.	2-2
Pad	87	516-70	M48345	3/8"	Item=7	✓	C.V.C.	2-2
Neck	88	A-106-B	47751	3"	W57490	✓	C.V.C.	2-2
37 38 Neck	89	A-106-B	47751	3"	"	✓	C.V.C.	2-2
3" Neck	91	A-106-B	47751	3"	"	✓	C.V.C	3-1
2 A-C" Cover	104	A-105	—	3"	W57489	cert	C.V.C.	3-1
7A-D" Flg.	107	A-105	—	1"	W57489	cert	C.V.C.	2-2
7A-D" Covers	108	A-105	—	1"	W57489	cert	C.V.C.	3-16
45" Flg.	111	A-105	—	3/4"	(6) W57489 (6) W57597	CerT	C.V.C.	2-2
Covers	112	A-105	—	3/4"	(6) W57489 (6) W57597	cerT	C.V.C.	3-16
16 Flgn	115	A105	—	1 1/2"	W57489	cert	C.V.C.	3-16
0 Int.								

RECEIVING CHECKLIST

Page # 2

3473 Customer: Lyondell Pet. Co.

DESCRIPTION	BM#	MAT'L	MARKING	DIM.	P.DATA	MTR	INSPT BY	DATE
4" Deck Nipple		SA						
Feeder Vent	28	516-70	897 7424460-	1/4"	57488	✓	C.V.C	3/16
COVER	29	A-36	Y204694 8052	3/16"	STOCK	✓ B770	C.V.C.	3-16
cover Pipe ent Leg.	31	A-106 B	W72528	3"	STOCK	✓ A979	C.V.C	3-16
10" SLEEVE	47	A-106 B		10"	STOCK		A.S.	3/10/93
Pad	48	A-36	Y204 694 8052	3/16"	STOCK	✓ A979	A.S.	3/10/93
Flg.	49	516-70	m48345	3/8"	Item = 7	✓	A.S	3/10/93
Neck Flg.	50	516-70	m48345	3/8"	Item = 7	✓	C.V.C.	3-16
Flg-	51	516-70	m48345	3/8"	Item = 7	✓	A.S	3/10/93
Neck Flg.	58	516-70	m48345	3/8"	Item = 7	✓	C.V.C	3-16
B) Flg Cover	70	516-70	090-410-98	5/8"	STOCK		C.V.C.	2-2
Neck	71	516-70	m48345-74-3	3/8"		✓	C.V.C	2-2
Pad	72	516-70	m48345-74-3	3/8"		✓	C.V.C.	2-2
150# Flg.	76	A-105	—	6"	(2) W57489 (2) W57597	✓ CENT	C.V.C.	2-2
51 Neck	77	A-106-B	u 11898	6"	W57490	✓	C.V.C.	2-2
						✓	C.V.C.	2-2

RECEIVING CHECKLIST

Page # 4

: 2472 Customer: Lyondell Pet Co.

DESCRIPTION	BM#	MATL. SA	MARKING	DIM.	P.DATA	MTR	INSPT BY	DAT
MANWAY Flg + COVER	116	A-36	7413708	1/4"	STOCK	✓ A624	C.V.C.	2-
NECK	117	A-36	7413708	1/4"	"	✓ A624	C.V.C.	2-
PAD	118	A-36	7413708	1/4"	"	✓ A624	C.V.C	2-
Sump Wall	136	A-106-B		24"	STOCK		C V C	2-15-
Bottom	137	516-70	m48345 74-3	3/8"		✓	C V C	2-15-
Flg.	138	516-70	m48345 74-3	3/8"	"	✓	C V C	2-15-
30" MANWAY Flg + COVER	141	516-70	D21855 3X2	3/4"	57592	✓	C.V.C.	2-2
NECK	142	516-70	IC1109-8-4	1/4"	57485	✓ B870	C.V.C.	2-2
PAD	143	A-36		3/8"	STOCK	Not cut	C.V.C.	2-2
30" Bld Flg. COVER	150	A-105	—	6"	57597	cut	C.V.C.	3-1
37 38 PADS	152	A-36		1/4"	57485	Not cut	C.V.C.	2-2
Bleeder Vent Stop	130	A-36	m48345-	3/8"		✓	C.V.C.	3-16
Roof PAD	45	A-36	G742996-897	1/4"		✓	C.V.C.	3-16
Anchor Chair Top R	20	516-70	583141-61-2	1/2"	STOCK	✓ A970	C V C	2-15
Lting R	20H	516-70	583141-61-2	1/2"	STOCK	✓ A970	C V C	2-15
Assets	21	516-70	55E103A6 55131-60-2	1/2"	STOCK	B578 A970	C V C	2-15
Deck								

RECEIVING CHECKLIST

P/N: 2472 A Customer: Lyon DeLL Pat Co

DESCRIPTION	BM#	MATL. SA	MARKING	DIM	P.DATA	MTR	INSPT BY	DA
Floating Roof Deck	D2+D3 14	516-70	803K73660 42320	1/4"	56797A 56797C	✓	C V C	3-
Di Ho	D1 14	"	803K73660 42320	"	"	✓	C V C	3-
Di Ho	D4 14	"	7424460 898	"	"	✓	C V C	3-1
Datum R	45A	"	897 7424460	"	-	✓	A.S	3/10/9
BASE R	26	"	"	"		✓	C.V.C	3-1
Anr. - Rotation Device	4D	A-105	F30203	8"	W57490	✓	C.V.C	3-1(
INT Flg	92	A-105	-	RFWN 3"	W57597	cert	C.V.C	3-1(
INT Elbow	103	A-234	-	Sch 40 3"	W57597	cert	CVC	3-1(

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 2-16-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Installed felt			JH	wyatt	VT ok
2.	Installing & welding replacement btm.			JH	"	VT ok
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 2-17-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting + welding replacement btm			JH	Wyatt	VT ok
2.	Laying out nozzles existing tk.			JH	"	VT ok
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
2.						
3.						
4.						
5.						
6.						
7.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Date: 2-18-93

Equipment Item/No: CAUSTIC SURGE TANK #3455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Vaccum Test replacement btm.			JH	wyatt	ok
2.	Laying out 3" grating			JH	"	VT ok
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 2-22-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW,TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Cutting 3" grating to fit replacement btm			SH	wyatt	VT ok
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 2-23-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Completed 3" grating			JH	Wyatt	VT ok
2.	Installed + weldout Nozzles 9a, 9b, 9c + 9d			JH	"	VT ok
3.	MT inspection on 9a, 9b, 9c + 9d			JH	"	MT ok
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 2-24-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Cut slots in existing tk. for annular ring			JH	Wyatt	VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 2-25-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting + welding annular ring			JH	wyatt	VT ok
2.	Began laying btm. inner ft.			JH	"	VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 2-26-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Completed annular ring			JH	wyatt	VT ok
2.	Vaccum test annular ring			JH	"	ok
3.	Fitting inner tk. btm.			JH	"	VT ok
4.	Hanging + fitting ring #1			JH	"	VT ok
5.	welding inner tk. btm. + ring #1 vert.			JH	"	VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Date: 2-27-93

Equipment Item/No: CAUSTIC SURGE TANK #3455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Gouged existing 24" manway & pad outer shell			JH	Wyatt	VT ok
2.	Installed 24" manway inner shell			JH	"	VTok
3.	Installed 76" manway outer shell			JH	"	VTok
4.	welding inner tk. btm.			JH	"	VTok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015
Date: 3-1-93
Inspector: JAMES HUNTLEY
Page 1 of 1

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.
Equipment Item/No: CAUSTIC SURGE TANK #3455

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Completed fit-up of 36" manway + pad			JH	Wyatt	VT OK
2.	welding verts ring #1			JH	"	VT OK
3.	welding inner tk. btm.			JH	"	VT OK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-2-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding verts ring #1 complete			JH	wyatt	VT ok
2.	Completed welding inner tk. btm.			JH	"	VT OK
3.	Hanging ring #2			JH	"	.
4.	welding inside corner inner tk.			JH	"	VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Date: 3-3-93

Equipment Item/No: CAUSTIC SURGE TANK #3455

Inspector: JAMES HUNTLEY

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fit vents ring #2 to girth seam ring #1			JH	wyatt	VT ok
2.	welding vents ring #2			JH	"	VT ok
3.	vaccum test inner TK. btm.			JH	"	ok
4.	MT inspection sump			JH	"	MT ok
5.	completed welding inside cornerweld			JH	"	VT ok
6.	Diesel tested cornerweld			JH	"	ok
7.	welding outside cornerweld			JH	"	VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-4-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Completed welding vert's ring #2			JH	wyatt	VT ok
2.	Completed welding outside cornerweld			JH	"	VT ok
3.	welding girth seam ring #1 to ring #2			JH	"	VT ok
4.	welding inner cornerweld outer HK.			JH	"	VT ok
5.	Hanging ring #3			JH	"	VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-5-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	fit verts. ring #3			JH	Wyatt	VTOK
2.	welding girth seam ring #1 to ring #3 complete			JH	"	VTOK
3.	welding verts ring #3			JH	"	VTOK
4.	welding inside cornerweld outer tk.			JH	"	VTOK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015
Date: 3-6-93
Inspector: JAMES HUNTLEY
Page 1 of 1

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.
Equipment Item/No: CAUSTIC SURGE TANK #3455

	Inspection Attribute	Reference	II/W	Owner	Contractor	Comments
1.	Completed welding vert. ring #3			JH	wyatt	VTOK
2.	Fit girth seam ring #2 to ring #3			JH	"	VTOK
3.	Welding girth seam ring #2 to ring #3			JH	"	VTOK
4.	Completed inside cornerweld outer tk.			JH	"	VTOK
5.	X-Rayed 10 spots btn 2 rings			JH	"	OK
6.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-8-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting deck for floating roof			JH	wyatt	VT ok
2.	welding floating roof deck			JH	"	VT OK
3.	welding Girth seam ring #2 to ring #3			JH	"	VT OK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-9-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Hanging ring #4			J.H.		
2.	welding girth seam ring #2 to ring #3			J.H.		VT ok
3.	welding verts. ring #4			J.H.		VT ok
4.	welding top deck floating roof			J.H.		VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-10-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding verts. ring #4			J.H.		VT ok
2.	Fitting + welding girth seam rg. #3 to rg. #4			J.H.		VT ok
3.	Vacuum test deck floating roof			J.H.		ok
4.	Fitting + welding outer rim plate floating roof			J.H.		VT ok
5.	Fitting bulkheads floating roof			J.H.		VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-11-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding extension center column			J.H.		VT OK
2.	welding vert's ring #4			J.H.		VT OK
3.	welding girth seam rg #3 to rg #4			J.H.		VT OK
4.	Fitting + welding bulkheads floating roof			J.H.		VT OK
5.	Fitting + welding inner rim plate floating roof			J.H.		VT OK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 7-12-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Rain-out					
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-13-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Set center column			J. H.		VTOK
2.	welding out floating roof			J. H.		VTOK
3.	Hang ring #5 inner tank			J. H.		VTOK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 4-13-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Completed Nozzle's 51+52			J.H.		VTOK
2.	MT & Air test 51+52			J.H.		MTOK
3.	Filled inner & outer shells			J.H.		Hydro OK
4.	with water on Completed					
5.	hydro					
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-15-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting + welding verts. ring #3 inner tk			J.H.		VT OK
2.	welding overhead deck floating roof			J.H.		VT OK
3.	Fitting Covers on pontoons			J.H.		VT OK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-16-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting & welding covers pontons			J. H.		VTOK
2.	welding overhead floating roof deck			J. H.		VTOK
3.	rain-out					
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-17-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting + welding ponton covers			J.H.		VT ok
2.	Hung ring #5 outer tk.			J.H.		VT ok
3.	Fitting & welding vents rg. #5 outer tk.			J.H.		VT ok
4.	Fitting & welding girth seam rg #4 to rg. #5 inner tk.			J.H.		VT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-18-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding girth seam rg #4 to rg #5 inner tk.			J.H.		VT ok
2.	welding vert. ring #5 outer tk.			J.H.		VT ok
3.	Fitting top angle inner tk.			J.H.		VT ok
4.	Fitting + welding pontoon covers + manways			J.H.		VT ok
5.	(ring #5 inner tk too tall informed Pat)			J.H.		
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-15-97

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting top angle inner tk.			J.H.		VTOK
2.	welding verts ring #5 outer tk.			J.H.		VTOK
3.	Fitting & welding girth seam outer tk rg #4 to rg #5			J.H.		VTOK
4.	Fitting & welding ponton covers & manways			J.H.		VTOK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-20-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Welding girth seam rg. #4 to rg #5 outer tk.			JH		VT ok
2.	Fitting & welding floating roof legs			JH		VT ok
3.	welding top angle inner tk.			JH		VT ok
4.	X-Rayed welds on inner & outer shell			JH		
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015
Date: 3-22-93
Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.
Inspector: JAMES HUNTLEY
Equipment Item/No: CAUSTIC SURGE TANK #3455
Page 1 of 1

	Inspection Attribute	Reference	II/W	Owner	Contractor	Comments
1.	Fitting Top angle outer tk			JH		VTOK
2.	Welding top angle inner tk			J.H.		VTOK
3.	welding overhead annular ring			JH.		VTOK
4.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-23-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding top angle outer ht.			J.H.		VT ok
2.	Fitting + welding angle seal floating roof			J.H.		VT ok
3.	Fitting + welding rafter clips			J.H.		VT ok
4.	Diesel test rim plate floating roof			J.H.		
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-24-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding angle for seal floating roof			J.H.		VTOK
2.	Installing nozzle #52			J.H.		VTOK
3.	Installing rafters			J.H.		
4.	welding outside rim plate floating roof			J.H.		VTOK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-25-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	welding rafters			J.H.		VT OK
2.	welding overhead annular ring			J.H.		VT OK
3.	welding cornerweld annular ring			J.H.		VT OK
4.	Completed rafter clips inner tk.			J.H.		VT OK
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9.						
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11.						
12.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3-26-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting + welding roof panels			J.H.		VT OK
2.	Fitting + welding door sheet			J.H.		VT OK
3.	Fitting + welding anchor chairs			J.H.		VT OK
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3/29/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Completed door sheet			JH		VT ok
2.	Fitting + welding anchor chairs			JH		VT ok
3.	welding roof			JH		VT ok
4.	X-Ray door sheet			JH		RT ok
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3/30/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Completed welding roof			JH		VT ok
2.	Completed anchor chairs			JH		VT ok
3.	Installing stairway			JH		VT ok
4.	Installing & welding nozzle's			JH		VT ok
5.						
6.						
7.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 3/31/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Installing + welding stairway			JH		VT ok
2.	Installing + welding nozzle's			JH		VT ok
3.						
4.						
5.						
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API 650 Tank- Field Construction Inspection Checklist

Job No: 2015
Date: 4/1/93
Inspector: JAMES HUNTLEY
Page 1 of 1

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.
Equipment Item/No: CAUSTIC SURGE TANK #3455

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fitting & welding top platform			JH		VT ok
2.	Changing supports on overflow pipe			JH		VT ok
3.	Air test nozzle's upper shell + roof			JH		VT ok
4.	MT test nozzle's upper shell + roof			JH		MT ok
5.						
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13.						
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15.						
16.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 4/2/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fabbing expansion Loops			JH		VT ok
2.	Installing floating roof seal			JH		VT ok
3.	Revising pipe support overflow pipe			JH		VT OK
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015
Date: 4/5/93
Inspector: JAMES HUNTLEY
Page 1 of 1

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.
Equipment Item/No: CAUSTIC SURGE TANK #3455

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Completed floating roof seal			JH		VT ok
2.	MT nozzle's 38 45A 45C 45E 1BI 37, 40, 45B, 45D, 45F + 1BO			JH		MT ok
3.	Air test nozzle's 37, 38, 1BI + 1BO			JH		VT ok
4.	Installing skimmer			JH		VT ok
5.	welding expansion loop's			JH		VT ok
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 4/3/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Fabbing expansion Loop's			JH		VT ok
2.	Installing floating roof seal			JH		VT ok Factory rep. making splice
3.	Revising top platform for full step			JH		VT ok
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 4/4/93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Installing floating roof seal			JH		VTOK
2.	Fabbing & installing expansion loop's			JH		VTOK
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 4-6-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Completed skimmer			J.H.		VT ok
2.	Welded baffle Plate inner tk.			J.H.		VT ok
3.	Moving tk. guage 3 ft. north			J.H.		
4.	Cleaning up inner tk.			J.H.		
5.	Grinding mark-up's			J.H.		VTOK
6.	Completed expansion loop's			J.H.		VTOK
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 4-7-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Completed Hk. quage			J.H.		VT ok
2.	MT+Air test last of nozzle's			J.H.		MT ok
3.	Rounding Corners on anchor chair's			J.H.		VT ok
4.	Blinding inner tk for Hydro			J.H.		
5.	Filling inner tk. with water			J.H.		
6.	walk through completed					
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 4-8-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Overflow nozzle too high Floating			J.H.		
2.	roof will hit top					
3.	Nozzle's 51+52 to be			J.H.		
4.	moved down 1 ft.					
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 4-9-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW,TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Cutting out an moving			J.H.		VT OK
2.	Nozzle's 51 +52					
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						

API 650 Tank- Field Construction Inspection Checklist

Job No: 2015

Date: 4-12-93

Client/Location: LYONDELL PETROCHEMICAL CO. CHANNELVIEW, TX.

Inspector: JAMES HUNTLEY

Equipment Item/No: CAUSTIC SURGE TANK #3455

Page 1 of 1

	Inspection Attribute	Reference	H/W	Owner	Contractor	Comments
1.	Cut hole for nozzle			J.H		VTOK
2.	52 in wrong place					
3.	will patch an recut					
4.	hole. (outer Pl.)					
5.						
6.	Continued welding on			J.H.		VTOK
7.	nozzle's 51 + 52					
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						

WYATT FIELD SERVICE COMPANY

WELDING PROCEDURE LIST

: 2472

Customer: Lyondell Petrochemical
Items T-3455 & T-2455

WPS#	Rev.	Comments	List Rev.
HW-1.5	0		0
HW-1.5(34)-1	0	Nozzle piping	1

WFS JN 2472
Lyondell Petrochemical
Items T-3455 & T-4455

WYATT FIELD SERVICE CO.

WELDING PROCEDURE SPECIFICATION

WPS #: HW-1.5(34)-I
Revision #: 0
Supporting PQR #: HW-1.5(3)-H (69-5) & HW-1.5-I (73-64)
Welding Processes: SMAW (Manual)

Base Metals:
P #: 1 to P # 1
Thickness Range: 3/16 to 1-1/4"
Bevel:
5/16" & under: square or single vee.
Over 5/16": single or double vee.

Filler Metals:
SFA #: 5.1 A #: 1
Type: E6010 F #: 3
&/or E7018 F #: 4
Dia.3/32 Amps 40-110
1/8 Amps 85-150
5/32 Amps 150-200
3/16 Amps 210-280

Consumable Insert: none

Preheat: 50 F min.
Interpass: 50-500 F
Maintenance: During Welding

Position & Progression :Any

Postweld Heat Treatment: none

Electrical Characteristics:
Current: direct Polarity: reverse

Technique:
String or Weave Bead Single Electrode Peening: none

Notes:
1)Backing: Double welded or single welded with or without B.U.S.(as specified on drawings)
2)Root Gap: 1/8" Nom. for butt welds. 1/4" min. for B.U.S.
3)Max. pass thickness: 3/8"
4)Any or all of the electrode types or sizes listed may be used. E6010 must be used for the root pass of single welded joints.
5)Initial and interpass cleaning: Brushing and/or grinding.
6)Back Gouging: C-Arc Air and/or grinding. none required for fillets or single welded joints.
7)Non-metallic or non-fusing retainers: none

Approved: Andy Seale Date: 3/26/97

\2472\18(34)

WYATT FIELD SERVICE COMPANY

WELDING PROCEDURE QUALIFICATION RECORD

PQR#: HW-1.S(3)-H (69-5)
Process: SMAW

WPS#: HW-1.S(3)-H
Type: Manual

VARIABLES:

Base Material:
P#: 1 SA 285-C
Thickness: 3/4"
Max. Pass Thickness: <1/2"

Filler Metal:
F#: 3 A#: 1 SFA: 5.1 Class: E6010
Size: 7/32"

Electrical:
Polarity: Rev. Electrodes: Single
Amps: 240

Position: 3G, Horizontal
Preheat: 50 F Interpass: 500 F Max. PWHT: None

Test Results:

Bend Tests:
Number: 4 Type: Side (QW-462.2) Results: Good

Tensile Tests:
Ultimate Stress: 64,200 psi Break Location: Plate
" " 63,000 psi " " Plate

Welders Name: F. Johnson
Test Conducted By: J. Skolaski
Emp.# 397
Date: 1-23-69

We certify that the statements made in this report are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By.: _____ Date: 3-13-88
Editorial Rev. 8-13-88

WYATT FIELD SERVICE COMP.

WELDING PROCEDURE QUALIFICATION RECORD

PQR#: HW-1.S-I (73-64)
Process: SMAW

WPS#: HW-1.S-I
Type: Manual

VARIABLES:

Base Material:
P#: 1 SA 333-1
Thickness: 0.75 (5" XXH Pipe)
Max. Pass Thickness: <1/2"

Filler Metal:
F#: 4 A#: 1 SFA: 5.1 Class: E7018
Size: 1/8"

Electrical:
Polarity: Rev. Electrodes: Single
Electrode Size: 1/8" Amps: 120

Position: 6G, Inclined Fixed
Preheat: 50 F Interpass: 500 F Max. PWHT: none

Test Results:

Bend Tests:
Number: 4 Type: Side (QW-462.2) Results: Good

Tensile Tests:
Ultimate Stress: 70,500 psi Break Location: Pipe
" " 72,000 psi " " Pipe

Hardness (HRB): Weld: 193,187,189 HAZ: 185,190,179

Welders Name: J.T. Johnson
Test Conducted By: E.A. Zemba Emp.# 617
Date: 3-23-73

We certify that the statements made in this report are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: [signature] Date: 5-13-88

Editorial Rev. 8/13/88

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME Kenneth Lyday S.S.# 453-94-0699 STAMP KL
USING WPS NO. RW-1.3-1
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/8"	3/4" Max.
Fillet	---	Any
Diameter	Plate	*Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-462.3(a)

				Result
1 Face & 1 Root Bend		2G Position		Good
"	"	3G	"	"
"	"	4G	"	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result NA

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing)
NA
Length and Per Cent of Defects _____ inches _____
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by C. Hamblin Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date 9-11-87 Organization Wyatt Field Service Co

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder Name: Carl Turcin S.S.# 457-13-6325 Stamp: CT
WPS#: HW-1.5-I

VARIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual or Semiauto.
Material Spec.	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove Weld Thickness	3/4"	Any
Pipe Diameter	Plate	>24" O.D.*.Any Fillet
Filler Metal:		
Spec. Number	SFA 5.1	
Class	E7018	
F Number	4	
Position	2G, 3G & 4G	1 thru 4
Progression	Uphill	Any
		Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

RT TEST

Results: Meets the requirements of Sec. IX

GUIDED BEND TEST RESULTS

Type: Side Bends Fig.# QW-462.3
Number of Bend Tests: 2 in each position.
Results: Meets the requirements of Sec. IX

Test Conducted By: Jeff Miller Date: 10/27/92
Specimen preparation and testing by Central Testing Co., Inc.

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: [signature] Date: 11-16-92

SMAW CS SB

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME Pbt. B. Clark S.S.# 455-72-8496 STAMP RBC
USING WPS NO. BW-1.S-I
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/4"	Any
Fillet	---	Any
Diameter	Plate	*Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-462.2

	Result
2 Side Bends: 2G Position	Good
" " " : 3G "	"
" " " : 4G "	"

RADIOGRAPHIC TEST RESULTS

Radiographic Result NA

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing)
NA
Length and Per Cent of Defects _____ inches _____%
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by Rev Napper Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Organization

SMAW CS

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME L.D. McClure S.S.# 233-74-7030 STAMP LDM
USING WPS NO. HW-1.S-I
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/4"	Any
Fillet	---	Any
Diameter	Plate	*Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-462.2

	Result
2 Side Bends: 2G Position	
" " " : 3G "	
" " " : 4G "	

RADIOGRAPHIC TEST RESULTS

Radiographic Result Good

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing)
NA
Length and Per Cent of Defects _____ inches _____%
Macro Test - Fusion
Appearance - Fillet Size (Leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by J. Peterson Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder Name: Claude V. Chapman S.S.# 456-90-0350 Stamp: CVC
WPS#: HW-1.5-1

VARIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual or Semiauto.
Material Spec.	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove Weld Thickness	3/4"	Any
Pipe Diameter	Plate	>24" O.D.*, Any Fillet
Filler Metal:		
Spec. Number	SFA 5.1	
Class	E7018	
F Number	4	
Position	2G, 3G & 4G	1 thru 4
Progression	Uphill	Any
		Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

RT TEST

Results: Meets the requirements of Sec. IX

Test Conducted By: JJ Williams Date: 1/7/93

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: Andy Searle Date: 1-8-93

SMAW CS XR

RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS

NAME R.A. Harbison S.S.# 452-27-6722 STAMP RAH
USING WPS NO. RW-1.5-I
The above welder is qualified for the following ranges:

VARIABLE	RECORD ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Backing	Weld Metal	With Backing
Material Specification	P-1	P-1 thru P-11 & P-4X
Thickness		
Groove	3/4"	Any
Fillet	---	Any
Diameter	Plate	*Over 24" O.D.;Any Fillet
Filler Metal		
Spec. No.	SFA 5.1	---
Class	E7018	---
F-No.	4	1 thru 4
Position	2G,3G & 4G	Over 24" O.D.: Any*
Progression	Up	Up(Cover: Up or Down)**
Gas Type	NA	---
Electrical		
Current	Direct	Any
Polarity	Reverse	Any

*2-7/8" Min. O.D. Pipe: Flat & Horiz. only.
**Root pass may be down if removed before welding second side.

GUIDED BEND TEST RESULTS

Type and Fig. No. QW-462.2

	Result
2 Side Bends: 2G Position	
" " " : 3G "	NA
" " " : 4G "	

RADIOGRAPHIC TEST RESULTS

Radiographic Result Good

FILLET WELD TEST RESULTS

Fracture Test (Describe location, nature, and size of any crack or tearing)
NA
Length and Per Cent of Defects _____ inches _____%
Macro Test - Fusion
Appearance - Fillet Size (leg) ___" X ___" Convexity ___" or
Concavity ___"

Test Conducted by J. Peterson Laboratory Test No. NA
We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Organization Wyatt Field Service Co.

Date 10-1-86

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder Name: Todd Duvall S.S.# 453-45-1900 Stamp: TD
WPS#: HW-1.S-1 Revision 0

VARIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual
Material Spec.	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove Weld Thickness	3/4"	Max. to be welded
Pipe Diameter	Plate	>24" O.D.* Any Fillet
Filler Metal:		
Spec. Number	SFA 5.1	
Class	E7018	
F Number	4	
Position	2G, 3G & 4G	1 thru 4
Progression	Uphill	Any
		Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

RT TEST

Results: Meets the requirements of Sec. IX

GUIDED BEND TEST RESULTS

Type: Side Bends Fig.# QW-462.2
Number of Bend Tests: 2 in each position.
Results: Meets the requirements of Sec. IX

Welding Test Conducted By: D.R. Steinhauser Date: 11-08-91
Mechanical Tests Conducted By: RTI Testing Laboratories Lab Test #: R920

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: [signature] Date: 01-10-92

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder Name: Clay Baker S.S.# 450-15-7285 Stamp: CB
WPS#: HW-1.S-1

VARIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual or Semiauto.
Material Spec.	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove Weld Thickness	3/4"	Any
Pipe Diameter	Plate	>24" O.D.*, Any Fillet
Filler Metal:		
Spec. Number	SFA 5.1	
Class	E7018	
F Number	4	
Position	2G, 3G & 4G	1 thru 4
Progression	Uphill	Any
		Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

RT TEST

Results: Meets the requirements of Sec. IX

Test Conducted By: Claude Chapman Date: 11/21/93 97

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By: Andy Searle Date: 11/22/93

WYATT FIELD SERVICE COMPANY
RECORD OF WELDER OR WELDING OPERATOR
QUALIFICATION TESTS

Welder Name: B.D. Hendrix S.S.# 527-19-3357 Stamp: BDH
WPS#: HW-1.S-1

VARIABLE	ACTUAL VALUES USED IN QUALIFICATION	QUALIFICATION RANGE
Process	SMAW	SMAW
Process Type	Manual	Manual or Semiauto.
Material Spec.	P-1	P-1 thru P-11 & P-4X
Backing	Weld Metal	With Backing
Groove Weld Thickness	3/4"	Any
Pipe Diameter	Plate	>24" O.D.*,Any Fillet
Filler Metal:		
Spec. Number	SFA 5.1	
Class	E7018	
F Number	4	
Position	2G, 3G & 4G	1 thru 4
Progression	Uphill	Any
		Uphill

*2-7/8" Min. O.D. Pipe: Flat & Horizontal Only.

GUIDED BEND TEST RESULTS

Type: Side Bends Fig.# QW-462.2
Number of Bend Tests: 2 in each position.
Results: Meets the requirements of Sec. IX

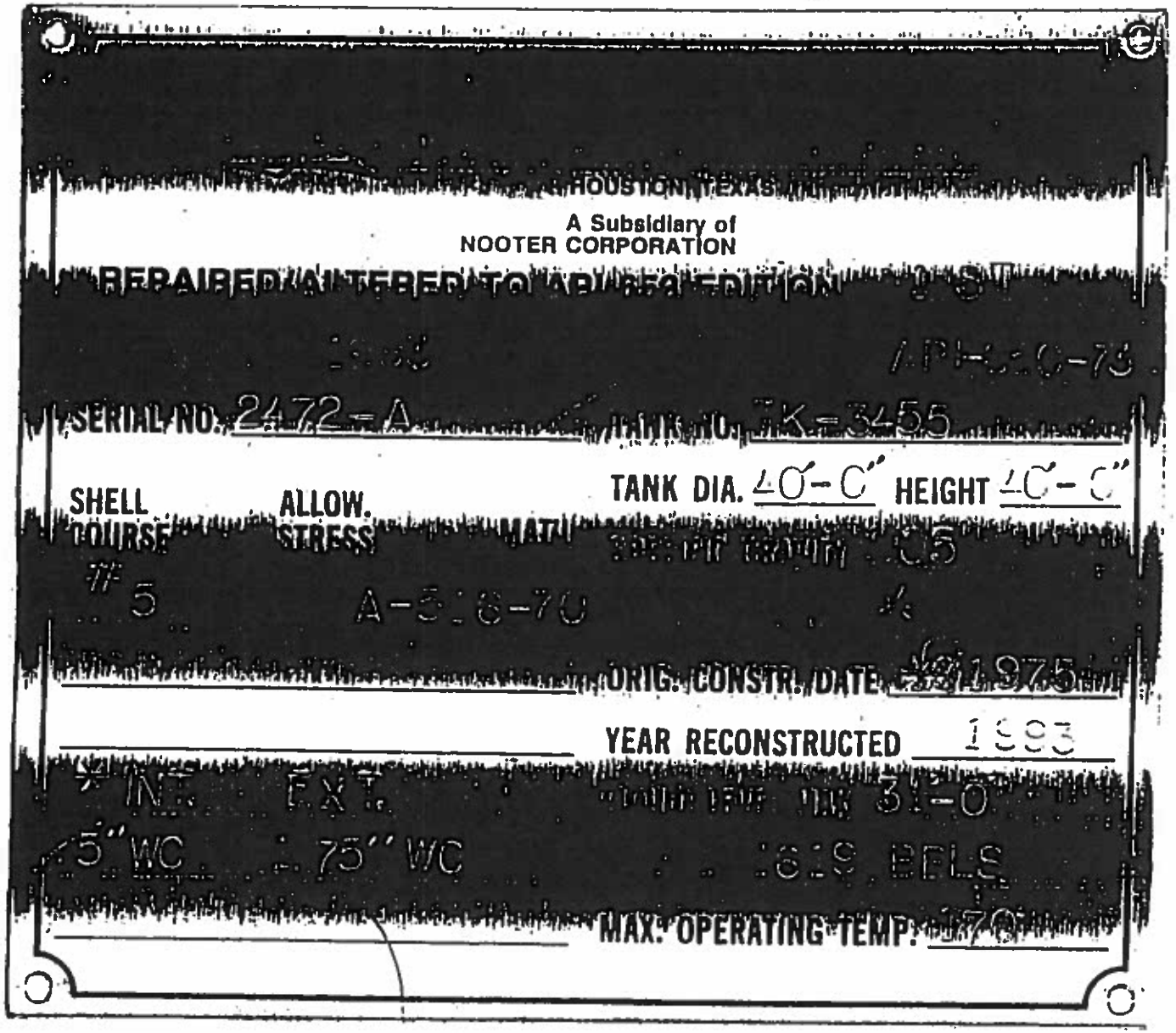
Test Conducted By: Claude Chapman Date: 10-18-91

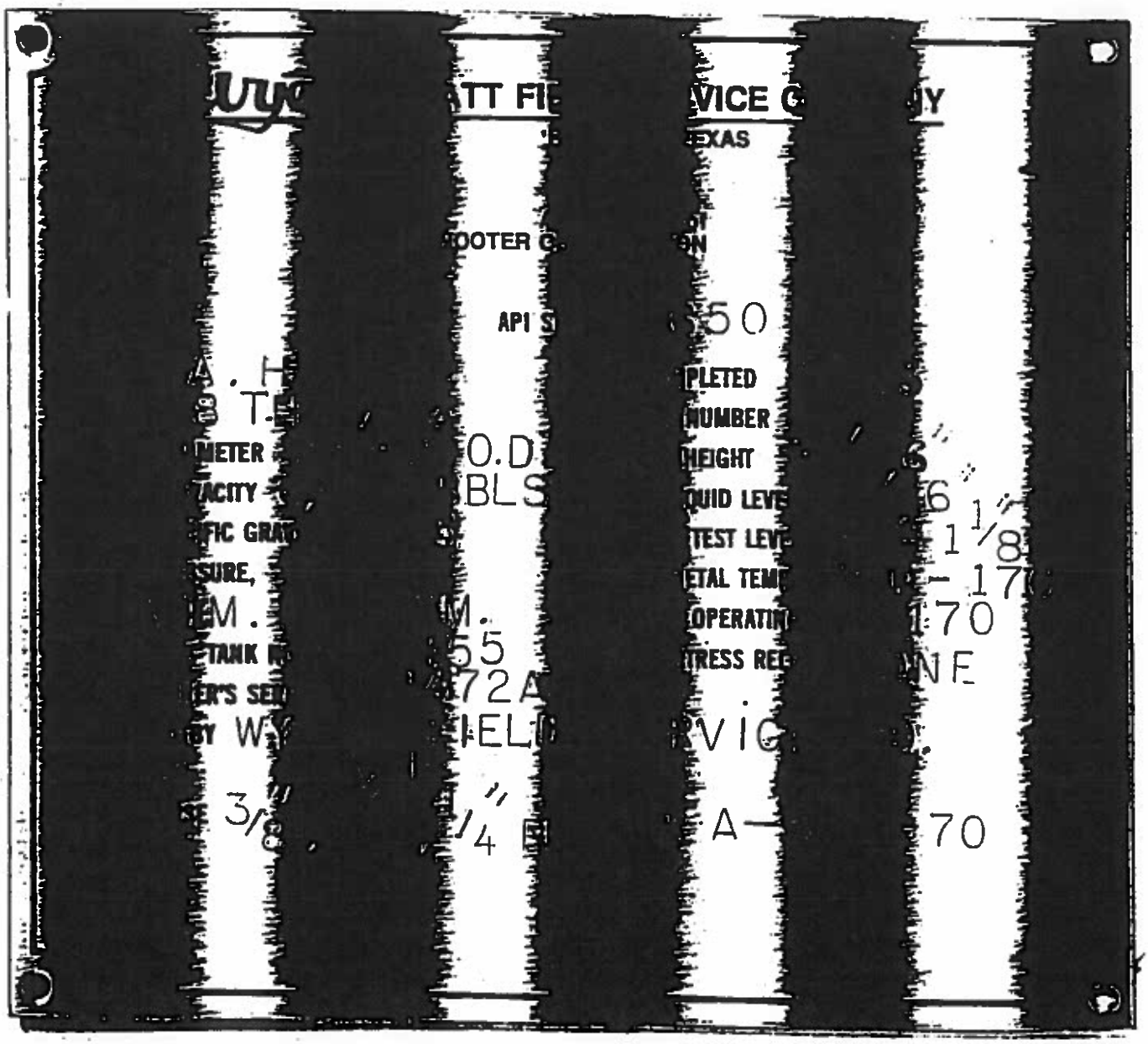
We certify that the statements in this record are correct and that the test welds were prepared. welded and tested in accordance with the requirements of Section IX of the ASME Code.

MANUFACTURER: WYATT FIELD SERVICE COMPANY

By:  Date: 10-23-91

1S-SR


HOUSTON, TEXAS
A Subsidiary of
NOOTER CORPORATION
REPAIRED/ALTERED TO API 653 EDITION
API-650-73
SERIAL NO. 2472-A
TANK NO. TK-3455
SHELL COURSE
ALLOW. STRESS
MAT'L
PT. EFF.
#5
A-36-70
1.0
ORIG. CONSTR. DATE
1975
YEAR RECONSTRUCTED
1993
INT.
EXT.
WELD TYP.
5" WC
.75" WC
BTLS
MAX. OPERATING TEMP.


TT FI
VICE G
Y
EXAS
OOTER G.
API S
50
PLETED
NUMBER
HEIGHT
QUID LEVE
TEST LEV
ETAL TEM
OPERATIN
RESS REL
NE
METER
ACITY
FIC GRA
SURE,
M.
TANK
ER'S SE
BY W
3/
0.D
BLS
M.
55
72A
HEL
1/4
VIC
A
70
6 1/
1 1/8
170

NAM FIELD SERVICE COMPANY

QUALITY ASSURANCE CHECKLIST FOR TANKS

.: 2472-A Customer: LYONDELL

	Check	Inspector WYATT	Inspector LYONDELL	Date	Comments
Material	✓	A.S.	J.H.	4/5/93	
Fit Up	✓	A.S.	JH	4/13/93	
WPS/PQR	✓	A.S.	J.H.	2/18/93	
Welder Qual	✓	A.S.	J.H.	2/18/93	
Weld Map	✓	A.S.	J.H.	4/5/93	
RT	✓	A.S.	JH	3/30/93	
Pressure Test	✓	A.S.	JH	4/13/93	
Name Plate	✓	A.S.	JH	4/13/93	
Dimensional	✓	A.S	J.H.	4/5/93	

WYATT FIELD SERVICE COMPANY

API 650: DIMENSIONAL INSPECTION

J/N: 2472-A Customer: LYONDELL

	Tolerance	Actual	Inspector WYATT		Date LYONDELL
Circumference	NA	109'-11 3/16"			
Diameter 0-180	± 1"	34'-11 1/4"	A.S.	3/23/93	J.H.
Diameter 45-225	"	34'-10 7/8"	A.S.	3/23/93	J.H.
Diameter 90-270	"	34'-11 7/16"	A.S.	3/23/93	J.H.
Diameter 135-315	"	34'-11"	A.S.	3/23/93	J.H.
Plumbness 0	2 3/8"	1/4"	A.S	3/23/93	J.H.
Plumbness 90	"	5/8"	A.S	3/23/93	J.H.
Plumbness 180	"	3/8"	A.S.	3/23/93	J.H.
Plumbness 270	"	1/2"	A.S.	3/23/93	J.H.
aking	1/2" in 36"	1/4" in 48"	A.S.	3/23/93	J.H.
anding	1/2" in 36"	3/16" to 1/4" in 48"	A.S.	3/23/93	J.H.

Form 650DIM

ÄLVSUND

INSPECTION CERTIFICATE

DATE : 1991-10-22 51670 -10041
VO : 33256-009 PAGE 2/ 2

* * * C H E M I C A L C O M P O S I T I O N * * *

FINED LADLE ANALYSIS (%):

NO.	C	SI	MN	P	S	CR	NI	MO	V	TI	CU	AL	NB	B	N
21	.21	.31	1.13	.009	.004	.02	.03	.012	.008		.01		.002		
31	.22	.32	1.17	.012	.004	.02	.03	.007	.008		.01		.002		
41	.20	.30	1.14	.008	.004	.01	.03	.005	.007		.01		.002		

* * * M E C H A N I C A L T E S T I N G * * *

T E N S I L E T E S T

RESULTS:

T	PLATE	MILL CODE	T(MM)	TREAT-MENT:0	SPECIMEN POS.	SPECIMEN TYPE	REH (KSI)	RM (KSI)	ELONG. AX	ELONG. (%)
21	04-0	779759	15.9		4	1	54	83	A200	27
21	61-6	779874	12.7		4	1	54	83	A200	24
31	12-0	779928	12.7		4	1	55	81	A200	25
31	60-2	783172	14.3		4	1	54	81	A200	26
31	60-4	785794	14.3		4	1	54	80	A200	24
41	60-4	783309	14.3		4	1	53	81	A200	24
41	61-0	783325	14.3		4	1	52	79	A200	26
41	61-2	785850	14.3		4	1	52	79	A200	26
41	60-8	785893	14.3		4	1	54	79	A200	28
41	60-6	785950	14.3		4	1	53	79	A200	26

M C Q U A I D - E H N T E S T

RESULTS:

T	PLATE	MILL CODE	T(MM)	TREAT-MENT:0	TEST POSITION	GRAIN SIZE (ASTM E112)
1		775739	22.2		9	10
1		779587	7.9		9	10
1		759528	22.2		9	10

MENT : 0=DELIVERY CONDITION
MEN POSITION: 4=TOP TRANSV., 9=TOP
MEN TYPE : 1: RECTANGULAR

RECEIVED
DATE 1-23-92
P.O. # W53726
JOB # 2326

Telephone Natl 0155-540 00 Int +46 155 540 00
Telex 80950 asab s
Telefax Natl 0155-540 73 Int +46 155 540 73
Bank Skandinaviska Enskilda Banken STOCKHOLM
Bankgiro 887-6468 Postgiro 37 78 44-2 Org nr 04-888313-7833
Please effect payment through Skandinaviska Enskilda Banken STOCKHOLM

Gulf States Steel, Inc. GADSDEN AL 35904-1935

CONTROL CARD	REQ JOB CONTRACT NO	PURCHASE ORDER DATE	PURCHASE ORDER NO	RELEASE
M816-01		07/09/91	W 49647	

CERTIFICATE OF TESTS

CUSTOMER IDENTIFICATION

DIST	GSS ORDER NO NUMBER	SHPG	ITEM NO
G	20787	742	

TEAM	MAT	OFFICE DIST	SLM	INVOICE DATE	INVOICE NUMBER
AC	2	FC			742-73852

LE	ACCOUNT NUMBER	TERMS
	82509704	30-3/4-10

SOLD TO:
WYATT FIELD SERVICE CO
P O BOX 3052
HOUSTON TX 77253

SHIP TO:
WYATT FIELD SERVICE CO
GREENS PORT IND PARK 13609
IND RD SPOT PTRA 2172288
HOUSTON TX 77015

DATE SHIPPED	FROM	ROUTE/VEHICLE IDENTIFICATION	SHEET NO
07 26 91	ALA CITY	NW300343	

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS

LEONARD A. TROMAN
DIR. QUALITY ASSURANCE AND METALLURGY

ITEM NO	MATERIAL DESCRIPTION	P/C	QUANTITY SHIPPED

9-25-91
W-47647
5161-5164

ANALYSIS

ITEM NO	HEAT NO	GRAIN	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL
05	7420000		.15	0.80	.006	.014	.088							
05	7489993		.14	0.89	.006	.011	.056							

TEST RESULTS

ITEM NO	HEAT NUMBER	TESTOR PIECE IDENTITY NO	YIELD KSI	TENSILE STGTH KSI	ELONG 8"	GALV COATING	BEND TEST	HARD	CHARPY IMPACT V-NOTCH FT LBS AT TEST NO	SPEC SIZE	1	2	3	AVG
05	7420000		48	65	24.0									
	7489993		43	62	30.0									

Gulf States Steel, Inc

GADSDEN, AL 35904-1626

A626

CONTROL CARD	RFQ JOB CONTRACT NO	PURCHASE ORDER DATE	PURCHASE ORDER NO
MP16-01		07/09/91	W 49647

CERTIFICATE OF TESTS

CUSTOMER IDENTIFICATION

DIST	GSS ORDER NO NUMBER	SHPL	ITEM NO
G	20787	742	

TEAM	OFFICE DIST	SLM	INVOICE DATE	INVOICE NUMBER
12				742-73852

LE	ACCOUNT NUMBER	TERMS
	02509704	30-3/4-10

SOLD TO:
WYATT FIELD SERVICE CO
OP O BOX 3058
HOUSTON TX 77253

SHIP TO:
WYATT FIELD SERVICE CO
GREENS PORT IND PARK 13609
IND ED SPUR PTRA 2172258
HOUSTON TX 77015

DATE SHIPPED	FROM	ROUTE/VEHICLE IDENTIFICATION	SHEET NO.
07 26 91	OLA CITY	MU5707131	

I HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS.

LEONARD A. TROMAN
DIR QUALITY ASSURANCE
AND METALLURGY

ITEM NO	MATERIAL DESCRIPTION	PC	QUANTITY SHIPPED
	PLATE CARBON ASTM A-36-90 APPLY DOMESTIC STEEL ONLY CUST ID: 5161-5164		
05	.2500 X 115.5000 SHEARED EDGE X 378.0000 IN HT 7489441 1PCS HT 7413748 2PCS HT 7413743 2PCS HT 7489938 2PCS HT 7413708 2PCS HT 7420000 1PCS HT 7489993 5PCS	B	49520
CH	C 25MX MN RPT P .040MX S .050MX SI RPT		
MR	YLD 36000 MIN TEN 58/80000 % ELONG MIN 2 IN 23 OR 8 IN 20		
TI	1 TR W/SHPMNT 2 TR CA ATTN JOHN WILLIAMS		

8-25-91
W-49647
5161-5164

ANALYSIS

ITEM NO	HEAT NO	GRAIN	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL
05	7489441		.19	0.73	.007	.015	.026							
	7413748		.19	0.78	.005	.016	.024							
	7413743		.19	0.81	.009	.013	.024							
	7489938		.19	0.81	.012	.013	.030							
05	7413708		.19	0.78	.010	.013	.026							

TEST RESULTS

ITEM NO	HEAT NUMBER	TESTOR PIECE IDENTITY NO	YIELD KSI	TENSILE STGTH KSI	ELONG 2"	ELONG 8"	GALV COATING	BEND TEST	HARD	CHARPY IMPACT V NOTCH FT LBS AT TEST NO	SPEC SIZE	1	2	3	AVG
05	7489441		48	64		27.0									
	7413748		45	61		30.0									
	7413743		44	62		29.0									
	7489938		44	62		30.0									
	7413708		45	64											

TEST REPORTS

FRIEDMAN INDUSTRIES, Incorporated
P.O. BOX 21147 • HOUSTON, TEXAS 77226 • (713) 672-9433

Wyatt Field Services
Houston, TX

1/29/93

P.O. W57492
Inv. 24330

Attn: John Williams

P.O. W56170
Inv. 24331

HEAT NUMBER	SIZE	SPECIFICATIONS
052043	5/16 72 x 240	A36
1D0068	3/16 72 x 301	A36
1D0068	3/16 72 x 240	A36

CHEMICAL ANALYSIS

HEAT NUMBER	C	MN	P	S	SI	AL
052043	.132	.837	.12	.5	.100	.37
1D0068	.21	.71	.012	.022	.004	--

PHYSICAL PROPERTIES

HEAT NUMBER:	YIELD POINT PSI	TENSILE STRENGTH PSI	ELONG %	BEND TEST
052043	43,150	65,449	31% in 2"	
1D0068	52,500	67,300	25% in 8"	

WE HEREBY CERTIFY THAT THE ABOVE FIGURES ARE CORRECT AS CONTAINED IN THE RECORDS OF FRIEDMAN INDUSTRIES, INC.

RECEIVED
DATE 1-28-93
P.O. # W57492

FRIEDMAN INDUSTRIES, INC.
By Alvin Smith

Test Report

ITEM NO.

NEVA STEEL
P.O. BOX 2500
ROVO, UTAH 84603

P.O. DATE: 12/07/92
PURCHASE ORDER NO.: 60-8843/1472-H
SHIPPERS NO.: GC63750C 01-13-93
MILL ORDER NO.: E956660
INVOICE NO.: GC63750C
VEHICLE IDENTITY: RG 330275

MANNESMANN PIPE&STEEL CORP
1990 POST OAK BLVD
HOUSTON TX 77056-3811

FRIEDMAN INDUSTRIES
4001 HOMESTEAD ROAD
SPINS #273001
HOUSTON, TX 77028

SHIP TO

THIS IS TO CERTIFY THAT T
PRODUCT DESCRIBED HEREIN
MANUFACTURED, SAMPLED, TE
ED AND/OR INSPECTED IN
ACCORDANCE WITH THE SPECI
CATION AND FULFILLS REQUI
MENTS IN SUCH RESPECTS.

Larry D. Clinge
MANAGER - QUALITY ASSURANC
DATE 01-13-93

H.R. SHEET C.25MAX P.040MAX S.050MAX HR36S058 Y/P 36 KSI MIN T/S
58 KSI MIN DRY NO OIL

01 MILL RA/SN CERTIFIED T/R ANALYSIS

ITEM NO.	MATERIAL DESCRIPTION: THICKNESS OR SECTION	WIDTH, DIA. OR FT WT	LENGTH	QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	YIELD PT. PSI	TENSILE STR. PSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED. OF AREA
1	.1780"	72.0000"	COIL 576460	1	49450#	100068	.1780"	52500	67300	25.0		
							.1780"	52500	67900	25.0		
							END OF DATA					

RECEIVED
DATE 1-26-93
P.O. # 45792

HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
00068	HEAT	21	71	012	022	004												

GENEVA STEEL COMPANY CERTIFIES ALL SMELTING, MELTING AND MANUFACTURING PROCESSES OCCURRED IN THE USA.

END OF DATA

098044 (3 C R A)

GE

BURNS HARBOR PLANT

BETHLEHEM STEEL CORPORATION
QUALITY ASSURANCE DEPARTMENT
REPORT OF TESTS AND ANALYSES

PLANT NO: 803-11981 | DATE SHIPPED: 7-14-92 | CAR OR VEHICLE NO.: CSS-CHGO-MP | PAGE: PONE 000650

SOLD TO: DELTA STEEL INC
PO BOX 2289
HOUSTON TX 77252
206816

SHIP TO: DELTA STEEL INC
SPOT 0275400
9217 S FREEWAY
FORT WORTH TX 76140

QUALITY STEEL MELTED & MANUFACTURED IN THE U. S. A.

PLATES - ASTM A516-86 GR 70 PVQ
MFST - LIFT MAX 10 TON-SIZES SEP UNLDG OH-PLATE HOOK
CO# DF115808 GH 024-4541
YIELD STRENGTH @ .5% E.U.L.

SERIAL NUMBER	PAT NO	HEAT NUMBER	NO. PCS.	SIZE AND QUANTITY: THICKNESS INCHES	WIDTH OR DIA. INCHES	LENGTH INCHES	WEIGHT POUNDS	YIELD POINT PSI	TENSILE STRENGTH PSI	ELONG IN	
42319		803X73660	2	1/4	96	480	6534	61300	81900	8	22
42320		803X73660	2	1/4	96	480	6534	56700	80700	8	19
42321		803X73660	2	1/4	96	480	6534	56900	80200	8	18
42322		803X73660	1	1/4	96	480	3267	45200	77700	8	22

RECEIVED
DATE 1-19-93
P.O. # 456797-A+C
JOB # 2472

Floating roof deck

Q=QUENCH TEMPERATURE T=TEMPER TEMPERATURE N=NORMALIZE TEMPERATURE

SER	PAT NO	HEAT NUMBER	HARD	BEND	CHARPY IMPACT: THICKNESS INCHES	TYPE	SIZE	DIR.	TEST TEMP F	ENERGY FT. LBS. 1	2	3	SHEAR (%) 1	2	3	LAT. EXP 1	2	HTT

CHEMICAL ANALYSIS

SER	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Ti	Al	B	Cb	N	MICRO GRAIN SIZE
803X73660	.23	1.00	.017	.014	.21	1.015	.02	.04	.006	.004		.036		.002		

SUSCRIBED AND SWORN TO BEFORE ME
THIS 15 DAY OF [illegible] 19 93
NOTARY PUBLIC
PORTER COUNTY
MY CO.

RT STATUS REPORT

Page #_____

Customer: Lyondell

J/N: 2472-A

N.D.T. Contractor: GCT Inspection

Component: TK # 3455

Full or Spot: Spot

Seam	Acceptance Insp.	Date	AI	Date
G1, H1	A.S.	3/8/93	JH	3/8/93
G1, H2	A.S.	3/8/93	JH	3/8/93
G1, J1	A.S	3/8/93	JH	3/8/93
R1, V3	A.S.	3/8/93	JH	3/8/93
R1, V4	A.S.	3/8/93	JH	3/8/93
R1, V2	A.S	3/8/93	JH	3/8/93
R1, V6	A.S.	3/8/93	JH	3/8/93
R2, V3	A.S.	3/8/93	JH	3/8/93
R2, V5	A.S.	3/8/93	JH	3/8/93
J2-G1	A.S	3/23/93	JH	3/23/93
H1-G4	A.S	3/23/93	JH	3/23/93
H2-G4	A.S.	3/23/93	JH	3/23/93
J1-G40	A.S	3/23/93	JH	3/23/93
J2-G40	A.S	3/23/93	JH	3/23/93
J3-G40	A.S.	3/23/93	JH	3/23/93
J4-G40	A.S.	3/23/93	JH	3/23/93
J5-G40	A.S.	3/23/93	JH	3/23/93
J6-G40	A.S.	3/23/93	JH	3/23/93

Seam	Acceptance Insp.	Date	AI	Date
H1-G40	A.S.	3/23/93	JH	3/23/93
H2-G40	A.S.	3/23/93	JH	3/23/93
H3-G40	A.S.	3/23/93	JH	3/23/93
DS-V-1	A.S.	3/30/93	JH	3/30/93
DS-C1	A.S.	3/30/93	JH	3/30/93
DS-C2	A.S.	3/30/93	JH	3/30/93
DS-H1	A.S	3/30/93	JH	3/30/93
DS-J1	A.S.	3/30/93	JH	3/30/93
Noz. 33	-	-	-	-
W-1	A.S.	4/7/93	JH	4/7/93
W-2	A.S	4/7/93	JH	4/7/93

Final Acceptance:

Inspector: Andy Searle

Date: 3-30-93

AI: Represents Customer Inspector

Date: 3-30-93

B/L #: 40175
DATE: 1/18/93

NUCOR STEEL
A DIVISION OF NUCOR CORPORATION
[illegible] TEXAS 75846 PH(903) 626-4461

MILL TEST REPORT

Sold SERVICE STEEL WAREHOUSE CO. Ship SERVICE STEEL WAREHOUSE
to P.O. BOX 9207 to 8827 MISSISSIPPI
HOUSTON, TEXAS 77213

SIZE: 5X3X1/4

ASTM-A36-90 / ASME SA36-88

HEAT NO.	CUST.P.O.	TENSILE	YIELD	8 INCH SCALE ELONG.%
324-2335	81963	62000 PSI	46000 PSI	29

C	MN	SI	S	P	V	Nb	Cu
0.13	0.68	0.19	0.03	0	0	0	0.42

Cr	Ni	Mo
0.13	0.16	0.011

(signed)
CHIEF CHEMIST

RECEIVED
DATE 1-21-93
P.O. # W57488

...TIONAL METALS, INC.
S M I BOX 911, SEGUIN, TEXAS 78156-0911
512-372-8000

WE HEREBY CERTIFY THAT THE FOLLOWING DATA IS A TRUE COPY FROM TESTS PERFORMED IN OUR LABORATORY.

C E R T I F I E D T E S T R E P O R T

THE FOLLOWING TESTS CONFORM TO THE REQUIREMENTS OF THE SPECIFICATIONS LISTED.

DAN SCHACHT 12/1/92
QUALITY CONTROL MANAGER

SIN#: 576421
BOL NO: B9373668

INV NO: V145560
INV DATE: 11/30/92

S 661600
D SERVICE STEEL WHS
L 8827 MISSISSIPPI
D BOX 9207
T HOUSTON TX
O 77213

S 0001
H SERVICE STEEL WHS
L 8827 MISSISSIPPI
P TX
T
O

HEAT NO	SPECIFICATION	YIELD PSI	TENSILE PSI	ELONG % IN
4045	L2X2X1/4	ASTM A36-92	52000	73600	29.0 8

HEAT NO	C	Mn	P	S	Si	Cu	Cr	Ni
4045	0.19	0.59	0.009	0.033	0.17	0.36	0.1	0.15

Mo	Cb	V	Al	CE	BHN	
0.044	0	0.001	0.002	0.00		

REMARKS: THIS STEEL IS MELTED AND MANUFACTURED IN THE USA AND IS FREE FROM MERCURY CONTAMINATION IN THE PROCESS.

FOR ADDITIONAL COPIES
CALL ACCOUNTING
(512)372-8225

RECEIVED
DATE 1-21-93
P.O. # W57488

BETHLEHEM STEEL CORPORATION
QUALITY ASSURANCE DEPARTMENT

BURNS HARBOR PLANT

REPORT OF TESTS AND ANALYSES

PLANT NO: 803-11981 | DATE SHIPPED: 7-14-92 | CAR OR VEHICLE NO.: CSS-CHGO-MP | PBNE 000650 | PAGE

SOLD TO:
DELTA STEEL INC
PO BOX 2289
HOUSTON TX 77252

206810

SHIP TO:
DELTA STEEL INC
SPOT 0275400
9217 S FREEWAY
FORT WORTH TX 76140

SERIAL NUMBER	PAT NO	HEAT NUMBER	NO. PCS	SIZE AND QUANTITY: THICKNESS INCHES	WIDTH OR DIA. INCHES	LENGTH INCHES	WEIGHT POUNDS	YIELD POINT PSI	TENSILE STRENGTH PSI	ELONG IN	ELONG %
~~QUALITY STEEL MELTED & MANUFACTURED IN THE U.S.A.~~											
PLATES - ASTM A516-86 GR 70 PVQ											
MFST - LIFT MAX 10 TON-SIZES SEP UNLOG OH-PLATE HOOK											
CO# DF115808 GH 024-4541											
YIELD STRENGTH @ .5% E.U.L.											
42319		803X73660	2	1/4	96	480	6534	61300	81900	8	22
42320		803X73660	2	1/4	96	480	6534	56700	80700	8	19
42321		803X73660	2	1/4	96	480	6534	56900	80200	8	18
42322		803X73660	1	1/4	96	480	3267	45200	77700	8	22

RECEIVED
DATE 1-19-93
P.O. # 1,156797-A+C
JOB # 2472

QUENCH TEMPERATURE ____ NORMALIZE TEMPERATURE ____

Floating roof deck

AL SER	PAT NO.	HEAT NUMBER	HARD	BEND	THICKNESS INCHES	CHARPY IMPACT: TYPE	SIZE	DIR.	TEST TEMP F	ENERGY FT-LBS 1	2	3	SHEAR PCT 1	2	3	LAT. EXP 1	2	3	MTI S

CHEMICAL ANALYSIS

AT SER	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Ti	Al	B	Cb	N	MODIFIED GRAIN SIZE
73660	.23	1.00	.017	.014	.211	.015	.02	.04	.006	.004		.036		.002		

SUSCRIBED AND SWORN TO BEFORE ME
THIS 15 DAY OF July 19 92
NOTARY PUBLIC

METALLURGICAL TEST REPORT

ORIGINAL

CONTRACT NO.

PO DATE | PURCHASE ORDER NO. 4154

SHIPPERS NO. | MILL ORDER NO. DR33455 | INVOICE NO.

VEHICLE IDENTITY

SS TUBULAR PPODUCTS

BULAR STEEL INCORPORATED
031 EXECUTIVE PARKWAY DR
EVE COEUR MO 63141-6351

TUBULAR STEEL INCORPORATED
1031 EXECUTIVE PARKWAY DR
CREVE COEUR MO 63141-6351

MAIL TO

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFG., SAMPLED, TESTED, AND/OR INSPD. IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

APPROVED BY THE OFFICE OF:
D.S. DABKOWSKI MGR. MET. &
Q.A. USS TUBULAR PRODUCTS
DATE 11/02/93

TSI QUALITY CHECK
BY GP DATE 12/1

MATERIAL DESCRIPTION: SIZE	WALL	SPECIFICATION & GRADE	MATL.	HEAT/ LOT NO.	MIN HYDRO PSI	YIELD STR PSI	TENSILE STR PSI	ELONG. % IN 2"	GAGE WIDTH IN	FLAT	BE
3 1/2	.438	API 5L GR.B 39TH ED 6/91 ASTM A53-90D GR.B ASME SA53 GR.B B9ED 91ADD. ASTM A106-91 GR.B/C ASME SA106 GR.B/C B9ED 91ADD.	SMLS	N47751	2500	48100	77200	36.00	3/4	OK	

RECEIVED
DATE 1-28-93
P.O. # 105 7490
JOB # 2472-

HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
N47751	HEAT	24	50	012	007	21	01	01	03	01				002				
N47751	PROD	24	51	009	006	27	01	01	04	01				002				

OF DATA THIS SHE T * ALL MELT NG MD M SURFA INRING TI OK PLACE IN THE 990

CONTRA J

METALLURGICAL TEST REPORT

HT-2056

ORIGINAL

P.O. DATE	PURCHASE ORDER NO.
	4162 -103
SHIPPERS NO.	MILL ORDER NO. / INVOICE NO.
F16267	DR33755 / 489-040927
VEHICLE IDENTITY	DSX1482278 09/24/92

FAIRFIELD WORKS
P.O. BOX 599
FAIRFIELD, ALABAMA 35064

TUBULAR STEEL INC
1031 EXECUTIVE PARKWAY DR

CREVE COEUR MO 63141-6351

MAIL TO

TUBULAR STEEL INC
27700 KATY BROOKSHIRE ROAD
KATY TX

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

PREPARED BY THE OFFICE OF:
M.R. STEIN MGR. Q.A.

DATE SEPTEMBER 25, 1992

PIPE CARBON SMLS STD PIPE API 5L-*39TH EDITION DTD 6/1/91 GRADE B ASTM A53-*90B GRADE B ASTM A106-*1991 GRADE B/C BLK BEG MILL COAT PE BEV 30 DEG
:01 MILL

MATERIAL DESCRIPTION: SIZE	WALL	SPECIFICATION & GRADE	MATL	HEAT / LOT NO.	MIN HYDRO PSI	YIELD STR PSI	TENSILE STR PSI	ELONG % IN 2"	GAGE WIDTH IN	FLAT	BE
6.6250	0.4328		SMLS	U41698	4,000 OSSEC	50,300 AS ROLLED	78,400 TENSILE.	42.6	1.5	OK.	
6.6250	0.4328		SMLS	X45972	4,000 OSSEC	48,600 AS ROLLED	78,500 TENSILE.	40.8	1.5	OK	
6.6250	0.4328		SMLS	X45974	4,000 OSSEC	48,400 AS ROLLED	78,400 TENSILE.	40.6	1.5	OK	

YIELD STRENGTH @ .005 EXT.
NGITUDINAL STRIP TENSILE SPECIMENS USED UNLESS NOTED OTHERWISE.
SO MEETS THE REQUIREMENTS OF ASME SA53 1989 EDITION, 1991 ADDENDA, HOT FINISHED -- NO HEAT TREATMENT & SA106 1989 EDITION, 1991 ADDENDA

RECEIVED
DATE 1-28-93

ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.

HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI
U41698	HEAT	.25	.94	.012	.026	.25	.22	.12	.04	.01				.00		
	PROD	.24	.95	.011	.027	.24	.21	.11	.03	.01				.00		
X45972	HEAT	.25	.97	.013	.025	.25	.22	.12	.03	.01				.00		
	PROD	.25	1.00	.012	.025	.27	.22	.12	.02	.00				.00		
X45974	HEAT	.25	.95	.015	.029	.24	.21	.11	.03	.00				.00		
	PROD	.25	.97	.012	.010	.24	.21	.11	.03	.00				.00		
	END OF DATA															

CB LCO W59490

JOB 2477

TSI QUALITY CHECK
BY VMA DATE 10-15-92

4 41002100I LBCLOSEIE 4R5R01500I

-8860-01

CERTIFICATE OF TESTS

GADSDEN, AL 35904-1655

PURCHASE ORDER DATE: 09/08/92 | PURCHASE ORD NO: Q 23323 | RELEASE:

CUSTOMER IDENTIFICATION:

SALES ORDER: DIST G | NUMBER 26678 | BRN 748

OFFICE DIST DM | INVOICE DATE | INVOICE NUMBER 742-18980

LC | ACCOUNT NUMBER 56755059 | TERMS 30-3/4-10

SHIP TO:
Bestline Steel Products Inc.
3001 W. Eleventh
Houston, TX 77008

SHPD FROM: 1 13 92 ALA CITY

ROUTE/VEHICLE IDENTIFICATION: STILES TRK

SHEET NO.

WE HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED THEREON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO SPECIFICATIONS.

LEONARD A. TROMAN
DIR. QUALITY ASSURANCE
AND METALLURGY

MATERIAL DESCRIPTION	WC	QUANTITY SHIPPED
PLATE CARBON ASTM A-516-90 GRADE 70 ASME SA-516 DATE 07 01 89 GRADE 70 FVQ KILLED FINE GRAIN PRACTICE CUST ID: 0412951		
.2500 X 96.0000 SHEARED EDGE X 80.0000 IN	A	39204
HT 7424460 T 891 1PCS		
HT 7424460 T 892 1PCS		
HT 7424460 T 893 1PCS		
HT 7424460 T 894 1PCS		
HT 7424460 T 895 1PCS		
HT 7424460 T 896 1PCS		
HT 7424460 T 897 1PCS		
HT 7424460 T 898 1PCS		
HT 7424460 T 899 1PCS		
HT 7424460 T 900 1PCS		
HT 7424460 T 901 1PCS		
HT 7424460 T 902 1PCS		
C 27MX MN 85/1.20 P 035MX S 035MX SI 15/40 AL 020MIN CU 40MX NI 40MX		

RECEIVED
DATE 1-15-93
P.O. # 056797
JOB # 2472

Floating roof deck

HEAT NO	GRAIN	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL
7424460		.21	1.08	.010	.010	.226	0.03	0.01	0.04	.02	.000	.003	.034

HEAT NUMBER	TESTCH PIECE IDENTITY NO	YIELD KSI	TENSILE STRGTH KSI	ELONG %	GALV COATING	BEND TEST	HARD	CHARPY IMPACT V NOTCH FT LBS AT TEST NO	SPEC TEST	1	2	3	AVG
7424460	891	57	77	26									
	892	56	77	24									
	893	57	77	25									
	894	56	77	24									
	895	57	77	24									
	896	58	78	28									

-8860-01

CERTIFICATE OF TESTS

PURCHASE ORDER DATE: 09/08/92 | PURCHASE ORDER NO.: Q 23323 | RELEASE:

CUSTOMER IDENTIFICATION:

SHIP VIA: E W A L | OFFICE ORDER NO.: 6 20678 748 | INVOICE DATE: | INVOICE NUMBER: 742F18980

LE | ACCOUNT NUMBER: 56755059 | TERMS: 30-3/4-10

SHIP TO:
Bestline Steel Products Inc.
3001 W. Eleventh
Houston, TX 77008

FOB	FROM	TRUCK/VEHICLE IDENTIFICATION	SHEET NO.
13 92	ALA CITY	STILES TRK	

I CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED ME RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE E SPECIFICATIONS

LEONARD A. TROMAN
DIR. QUALITY ASSURANCE AND METALLURGY

MATERIAL DESCRIPTION	P/C	QUANTITY SHIPPED
R 30MX MO 12MX CB 02MX V 03MX		
YLD 38000 MIN TEN 70/90000 % ELONG MIN 2 IN 21 OR 8 IN 17		
TR WAREHOUSE PICK-UP CLERK CA		

RECEIVED
DATE 1-15-92
P.O. # W56797
JOB # 2472

OTAL WT. 39,204# PCS 12

HEAT NO.	GRAIN	CARBON	MANG	PHOS	SUL	SIL	COPPER	NICKEL	CHROME	MOLY	VAN	CB	AL

HEAT NO.	TESTOR PIECE IDENTITY NO.	YIELD KSI	TENSILE STRENGTH KSI	ELONG % 2"	ELONG % 8"	GALV COATING	BEND TEST	HARD	CHARPY IMPACT V-NOTCH FT LBS AT TEST NO.	SPEC SIZE	1	2	3	AVG
460	398	57	77		26									
	399	56	76		25									
	400	56	76		24									
	401	58	77		24									
	402	56	77		26									

OREGON STEEL MILLS

PO Box 2760, Portland, Oregon 97208 · (503) 285-9651 TX. . 910 464 1549

CERTIFICATE DATE: 221405 Jul 20, 199

SOLD TO:
THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

5/16 x 96 x 480

MILL ORDER NO.: 21682 | DATE:
CUSTOMER ORDER NO.: 0701-410-121
JOB/REQ. NO.:
SHIPPING NO.: 221405 | DATE: 07/17
CARRIER: SOUTHERN PACIFIC
CAR/TRUCK NO.: SP508458

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS
OSM CARBON PRESSURE VESSEL QUALITY ASTM A515-86 GRADE 70 ASME SA516 GRADE 70.

PHYSICAL PROPERTIES

OSM TEM NO	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG 8"	% ELONG 2"	% R.A.	HARDNESS BHN	BEND TEST	IMPACTS
1	0.2500 X 96.000 X 480.000										
	1 PC 3267 LBS	VC0008	A55	550	770	21					
3	0.3125 X 96.000 X 480.000										
	1 PC 4084 LBS	VC0025	B61	530	760	22					
	1 PC 4084 LBS	VC0025	B62	520	760	23					
	1 PC 4084 LBS	VC0025	B63	525	755	22					
	1 PC 4084 LBS	VC0026	A61	545	785	25					
	1 PC 4084 LBS	VC0026	A62	520	760	21					
	1 PC 4084 LBS	VC0026	A63	520	750	21					
	1 PC 4084 LBS	VC0026	A65	520	755	21					
	1 PC 4084 LBS	VC0026	B25	515	750	20					
	1 PC 4084 LBS	VC0026	B27	510	750	21					
	1 PC 4084 LBS	VC0026	B28	510	745	25					
	1 PC 4084 LBS	VC0031	A24	535	795	18					
	1 PC 4084 LBS	VC0031	A25	595	800	18					

Bm #2

RECEIVED
DATE 1-18-
P.O.# W5669
JOB # 2472

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Cb	Al	Cr	Mo	Ti	B	N	Ca	CE	CE
VC0008	.21	1.15	.023	.006	.20	.01	.01	.01	.002	.039	.02	.01						
VC0025	.20	1.15	.015	.006	.24	.01	.02	.01	.002	.047	.01	.01						
VC0026	.20	1.01	.016	.009	.21	.01	.02	.01	.002	.039	.01	.01						
VC0031	.23	1.05	.024	.010	.22	.01	.01	.01	.002	.041	.01	.01						

TEST REPORT APPROVED DATE 1-15-9
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

Angie McCoard
TEST REPORT CLERK

I certify the above test is to be correct as contained in the records of OREGON STEEL MILLS By

OREGON STEEL MILLS

P.O Box 2760 Portland, Oregon 97208 · (503) 286-9651 TWX 910 464 1549

REPORT OF CHEMICAL AND PHYSICAL TESTS

CERTIFICATE NO.	DATE	PAGE
230113F	Oct 07, 1992	1

MILL ORDER NO.	DATE
24191	

CUSTOMER ORDER NO.: 0701-410-156

JOB/REQ. NO.:

SHIPPING NO.	DATE
230113	10/07/1992

CARRIER: SOUTHERN PACIFIC

CAR/TRUCK NO: SSWB7547

SOLD TO:

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

5/16 X 96 X 480

THYSSEN METAL SERVICE/SOUTHWEST
2700 POST OAK BLVD, SUITE 1625
HOUSTON, TX 77056

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS

OSM CARBON PRESSURE VESSEL QUALITY ASTM A516-90 GRADE 70 ASME SA516 GRADE 70.

PHYSICAL PROPERTIES

OSM ITEM NO.	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI x 100	TENSILE PSI x 100	% ELONG	% R/A	HARDNESS BHN	BEND TEST	IMPACTS
1	0.2500 X 96.000 X 480.000									
	1 PC 3267 LBS	34280	C21	550	755	23				
2	0.3125 X 96.000 X 480.000									
	1 PC 4084 LBS	34265	B23	493	705	25				
	1 PC 4084 LBS	34267	B22	535	745	25				
	1 PC 4094 LBS	34267	B23	520	745	24				
	1 PC 4094 LBS	34280	A23	515	720	25				
	1 PC 4084 LBS	34295	A24	555	785	22				
	1 PC 4094 LBS	34295	B20	530	800	22				
	1 PC 4084 LBS	34295	B22	590	805	20				
	1 PC 4064 LBS	34295	B24	520	800	21				
4	0.3750 X 96.000 X 480.000									
	1 PC 4901 LBS	33896	A22	530	700	27				
	1 PC 4901 LBS	33896	A23	492	700	25				

Bm # 2

RECEIVED
DATE 1-18-93
P.O. # 057849
JOB # 2477

Certified a true copy of the original, retained in our file.
AMERICAN ALLOY STEEL, INC.

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Cb	Al	Cr	Mo	Ti	B	N	Ca	Sn	Ce	McQuaig Fine Grain Size
34280	.14	1.14	.010	.006	.23	.22	.10	K.01	K.002	.028	.06	.02							
34265	.12	1.10	.005	.005	.20	.17	.08	K.01	K.002	.026	.03	.02							
34267	.15	1.13	.006	.007	.21	.24	.09	K.01	K.002	.030	.03	.02							
34295	.18	1.11	.009	.010	.19	.25	.11	K.01	K.002	.040	.04	.02							
33896	.14	0.92	.007	.007	.20	.25	.10	K.01	K.002	.025	.06	.03							

TEST REPORT APPROVED DATE 1-18-93
AMERICAN ALLOY STEEL BY
QUALITY ASSURANCE DEPT.

I certify the above results to be correct as contained in the records of OREGON STEEL MILLS. By Angie McCasland TEST REPORT CLERK

CitiSteel USA
INCORPORATED

4001 PHILADELPHIA PIKE
CLAYMONT, DELAWARE 19703 U.S.A.

B846

MATERIAL TEST REPORT

SOLD TO: INTSEL SOUTHWEST
11310 WEST LITTLE YORK
HOUSTON, TX 77041

SHIP TO: INTSEL SOUTHWEST
11310 WEST LITTLE YORK
HOUSTON, TX 77041

MILL ORDER	BILL OF LADING	CUSTOMER P.O. NO.	DATE	SPECIFICATION
52783	35311	5250	24-Aug-92	ASTM A516-86/ASME SA516-89 GRADE 70 PVQ

HEAT	SERIAL	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	V
E275		0.161	1.136	0.006	0.017	0.290	0.298	0.104	0.093	0.008	0.024	0.021	0.007
E283		0.161	1.077	0.006	0.016	0.293	0.291	0.134	0.078	0.012	0.020	0.022	0.007
E297		0.151	1.063	0.007	0.012	0.308	0.319	0.096	0.072	0.003	0.025	0.022	0.007
E274		0.167	1.125	0.008	0.015	0.307	0.291	0.100	0.092	0.007	0.022	0.024	0.008
E298		0.160	1.057	0.005	0.017	0.292	0.301	0.085	0.061	0.003	0.018	0.022	0.007

HEAT	SERIAL	PCS	GAUGE (IN)	WIDTH (IN)	LENGTH (IN)	TENSILE (KSI)	YIELD (KSI)	ELONG % IN	TEST TEMP	FT-LBS 1 2 3	MILS LAT EXP 1 2 3	% SHEAR 1 2
E275	112297	1	0.3750	96.0000	480.0000	77.4	59.6	21 @ 8"				
E283	112299	2	0.3750	96.0000	480.0000	76.0	54.0	24 @ 8"				
E283	112300	2	0.3750	96.0000	480.0000	73.3	54.9	25 @ 8"				
E283	112301	1	0.3750	96.0000	480.0000	73.5	55.0	25 @ 8"				
E283	112781	2	0.3750	96.0000	480.0000	81.0	67.7	20 @ 8"				
E297	112836	2	0.3750	96.0000	480.0000	76.3	58.0	25 @ 8"				
E274	112311	1	0.5000	96.0000	480.0000	74.0	49.6	25 @ 8"				
E275	112868	2	0.5000	96.0000	480.0000	74.2	53.0	25 @ 8"				
E298	112879	2	0.5000	96.0000	480.0000	76.3	53.6	26 @ 8"				
E298	112880	2	0.5000	96.0000	480.0000	75.7	53.8	23 @ 8"				

RECEIVED

DATE

P.O. #

JOB #

COLUMBIUM/VANADIUM = <.02%

Material Melted and Manufactured in USA
Mercury Free Material

I CERTIFY THE ABOVE RESULTS TO BE CORRECT
CONTAINED IN THE RECORDS OF THE CORPORATI

G. J. Buongiorno

MANAGER, QUALITY ASSURANCE AND METALLUR

S-1035 0691

3. CONTR NO.

MILL TEST REPORT

2770

FAIRFIELD WORKS
P.O. BOX 599
FAIRFIELD, ALABAMA 35064

PO DATE	PURCH ORDER NO.
	4174-USS

SHIPPERS NO	MILL ORDER NO	INVOICE NO
P17040.	0885090	488-0410681

VEHICLE ID NO. BN589580 11/11/92

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND, OR, INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

PREPARED BY THE OFFICE OF:
M.R. STEIN MGR. Q.A.

DATE NOVEMBER 16, 1992

DIXIE PIPE SALES INC
PO BOX 300650

HOUSTON TX 77230-0650

MAIL TO
DIXIE PIPE SALES INC
C/O HOUSTON BELT & TERMINAL
ZONE 13 TRACK 93100
HOUSTON TX

PIPE CARBON SMLS STD PIPE API 5L-*39TH EDITION DTD 6/1/91 GRADE B ASTM A53-*90B GRADE B ASTM A106-*1991 GRADE B/C BLK REG MILL COAT PE BEV 30 DEG
:01 MILL ALSO CERTIFY TO ASME

Mill Test Reports furnished by
DIXIE PIPE SALES, INC.
Apply to your Order No. W57593

MATERIAL DESCRIPTION												
SIZE	WALL	SPECIFICATION & GRADE	MATL	HEAT / LOT NO	GIH HYDRO PSI	YIELD STR PSI	TENSILE STR PSI	ELONG % IN 2"	GAGE WIDTH IN	FLAT	
4.5000	0.5310	ROCKWELL B = 80.2	SMLS	X46547	7,100 05SEC	48,700 AS ROLLED TENSILE.	76,800	41.6	1.5	OR	

YIELD STRENGTH @ .005 EXT.
NGITUDINAL STRIP TENSILE SPECIMENS USED UNLESS NOTED OTHERWISE.
SO MEETS THE REQUIREMENTS OF ASME SA53 1989 EDITION, 1991 ADDENDA, HOT FINISHED -- NO HEAT TREATMENT & SA106 1989 EDITION, 1991 ADDENDA

RECEIVED
DATE 2-10-93
P.O. # W57593
JOB # 2477

ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.

HEAT NO	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
X46547	HEAT	25	94	010	007	22	01	01	02	00				00				
	PROD	24	95	011	008	23	01	01	02	00				00				
	END OF DATA																	

3 410031001 FBC05829. 2338310251 1

A ision of USA Corporation
01000 0772 (REV. 8/91)

RECEIVED DEC [illegible] 1992

Test Report

CONTRACT NO.

P.O. DATE	PURCHASE ORDER NO.		
11/13/92	5634		
SHIPPERS NO.		MILL ORDER NO.	INVOICE NO.
H08990 11 30 92		GF18280	154-166169
VEHICLE IDENTITY EJE 005752			H8990

SARY WORKS
SARY, INDIANA 46402

MELTED AND MANUFACTURED IN THE USA

ECHINEY WORLD TRADE USA INC
NTSEL SOUTHWEST DIV
O BOX 41041
OUSTON TX 77241-1041

SHIP TO
PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

THIS IS TO CERTIFY THAT TH
PRODUCT DESCRIBED HEREIN W
MFGD., SAMPLED, TESTED AND
INSPECTED IN ACCORDANCE WI
THE SPECIFICATION AND FUL-
FILLS REQUIREMENTS IN SUCH
RESPECT.

PREPARED BY THE OFFICE OF:
G. D. LUKES GEN. MGR. Q

DATE 12-1-92 RECEIVED

PLATE CARBON ASME SA516-#1989 EDITION-1991 ADDENDA DECEMBER 31,
1991 GRADE 70 PRESSURE VESSEL QUALITY

1 MILL CERTIFIED T/R

DATE _____

P.O. # _____

MATERIAL DESCRIPTION			QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY		YIELD STR. KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED OF AREA
THICKNESS OR SECTION	WIDTH DIA. OR FT. WT	LENGTH										
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9802 3 TO 1	M48345	74 3						
						74 3	#	50.5	73.5	28.0	48.0	
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9802 3 TO 1	M48345	74 4						
						74 4	#	51.0	73.5	27.0	47.0	
3/8 " STEEL-TYPE	96.0000 = CAST	480" REDUCTION RATIO	02 = 24	9802 3 TO 1	M48345	74 5						
						74 5	#	51.5	73.5	26.0	48.0	

##END OF DATA####

YIELD STRENGTH @ 0.5% E.U.L.

	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
	HEAT	18	103	018	008	24	02	02	03	01		026		000			003	

##END OF DATA####

FINE GRAIN

A ion of USX Corporation

J10000772 (REV. 8/91)

Test Report

ONTRACT NO.

P.O. DATE	PURCHASE ORDER NO.
11/13/92	5634

SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.
H01022 12 03 92	GF18280	154-166528

VEHICLE IDENTITY EJE 006213 H1022

:ARY WORKS
:ARY, INDIANA 46402

THIS IS TO CERTIFY THAT THI PRODUCT DESCRIBED HEREIN W MFGD., SAMPLED, TESTED AND INSPECTED IN ACCORDANCE WI THE SPECIFICATION AND FUL- FILLS REQUIREMENTS IN SUCH RESPECT.

PREPARED BY THE OFFICE OF:
G. D. LUKES GEN. MGR. Q

DATE 12-3-92

RECEIVED

DATE _____

P.O. # _____

MELTED AND MANUFACTURED IN THE USA

PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
P O BOX 41041
HOUSTON TX 77241-1041

SHIP TO
PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

PLATE CARBON ASME SA516-#1989 EDITION-1991 ADDENDA DECEMBER 31, '991 GRADE 70, PRESSURE VESSEL QUALITY

1 MILL CERTIFIED T/R

MATERIAL DESCRIPTION: THICKNESS OR SECTION	WIDTH, DIA. OR FT. WT	LENGTH	QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	YIELD PT. 308 # KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED. OF AREA
3/8 "	96.0000	480"	01	4901	M48345	73 2					
STEEL-TYPE	= CAST	REDUCTION RATIO	= 24.3 TO 1								
						73 2 #	52.0	73.5	29.0	48.0	
3/8 "	96.0000	480"	01	4901	M48345	73 3					
STEEL-TYPE	= CAST	REDUCTION RATIO	= 24.3 TO 1								
						73 3 #	52.0	73.5	28.0	50.0	
3/8 "	96.0000	480"	02	9802	M48345	73 4 ✓					
STEEL-TYPE	= CAST	REDUCTION RATIO	= 24.3 TO 1								
						73 4 #	50.5	74.0	27.0	48.0	
3/8 "	96.0000	480"	02	9802	M48345	73 5 ✓					
STEEL-TYPE	= CAST	REDUCTION RATIO	= 24.3 TO 1								
YIELD STRENGTH @ 0.5% E.U.L.											

	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
	HEAT	18	103	018	008	24	02	02	03	01		026		000			003	

FINE GRAIN

END OF DATA

A sion of USX Corporation
010000772 (REV. 8/91)

Test Report

CONTRACT NO.

P.O. DATE	PURCHASE ORDER NO.		
11/13/92	5634		
SHIPPERS NO.		MILL ORDER NO.	INVOICE NO.
HQ1022 12 03 92		GE18280	154-166528
VEHICLE IDENTITY	EJE 006213		H1022

GARY WORKS
GARY, INDIANA 46402

THIS IS TO CERTIFY THAT TH PRODUCT DESCRIBED HEREIN W MFGD., SAMPLED, TESTED AND INSPECTED IN ACCORDANCE WI THE SPECIFICATION AND FUL- FILLS REQUIREMENTS IN SUCH RESPECT.

PREPARED BY THE OFFICE OF:
G D LUKES GEN MGR. Q

DATE 12-3-92
RECEIVED

** MELTED AND MANUFACTURED IN THE USA **

PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
P O BOX 41041
HOUSTON TX 77241-1041

SHIP TO
PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

PLATE CARBON ASME SA516-#1989 EDITION-1991 ADDENDA DECEMBER 31, 1991 GRADE 70 PRESSURE VESSEL QUALITY

01 MILL CERTIFIED T/R

DATE _____

P.O. # _____

MATERIAL DESCRIPTION			QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	JOB #	TENSILE STR.	ELONGATION %		% RED. OF AREA
THICKNESS OR SECTION	WIDTH, DIA. OR FT WT	LENGTH					KSI	KSI	IN 8"	IN 2"	
3/8 "	96.0000	480"			M48345	73 5 R	53.0	73.5	27.0	47.0	
3/8 "	96.0000	480"	02	9802	M48345	74 2					
STEEL-TYPE = CAST		REDUCTION RATIO = 24		3 TO 1							
						74 2 R	52.5	72.5	25.0	46.0	

END OF DATA

AYIELD STRENGTH @ 0.5% E.U.L.

	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
5	HEAT	18	103	018	008	24	02	02	03	01		026		000			003	

END OF DATA

FINE GRAIN

B. CONT NO.	P.O. DATE	PURC ORDER NO.
	06/19/91	70[illegible]-2

SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.
H04381 07 28 91	V875350	154-119924
VEHICLE IDENTITY EJE 006049		H4381

DARY WORKS
DARY, INDIANA 46402
** MELTED AND MANUFACTURED IN THE USA **

PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
P O BOX 41041
HOUSTON TX 77241-1041

SHIP TO
PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECT.

BB

PREPARED BY THE OFFICE OF:
J. J. HARRINGTON Q. A. M

DATE 7-30-91

PLATE CARBON ASTM A516-#1986 GRADE 70 ASME SA516-#1989
EDITION-1990 ADDENDA DECEMBER 31, 1990 GRADE 70 PRESSURE VESSEL
QUALITY NORMALIZE CHARPY V-NOTCH LONGITUDINAL IMPACT TESTS EACH
PLATE AB HEAT TREATED 15/12 FT/LBS AT -50 DEG F
:01 MILL CERTIFIED T/R ANALYSIS

MATERIAL DESCRIPTION: THICKNESS OF SECTION	WIDTH DIA OF FLWG	LENGTH	QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	YIELD PT. KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED OF AREA
3/4 "	120.0000	480"	01	12252	D21855						
STEEL-TYPE = INGOT											
						03X 2 #	54.0	77.0	25.0	45.0	
LONG. FL SZ CHARPY IMPT V-NTCH -050 DEG F FT LBS/ 051-066-056											
AVERAGE IMPACT STRENGTH +58 FT LBS											
						IMPACT PCE ID = 03X 2					
PRODUCT & TEST SPECIMENS WERE NORMALIZED AT 1660 DEG. F. FOR 0024 MINUTES. COOLING COMPLETED IN STILL AIR.											
3/4 "	120.0000	480"	01	12252	D21855						
STEEL-TYPE = INGOT											
						03Y 2 #	51.5	73.0	27.0	47.0	
KYIELD STRENGTH @ 0.5% E.U.L.											

RECEIVED
DATE 2-9-93
P.O. # 615772
JOB # 2472

NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
:55	HEAT	23	109	021	018	23	02	01	04	00		034		000			000	

FINE GRAIN

END OF DATA

DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LEFT MARGIN. VERTICAL LINES ARE DECIMAL POINTS.

A DIVISION OF USX CORPORATION

10000772 (REV. 8/91)

ONTRACT

P.O. DATE	PURCHASER NO.
11/13/92	5634

SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.
H01022 12 03 92	GF18280	154-166528

VEHICLE ID NO. EJE 006213 H1022

SARY WORKS
SARY, INDIANA 46402

MELTED AND MANUFACTURED IN THE USA

'ECHINEY WORLD TRADE USA INC
NTSEL SOUTHWEST DIV
O BOX 41041
OUSTON TX 77241-1041

SHIP TO
PECHINEY WORLD TRADE USA INC
INTSEL SOUTHWEST DIV
SPINS 4038
MELENDY TX 77429

THIS IS TO CEI FY THAT THI
PRODUCT DESCRIBED HEREIN W/
MFGD., SAMPLED, TESTED AND
INSPECTED IN ACCORDANCE WI
THE SPECIFICATION AND FUL-
FILLS REQUIREMENTS IN SUCH
RESPECT.

PREPARED BY THE OFFICE OF:
G. D. LUKES GEN. MGR. Q

RECEIVED 12-3-92

DATE

P.O. #

JOB #

PLATE CARBON ASME SA516-M1989 EDITION-1991 ADDENDA DECEMBER 31,
1991 GRADE 70 PRESSURE VESSEL QUALITY

1 MILL CERTIFIED T/R

MATERIAL DESCRIPTION: THICKNESS OR SECTION	WIDTH DIA. OR FT. WT.	LENGTH	QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY		YIELD PT. KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED. OF AREA
3/8 "	96.0000	480"	01	4901	M48345	73 2						
STEEL-TYPE	= CAST	REDUCTION RATIO	= 24.	3 TO 1		73 2	M	52.0	73.5	29.0	48.0	
3/8 "	96.0000	480"	01	4901	M48345	73 3						
STEEL-TYPE	= CAST	REDUCTION RATIO	= 24.	3 TO 1		73 3	M	52.0	73.5	28.0	50.0	
3/8 "	96.0000	480"	02	9802	M48345	73 4						
STEEL-TYPE	= CAST	REDUCTION RATIO	= 24.	3 TO 1		73 4	M	50.5	74.0	27.0	48.0	
3/8 "	96.0000	480"	02	9802	M48345	73 5						
STEEL-TYPE	= CAST	REDUCTION RATIO	= 24.	3 TO 1								

YIELD STRENGTH @ 0.5% E.U.L.

TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	W	CB	CO
HEAT	18	103	018	008	24	02	02	03	01		026		000			003	

M END OF DATA M

FINE GRAIN

TRI-STATE SUPPLY, C..

5930 CENTRALCREST
P.O. BOX 40512
HOUSTON, TEXAS 77240-0512
(713) 686-5678
TOLL FREE (800) 221-7922
FAX (713) 686-5778

Date 1-28-93

Customer: WYATT FIELD SERVICES

Your Order #: W-57489

MATERIAL CERTIFICATION

Tri-State Supply Co. hereby certifies that to the best of our knowledge and belief the material purchased on the order number listed above conforms to the specifications listed below and has been produced in accordance with the standard mill practice.

4 - 6" 150# RF SO Bm 76	SA105
2 - 4" 150# RF SO Bm 81	SA105
6 - 3" 150# RF SO Bm 86	SA105
6 - 3" 150# RF BLIND Bm 104	SA105
2 - 8" 150# FF SO	SA105
2 - 1 1/2" 3000# THRD CPLG	SA105
2 - 4" S/160 SR 90 Bm 85	SA234WPB
6 - 1 1/2" 150# RF LWN X9" Bm 115	SA105
6 - 1" 150# RF LWN X9" Bm 107	SA105
6 - 3/4" 150# RF LWN X9" Bm 111	SA105
4 - 1" 150# RF BLIND Bm 108	SA105
6 - 3/4" 150# RF BLIND Bm 112	SA105

Authorized Signature

RECEIVED

DATE 1-27-93

P.O. # W57489

JOB # 2472

Seamle Tubular Products CERTIFIED T ST REPORT

HEAT NO.: 9 SLN F30203

PRODUCT DESCRIPTION :
8.625 OD 0.500 WALL 43.39 LBS/FT PE DRL

GRADE :API 5L X42/B

CUSTOMER :
TUBULAR STEEL INC.

CUSTOMER ORDER NO.:
2965 - 107

CUSTOMER SPEC.:

NSSO MILL ORDER NO.:
0-009855-0

NSSH W/O NO.:

NSSH LOT NO.:

ECHANICAL PROPERTIES:

SPECIMEN CROSS SECTION			ACTUAL LOAD (KIPS)		STRENGTH (KSI)		ELONGATION	
WIDTH (IN)	THICK (IN)	AREA (SQIN)	YIELD	TENSILE	YIELD	TENSILE	GAGE LENGTH	% ELONG
1.504	0.490	0.7370	34.9	47.3	52.7	71.5	2	32.5

COMMENTS

This material is also manufactured to
ASTM A53B Rev. 91a
ASTM A106B Rev. 91a
ASME SA53-B
ASME SA106-B
No repair welding has been conducted
Material has no contamination by Mercury

IEMICAL ANALYSIS:

NS61

	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Al	B	Ti
HEAT	0.20	0.75	0.007	0.008	0.27	0.16	0.08	0.06	0.02	0.001	0.039	0.0000	0.000
PRODUCT #1	0.21	0.73	0.006	0.007	0.25	0.16	0.08	0.06	0.02	0.001	0.037	0.0000	0.000
PRODUCT #2	0.22	0.72	0.007	0.008	0.23	0.16	0.07	0.06	0.02	0.005	0.034	0.0000	0.000

RECEIVED
DATE 1-28-93

DROSTATIC TEST (psi):

3000

P.O. # W57450

JOB # 2477

SUPPLEMENTAL REQUIREMENTS	YES	NO	REMARKS
RDNESS			
HARPY IMPCT TST			
LLAPSE TEST			
CROHARDNESS			
ATTENING TEST	X		PASSED
CE TEST			NOT APPLICABLE
IMINY HARDEN			
AIN SIZE			
HER			TSI QUALITY CHECK

BY MA DATE 8-25-92

This material has been produced and tested in accordance with the requirements of applicable specifications unless otherwise listed below. We hereby certify that the above test results are representative of those contained in the records of the company. Any modification to this certification as provided by North Star Steel without the expressed written consent of North Star Steel negates the validity of this test report. North Star Steel is not responsible for the inability of this material to meet specific applications.

SIGNED Dan K Clark

DATE 3/4/97

APPROVAL

SWORN AND SUBSCRIBED TO BEFORE

THIS _____ DAY _____

_____
Notary Public

MY COMMISSION EXPIRES _____

THIS CERTIFICATE IS NOTORIZED ONLY WHEN REQUESTED

TRI-STATE SUPPLY, C.
5930 CENTRAL CREST
P.O. BOX 40512
HOUSTON, TEXAS 77240-0512
(713) 686-5678
TOLL FREE (800) 221-7922
FAX (713) 686-5778

Date 2-10-93

Customer:
WYATT FIELD SERVICES

Your Order #:
W-57597

MATERIAL CERTIFICATION

Tri-State Supply Co. hereby certifies that to the best of our knowledge and belief the material purchased on the order number listed above conforms to the specifications listed below and has been produced in accordance with the standard mill practice.

2 - 6" 150# RF SO Bm 76	SA105
4 - 3" 150# RF SO Bm 86	SA105
2 - 6" 150# RF BLIND Bm 150	SA105
6 - 3/4" 150# RF BLIND Bm 112	SA105
6 - 3/4" 150# RF LWN X 9" Bm 111	SA105
20 - 3" 150# RF WN STD Bm 92	SA105
2 - 4" S/160 LR 90 Bm 85	SA234WPB
2 - 3" STD LR 90 Bm 103	SA234WPB

Authorized Signature

RECEIVED
DATE 2-11-93
P.O. # W57597
JOB # 2472

Engineering Report

Tank D-4383

DESIGN ASSESSMENT OF ANCILLARY EQUIPMENT AND SECONDARY CONTAINMENT FOR TANK D-4383

EQUISTAR CHEMICALS, L.P.
CHANNELVIEW PLANT

8280 SHELDON ROAD
CHANNELVIEW, TEXAS 77530

Hazardous Waste Permit No. **HW-50117**
EPA ID Number **TXD058275769**
TCEQ Solid Waste Registration Number **30030**

May 1, 2009

Prepared by: H.A. Clark, Inc.
2500 Wilcrest Drive, Suite 300
Houston, Texas 77042
(713) 365-9540

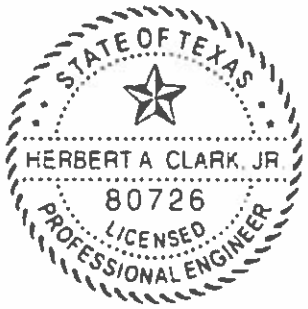
CERTIFICATION

Professional Engineer's Certification

I have reviewed that attached design drawings and performed a design assessment of the ancillary equipment and secondary containment for Tank D-4383 required by 40 CFR 264.192(a). I attest that the ancillary equipment and secondary containment have sufficient structural integrity and are acceptable for the storage and treatment of hazardous waste. I have inspected the facilities and based on those components observable with a visual inspection, the facilities appear to have been built according to the referenced drawings. This certification applies to the following attached drawing numbers:

E-43-M-010 E-43-M-031 E-43-M-034 B-44-S-005 E-43-C-086

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Herbert A. Clark, Jr., P.E.
Texas License Number 80726

5/1/09
Date

TABLE OF CONTENTS

Section **Page**

CERTIFICATION I

1.0 INTRODUCTION AND BACKGROUND 1

2.0 ANCILLARY EQUIPMENT DESIGN ASSESSMENT 2

2.1 Design Standard 2

2.2 Hazardous Characteristics of the Waste 3

2.3 Corrosion Protection 3

2.4 Secondary Containment 3

2.5 New Tank System Component Installation 4

3.0 CONCLUSIONS 6

LIST OF ATTACHMENTS

Attachment A — Piping and Instrumentation Diagrams and Ancillary Equipment Design Information

Attachment B — Secondary Containment Design Information

1.0 INTRODUCTION AND BACKGROUND

The purpose of this report is to document the design of the secondary containment for Tank D-4383 at the Equistar Chemicals, L.P. (Equistar) facility in Channelview, Texas. This tank is listed as Unit Number 047 on Texas Commission on Environmental Quality (TCEQ) Notice of Registration (NOR) Number 30030. The tank is operated as a permitted hazardous waste storage tank. The tank and piping manage waste caustic from the OP-II Flex unit. The tank was constructed in 1984 to American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section VIII, Division I. The tank receives low-concentration liquid caustic waste from the Flex Unit Spent Caustic Flash Drum (D-4335). In 1999, a concrete secondary containment area was constructed for the tank as required by 40 CFR 264.193. A hazardous waste assessment of the tank was performed in December 1993 by The Hendrix Group, Inc. and was included as part of the renewal application for TCEQ Permit No. HW-50117. However, at that time, the secondary containment structure had not been constructed and the associated tank piping was not included as part of the assessment.

When the tank was modified to add secondary containment, containment was not added to the attached piping. Rather, the ancillary equipment associated with Tank D-4383 is inspected daily for leaks. Therefore, the piping itself is exempt from the secondary containment requirement. However, the valves will be replaced with sealless valves and the pumps with magnetically driven. sealless pumps in order to comply with 40 CFR 264.193(f).

2.0 ANCILLARY EQUIPMENT DESIGN ASSESSMENT

2.1 Design Standard

The piping attached to Tank D-4383 is Class 150 and Class 300 carbon steel meeting the requirements of ASME B31.3, Process Piping and ASME B16.5, Pipe Flanges and Flanged Fittings.

Existing valves between Tank D-4383 and the truck loading area will be replaced with either Bellows-seal valves or live-loaded valves as part of this permit modification. Valves less than 2½ inches in diameter will be replaced with Bellows-seal gate valves. Valves with a diameter of 2½ inches and above will be replaced with valves equipped with live-loaded packing sets.

Bellows valves will be constructed of Inconel 625. Inconel is a nickel-chromium-molybdenum alloy in accordance with ASTM B446. Inconel is appropriate for this service due to its corrosion and oxidation resistance.

Pumps P-4382 will be replaced with magnetically driven sealless pumps are designed according to American National Standards Institute (ANSI) B73.3, Specification for Sealless Horizontal End Suction Metallic Centrifugal Pumps for Chemical Process. Filter SP-4395 will be replaced with two new filters, SP-4395A and SP-4395B. The new filters are designed according to ASME Boiler and Pressure Vessel Code Section VIII, Division I.

Piping and instrumentation diagrams (P&IDs) for the tank piping are included as Attachment A.

2.2 Hazardous Characteristics of the Waste

The waste managed in the Tank D-4383 piping is a low-concentration aqueous caustic stream. Some naphtha hydrocarbons are included in the stream as a rag layer. The hazardous characteristics of the waste are ignitability, reactivity, corrosivity and toxicity (for benzene).

2.3 Corrosion Protection

The piping, valves, pumps and filter housing will not be in contact with soil and are not anticipated to be in continous contact with water. Experience with the materials of construction at this facility indicates that internal corrosion from the caustic waste is not an issue. The exterior of the piping will be protected from corrosion by an epoxy coating or paint.

2.4 Secondary Containment

The reinforced concrete secondary containment area is constructed to American Concrete Institute (ACI) 318, Building Code Requirements for Structural Concrete. Polyvinyl chloride (PVC) waterstops were used at all concrete joints. The containment area is coated with a polyamine epoxy coating. The coating is resistant to organic and inorganic acids, caustics and most solvents. Therefore, the coating is compatible with and impermeable to the material stored in Tank D-4383. A Material Safety Data Sheet (MSDS) for the coating is in Attachment B.

The nominal capacity of Tank D-4383 is 12,000 gallons. Based upon a 25-year, 24-hour rainfall of 9.8 inches (from Technical Paper No. 40, "Rainfall Frequency Atlas of the United States for Durations from 30 minutes to 24 hours and Return Periods from 1 to 100 years". United States Weather Service, 1961), approximately 3,900 gallons of containment capacity is required to account for precipitation. Therefore, a total containment capacity of 15,900 gallons is required to comply with 40 CFR 264.193(e)(1). The capacity of the secondary containment area is approximately

17,421 gallons, which is sufficient to contain the contents of the tank plus a 25-year, 24-hour rainfall event.

The floor of the secondary containment structure slopes toward a concrete sump to facilitate removal by vacuum truck. The sump is equipped with a gate valve to facilitate removal of stormwater. The gate valve remains closed and is car-sealed to prevent the valve from being inadvertently opened. Any releases of hazardous waste will be evident by visual inspection. The containment area is inspected daily in order to determine if there are waste materials, stormwater or other liquid in the containment area and verify that the gate valve remains closed unless an authorized discharge is taking place. Any liquids accumulated within the secondary containment system will be removed within 24 hours.

2.5 New Tank System Component Installation

New tank system components associated with Tank D-4383 will be properly handled according to facility procedures to prevent damage during installation. Prior to placing the Tank D-4383 new tank system components in use, a qualified Professional Engineer, trained and experienced in the proper installation of tanks system components, will inspect the system for the presence of any of the following items:

- Weld breaks;
- Punctures;
- Scrapes of protective coatings;
- Cracks;
- Corrosion;
- Other structural damage or inadequate construction/installation.

All discrepancies will be remedied before the Tank D-4383 new tank system components are placed in use.

No new tank system components associated with Tank D-4383 will be placed underground. Therefore, the requirement that they be provided with a backfill material that is a noncorrosive, porous, homogeneous substance and that is installed so that the backfill is placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported is not applicable.

The Tank D-4383 new tank system components will be tested for tightness prior to being placed in use. If a new tank system component is found not to be tight, all repairs necessary to remedy the leak(s) will be performed prior to the new tank system component being placed into use.

The Tank D-4383 new tank system components will be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction. The new tank system components will be installed using ANSI Standard B31.3, "Petroleum Refinery Piping," as a guideline for proper installation.

3.0 CONCLUSIONS

Based upon the assessment of the design of the ancillary equipment and secondary containment structure for Tank D-4383 and the proposed modifications, the ancillary equipment and secondary containment structure appear to be adequately designed, have sufficient structural strength and are compatible with the hazardous waste to be managed in the equipment so that leakage, collapse or rupture should not occur under normal operating conditions.

The proposed sealless valves and magnetically driven, sealless pumps are adequate to meet the requirements of 40 CFR 40 CFR 264.193(f)(3) and the secondary containment structure meets the applicable requirements of 40 CFR 264.193.

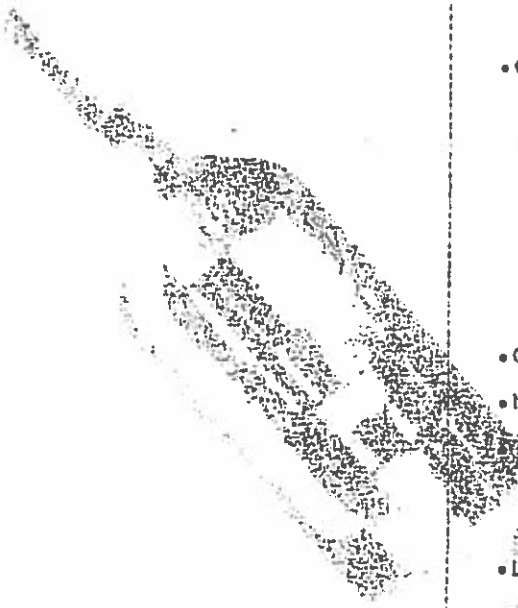
ATTACHMENT A

PIPING AND INSTRUMENTATION DIAGRAMS

AND

ANCILLARY EQUIPMENT DESIGN INFORMATION

BELLOWS SEAL DESIGN FEATURES



- Wall Thickness and General Design :
  API 602 for forged gate valves
  ASME B16.34/BS 5352 for forged globe valves
  API 600 for cast valves
- Bellows Inspection and Test : MSS SP-117
- Cycle Life upto and including class 800 Forged Valves
  : as per BS 5352
  Min. 10,000 Cycles for Globe Valves
  Min. 2,000 Cycles for Gate Valves
- Cycle Life for class 1500 Forged Valves
  & all classes Cast Valves
  : as per MSS SP-117

Size(inch)	upto and including class 600		above class 900	
	Gate Valve	Globe Valve	Gate Valve	Globe Valve
≤ 2	2,000	5,000	2,000	2,000
2-1/2 ~ 4	2,000	5,000	1,000	2,000
> 4	1,000	2,000	1,000	1,000

- Cycle Life Test is performed under the max. pressure condition.
- Non-Rotating stem prevents torsion of bellows.
- Two Secondary Stem Seals :
  Stem packseat and stem packing ensure the perfect sealing when a bellows is damaged.
- Long Life Seating Surface :
  Stellite 6 faced both seat and wedge/disc to prevent seizing and galling.
- End Flange Dimension : ASME B16.5
- Butt Weld End Dimension : ASME B16.25
- Face to Face & End to End : ASME B16.10
- Helium Leak Test is performed for each bellows assembly using an Helium detector with sensitivity of 10 cc/sec.
- Bellows Materials : 321SS, Inconel 625, Hastelloy, Monel etc
- Two or Three Section Assembly
- Multi-Ply Bellows : minimum two plies bellows
- Soft Seat Insert on Globe Disc :
  Soft seat also available for Gas or Vacuum Service
- Hammer Blow Handwheel for Globe Valve
  is used to give the higher closing force 3 ~ 10 times the closing force of standard handwheel and it is the most mechanism

SWI FIGURE NUMBER SYSTEM

GATE GLOBE CHECK VALVES

CODE TABLE **B C E F G H I J**

SAMPLE VALVE CODE: **AA - H - 124 - AN - A1 - A2 - N - 2 - A**

GATE 1500 316L 316 STELLITE TRIM SOCKET WELD BOLTED BONNET FULL PORT GRAPHOIL PACKING AND GASKET

B VALVE TYPE

AA	GATE
AB	GLOBE
AC	LIFT CHECK
AD	SWING CHECK
AE	BALL CHECK
AF	NEEDLE GLOBE
AG	ANGLE GLOBE
AH	STOP CHECK GLOBE
AJ	LIFT CHECK (SPRING LOADED)
AK	BALL CHECK (SPRING LOADED)
AL	BOILER BLOWDOWN
BA	BELLOWS GATE (321 BELLOWS)
BB	BELLOWS GLOBE (321 BELLOWS)
BC	BELLOWS GATE (316 BELLOWS)
BD	BELLOWS GLOBE (316 BELLOWS)
BE	BELLOWS GATE (HAST-C BELLOWS)
BF	BELLOWS GLOBE (HAST-C BELLOWS)
BG	BELLOWS GATE (INCONEL 625 BELLOWS)
BH	BELLOWS GLOBE (INCONEL 625 BELLOWS)
CG	TILTING DISC CHECK
CH	ANGLE GLOBE STOP CHECK
DB	Y-GLOBE
DC	Y-LIFT CHECK
DD	Y-NEEDLE
DE	Y-BALL CHECK
DF	Y-GLOBE STOP CHECK
ZZ	SPECIAL

C CLASS

A	125
B	150
C	200
D	300
E	600
F	800
G	900
H	1500
J	2500
K	4500
L	1690
M	2690
Z	SPECIAL

E SHELL MATERIAL

1	A105, WCB
2	LF2, LC2
3	LF3, LC3
5	F5, C5
6	F6, C12
11	F11, WC6
22	F22, WC9
8	F304, CF8
8L	F304L, CF3
8H	F304H,
16	F316, CF8M
16L	F316L, CF3M
16H	F316H,
21	F321
21H	F321H
47	F347, CF8C
91	F91
92	F92

51	F51, C12A
55	MONEL
825	INCOLOY 825
800H	INCOLOY 800H
800HT	INCOLOY 800HT
B	HASTELLOY-B
C	HASTELLOY-C
20	ALLOY-20
TI	TITANIUM
317	F317, CG8M
317L	F317L, CG3M
LCC	LCC
Z	SPECIAL

F TRIM MATERIAL

	STEM	WEDGE/DISC	SEAT
AA	CR13	CR13	CR13
AB	CR13	CR13	STELLITE 6
AC	CR13	CR13+ST 6	STELLITE 6
AD	304	304CF8	STELLITE 6
AE	304	304CF8+ST 6	STELLITE 6
AF	316	316CF8M	316CF8M
AG	316	316CF8M	STELLITE 6
AH	316	316CF8M+ST 6	STELLITE 6
AJ	321	321+ST 6	STELLITE 6
AK	347	347+STELLITE 6	STELLITE 6
AW	DUPLEX	DUPLEX+ST 6	STELLITE 6
BB	F91	F91+ST 6	STELLITE 6
BC	MONEL	MONEL	MONEL
BD	MONEL	MONEL	STELLITE 6
BE	INCOLOY	INCOLOY	INCOLOY
BF	HASTELLOY-B	HASTELLOY-B	HASTELLOY-B
BH	HASTELLOY-C	HASTELLOY-C	HASTELLOY-C
BG	ALLOY 20	ALLOY 20	ALLOY 20
BJ	TITANIUM	TITANIUM	TITANIUM
BS	CR13 (1)	CR13	STELLITE 6
BK	CR13 (1)	CR13+ST 6	STELLITE 6
BM	316 (1)	316CF8M+ST 6	STELLITE 6
BT	MONEL (1)	MONEL	MONEL
BZ	MONEL (1)	MONEL	STELLITE 6
ZC	SAME AS BODY	SAME AS BODY	SAME AS BODY (INTEGRAL)
ZZ	SPECIAL		

(1) Trims for NACE service. With grade M bolting, RC22 Hardness

G END CONNECTION

A	SOCKET WELD (ASME)
B	BW (SPECIFY BORE)
C	NIPPLE
D	EXTENDED BODY BSW x FNPT
E	EXTENDED BODY BSW x FSW
F	BW x NIPPLE (STUB END)
G	NPT x NIPPLE (STUB END)
H	EXTENDED BODY MNPT x FNPT
J	EXTENDED BODY MNPT x FSW
N	FNPT
P	PT
R	FLAT FACE
S	RAISED FACE
T	SOCKET WELD x FNPT
V	RING TYPE JOINT
W	SW (BS)
X	SW (BS) x PT
Z	SPECIAL

H BONNET STYLE

A	OS&Y BOLTED BONNET
B	OS&Y WELDED BONNET
C	OS&Y SEAL WELDED BONNET
D	OS&Y PRESSURE SEAL BONNET
N	NO BONNET JOINT
P	EXTENDED BOLTED BONNET
Q	EXTENDED WELDED BONNET
R	CRYOGENIC BOLTED BONNET
T	CRYOGENIC WELDED BONNET
Z	SPECIAL

I BORE TYPE

R	REDUCED BORE
F	FULL BORE
Z	SPECIAL

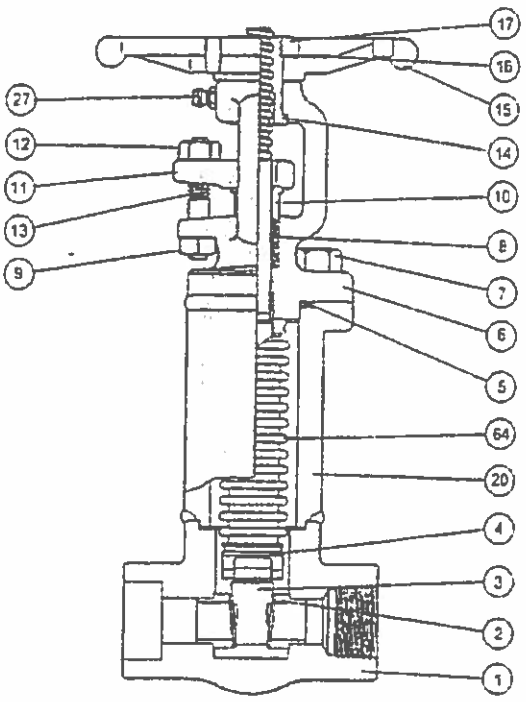
J GASKET / PACKING

GASKET	PACKING
304 SPIRAL WOUND+GRAPHITE	GRAPHOIL
304L SPIRAL WOUND+GRAPHITE	GRAPHOIL
316 SPIRAL WOUND+GRAPHITE	GRAPHOIL
316L SPIRAL WOUND+GRAPHITE	GRAPHOIL
MONEL SPIRAL WOUND+GRAPHITE	GRAPHOIL
A20 SPIRAL WOUND+GRAPHITE	GRAPHOIL
304 SPIRAL WOUND+TEFLON	TEFLON
304L SPIRAL WOUND+TEFLON	TEFLON
316 SPIRAL WOUND+TEFLON	TEFLON
316L SPIRAL WOUND+TEFLON	TEFLON
MONEL SPIRAL WOUND+TEFLON	TEFLON
A20 SPIRAL WOUND+TEFLON	TEFLON
304 SPIRAL WOUND+TEFLON	BRAIDED TEFLON
304L SPIRAL WOUND+TEFLON	BRAIDED TEFLON
316 SPIRAL WOUND+TEFLON	BRAIDED TEFLON
316L SPIRAL WOUND+TEFLON	BRAIDED TEFLON
MONEL SPIRAL WOUND+TEFLON	BRAIDED TEFLON
A20 SPIRAL WOUND+TEFLON	BRAIDED TEFLON
SPECIAL	SPECIAL

UNLESS SPECIFIED CODE "A" IS SUPPLIED AS STANDARD

SWI FORGED STEEL BELLOWS SEAL GATE VALVE

API 602 / ASME B16.34 – BOLTED / WELDED BONNET – REDUCED / FULL PORT



No.	Parts	Material	A.S.T.M
1	Body	Forged Steel	A105N
2	Seat Ring	Stellite 6 faced A276–316	
3	Wedge	Stellite 6 faced A351–CF8M	
4	Stem	Stainless Steel	A276–316
5	Gasket	304 Spiral Wound Graphite	
6	Bonnet	Forged Steel	A105N
7	Bonnet Bolt	Alloy Steel	A193–B7M
8	Gland Packing	Graphoil	
10	Gland	Stainless Steel	A276–316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194–2H
13	Gland Bolt	Stainless Steel	A193–B6
14	Yoke Sleeve	13Cr Stainless Steel	A582–416
16	Handwheel	Malleable Iron	A47
16	Name Plate	Aluminum	
17	Handwheel Nut	Carbon Steel	A563A
20	Connector	Forged Steel	A105N
27	Grease Nipple	Cr Plated Carbon Steel	
64	Bellows	321 Stainless Steel or Inconel 625	

CLASS 600 / 800

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	End to End	Center to Top (Open)	Dia. of Port Openings	Approx. Wt Kg(Lb)
Reduced	1/2	86 (3.39)	76 (2.99)	210 (8.27)	9.8 (0.39)	2.4 (5.3)
	3/4	86 (3.39)	86 (3.39)	227 (8.94)	13.0 (0.51)	3.1 (6.8)
	1	99 (3.90)	102 (4.02)	306 (12.05)	18.0 (0.71)	4.0 (8.8)
	11/4	124 (4.88)	117 (4.61)	400 (15.75)	31.0 (1.22)	8.1 (17.9)
	11/2	124 (4.88)	117 (4.61)	400 (15.75)	31.0 (1.22)	8.1 (17.9)
	2	138 (5.43)	133 (5.24)	500 (19.69)	37.0 (1.46)	12.9 (28.5)
Full	1/2	86 (3.39)	86 (3.39)	227 (8.94)	13.0 (0.51)	3.1 (6.8)
	3/4	99 (3.90)	102 (4.02)	306 (12.05)	18.0 (0.71)	4.0 (8.8)
	1	124 (4.88)	117 (4.61)	400 (15.75)	23.0 (0.91)	8.1 (17.9)
	11/4	138 (5.43)	133 (5.24)	500 (19.69)	37.0 (1.46)	12.9 (28.5)
	11/2	138 (5.43)	133 (5.24)	500 (19.69)	37.0 (1.46)	12.9 (28.5)
	2	157 (6.18)	218 (8.58)	610 (24.02)	50.8 (2.00)	18.5 (40.8)

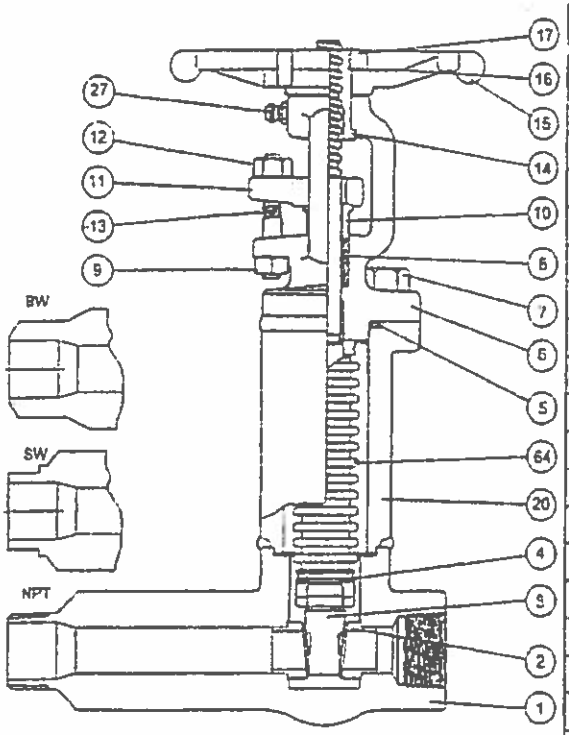
CLASS 1500

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	End to End	Center to Top (Open)	Dia. of Port Openings	Approx. Wt Kg(Lb)
Reduced	1/2	157 (6.18)	86 (3.39)	316 (12.44)	9.8 (0.39)	4.0 (8.8)
	3/4	157 (6.18)	102 (4.02)	348 (13.70)	13.0 (0.51)	5.5 (12.1)
	1	157 (6.18)	117 (4.61)	410 (16.14)	18.0 (0.71)	9.0 (19.9)
	11/4	200 (7.87)	133 (5.24)	550 (21.65)	31.0 (1.22)	16.0 (35.3)
	11/2	200 (7.87)	133 (5.24)	550 (21.65)	31.0 (1.22)	16.0 (35.3)
	2	230 (9.06)	210 (8.27)	620 (24.41)	37.0 (1.46)	20.0 (44.1)

SWI FORGED STEEL BELLOWS SEAL GATE VALVE

API 602 / ASME B16.34 – BOLTED / WELDED BONNET – REDUCED PORT



No.	Parts	Material	A.S.T.M
1	Body	Forged Steel	A105N
2	Seat Ring	Stellite 6 faced A276-316	
3	Wedge	Stellite 6 faced A351-CF8M	
4	Stem	Stainless Steel	A276-316
5	Gasket	304 Spiral Wound Graphite	
6	Bonnet	Forged Steel	A105N
7	Bonnet Bolt	Alloy Steel	A193-B7M
8	Gland Packing	Grophoil	
10	Gland	Stainless Steel	A276-316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Gland Bolt	Stainless Steel	A193-B6
14	Yoke Sleeve	13Cr Stainless Steel	A582-416
15	Handwheel	Malleable Iron	A47
16	Name Plate	Aluminum	
17	Handwheel Nut	Carbon Steel	A563A
20	Connector	Forged Steel	A105N
27	Grease Nipple	Cr Plated Carbon Steel	
64	Bellows	321 Stainless Steel or Inconel 625	

CLASS 800

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	End to End	Center to Male End	Center to Top (Open)	Dia. of Port Openings	Approx. Wt Kg(Lb)
Reduced	1/2	86 (3.39)	142 (5.59)	104 (4.10)	210 (8.27)	9.8 (0.39)	2.5 (5.5)
	3/4	86 (3.39)	157 (6.18)	114 (4.49)	227 (8.94)	13.0 (0.51)	4.8 (10.6)
	1	99 (3.90)	165 (6.50)	114 (4.49)	306 (12.05)	18.0 (0.71)	8.8 (19.4)
	11/2	124 (4.88)	193 (7.60)	135 (5.32)	400 (15.75)	31.0 (1.22)	11.8 (26.0)
	2	138 (5.43)	212 (8.35)	146 (5.75)	500 (19.69)	37.0 (1.46)	15.0 (33.1)

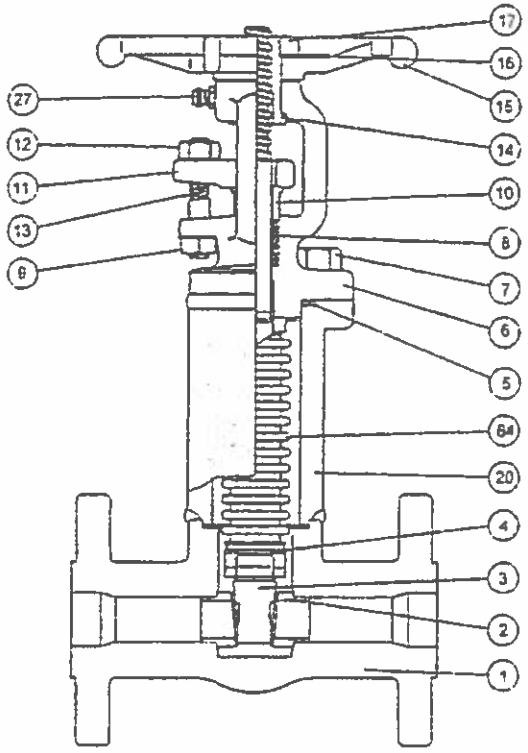
CLASS 1500

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	End to End	Center to Male End	Center to Top (Open)	Dia. of Port Openings	Approx. Wt Kg(Lb)
Reduced	1/2	157 (6.18)	157 (6.18)	114 (4.49)	316 (12.44)	9.8 (0.39)	4.8 (10.6)
	3/4	157 (6.18)	165 (6.50)	114 (4.49)	348 (13.70)	13.0 (0.51)	8.2 (18.1)
	1	157 (6.18)	193 (7.60)	135 (5.32)	410 (16.14)	18.0 (0.71)	11.2 (24.7)
	11/2	200 (7.87)	212 (8.35)	146 (5.75)	550 (21.65)	31.0 (1.22)	15.0 (33.1)

SWI FORGED STEEL BELLOWS SEAL GATE VALVE

API 602 / ASME B16.34 – BOLTED / WELDED BONNET – REDUCED PORT



No.	Parts	Material	A.S.T.M
1	Body	Forged Steel	A105N
2	Seat Ring	Stellite 6 faced A276-316	
3	Wedge	Stellite 6 faced A351-CF8M	
4	Stem	Stainless Steel	A276-316
5	Gasket	304 Spiral Wound Graphite	
6	Bonnet	Forged Steel	A105N
7	Bonnet Bolt	Alloy Steel	A193-B7M
8	Gland Packing	Graphoil	
10	Gland	Stainless Steel	A276-316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Gland Bolt	Stainless Steel	A193-B6
14	Yoke Sleeve	13Cr Stainless Steel	A582-416
15	Handwheel	Malleable Iron	A47
16	Name Plate	Aluminum	
17	Handwheel Nut	Carbon Steel	A563A
20	Connector	Forged Steel	A105N
27	Grease Nipple	Cr Plated Carbon Steel	
64	Bellows	321 Stainless Steel or Inconel 625	

CLASS 150 – 300 – 600

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	Center to Top (Open)	Dia. of Port Openings	Face to Face			Approx. Wt , Kg(Lb)		
					Class 150	Class 300	Class 600	Class 150	Class 300	Class 600
Reduced	1/2	86 (3.39)	210 (8.27)	9.8 (0.39)	108 (4.25)	140 (5.50)	165 (6.50)	3.4 (7.5)	3.9 (8.6)	4.2 (9.3)
	3/4	86 (3.39)	227 (8.94)	13.0 (0.51)	117 (4.62)	152 (6.00)	190 (7.50)	4.2 (9.3)	5.1 (11.3)	5.7 (12.6)
	1	99 (3.90)	305 (12.05)	18.0 (0.71)	127 (5.00)	165 (6.50)	216 (8.50)	5.9 (13.0)	7.2 (15.9)	7.8 (17.2)
	11/2	124 (4.88)	400 (15.75)	31.0 (1.22)	165 (6.50)	190 (7.50)	241 (9.50)	11.6 (25.6)	13.9 (30.7)	15.1 (33.3)
	2	138 (5.43)	500 (19.69)	37.0 (1.46)	178 (7.00)	216 (8.50)	292 (11.50)	16.9 (37.3)	18.7 (41.2)	20.5 (45.2)

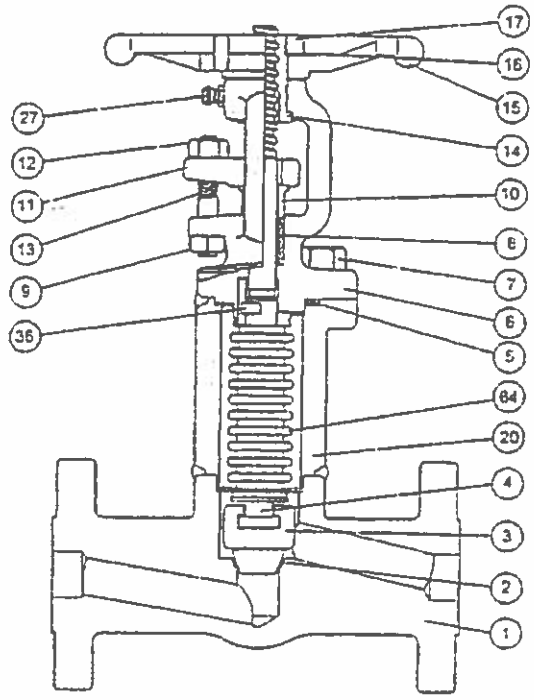
CLASS 1500

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	Center to Top (Open)	Dia. of Port Openings	Face to Face	Approx. Wt , Kg(Lb)
Reduced	1/2	157 (6.18)	316 (12.44)	9.8 (0.39)	216 (8.50)	8.5 (18.7)
	3/4	157 (6.18)	348 (13.70)	13.0 (0.51)	229 (9.00)	11.1 (24.5)
	1	157 (6.18)	410 (16.14)	18.0 (0.71)	254 (10.00)	17.0 (37.5)
	11/2	200 (7.87)	550 (21.65)	31.0 (1.22)	305 (12.00)	29.7 (65.5)
	2	200 (7.87)	620 (24.41)	37.0 (1.46)	368 (14.25)	41.5 (91.5)

SWI FORGED STEEL BELLOWS SEAL GLOBE VALVE

ASME B16.34 / BS 5352 – BOLTED / WELDED BONNET – REDUCED PORT



No.	Parts	Material	A.S.T.M
1	Body	Forged Steel	A105N
2	Seat	Integral Hardfaced Stellite 6	
3	Disc	Stellite 6 faced A351-CF8M	
4	Stem	Stainless Steel	A276-316
5	Gasket	304 Spiral Wound Graphite	
6	Bonnet	Forged Steel	A105N
7	Bonnet Bolt	Alloy Steel	A193-B7M
8	Gland Packing	Graphoil	
10	Gland	Stainless Steel	A276-316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Gland Bolt	Stainless Steel	A193-B6
14	Yoke Sleeve	13Cr Stainless Steel	A582-416
15	Handwheel	Malleable Iron	A47
16	Name Plate	Aluminum	
17	Handwheel Nut	Carbon Steel	A563A
20	Connector	Forged Steel	A105N
27	Grease Nipple	Cr Plated Carbon Steel	
36	Guide Pin	13Cr Stainless Steel	A276-410
64	Bellows	321 Stainless Steel or Inconel 625	

CLASS 150 – 300 – 600

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	Center to Top (Open)	Dia of Port Opening	Face to Face			Approx. Wt , Kg(Lb)		
					Class 150	Class 300	Class 600	Class 150	Class 300	Class 600
Reduced	1/2	86 (3.39)	202 (7.95)	9.5 (0.37)	108 (4.25)	152 (6.00)	165 (6.50)	2.8 (6.2)	3.3 (7.3)	3.6 (7.9)
	3/4	86 (3.39)	202 (7.95)	12.7 (0.50)	117 (4.62)	178 (7.00)	190 (7.50)	3.6 (7.9)	4.5 (9.9)	5.1 (11.2)
	1	99 (3.90)	233 (9.17)	17.5 (0.69)	127 (5.00)	203 (8.00)	216 (8.50)	5.4 (11.9)	6.7 (14.8)	7.3 (16.1)
	1 1/2	124 (4.88)	269 (10.59)	29.5 (1.16)	165 (6.50)	229 (9.00)	241 (9.50)	10.8 (23.8)	12.0 (26.5)	13.3 (29.3)
	2	138 (5.43)	351 (13.82)	35.0 (1.38)	203 (8.00)	267 (10.50)	292 (11.50)	15.9 (35.1)	17.4 (38.4)	18.3 (40.4)

CLASS 1500

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	Center to Top (Open)	Dia. of Port Openings	Face to Face	Approx. Wt , Kg(Lb)
Reduced	1/2	86 (3.39)	290 (11.42)	9.5 (0.37)	216 (8.50)	7.4 (16.3)
	3/4	99 (3.90)	290 (11.42)	12.7 (0.50)	229 (9.00)	10.8 (23.8)
	1	124 (4.88)	300 (11.81)	17.5 (0.69)	254 (10.00)	15.6 (34.4)
	1 1/2	138 (5.43)	332 (13.07)	29.5 (1.16)	305 (12.00)	27.4 (60.4)
	2	157 (6.18)	420 (16.54)	35.0 (1.38)	368 (14.25)	37.0 (81.6)

ISSUE FOR CONS JCTION 03-26-09

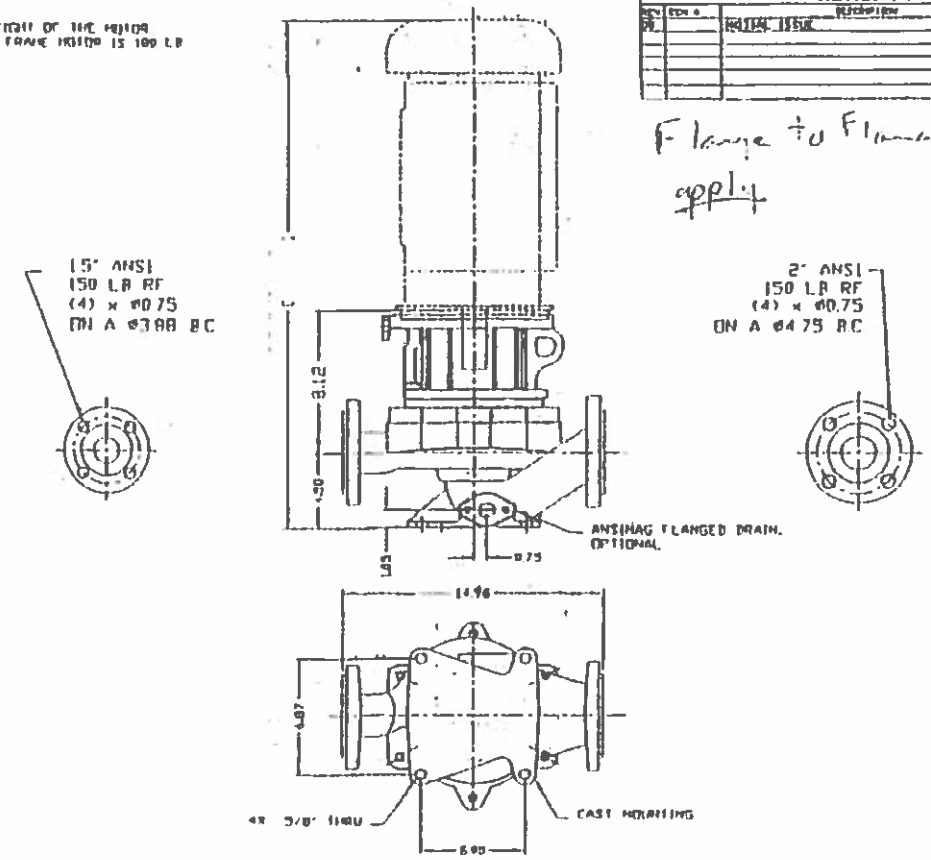
NOTES:

1. SHIPPING WEIGHT DOES NOT INCLUDE THE WEIGHT OF THE MOTOR
2. APPROXIMATE WEIGHT OF THE 213/5TC NEMA FRAME MOTOR IS 100 LB

REVISIONS

REV.	DESCRIPTION	APPROVED	DATE
A	INITIAL ISSUE		03/26/09

Flange to Flange & foot print appl.



MOTOR DIMENSIONS
CERTIFIED BY: _____ DATE: _____

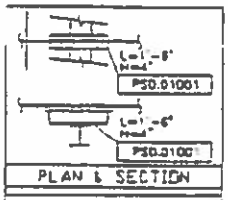
PUMP DIMENSIONS
CERTIFIED BY: M. MARINOVA DATE: 09/10/00

CUSTOMER NAME	APPLICATION	ITEM #	APPROVALS: DATE:
	PROJECT/REFERENCE NAME		
PUMP P.O. #	PUMP CODE #	WEIGHT (APPROXIMATE) 140 LBS	DRAWN BY: M.MARINOVA 09/10/00
PUMP MODEL	MOUNTING TYPE	HP PHASE	CHK'D: M.CLARK 09/10/00
IMPELLER # / DIA	MOTOR M.O.	FRAME RPM	ENGINEERING: 09/10/00
	MOTOR CODE #	BASE CODE #	QA: 09/10/00

ANSIMAG INCORPORATED
BLOOMINGDALE, IL 60108 USA

DESCRIPTION
KV-2156 ANSI-NEMA PUMP
213/5TC NEMA FRAME MOTORS

REF. SIZE	TYPE	REF. PART NO	DWG NO	REV
	IP		IP1136	00
SCALE	DATE 09/10/00	SHEET 1 OF 1		



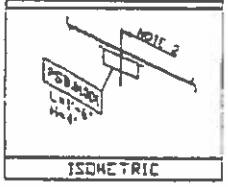
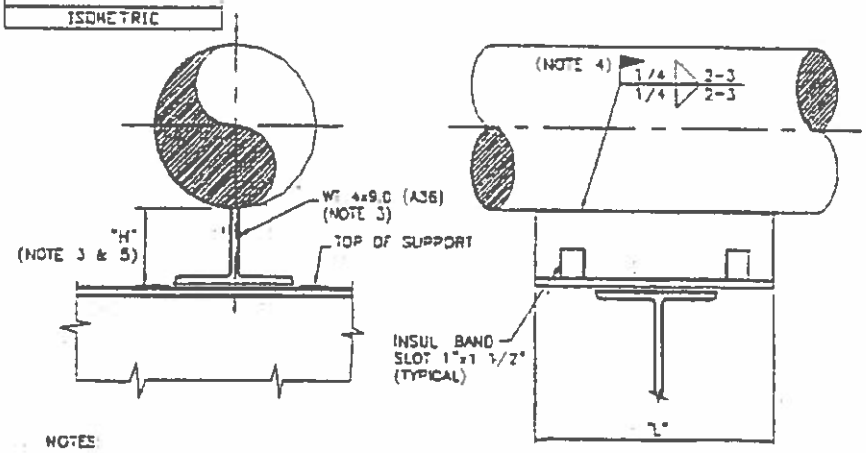


CHART 1

	"L"	AMOUNT OF LINE MOVEMENT
A	1'-6"	0" TO 5 15/16"
B	2'-0"	6" TO 9"



NOTES:

1. "H" & "L" DIMENSION TO BE SPECIFIED ON PIPING DRAWING AND/OR ISOMETRIC. SEE CHART 1 FOR LENGTH BASED ON MOVEMENT. ANCHOR REQUIREMENTS MAY AFFECT LENGTH ALSO.
2. LOCATE SHOE WITH A DIMENSION IF SHOE IS INSTALLED IN THE SHOP.
3. FOR HEIGHT GREATER THAN 4" AND LESS THAN 7" CUT SHOE FROM W8x18 (A36).
4. ON STRESS RELIEVED LINES, SHOES SHALL BE WELDED TO PIPE BEFORE STRESS RELIEVING.
5. THE SHOE HEIGHT IS TO BE 1" HIGHER THAN THE INSULATION THICKNESS OR 4" MIN. OTHER HEIGHT SHOES MAY BE USED FOR DE REQUIREMENTS AND SLOPING LINES.
6. PAINT TO MATCH THE SYSTEM SPECIFIED FOR THE MAIN LINE.
7. FOR GALVANIZED PIPE USE SHOE LYO.STD.0523.PSD.01003

Lyondell Petrochemical Company

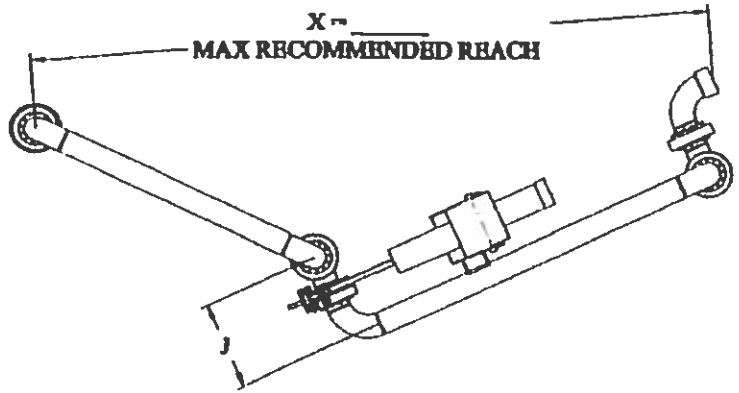
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4			JMA	1/97
3			CHK	DATE
2			MAM	1/97
1			APP	DATE
0	4/1/97	Issued For Design	CMP	4/97

PIPE SHOE FOR 3/4" THRU 12" C.S. PIPE

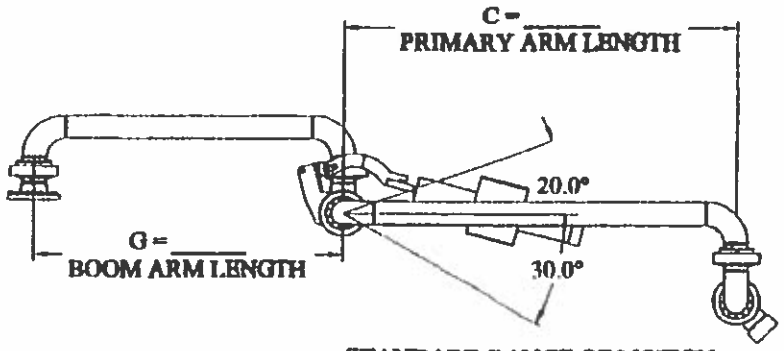
DRAWING NUMBER	REV
LYO.STD.0523.PSD.01001	0

ISSUE FOR CONS JCTION 03-26-09

E2033 WORLD SERIES BOTTOM TRANSFER LOADING ARM: UP FEED RIGHT HAND DOWN FEED
(STANDARD ARRANGEMENT FOR QUOTING PURPOSES ONLY)



Swivel Joints: All D2000 World Series
Balance Mechanism: Spring Cylinder



STANDARD RANGE OF MOTION

	APPROX. WEIGHT	TYPICAL "C"	TYPICAL "G"	"J"	REACH "X"
3"	280 lbs	60"	48"	13.1"	96"
4"	350 lbs	60"	60"	16.1"	108"
6"	410 lbs	60"	60"	24.5"	108"

MATERIAL OPTIONS

- STAINLESS STEEL
- CARBON STEEL
- ALUMINUM

SEAL OPTIONS

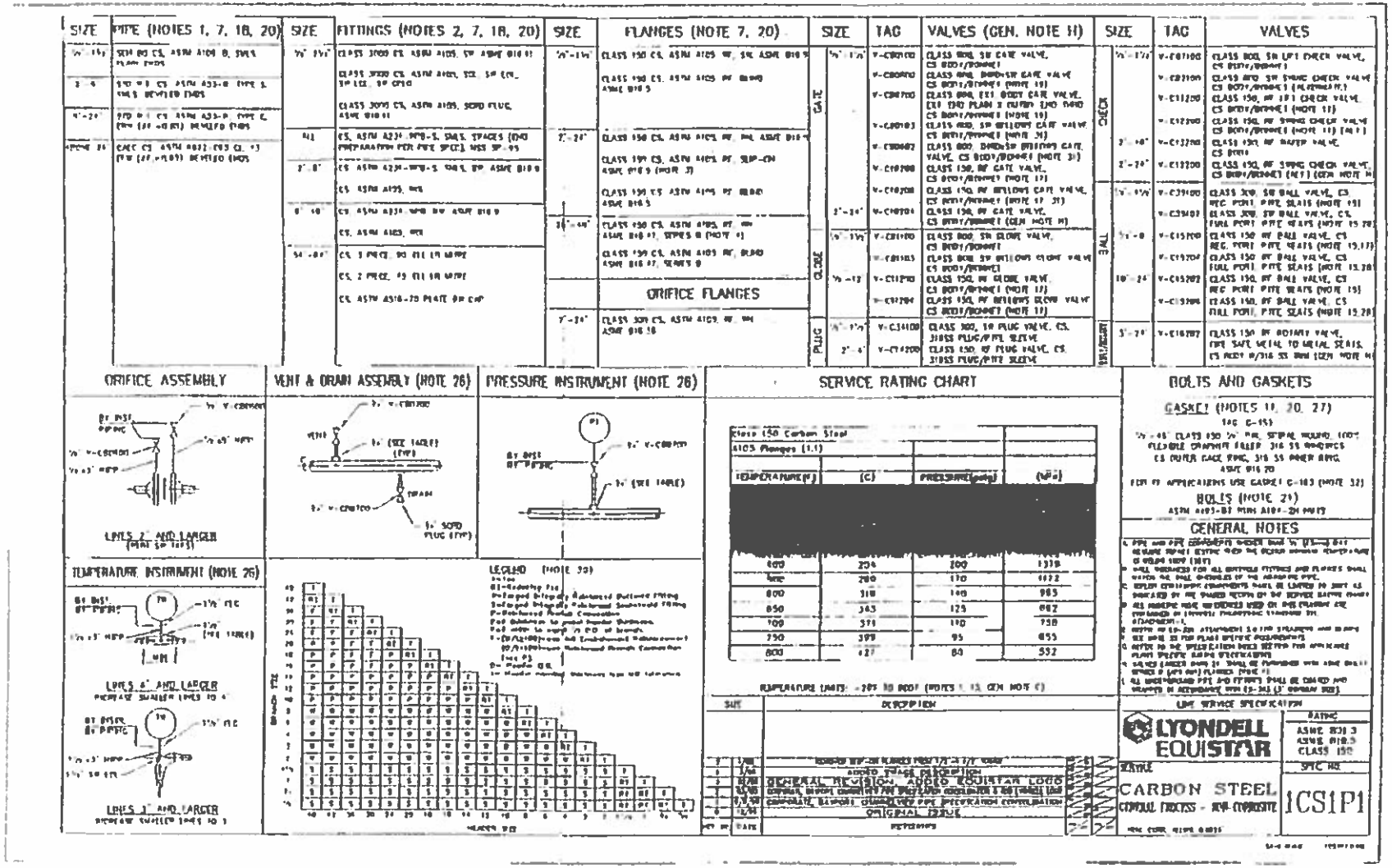
- VITON
- BUNA
- PTFE

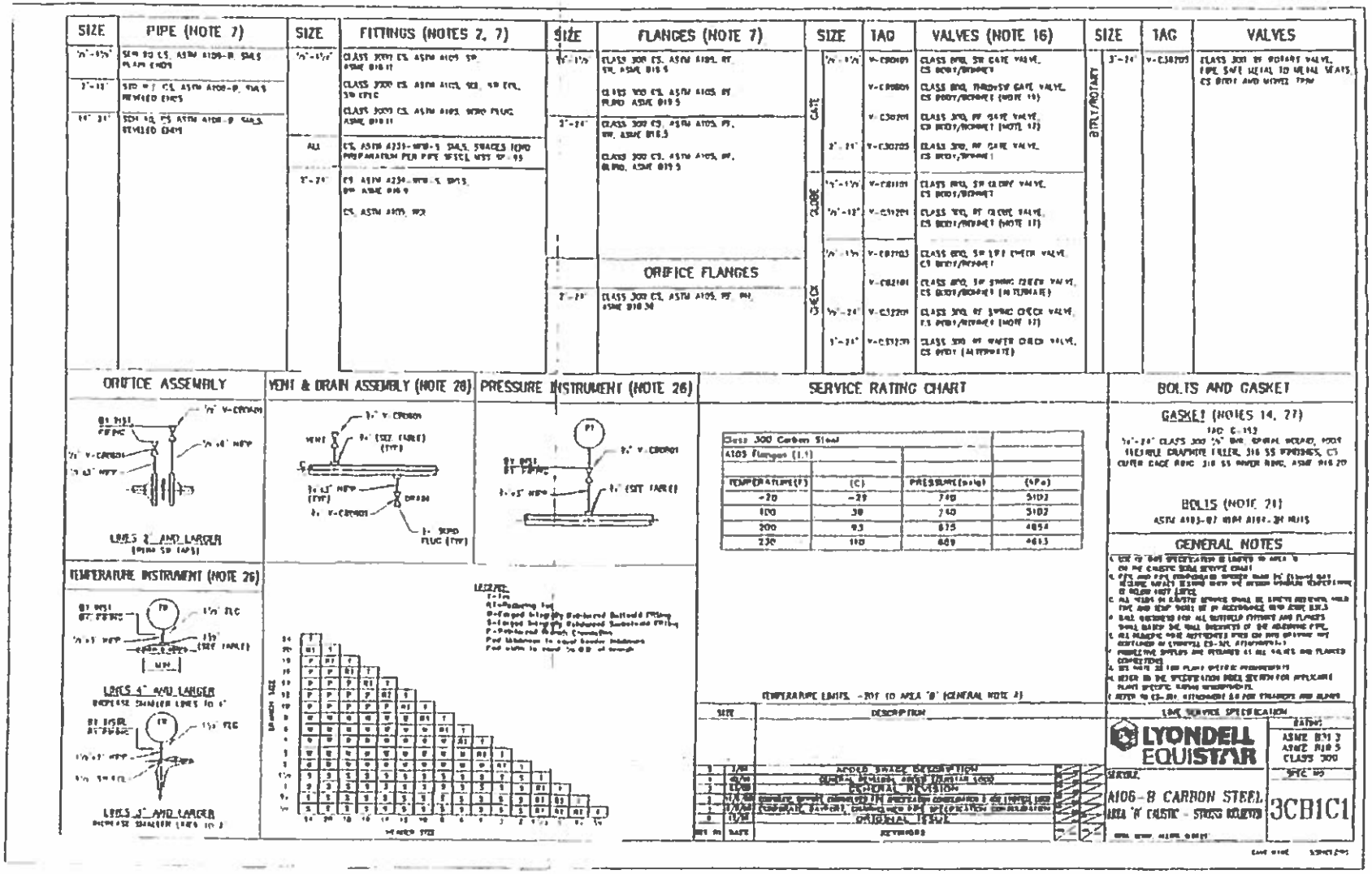
SWIVEL OPTIONS

- D2000
- D1070
- D2001
- D0116

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EMCO WHEATON
A Gardner Denver Product


PIPE (NOTES 1, 7, 18, 20)
FITTINGS (NOTES 2, 7, 18, 20)
FLANGES (NOTE 7, 20)
VALVES (GEN. NOTE 11)
ORIFICE FLANGES
ORIFICE ASSEMBLY
VENT & DRAIN ASSEMBLY (NOTE 26)
PRESSURE INSTRUMENT (NOTE 26)
TEMPERATURE INSTRUMENT (NOTE 26)
SERVICE RATING CHART
BOLTS AND GASKETS
GASKET (NOTES 11, 20, 27)
BOLTS (NOTE 21)
GENERAL NOTES
LYONDELL EQUISTAR
CARBON STEEL
1CS1P1


SIZE
PIPE (NOTE 7)
FITTINGS (NOTES 2, 7)
FLANGES (NOTE 7)
VALVES (NOTE 16)
TAG
VALVES
ORIFICE FLANGES
ORIFICE ASSEMBLY
VENT & DRAIN ASSEMBLY (NOTE 26)
PRESSURE INSTRUMENT (NOTE 26)
SERVICE RATING CHART
BOLTS AND GASKET
GASKET (NOTES 14, 27)
BOLTS (NOTE 21)
GENERAL NOTES
TEMPERATURE INSTRUMENT (NOTE 26)
LINES 2" AND LARGER
LINES 4" AND LARGER
LINES 3" AND LARGER
LYONDELL EQUISTAR
A106-B CARBON STEEL
AREA 'N' CAUSTIC - STRESS RELIEVED
3CB1C1

REQUESTOR	Robby Talbert
COMPANY	CDI Corp
AFC / WO#	91514697
DATE	1/0/1900
PROJECT TITLE	FLEX D-4383 RCRA PROJECT

lyondellbasell

MISCELLANEOUS SPECIALTY ITEM NUMBER REQUEST FORM

MSP	AREA	TEMP NO.	PERM NO.	VENDOR	MODEL / PART NO.	DESCRIPTION	SIZE	ASSOCIATED LINE, EQUIPMENT No. or P&ID No.			REMARKS
								P&ID	LINE NO.	EQUIP NO.	
MSP	43	XX1	001	MGM	189	EXCESS FLOW VAEVE	2"	E43M022	HL48025	D-4801A	THIS IS AN EXAMPLE LINE
MSP	43	XX1	001	HATFIELD			3"	E-43-M-034	P-43256 SHT 4		
MSP	43	XX2	11	SUNBELT	V-C10208	BELLOWS GATE VALVES	2"	E-43-M-034			RCRA 2" 150#RF
MSP	43	XX3	12	SUNBELT	V-C10207	LIVE LOAD PACKED GATE VALVES	3"	E-43-M-034			RCRA 3" 150#RF
MSP	43	XX4	13	SUNBELT	V-C10207	LIVE LOAD PACKED GATE VALVES	4"	E-43-M-034			RCRA 4" 150#RF

Document Control Signature _____

FORM NO. CVO DC 1104-4

Note: A marked up P&ID must be included with this request (use temporary numbers: XX1, XX2, XX3, ec.) until final numbers are assigned by Document Control.
Caution: A completed copy of this form MUST be returned with your 'Issued For Records' (IFR), see CVC.DC.1109.

ISSUE FOR CONSTRUCTION 03-26-09

ITEM NO.	D-4333	D-4335	P-4332A/B
TITLE	BABBLER/CAUSTIC SCRUBBER, FEED ST.	SPENT CAUSTIC FLASH DRUM	CAUSTIC CIRCULATION PUMP, FEED ST.
DESCRIPTION	6'-0" I.D. X 25'-0" S/T HS 150 PSIG 350°F CARBON STEEL	6'-0" I.D. X 8'-0" S/T HS 150 PSIG 350°F CARBON STEEL	CENTRIFUGAL SEALLESS MAGNETIC DRIVE

DWG. NO.	REFERENCE DRAWINGS
E-43-M-001	PIPING ISOMETRIC DRAWING, SHT. 1 OF 1
E-43-M-002	INSTRUMENT DIAGRAM, SHT. 1 OF 2
E-43-M-003	INSTRUMENT DIAGRAM, SHT. 1 OF 1
E-43-M-004	EQUIPMENT OUTLET SKETCH

NOTES:

1. LOCATE VALVE ABOVE THE FLARE HEADER.
2. "Y" STRAINER WITH 1/8" SCREEN.
3. PROVIDE 1/8" DIA. DRAIN HOLE AT LOW POINT OF THE BAFFLE.
4. DELETED.
5. SEE VENDOR DRAWINGS FOR DETAILS.
6. DELETED.
7. LOCATE CLOSE TO TC ON D-4335.
8. LOCATE SPEC 43B/H1A BREAK AFTER FIRST ELBOW FROM VESSEL D-4335.
9. LOCATE TEE TO U AT EACH DRAW-OFF NOZZLE STATION FOR E-43B1, D-4333 & D-4334.
10. VALVES TO BE ACCESSIBLE FOR FREQUENT OPERATION. LOCATE AT CENTRAL LOCATION.
11. INSULATE WITH CELLULAR GLASS INSULATION.
12. DO NOT STEAM OUT D-4333
13. SWITCHES NOT CONNECTED

ISSUE FOR DEMO ONLY!

THIS IS A DUPLICATE DRAWING TO BE USED ON PROJECT 91314887 ONLY. DO NOT REMOVE THIS NOTE

NO.	DATE	REVISIONS	DRWN. APP.
9	10/09/08	[illegible]	[illegible]
8	05/23/07	[illegible]	[illegible]
7	03-26-09	[illegible]	[illegible]
6	05/05/05	[illegible]	[illegible]
5	02-11-02	[illegible]	[illegible]
4	05-03-01	[illegible]	[illegible]
3	01-05-01	[illegible]	[illegible]
2	12-05-00	[illegible]	[illegible]
1	10-15-97	[illegible]	[illegible]
0	11/96	[illegible]	[illegible]

NOTICE
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Lyondell

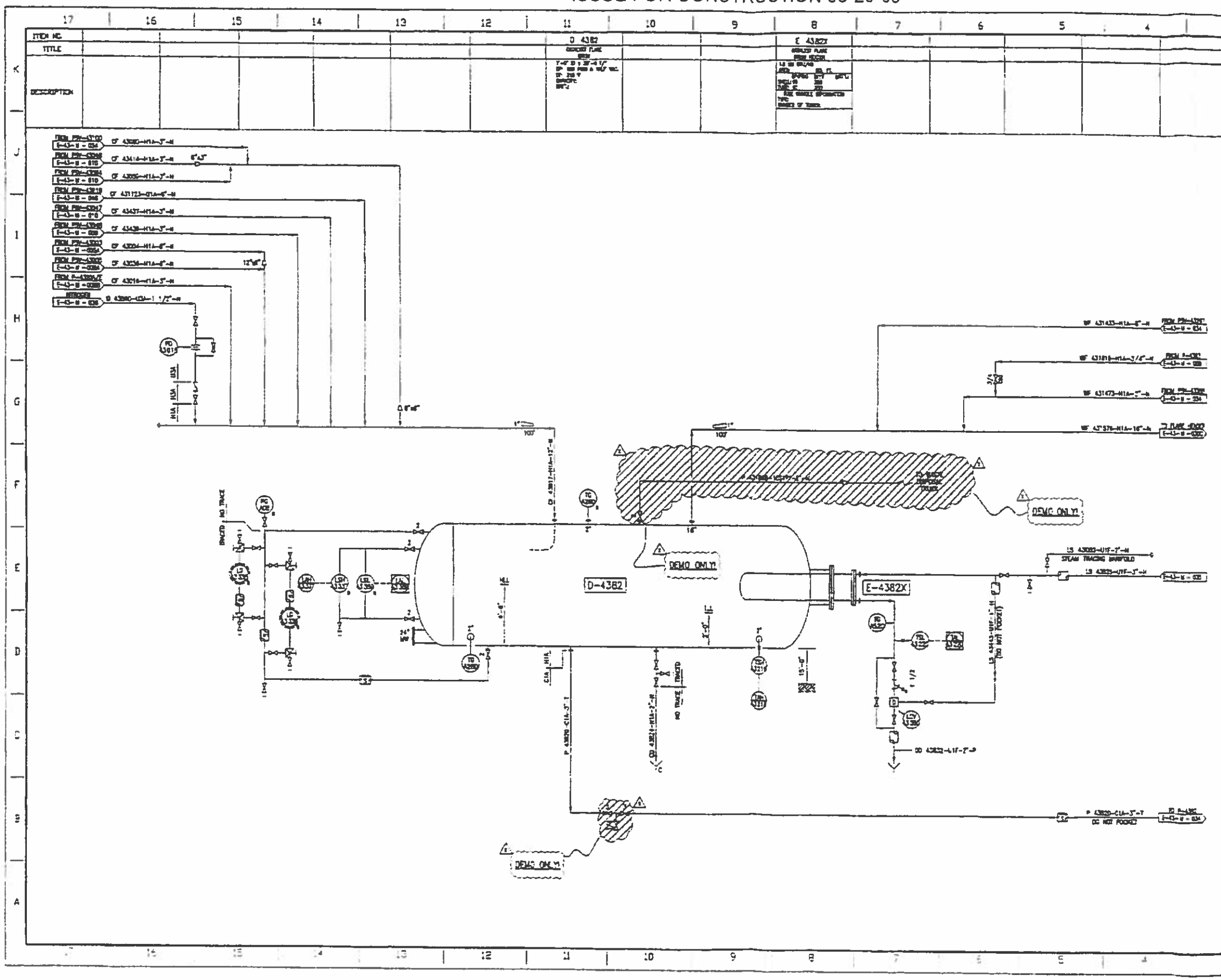
LOCATION CHANNELVIEW ENGINEERING DEPARTMENT

PIPING AND INSTRUMENT DIAGRAM
BUTENE/CAUSTIC SEPERATION

DRWN.	DATE	SCALE	ENGINEERING NUMBER	REV.
CHKD.	DATE	NTS	E 43 M 010	X
APP.	DATE			

LAST FILE: E-43M010.REV1.dgn 10/09/08

ISSUE FOR CONSTRUCTION 03-26-09



ISSUE FOR CONSTRUCTION 03-26-09

D 4383
WASTE CAUSTIC/RAG LAYER TRANSFER PUMP

D 4384
GASOLINE PRODUCT SURGE DRUM

SP 4340A/B
GASOLINE PRODUCT FILTERS

SP 4385
FILTER

NOTES:

1. START-STOP STATION WITH RUN (GREEN) AND STOP (RED) INDICATING LIGHTS AT TRUCK LOADING STATION. LOW LEVEL STOPS THE PUMP.
2. "Y" STRAINER WITH 6 MESH TO BE LOCATED IN A HORIZONTAL PUMP SUCTION LINE AND PARALLEL TO GRADE.
3. LOCATE VALVE ABOVE THE FLARE HEADER.
4. "Y" STRAINERS WITH 1/8" OPENINGS TO BE LOCATED IN A HORIZONTAL PUMP SUCTION LINE AND PARALLEL TO GRADE.
5. INSULATE WITH CELLULAR GLASS
6. SEE DWG E-43-M-004 FOR PLANT TO REFINERY CONNECTION

E-43-M-031 — TO FLARE

E-43-M-036 — 1 1/2" N

E-43-M-031 — 3" N

E-43-M-011 — FROM E-4342

E-43-M-056 — 1 1/2" N — 120# NITROGEN

E-43-M-015 — WATER FROM D-4335

E-43-M-040 — DIMCL REACTION WASHWATER FROM P-4321

E-43-M-060 — FROM CAUSTIC STORAGE AREA P-4312

E-43-M-010 — WATER RECIRCULATION TO D-4335

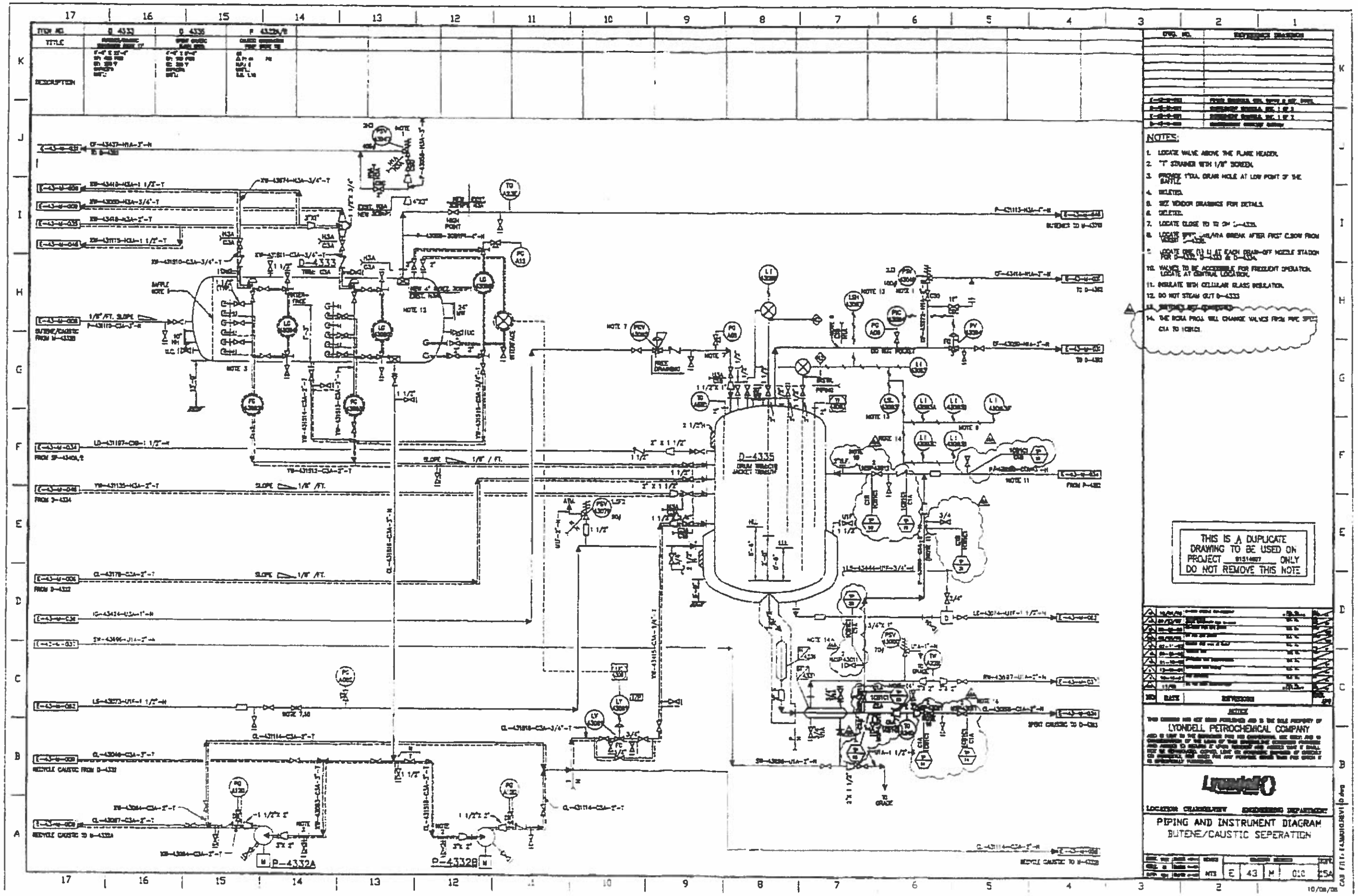
E-43-M-031 — FROM "GASOLINE" FLARE DRUM T-4361

E-43-M-031 — 3" N

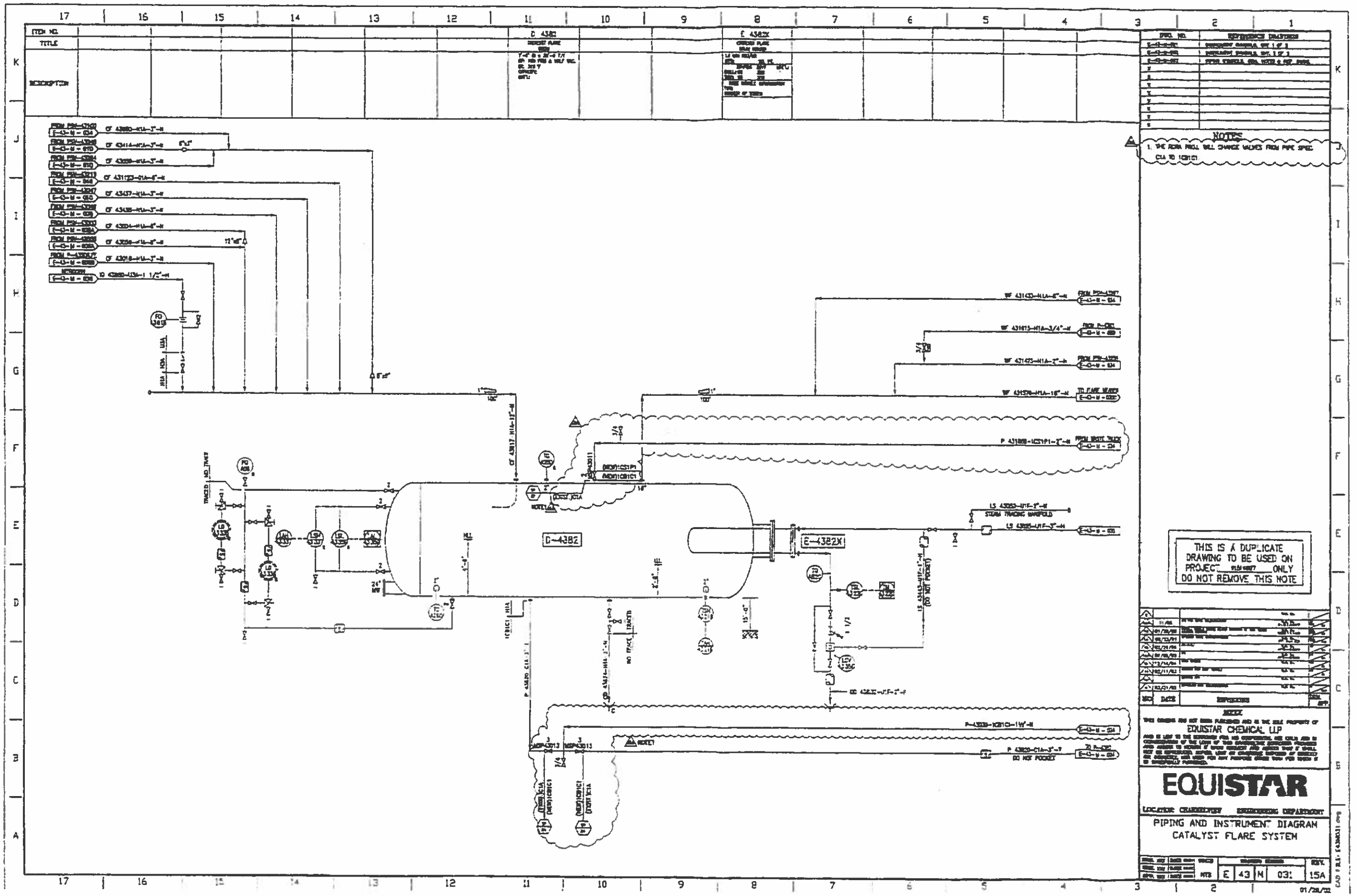
E-43-M-031 — 3" N

E-43-M-031 — 3" N

ISSUE FOR CONSTRUCTION 03-26-09



ISSUE FOR CONSTRUCTION 03-26-09



ISSUE FOR CONSTRUCTION 03-26-09

D 4383
WATER NEUTRALIZATION
LAGOA STORAGE BASIN

D 4384
GASOLINE PRODUCT
FLARE KNOCK OUT DRUM

SP 4340A/B
GASOLINE PRODUCT
FLARE

SP 4385
FLARE

NOTES:

1. START-STOP STATION WITH RUN (GREEN) AND STOP (RED) INDICATING LIGHTS AT TRUCK LOADING STATION. LOW LEVEL STOPS THE PUMP.
2. "Y" STRAINER WITH 6 MESH TO BE LOCATED IN A HORIZONTAL PUMP SUCTION LINE AND PARALLEL TO GRADE.
3. LOCATE VALVE ABOVE THE FLARE HEADER.
4. "Y" STRAINERS WITH 1/8" OPENINGS TO BE LOCATED IN A HORIZONTAL PUMP SUCTION LINE AND PARALLEL TO GRADE.
5. INSULATE WITH CELLULAR GLASS
6. SEE SPEC E-43-M-004 FOR PROPER AUXILIARY CONNECTION.
7. THE SIGMA PROG WILL CHANGE VALVES FROM PIPE SPEC. C1A TO 1C81C1.

D-4384
TANK H1A

D-4383
TANK 1C81C1

SP-4340A

SP-4340B

THIS IS A DUPLICATE FLOW SHEET TO BE USED ON PROJECT 81264887 ONLY DO NOT REMOVE THIS NOTE

P-4382
WASTE CAUSTIC/BAG LAYER TRANSFER PUMP
CAPACITY: 100 GPM
Δ P: 100 PSI
HP: 10

P-4383
GASOLINE PRODUCT PUMP
CAPACITY: 84 GPM
Δ P: 103 PSI
SG: 0.808
HP: 20

P-4381
GASOLINE PRODUCT PUMP
CAPACITY: 84 GPM
Δ P: 71 PSI
SG: 0.808
HP:

FLT-4395A

FLT-4395B

TO STORM DRAIN

REMOVABLE PLUG

NO.	DATE	REVISIONS
19	05/10/09	
18	10/10/08	
17	01/21/08	
16	01/18/08	
15	01/16/08	
14	11/08	

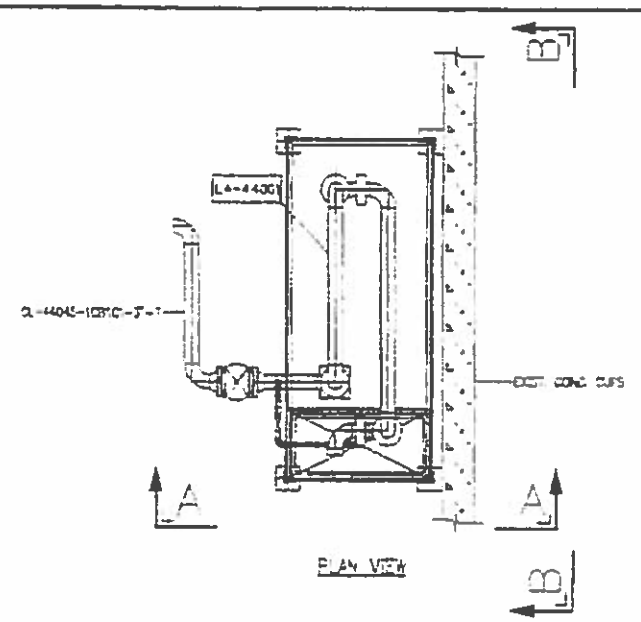
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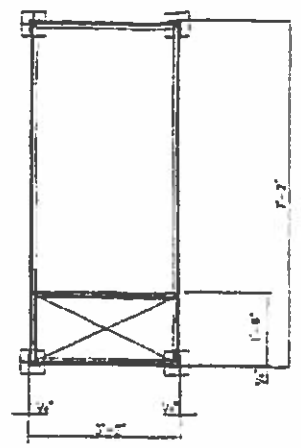
DWG. NO.	
E-43-M-010	SHEET 1 OF 2
E-43-M-001	INSTRUMENT SYMBOLS SHEET 1 OF 2
E-43-M-002	INSTRUMENT SYMBOLS SHEET 2 OF 2
E-43-M-003	PIPING SYM., GEN. NOTES, AND KEY DIAGS.

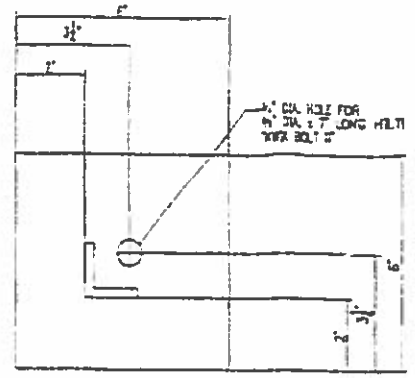
Lyondell Petrochemical Company
LOCATION: CHANNELVIEW ENGINEERING DEPARTMENT

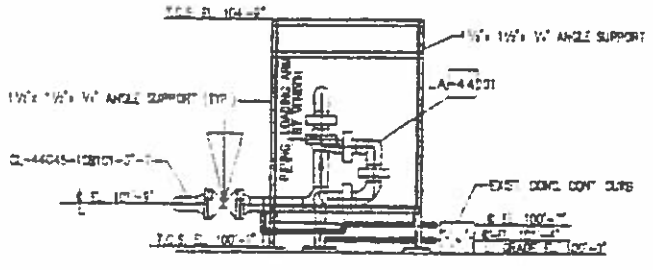
PIPING AND INSTRUMENT DIAGRAM
PLANT STORAGE SYSTEM

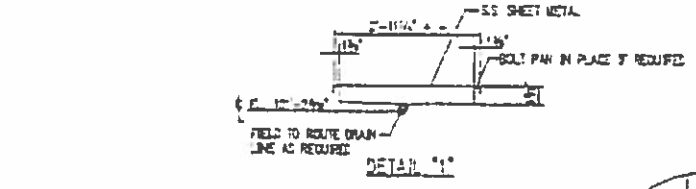
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APP.	DATE			

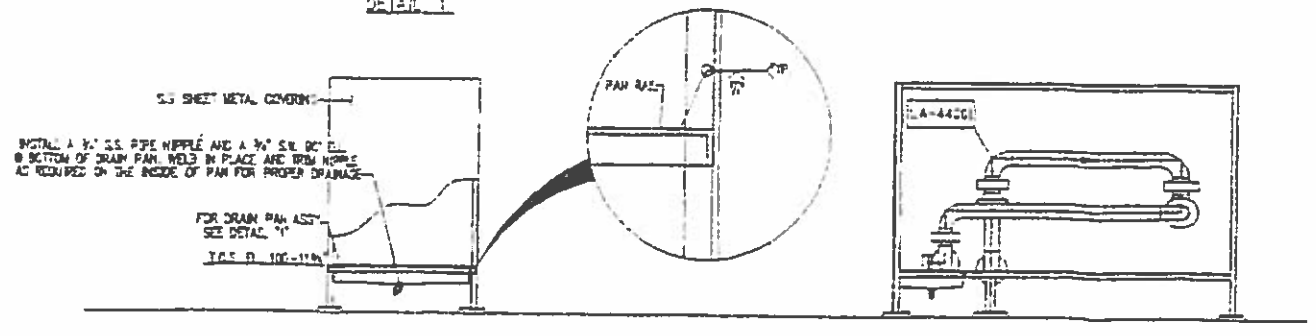












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LYONDELL

LOCATION: CHANNELVIEW

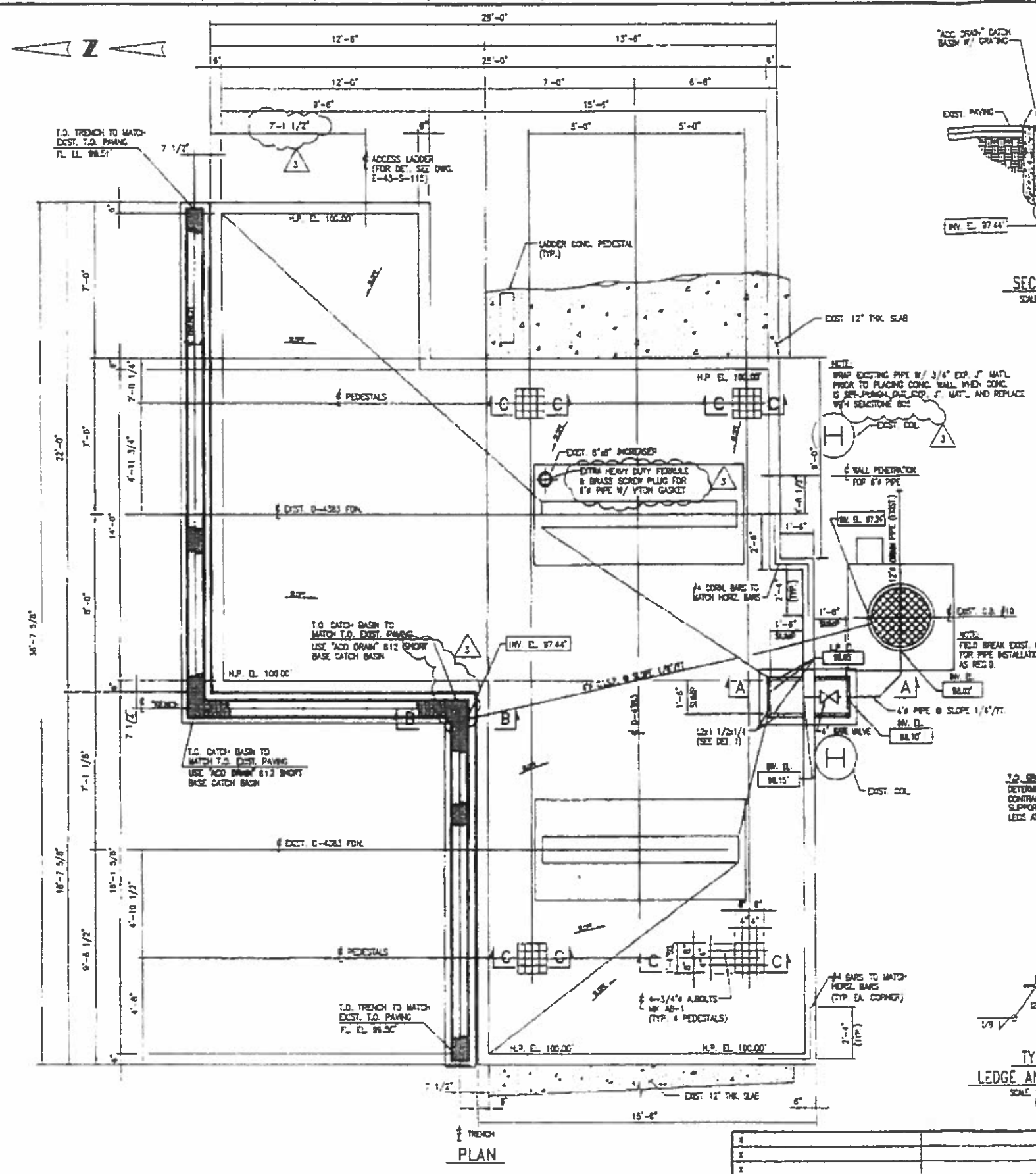
ENGINEERING DEPARTMENT

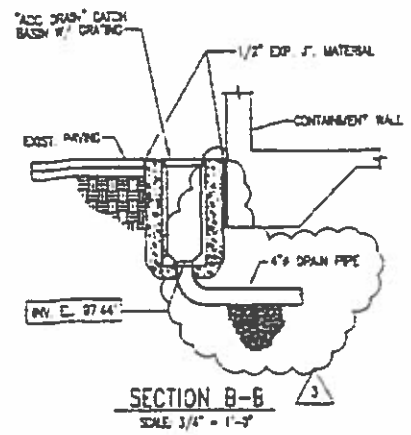
No.	DATE	REVISIONS	DR.
			RE
			KM
			BC
C	01/09	P.C. No 9.514697	RE KM BC AP

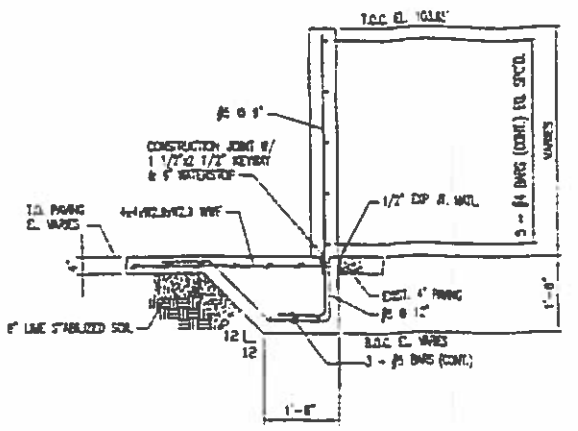
	DRN.	DATE
	RE	01/09
	CHK.	DATE
	KM	01/09
	APP	DATE
	BC	01/09

LOADING ARM CABINET FOR LA-44031

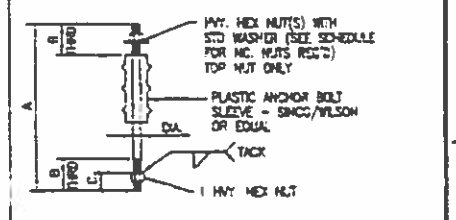
SCALE	DRAWING NUMBER				REV
NTS	B	44	S	005	C





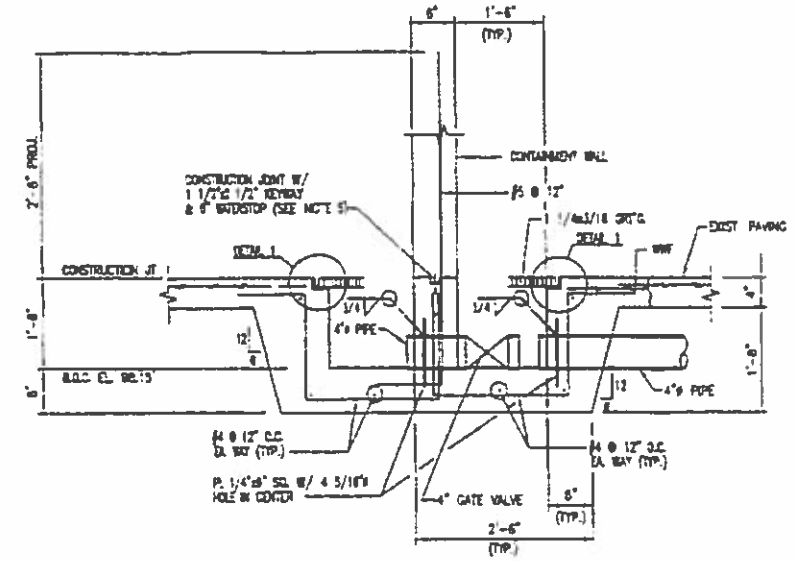


ANCHOR BOLT SCHEDULE

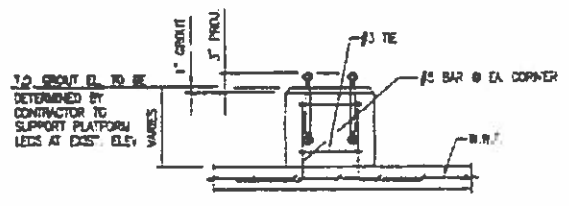


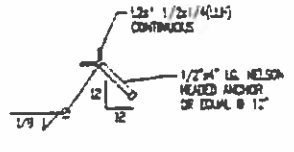
NOTE: PREFIX ALL A. BOLT MK NO's. THIS DWG. WITH E43S366
ALL DIMENSIONS ARE IN INCHES

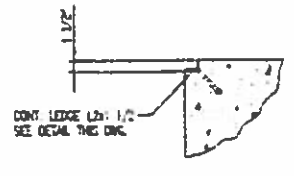
MK. NO.	NO. REQ'D	DIA.	A	B	C	NO. NUTS REQ'D	SLEEVE SIZE
AB-1	16	3/4	12	3	1 1/8	1	NA



SECTION A-A
N.T.S.







NOTES:

1. ALL WORK TO BE PERFORMED IN ACCORDANCE WITH LYONDELL STANDARDS LYD. STD. 702 AND 708.
2. ANCHOR BOLTS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH LYONDELL STANDARD 804.
3. ALL CONCRETE SURFACES (WALL, SLAB AND PEDESTALS) TO BE COATED W/ SEMSTONE 145-S (PER MANUF. SPECIFICATIONS) (INSTALLATION MUST BE PERFORMED BY MANUFACTURER APPROVED APPLICATION CONTRACTOR) INSIDE CONTAINMENT AREA.
4. FOR CONSTRUCTION OF TRENCH USE PRECAST "ACO DRAIN" NW 100 CHANNEL COMPONENTS AND MESH GALVANIZED STEEL GRATING. (OR EQUAL PER MANUF SPEC'S.)
5. FOR WATERSTOP USE GREENSTREAK PVC. (OR EQUAL PER MANUF. SPEC'S.)
6. CAULK AROUND ALL BASE PLATES & LADDER CONNECTIONS TO WALL USING SEMSTONE BCS.

EQUISTAR

Equistar Chemical
LOCATION CHANNELVIEW ENGINEERING DEPARTMENT

D-4383 CONTAINMENT AREA
PLAN, SECTIONS & DETAILS

DWG NO.	REFERENCE DRAWINGS	NO.	DATE	REVISIONS	APP.
E-43-S-115	D-4383 CONTAINMENT AREA-STEEL DETAIL	5	05/25/99	ISSUED FOR CONSTRUCTION	
		4	04/28/99	ISSUED CONTAINMENT AREA	
		3	03/31/99	ISSUED FOR CONSTRUCTION	
		2	03/31/99	CHANGED ENGINEER AT CONT. AREA	
		1	03/31/99	UPDATE PER NOTES	

JOB NO. E-5082
S&B ENGINEERS and CONSTRUCTORS, LTD. HOUSTON, TEXAS

DSN. A.L.	DATE 7/98/99	SCALE	DRAWING NUMBER				REV.
CHK. R.C.	DATE 8/98/99	3/8"=1'-0"	E	43	C	086	3
APP.	DATE						

CAD FILE: E-43-C-086.dgn

E43c086.dwg - LAST REVISED 03/30/99 09:29

12/15/98

product data

Phenoline® 379

(Formerly Semstone 145S)

Selection & Specification Data

Generic Type
Polyamine Epoxy Novolac

Description
Single-coat, airless-applied, ultra-high build coating for use on steel and concrete substrates subject to aggressive chemical fume and immersion exposure. Phenoline 379 has the same application and physical properties of Phenoline 309 but provides enhanced chemical protection for a broader and more concentrated range of acids.

Features
- Single coat application reduces labor costs
- Ultra-high build capabilities provides a void-free film and excellent edge protection
- Resistant to inorganic and organic acids, caustics and most solvents
- Can be mat reinforced where exposure conditions dictate
- Application by airless spray equipment (plural component acceptable but not required)
- VOC compliant to current AIM regulations

Color
Refer to Carboline Color Guide

Finish
Eggshell

Primers
Self-priming

Topcoats
Not recommended

Dry Film Thickness
1coat system: 20-50 mils (500-1250 microns) Min
2 coat system: 20-25 mils (500-625 microns) per coat.

Solids Content
By Volume: 99% ± 1%

Theoretical Coverage Rate
1588 mil ft² (39.0 m²/l at 25 microns)
Allow for loss in mixing and application

VOC Values
As supplied: 0.1 lbs/gal (12 g/l)
These are nominal values and may vary slightly with color.

Dry Temp. Resistance
Continuous: 140°F (60°C)
Non-Continuous: 180°F (82°C)
Discoloration and loss of gloss is observed above 140°F (60°C)

Wet Temp. Resistance
immersion temperature resistance depends upon exposure. Consult Carboline Technical Service for specific information. It is recommended that metal tanks operating above 140°F (60°C) be insulated.

Limitations
- Epoxies lose gloss, discolor and eventually chalk in sunlight exposure.
- This coating commonly develops an *amine-blush* during cure. While this condition will not adversely affect performance of the coating this blush must be removed before applying additional coats and may require removal before placing into service.

Substrates & Surface Preparation

General
Surfaces must be clean and dry. Employ adequate methods to remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating.

Steel

Immersion:	SSPC-SP5
Surface Profile:	3.0-5.0 mils (75-125 micron)
Non-Immersion:	SSPC-SP10
Surface Profile:	2 mils (50 micron) minimum

Concrete
Immersion and Non-Immersion:
Concrete must be cured 28 days at 75°F (24°C) and 50% relative humidity or equivalent. Prepare surfaces in accordance with ASTM D4258 Surface Cleaning of Concrete and ASTM D4259 Abrading Concrete. Voids in concrete may require surfacing.

To the best of our knowledge the technical data contained herein is true and accurate on the date of publication and is subject to change without prior notice. User should contact Carboline Company to verify correctness before specifying or ordering. No guarantee of accuracy is given or implied. We guarantee our products to conform to Carboline quality control. We assume no responsibility for coverage, performance or injuries resulting from use. Liability, if any, is limited to replacement of products. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY CARBOLINE EXPRESS OR IMPLIED, STATUTORY, BY OPERATION OF LAW, OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Carboline and Phenoline are registered trademarks of Carboline Company.

Phenoline® 379

Application Equipment

Spray Application (General)	Recommended for application by single or plural component airless spray. This is a high solids coating and may require adjustments in spray techniques. Wet film thickness is easily and quickly achieved. The following spray equipment has been found suitable and is available from manufacturers such as Binks, DeVilbiss and Graco.
Conventional Spray	Not recommended
Airless Spray	Pump Ratio 45:1 (min.) GPM Output 3.0 (min.) Material Hose ½" I.D. (min.) Tip Size .035-.042" Output PSI 2700-3000 Filter Size 60 mesh Teflon packings are recommended and available from the pump manufacturer. Contact Carboline Technical Service for plural component equipment recommendations.
Brush & Roller (General)	Not recommended for tank lining applications except when striping welds.
Brush	For touch up and limited areas only.
Roller	For touch up and limited areas only.

Mixing & Thinning

Mixing	Power mix separately, then combine and power mix. DO NOT MIX PARTIAL KITS.
Ratio	4:1 Ratio (A to B)
Thinning	Not recommended. Use of thinners other than those supplied by Carboline may adversely affect product performance and void product warranty, whether expressed or implied.
Pot Life	45 minutes at 75°F (24°C). Pot life ends when material begins to thicken and starts to heat up. Pot life times will be less at higher temperatures.

Cleanup & Safety

Cleanup	Use #2 Thinner or Acetone. In case of spillage, absorb and dispose of in accordance with local applicable regulations.
Safety	Read and follow all caution statements on this product data sheet and on the MSDS for this product. Employ normal workmanlike safety precautions. Hypersensitive persons should wear protective clothing, gloves and use protective cream on face, hands and all exposed areas.
Ventilation	Vapors and/or spray mist may cause explosion. When used as a tank lining or in enclosed areas, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. In addition to ensuring proper ventilation, appropriate respirators must be used by all application personnel.
Caution	This product contains flammable solvents. Keep away from sparks and open flames. All electrical equipment and installations should be made and grounded in accordance with the National Electric Code. In areas where explosion hazards exist, workmen should be required to use non-ferrous tools and wear conductive and non-sparking shoes.

Application Conditions

Condition	Material	Surface	Ambient	Humidity
Normal	60°-85°F (16°-29°C)	60°-85°F (16°-29°C)	60°-90°F (16°-32°C)	0-80%
Minimum	50°F (10°C)	50°F (10°C)	50°F (10°C)	0%
Maximum	90°F (32°C)	125°F (52°C)	110°F (43°C)	90%

This product simply requires the substrate temperature to be above the dew point. Condensation due to substrate temperatures below the dew point can cause flash rusting on prepared steel and interfere with proper adhesion to the substrate. Special application techniques may be required above or below normal application conditions. To reduce outgassing when applying to concrete substrates, do not apply in direct sunlight or when surface temperatures are increasing. Best results are obtained when ambient and surface temperatures are decreasing or constant.

Curing Schedule

Surface Temp. & 50% Relative Humidity	Minimum Recoat Time	Maximum Recoat Time	Final Cure for Immersion Service
45°F (10°C)	NR*	NR*	NR*
60°F (16°C)	24 Hours	4 Days	72 Hours
75°F (24°C)	12 Hours	2 Days	36 Hours
90°F (32°C)	4 Hours	1 Day	24 Hours

These times are based on a 20.0 mil (500 micron) dry film thickness. Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times. Condensation on the surface or humidity above 25% during application and curing will result in a surface haze or blush. Any haze or blush must be removed by water washing before recoating. During high humidity conditions, it is recommended that the application be done while temperatures are increasing. If the maximum recoat time is exceeded, the surface must be washed with detergent and water, then abraded by sweep blasting prior to the application of additional coats. **For force curing, contact Carboline Technical Service for specific requirements. *Note:** Final cure temperatures below 60°F (16°C) are not recommended for tank linings.

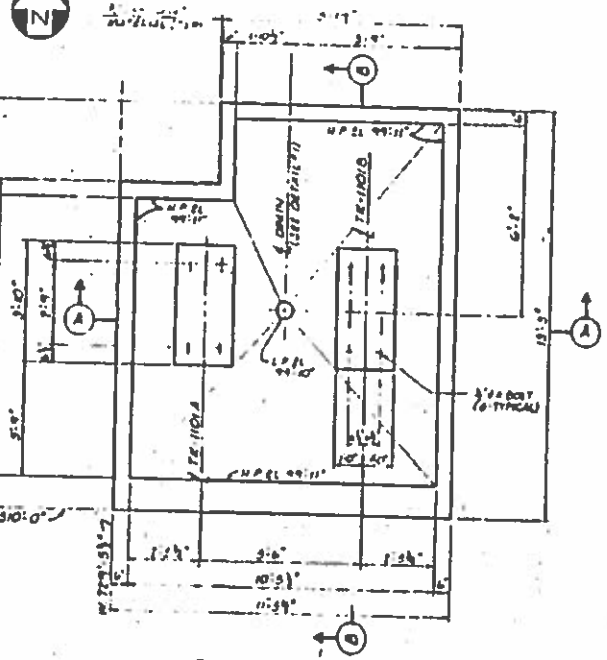
Packaging, Handling & Storage

Shipping Weight (Approximate)	1 Gallon Kit: 12 lbs (5 kg) 5 Gallon Kit: 55 lbs (25 kg)
Flash Point (Setaflash)	Part A >205°F (96°C) Part B >205°F (96°C)
Storage (General)	Store indoors.
Storage Temperature & Humidity	40° - 110°F (4°-43°C) 0-100% Relative Humidity
Shelf Life	1 year if stored at 50°-85°F. To ensure maximum film build, Phenoline 379 should be applied within three (3) months of the manufactured date.

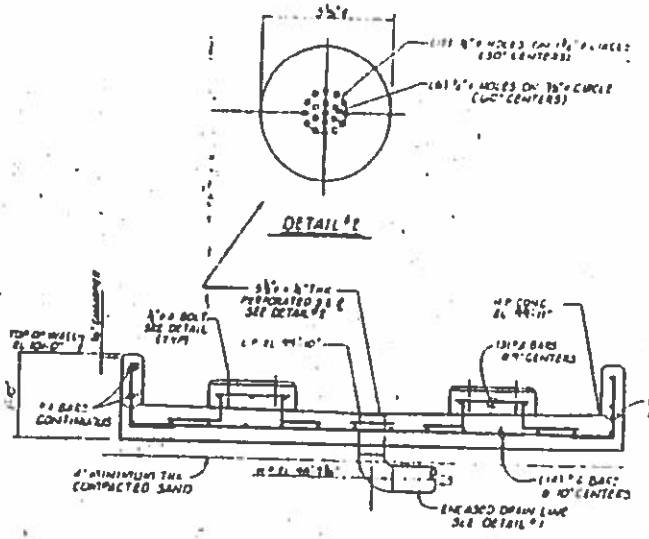
carboline
350 Hanley Industrial Court St. Louis MO 63144-1599
314-644-1000 314-644-4617 (fax) www.carboline.com
Group STONCOR

April 2000 replaces February 2000

To the best of our knowledge the technical data contained herein is true and accurate on the date of publication and is subject to change without prior notice. User must contact Carboline Company to verify correctness before specifying or ordering. No guarantee of accuracy is given or implied. We guarantee our products to conform to Carboline quality control. We assume no responsibility for coverage, performance or injuries resulting from use. Liability, if any, is limited to replacement of products. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY CARBOLINE EXPRESS OR IMPLIED, STATUTORY, BY OPERATION OF LAW OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Carboline® and Phenoline® are registered trademarks of Carboline Company.



ENLARGED PLAN



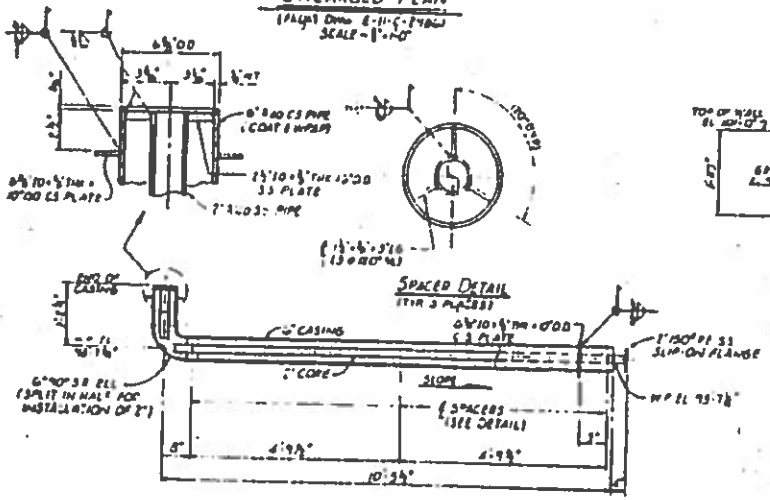
SECTION "A-A"

SCALE - 1/2"=1'-0"
(THIS DWG)



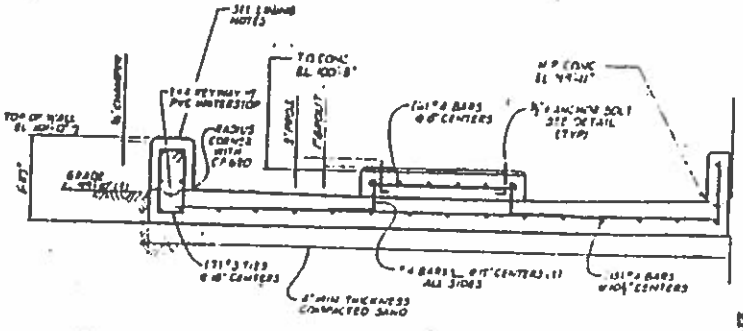
ANCHOR BOLT DETAIL

(8-REQUIRED)



DETAIL "1"

SECONDARY CONTAINMENT DRAIN LINE



SECTION "B-B"

SCALE - 1/2"=1'-0"
(THIS DWG)

GENERAL NOTES

1. All concrete construction shall be in accordance with "ACI Control Company Engineering Standard 301, Plain and Reinforced Concrete."
2. All concrete shall be 3000 PSI compressive strength in 28 days, unless otherwise specified.
3. All reinforcing bars shall be ASTM A615, Grade 60, unless otherwise specified.
4. For general concrete construction and testing data requirements see "ACI Control Company Spec No. 301."
5. Provide the following concrete protective coverings for bars reinforcing, unless otherwise specified.
   a. 3" for all concrete placed directly against the ground.
   b. 2" for all formed concrete exposed to weather or in contact with the ground.
6. All splices for reinforcing bars shall be 30 bar dia. unless otherwise specified. All welded wire fabric shall be lapped at least 6" and securely tied.
7. All exposed edges of concrete shall be chamfered 3/4", unless otherwise specified.

INTERIOR LINING NOTES

(1) THE INTERIOR SURFACE WALL & FLOOR TO BE LINED WITH "CARBOLINE CO. 395 HIGH SOLIDS POLYAMIDE EPOXY" PAINT CO. TWO MILS DRY FILM THICKNESS APPLIED ON CONCRETE SURFACES AS PER MFG. RECOMMENDATIONS.
(2) AREA TO BE COATED SHALL BE THAT PLATE "3"
(3) EXPOSED AREA JOINTS TO BE SEALED WITH "DEVCON CO. - 2 PART POLYSULFIDE RUBBER SEALANT"

ISSUED FOR COMMENTS

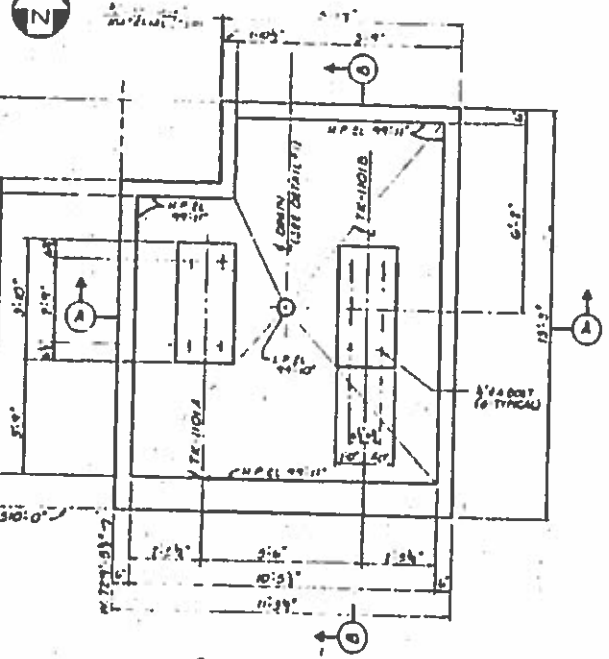
Drawing Has Been Reviewed
Some Not Approved

	FOUNDATION LOCATION PLAN
	ROOF STEEL, PLAN & SECTIONS

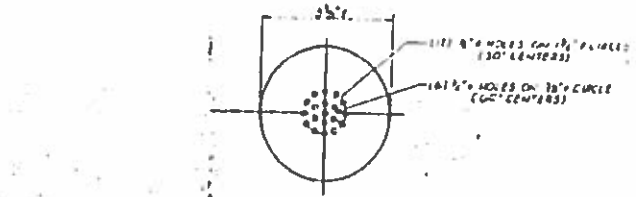
Lyondell Petrochemical Company

PLAN SECTIONS & DETAILS
SANITARY WASTE CONTAINMENT
SOUTH OF LABORATORY

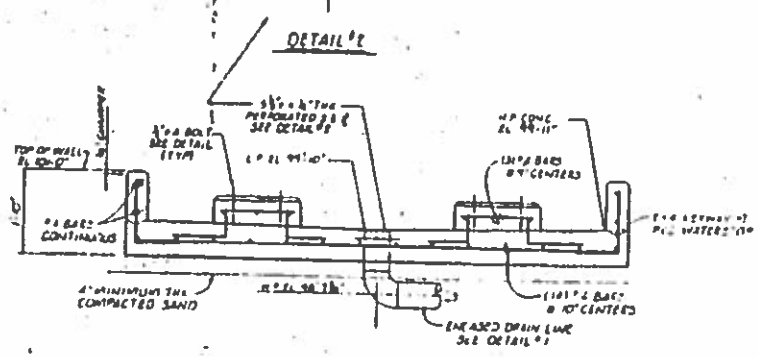
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DESIGNED					
CHECKED					
APPROVED					



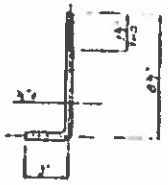
ENLARGED PLAN



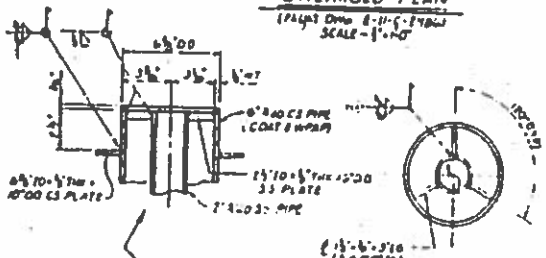
DETAIL "E"



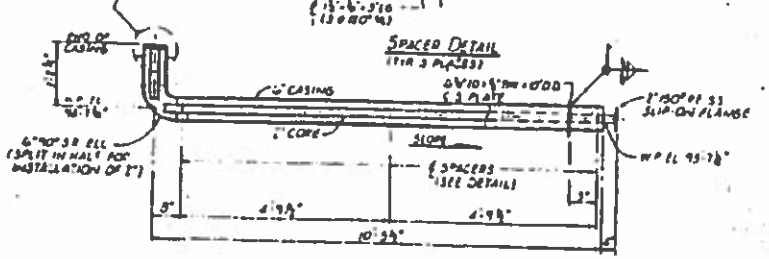
SECTION "A-A"



ANCHOR BOLT DETAIL

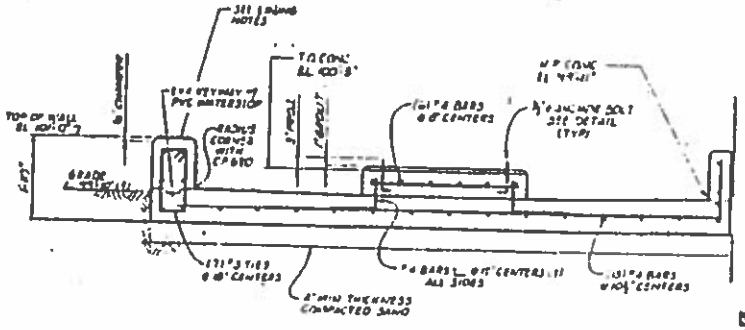


SPACER DETAIL



DETAIL "I"

SECONDARY CONTAINMENT DRAIN LINE



SECTION "B-B"

ISSUED FOR COMMENTS

Drawing Not Been Reviewed
Seals Not Applicable

GENERAL NOTES

1. All concrete construction shall be in accordance with "ACI Control Company Engineering Standard 300, Plain and Reinforced Concrete."
2. All concrete shall be 3000 PSI compressive strength in 28 days, unless otherwise specified.
3. All reinforcing bars shall be ASTM A615, Grade 60, unless otherwise specified.
4. For general concrete construction and testing data requirements see "ACI Control Company Spec No. 300."
5. Provide the following concrete protective coverings for main reinforcing, unless otherwise specified:
   a. 3" for all concrete placed directly against the ground.
   b. 1" for all formed concrete exposed to weather or in contact with the ground.
6. All options for re-starting bars shall be 24 bar dia., unless otherwise specified. All welded wire fabric shall be lapped at least 6" and securely tied.
7. All exposed edges of concrete shall be chamfered ¾", unless otherwise specified.

INTERIOR LINING NOTES

(1) THE INTERIOR SIDE WALL & FLOOR "C" SERIES
(2) [illegible] FACTORY APPLIED EPOXY TOPCOAT AS
BY [illegible] CO. AND [illegible]
AFTER CONCRETE CURES AND [illegible]
— W 150 W/W2
— W 200 W/W2
— W 200 BARE CONCRETE W/W2
— [illegible] BARE CONCRETE W/W2
— 25 555 FT (OVALL) FOR COAT
(3) AREA TO BE COATED SHALL BE [illegible]
(4) ALL AREA JOINTS TO BE SEALED WITH [illegible]
WATER CO. - CA 600 FLEXIBLE EPOXY SEALANT

1-1-1984	FOUNDATION LOCATION PLAN					
2-8-1984	ROOF STEEL PLAN & SECTIONS					
DWG NO	REFERENCE DRAWINGS	NO	DATE	REFERENCES		

Lyondell Petrochemical Company

PLAN SECTIONS & DETAILS
SAMPLE WASTE CONTAINMENT
SOUTH OF LABORATORY

Secondary Containment Volume Calculations

SECONDARY CONTAINMENT CALCULATION

TANK NO. 1101 A & B
Design Capacity: 195 gals each

I. Gross Containment Volume

Area A

L_A = Length = 10' 4 1/2" = 10.375 ft

W_A = Width = 9' 6" = 9.5 ft

H_A = Height = 1' 1" = 1.08 ft

V_{gA} = Gross Containment Volume for Area A = $L_A \times W_A \times H_A$

V_{gA} = 10.375' x 9.5' x 1.08' = 106.4 cuft

Area B

L_B = Length = 7' 7" = 7.58 ft

W_B = Width = 2' 7 1/2" = 2.625 ft

H_B = Height = 5 1/2" = 0.46 ft

V_{gB} = Gross Containment Volume for Area B = $L_B \times W_B \times H_B$

V_{gB} = 7.58' x 2.625' x 0.46' = 9.15 cuft

V_{gT} = Total Gross Containment

V_{gT} = $V_{gA} + V_{gB}$ = 106.4 + 9.15 = 115.55 cuft

II. Foundation Volume

Basis: 2 rectangular pads 3' 10" x 2' x 13"

V_F = Volume of Foundation = 2 (3' 10" x 2' x 13") = 16.6 cuft

III. Net Containment Volume

V_N = Net Containment Volume

V_N = $V_{gT} - V_F$ = 98.95 cuft @ 7.48 gal/cuft = 740 gallons

HASCO

IV. Rainfall Event Volume

The area is roofed and protected on one side with a wall. Assume 10% containment of 25 year 24 hour rainfall event of 10 inches due wind blown rain, i.e. 1 inch

A_C = Containment Area

$A_C = L_A \times W_A + L_B \times W_B = 10.375 \times 9.5 + 7.58 \times 2.625 = 118.46$ sqft

V_e = Event Volume $= (1/12) \times A_C \times 7.48$ gal/cuft $= 73.8$ gallons

V. Total Required Containment Volume

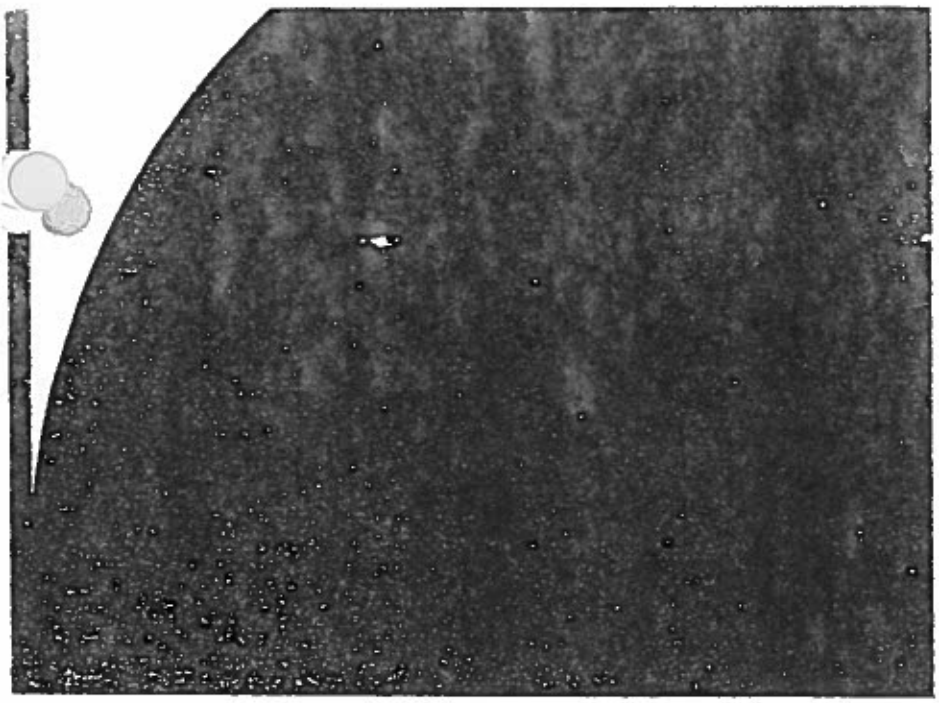
V_{TR} = Total Required Containment Volume

$V_{TR} = V_e$ + Tank Design Capacity $= 73.8$ gal + 195 gal $= 268.8$ gallons

VI. Comparison of Actual vs. Required Volume

Percent of Required $= V_N / V_{TR} \times 100 = 275$ percent

HASCO



OP-II Flex Unit
D-4383

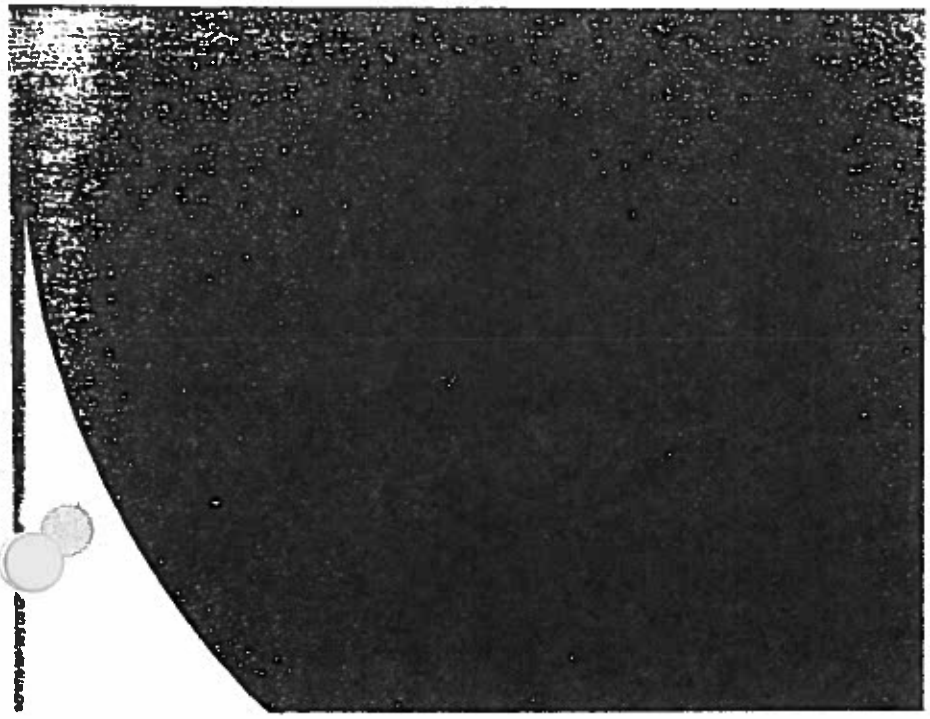
40 CFR 264/265.191
Hazardous Waste Assessment Report

LYONDELL PETROCHEMICAL

Channelview, Texas

THE HENDRIX GROUP, INC.

METALLURGICAL ENGINEERING
CORROSION INVESTIGATIONS
FAILURE ANALYSIS
TESTING



December 1993

THE HENDRIX GROUP, INC
METALLURGICAL ENGINEERING • CORROSION INVESTIGATIONS • FAILURE ANALYSIS • TESTING

December 23, 1993

Lyondell Petrochemical Co.
P.O. Box 777
Channelview, TX 77530

Attention: Mr. Ira Guilliams,

Subject: Hazardous Waste Storage Tank System Assessment
Drum D-4383
Lyondell Petrochemical Co.
Channelview, Texas

Dear Sirs:

The Hendrix Group is pleased to submit this report of an assessment of hazardous waste storage drum system D-4383 located at the Lyondell Petrochemical Company in Channelview, TX. The guidelines contained in 40 CFR Subsection 264/265.191, Assessment of Existing Tank system's Integrity were followed in conducting the assessment. The purpose of the assessment was to visually observe the drum for damage, modifications, and/or leaks, to ascertain that the previously reviewed drum contents had not changed, and to review thickness measurements taken by others to verify the ability of the drum to contain the stored waste, based on internal pressures. The present work involved a re-assessment of the drum system for 1993, as required until such time as secondary containment is provided.

Sincerely,

David E. Hendrix, P.E.
President

DEH/eh

15823 North Barkers Landing • Houston, Texas 77079 • (713) 556-8774

LYONDELL PETROCHEMICAL CO.
CHANNELVIEW, TEXAS

D-4383

HAZARDOUS WASTE STORAGE TANK ASSESSMENT REPORT

for:

Mr. Ira Guilliams

Lyondell Petrochemical Co.
P.O. Box 777
Channelview, TX 77530

The Hendrix Group Report No. H9342

by:

The Hendrix Group, Inc.
15823 N. Barkers Landing
Houston, TX 77079
(713) 556-8774

December 23, 1993

Table of Contents

1	Main Report
2	Checklists
3	Photographs
4	Thickness Measurements
5	Data Sheets

Lyondell Petrochemical Co.
Channelview, Texas

D-4383

40 CFR 264/265.191

Summary

An assessment of D-4383 has been performed to meet the requirements of 40 CFR 264/265.191 which require a yearly assessment of the integrity of hazardous waste storage tanks until secondary containment has been installed. This assessment is for the year 1993. The assessment results indicate that D-4383 is suitable for continued service with the presently contained waste. A certification statement is included in the report.

Project information

Drum D-4383, located at Lyondell Petrochemical Co.'s Channelview, TX facility, requires an assessment per 40 CFR subsection 264/265.191, Assessment of Existing Tank System's Integrity, until such time as secondary containment for the drum system is established. This assessment report is for the year 1993. D-4383 is an existing, above-ground, ASME Section VIII, div. 1 pressure vessel storing an aqueous waste caustic solution.

Scope of Services

The Hendrix Group was requested to provide the necessary engineering services to assess D-4383 and to provide a certification report attesting as to its suitability for storing the presently contained hazardous waste, if appropriate. The requirements of 40 CFR, subsection 264/265.191, Assessment of Existing Tank System's Integrity were followed in conducting the assessment.

Our assessment included the following:

(1) Perform visual observations of the exterior of D-4383.

(2) Review thickness measurements of the drum, shell, and heads taken by others and compare the measurements with those from previous years and original design minimums to verify that the drum has not experienced significant deterioration from internal corrosion and that the wall thickness still meets minimum design conditions.

(3) Review the present operating conditions, maintenance history, and waste composition of the drum to verify the effect of any changes since the last assessment on the integrity of the drum.

(4) Review documentation as to the test/maintenance history of the drum pressure safety valve.

An internal visual inspection of the drum was not performed based on it being an above-ground vessel with 100% access to the vessel exterior. Also, a review of the drum waste-stream piping was not within the scope of the project.

System Description

D-4383, Waste Caustic/Rag layer Storage Drum, is an above-ground, ASME Section VIII, div. 1 pressure vessel, built in 1984 and commissioned in 1985. It is a horizontal vessel, 10' in diameter by 19' 8" in length, supported by concrete foundations and "saddles" with the shell plates and 2:1 ellipsoidal heads fabricated from SA-516 Gr. 70 carbon steel. D-4383 was stress-relieved at the time of construction, based on the intended service of elevated-temperature dilute, aqueous caustic. The vessel shell and head design included a 1/8" corrosion allowance. The drum is rated for 103 psig maximum allowable working pressure and 2.5 psi vacuum. Vessel over-pressure protection is provided by a J.E. Lonergan 2" x 3" pressure safety valve set at 100 psig. The drum stores various waste streams on a batch basis originating from the OP-II "Flex" Unit.

Considerations of Assessment

Re-Assessment Considerations

The present assessment was conducted to meet the 40 CFR 264/265.191 requirements for an annual assessment of hazardous waste storage tank systems until such time as secondary containment is provided for. As such, a re-review of certain elements required in an initial existing tank assessment was not conducted, such as the drum original design standards. Details of those assessment considerations are in previous assessment reports. Only those items considered relevant to verifying that D-4383 is still adequate for continued operation were reviewed. Checklists used in performing the tank system review are detailed in Section 2 of the report. Where appropriate, the visual observations and analysis of the thickness data followed the guidelines of the American Petroleum Institute, "Guide For Inspection of Refinery Equipment", API-510, Maintenance Inspection, Rating, Repair, and Alteration, API-653, Tank Inspection, Repair, Alteration, and Reconstruction, and ASME Section VIII, div. 1.

Design Standards

Drum 4383 was built to ASME Section VIII, div. 1 code. This is considered to be an appropriate design standard for this storage drum.

Hazardous Characteristics of The Waste

The stored waste is a low-concentration aqueous caustic stream originating from the PO-II Flex Unit. It is primarily alkaline water. Its primary hazardous

characteristics are reactivity and corrosivity. A complete listing of the chemical elements is contained in the Part B application and in previous certification reports.

Existing Corrosion Protection Measures

Drum 4383 is a horizontal, above-ground drum that sits on two concrete saddles. The drum exterior is protected with a protective paint system. The internal waste is essentially non-corrosive.

Age of the Tank

Drum 4383 is 9 years old, being built in 1984 and placed in service in 1985. This age determination is based on tank nameplate and vendor drawing information. Based on the documented age of the tank system, the tank system requires secondary containment by the year 2000.

Observations and Discussion

Visual Observations

On November 24, 1993, this writer visited Lyondell Petrochemical Co.'s Channelview, TX facility to conduct visual observations of D-4383. Visual observation results are summarized in Section 2. Photographs of the drum showing its existing condition are shown in Section 3.

Visual observation did not reveal any indications of mechanical damage, denting, bulging, or sucked in areas. Neither were any weld repairs or added nozzles observed. The paint was in good condition and visual observation of the vessel and a walk through of the welded lines did not reveal any areas of leaking. All vessel supports and foundations were in good condition with no corrosion deterioration or concrete cracking, spalling or weather-related attack observed. The Lonergan pressure relief valve (PSV 43100), Model DB-10-J was in good visual condition.

Wall Thickness Measurements

Wall-thickness measurements were taken by a third party at locations specified by The Hendrix Group. Measurements were taken on the drum shell, the two heads, and the nozzles. Table 1 in Section 4 summarizes the results of thickness measurements taken yearly since 1988 as compared to design requirements. All shell, head and nozzle thicknesses met or exceeded minimum design requirements and no obvious gradual reduction in thickness from corrosion was observed.

D-4383 Data Sheets

A drum data sheet (Section 5) details the present operating and process conditions for the drum, and also attests that it has not been weld-repaired since the

last assessment. The present operating/process conditions do not violate any of the design, venting capacities, or waste compatibility assumptions previously made.

Section 5 also contains a specification sheet and a test report for the D-4383 pressure relief valve, attesting to its correct operation and set points. The test report indicated that it had been last inspected and repaired on December 17, 1992.

Assessment Conclusions

Based on the external visual observations and the results of the wall-thickness survey performed, the available information provided by Lyondell Petrochemical Co., and our experience with similar projects, it is the opinion of The Hendrix Group that D-4383 is structurally fit for the present service, is currently not leaking, and is compatible with the presently stored waste.

Prepared By: DE Hendrix Date: 2-25-93

David E. Hendrix, P.E.
President

CERTIFICATION STATEMENT

DRUM D-4383
LYONDELL PETROCHEMICAL CO.
CHANNELVIEW, TX

December 23, 1993

Based on the visual survey and thickness measurement results, information provided by Lyondell Petrochemical Co. concerning the drum system contents and operating conditions, and our experience with similar projects, it is the opinion of The Hendrix Group that Drum D-4383 is structurally fit for service at the present location, it is compatible with the currently stored hazardous waste under normal operating conditions, and was not leaking at the time of the inspection.

I certify under penalty of law that I have personally examined and am familiar with the information contained in this document and all related attachments, and that, based on my observations and my inquiry of those individuals responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

The Hendrix Group, Inc.
David E. Hendrix, P.E.
President

Date: 12 23 93

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT EXISTING TANK SYSTEM CHECKLIST	Rev. No. 0 Date: 10/16/92 Page: 1 of 1

Checklist Title: 40 CFR 264/265 Requirements Checklist		**Project No:** H5J2
Client: Ashland Petroleum LLC		**Location:** Catlettsburg, KY
Tank System I.D.: D-435	**Equipment No.** D-435	**Date:** 12-03-93

	Attribute	Reference	Reviewed by	ACC /REJ
1.	Appropriate design standards	40 CFR 264/265.191 (1)	DEH	ACC
2.	Hazardous characteristics of waste(s)	40 CFR 264/265.191 (2)	DEH	ACC
3.	Corrosion protection measures	40 CFR 264/265.191 (3)	DEH	ACC
4.	Age of tank system	40 CFR 264/265.191 (4)	DEH	ACC
5.	Leak detection/integrity examination (2)	40 CFR 264/265.192 (5ii)	DEH	ACC

Remarks:

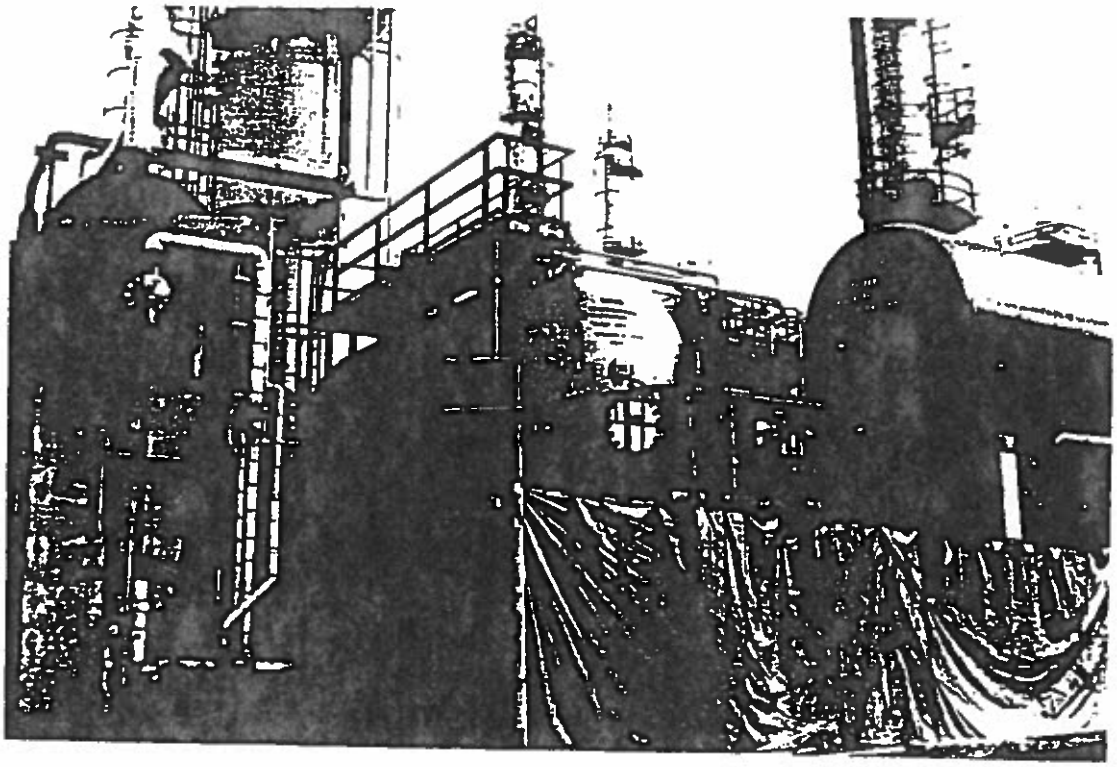
(2) Leak detection covered by visual inspection of the dome once every 25 tank movements

THE HENDRIX GROUP	HAZARDOUS WASTE TANK SYSTEM ASSESSMENT EXISTING TANK SYSTEM CHECKLIST	Rev. No. 1 Date: 12/23/93 Page: 1 of

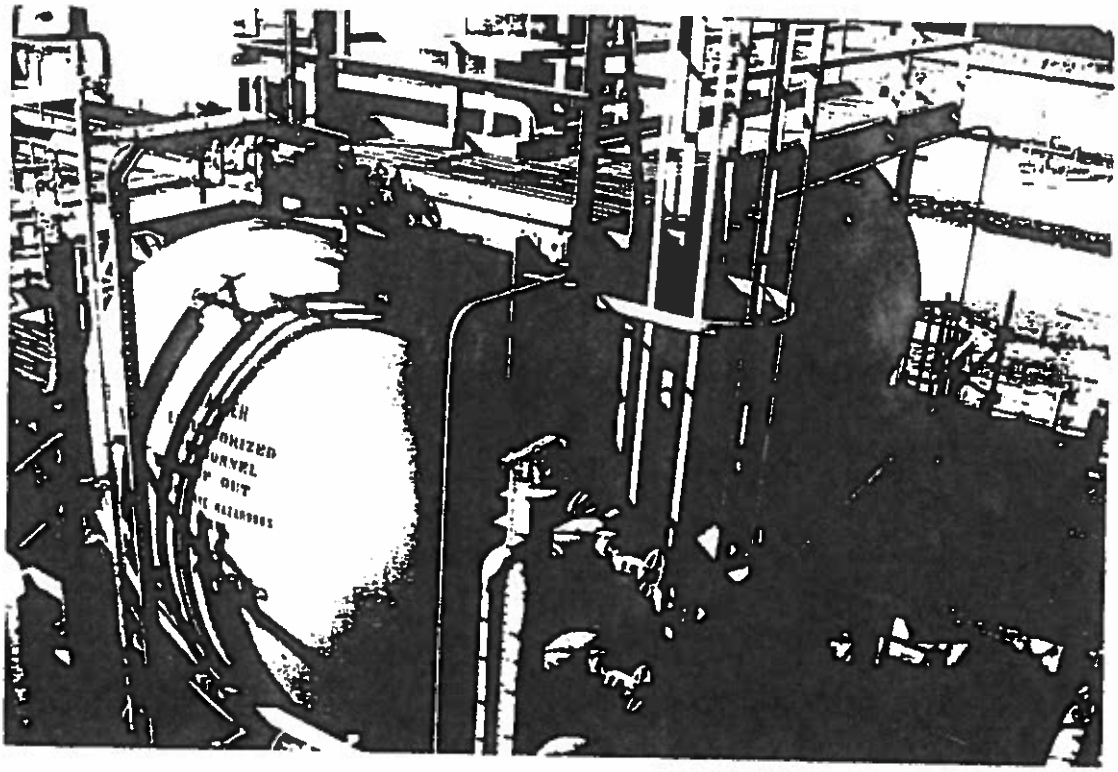
Checklist Title: Inspection Checklist- Pressure Vessel		**Project No:** 4542
Client: Lyondell Petrochemical Co.		**Location:** Channelview, Tx
Tank System ID: D 735	**Equipment No:** D-735	**Date:** 12/23/93

	Attribute	Reference	Reviewed by	ACC/ REJ
1.	Verify vessel head/shell thickness	ASME Section VIII, U-1A Report	DEH	ACC
2.	Observe vessel for mechanical, corrosion damage	NBIC, API-510, API-653	DEH	ACC
3.	Observe foundation/supports for damage, deterioration	NBIC, API-510, API-653	DEH	ACC
4.	Verify condition of ancilliary equipment	NBIC, API-510, API-653	DEH	ACC
5.	Confirm PSV repair/test dates, mech. condition	Test Report	DEH	ACC
6.	Observe for piping overstress, vessel settling		DEH	ACC
7.	Verify exterior corrosion protection condition		DEH	ACC
8.	Verify thermal expansion capabilities (1)		DEH	ACC
9.	Observe for leaks		DEH	ACC

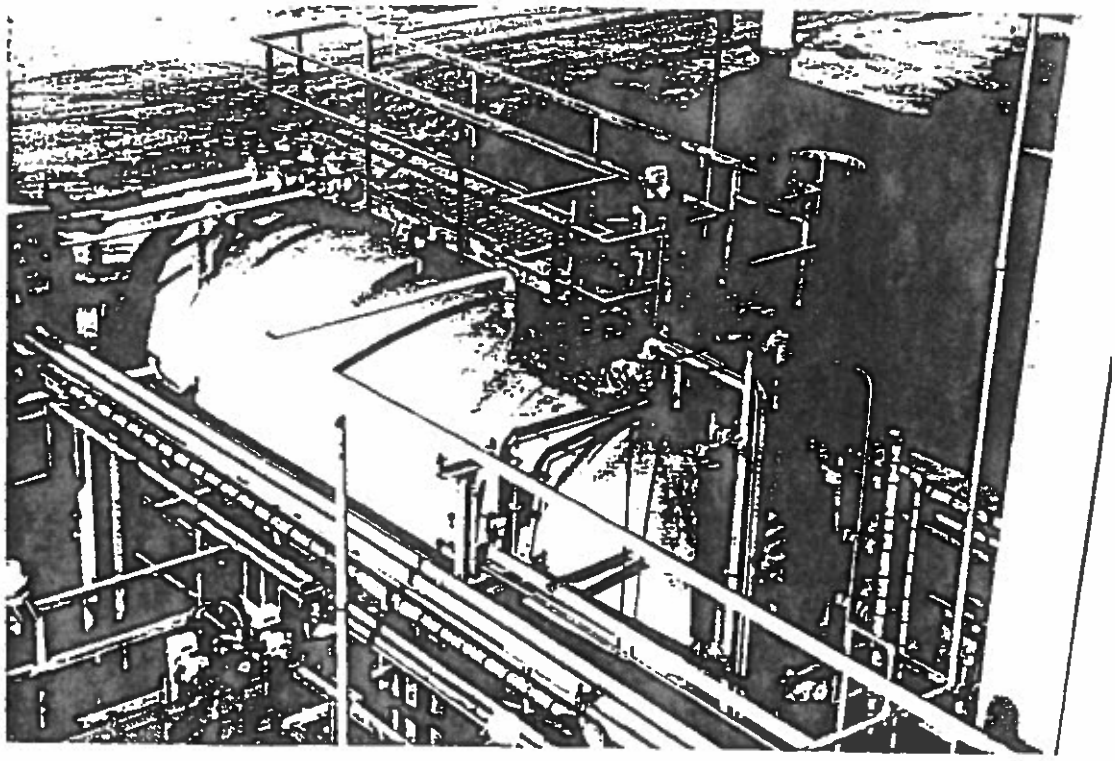
Remarks: (1) Provided by 3" wear plate and elevated S.H. Lines at one end of the drum.



Photograph 1- D-4383 looking from the West.



Photograph 2- D-4383 looking from the East.



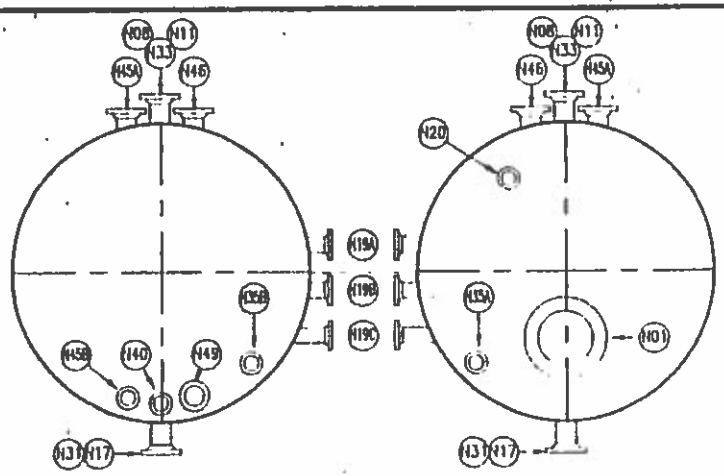
Photograph 3- D-4383 looking from above.

TABLE I

D-4383 WALL THICKNESS MEASUREMENTS

DATE	SHELL (in.) av./min.	E. HEAD (in.) av./min.	W. HEAD (in.) av./min.
As-built (1985)	0.563/0.438*	0.688/0.563*	0.688/0.563*
1988	0.608/0.590	0.700/0.660	0.712/0.650
1989	0.620/0.598	0.732/0.699	0.740/0.708
1990	0.607/0.573	0.728/0.720	0.722/0.710
1992	0.594/0.580	0.742/0.740	0.747/0.740
1993	0.591/0.570	0.732/0.655	0.721/0.661

* Nominal wall thickness minus 1/8" corrosion allowance



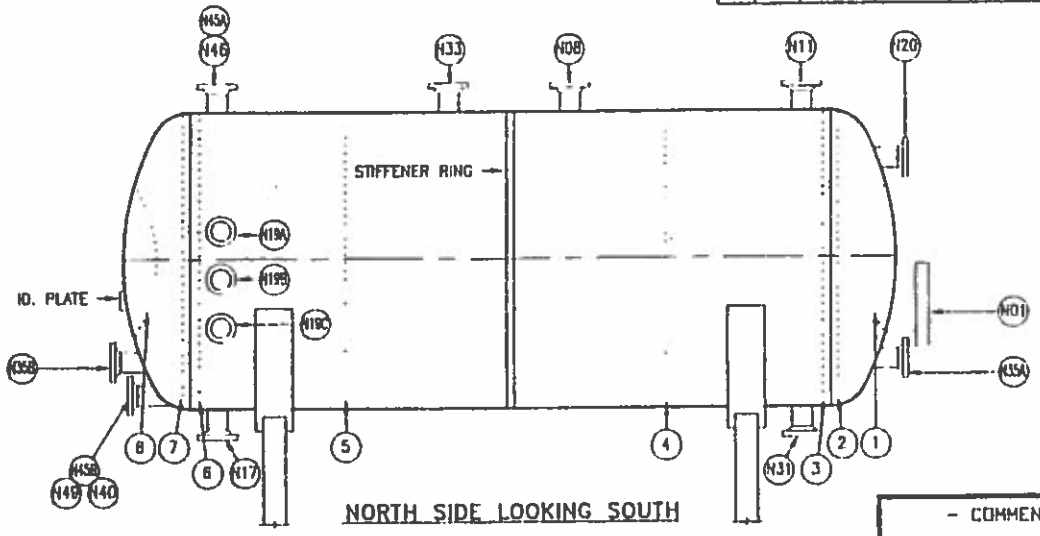
EAST END LOOKING WEST

WEST END LOOKING EAST

		UT LOCATION											
		1	2	3	4	5	6	7	8	N01	N08	N11	N17
REFER POINT	size	BAND	BAND	BAND	BAND	BAND	BAND	BAND	BAND	24"	3"	3"	6"
	A	.670	.765	.590	.600	.593	.560	.741	.673	.520	.649	.470	.450
	B		.745	.598	.599	.595	.580	.784		.527			
	C	.655	.733	.585	.595	.593	.570	.751	.668	.517	.652	.458	.442
	D		.794	.589	.595	.600	.583	.770		.515			
	E	N/A	.726	.590	.594	.592	.598	.727	.661	.512	.649	.450	.420
	F		.782	.580	.598	.615	.578	.745		.506			
	G	.660	.779	.578	.612	.605	.576	.740	.664	.515	.625	.480	.442
	H		.770	.585	.620	.610	.575	.750		.525			

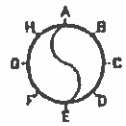
		N19A	N19B	N19C	N20	N31	N33	N35A	N35B	N40	N45A	N45B	N46
REFER POINT	size	3"	3"	3"	3"	6"	3"	3"	3"	3"	3"	3"	2"
	A	.473	.485	.474	.460	.585	.473	.650	.637	.638	.630	.645	.600
	B												
	C	.479	.463	.460	.500	.570	.455	.640	.660	.637	.620	.651	.591
	D												
	E	.450	.460	.470	.445	.585	.467	.648	.652	.635	.617	.640	.595
	F												
	G	.450	.450	.468	.464	.570	.460	.650	.644	.640	.625	.638	.602
	H												

		N49			
REFER POINT	size	2"			
	A	.575			
	B				
	C	.580			
	D				
	E	.575			
	F				
	G	.574			
	H				



NORTH SIDE LOOKING SOUTH

CIRCUMFERENTIAL UT READING LOCATIONS:



PRIORITIES USED TO ESTABLISH UT READING POSITIONS ON VESSEL:
1) ALL READINGS ARE IN INCHES
2) AT "A" — TOP or NORTH
3) AT "C" — NORTH or EAST

MQS Inspection, Inc.
HOUSTON, TEXAS

– COMMENTS –

Lyondell PETROCHEMICAL COMPANY
CHANNELVIEW, TX

OP–II FLEX
DRUM D–4383
INSPECTION LOCATIONS

SCALE: NONE
DR BY: GEP
DATED: 11/93

DWG. No. D–4383

Date: 11-22-1993 Time: 12:40 PM By: GEP Plot Scale: Fit

8280 Sheldon Road
Post Office Box 777
Channelview, Texas 77530
Telephone 713 452 8888

Lyondell Petrochemical Company

November 4, 1993

The Hendrix Group, Inc.
15823 N. Barkers Landing
Houston, Texas 77079

Re: Drum D-4383 Hazardous Waste Assessment

Dear Eddie Hendrix,

Enclosed is the data sheet certifying no changes have been made in the configuration or operation of D-4383. Also, included is the overhaul test sheet and spec sheet for the relief vale.

Respectfully,

Ira Guilliams, Sr. Mech. Inspector
Engineering Services

Lyondell Petrochemical Company

Drum D-4383 Data Sheet

We, the below signed, being both knowledgeable and responsible representatives of Lyondell Petrochemical Company, do attest that the following data and statements for D-4383, OP-II Waste Caustic/Rag Layer Storage Drum, are accurate.

1. M.A.W.P. is: **103 psi @ 160°F.**

2. Maximum drum contents specific gravity is: **1.13.**

3. Maximum operating temperature is: **260/265°F.**

4. Maximum design product height is: **10 feet.** And, the maximum indicated (external sight glass) product height is: **8'-9".**

5. The drum contents have not substantially changed since the last certification.

6. No welded repairs have been performed to the drum since the last certification.

7. Set point for PSV-43100 is: **100 psi @ 338°F.** The PSV was overhauled: **12/17/92.** The next scheduled overhaul due date is: **12/17/96.**

Signature: Jim Seals (for Bw.)

Title: SUPERINTENDENT 11/3/93

Signature: [signature] 11/3/93

Title: Sr. Mech Inspector

PWI

CUSTOMER Lyondell Petro DATE 12-14-92

P.O. NO. L57443 REL NO. 1214M REQN. NO.

TAG NO. PSV-43100 LOCATION PVI NO. 09-3644

VALVE DATA

SIZE 2x3 MODEL DB 10 J MANUFACTURER LONERGAN

TYPE: CONVENTIONAL — (BELLOWS) LL BOILER — PILOT OPR. —

SET PRESSURE 100 PSI, B/P 5 PSI, NET SET 100 PSI, COLD SET 100

TEMP. 338° F, SERVICE STM, CAPACITY 8024 PPH, LIFT — B/D —

SERIAL NO. 8405005-60-1, INLET FLANGE RATING 150 RF, SPRING NO. NA

CAPACITY VERIFIED BY: TM SPRING NO. VERIFIED BY: TM

WORK REQUIRED

PRETEST ____ TEST ONLY ____ TEST & RESET ____ (OVERHAUL) ____

INITIAL POP ____ PSI, LEAKED AT ____ PSI, COMMENTS: ____

RESET: ____ PSI, B/P ____ PSI, NET SET ____ PSI, COLD SET ____ PSI

INLET:	OUTLET:	SEATS:	GUIDE:	SPRINGS:
✓ DIRTY	✓ DIRTY	✓ FOULED	FOULED	CORRODED
PLUGGED	PLUGGED	CUT	GALLED	ERODED
FLANGE PITTED	FLANGE PITTED	ERODED	CORRODED	✓ GOOD CON
GOOD CONDITION	GOOD CONDITION	CORRODED	✓ GOOD CONDITION	REPLACE
		GOOD CONDITION	REPLACE	
		REPLACE		NEW SPRING NO.

SPECIAL REPAIRS

(DESCRIPTION) RANGE ____ TO ____ PSI

WELDING: ____

MECHANICAL: ____

FINAL TEST REPORT

SET 100 PSI, B/P 5 PSI, NET SET 100 PSI, COLD SET 100 PSI GAUGE # 1413

NOZZLE SETTING -7, GUIDE RING SETTING — FINAL CAP 8024 PPH

BACK PRESSURE TEST 50 PSI, BUBBLE TIGHT AT 90 % 90 PSI

TESTED BY: Dan Lewis, SEAL NO. 3348, DATE 12-17-92

PROCEDURE NO. ____, V-R STAMP APPLIED? YES ✓ NO ____

TAGGING VERIFIED BY ____ ASME SEC. VIII ✓, SEC. I ____

ON-LINE IDENTIFIER NO. 09-3644 ✓

DESIGN ASSESSMENT OF ANCILLARY EQUIPMENT AND SECONDARY CONTAINMENT FOR TANK D-4383

EQUISTAR CHEMICALS, L.P.
CHANNELVIEW PLANT

8280 SHELDON ROAD
CHANNELVIEW, TEXAS 77530

Hazardous Waste Permit No. **HW-50117**
EPA ID Number **TXD058275769**
TCEQ Solid Waste Registration Number **30030**

May 1, 2009

Prepared by: H.A. Clark, Inc.
2500 Wilcrest Drive, Suite 300
Houston, Texas 77042
(713) 365-9540

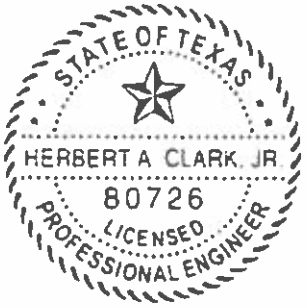
CERTIFICATION

Professional Engineer's Certification

I have reviewed that attached design drawings and performed a design assessment of the ancillary equipment and secondary containment for Tank D-4383 required by 40 CFR 264.192(a). I attest that the ancillary equipment and secondary containment have sufficient structural integrity and are acceptable for the storage and treatment of hazardous waste. I have inspected the facilities and based on those components observable with a visual inspection, the facilities appear to have been built according to the referenced drawings. This certification applies to the following attached drawing numbers:

E-43-M-010 E-43-M-031 E-43-M-034 B-44-S-005 E-43-C-086

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Herbert A. Clark, Jr., P.E.
Texas License Number 80726

5/1/09
Date

TABLE OF CONTENTS

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CERTIFICATION 1

1.0 INTRODUCTION AND BACKGROUND 1

2.0 ANCILLARY EQUIPMENT DESIGN ASSESSMENT 2

2.1 Design Standard 2

2.2 Hazardous Characteristics of the Waste 3

2.3 Corrosion Protection 3

2.4 Secondary Containment 3

2.5 New Tank System Component Installation 4

3.0 CONCLUSIONS 6

LIST OF ATTACHMENTS

Attachment A — Piping and Instrumentation Diagrams and Ancillary Equipment Design Information

Attachment B — Secondary Containment Design Information

1.0 INTRODUCTION AND BACKGROUND

The purpose of this report is to document the design of the secondary containment for Tank D-4383 at the Equistar Chemicals, L.P. (Equistar) facility in Channelview, Texas. This tank is listed as Unit Number 047 on Texas Commission on Environmental Quality (TCEQ) Notice of Registration (NOR) Number 30030. The tank is operated as a permitted hazardous waste storage tank. The tank and piping manage waste caustic from the OP-II Flex unit. The tank was constructed in 1984 to American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section VIII, Division 1. The tank receives low-concentration liquid caustic waste from the Flex Unit Spent Caustic Flash Drum (D-4335). In 1999, a concrete secondary containment area was constructed for the tank as required by 40 CFR 264.193. A hazardous waste assessment of the tank was performed in December 1993 by The Hendrix Group, Inc. and was included as part of the renewal application for TCEQ Permit No. HW-50117. However, at that time, the secondary containment structure had not been constructed and the associated tank piping was not included as part of the assessment.

When the tank was modified to add secondary containment, containment was not added to the attached piping. Rather, the ancillary equipment associated with Tank D-4383 is inspected daily for leaks. Therefore, the piping itself is exempt from the secondary containment requirement. However, the valves will be replaced with sealless valves and the pumps with magnetically driven, sealless pumps in order to comply with 40 CFR 264.193(f).

2.0 ANCILLARY EQUIPMENT DESIGN ASSESSMENT

2.1 Design Standard

The piping attached to Tank D-4383 is Class 150 and Class 300 carbon steel meeting the requirements of ASME B31.3, Process Piping and ASME B16.5, Pipe Flanges and Flanged Fittings.

Existing valves between Tank D-4383 and the truck loading area will be replaced with either Bellows-seal valves or live-loaded valves as part of this permit modification. Valves less than 2½ inches in diameter will be replaced with Bellows-seal gate valves. Valves with a diameter of 2½ inches and above will be replaced with valves equipped with live-loaded packing sets.

Bellows valves will be constructed of Inconel 625. Inconel is a nickel-chromium-molybdenum alloy in accordance with ASTM B446. Inconel is appropriate for this service due to its corrosion and oxidation resistance.

Pumps P-4382 will be replaced with magnetically driven sealless pumps are designed according to American National Standards Institute (ANSI) B73.3, Specification for Sealless Horizontal End Suction Metallic Centrifugal Pumps for Chemical Process. Filter SP-4395 will be replaced with two new filters, SP-4395A and SP-4395B. The new filters are designed according to ASME Boiler and Pressure Vessel Code Section VIII, Division 1.

Piping and instrumentation diagrams (P&IDs) for the tank piping are included as Attachment A.

2.2 Hazardous Characteristics of the Waste

The waste managed in the Tank D-4383 piping is a low-concentration aqueous caustic stream. Some naphtha hydrocarbons are included in the stream as a rag layer. The hazardous characteristics of the waste are ignitability, reactivity, corrosivity and toxicity (for benzene).

2.3 Corrosion Protection

The piping, valves, pumps and filter housing will not be in contact with soil and are not anticipated to be in continous contact with water. Experience with the materials of construction at this facility indicates that internal corrosion from the caustic waste is not an issue. The exterior of the piping will be protected from corrosion by an epoxy coating or paint.

2.4 Secondary Containment

The reinforced concrete secondary containment area is constructed to American Concrete Institute (ACI) 318, Building Code Requirements for Structural Concrete. Polyvinyl chloride (PVC) waterstops were used at all concrete joints. The containment area is coated with a polyamine epoxy coating. The coating is resistant to organic and inorganic acids, caustics and most solvents. Therefore, the coating is compatible with and impermeable to the material stored in Tank D-4383. A Material Safety Data Sheet (MSDS) for the coating is in Attachment B.

The nominal capacity of Tank D-4383 is 12,000 gallons. Based upon a 25-year, 24-hour rainfall of 9.8 inches (from Technical Paper No. 40, "Rainfall Frequency Atlas of the United States for Durations from 30 minutes to 24 hours and Return Periods from 1 to 100 years", United States Weather Service, 1961), approximately 3,900 gallons of containment capacity is required to account for precipitation. Therefore, a total containment capacity of 15,900 gallons is required to comply with 40 CFR 264.193(e)(1). The capacity of the secondary containment area is approximately

17,421 gallons, which is sufficient to contain the contents of the tank plus a 25-year, 24-hour rainfall event.

The floor of the secondary containment structure slopes toward a concrete sump to facilitate removal by vacuum truck. The sump is equipped with a gate valve to facilitate removal of stormwater. The gate valve remains closed and is car-sealed to prevent the valve from being inadvertently opened. Any releases of hazardous waste will be evident by visual inspection. The containment area is inspected daily in order to determine if there are waste materials, stormwater or other liquid in the containment area and verify that the gate valve remains closed unless an authorized discharge is taking place. Any liquids accumulated within the secondary containment system will be removed within 24 hours.

2.5 New Tank System Component Installation

New tank system components associated with Tank D-4383 will be properly handled according to facility procedures to prevent damage during installation. Prior to placing the Tank D-4383 new tank system components in use, a qualified Professional Engineer, trained and experienced in the proper installation of tanks system components, will inspect the system for the presence of any of the following items:

- Weld breaks;
- Punctures;
- Scrapes of protective coatings;
- Cracks;
- Corrosion;
- Other structural damage or inadequate construction/installation.

All discrepancies will be remedied before the Tank D-4383 new tank system components are placed in use.

No new tank system components associated with Tank D-4383 will be placed underground. Therefore, the requirement that they be provided with a backfill material that is a noncorrosive, porous, homogeneous substance and that is installed so that the backfill is placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported is not applicable.

The Tank D-4383 new tank system components will be tested for tightness prior to being placed in use. If a new tank system component is found not to be tight, all repairs necessary to remedy the leak(s) will be performed prior to the new tank system component being placed into use.

The Tank D-4383 new tank system components will be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction. The new tank system components will be installed using ANSI Standard B31.3, "Petroleum Refinery Piping," as a guideline for proper installation.

3.0 CONCLUSIONS

Based upon the assessment of the design of the ancillary equipment and secondary containment structure for Tank D-4383 and the proposed modifications, the ancillary equipment and secondary containment structure appear to be adequately designed, have sufficient structural strength and are compatible with the hazardous waste to be managed in the equipment so that leakage, collapse or rupture should not occur under normal operating conditions.

The proposed sealless valves and magnetically driven, sealless pumps are adequate to meet the requirements of 40 CFR 40 CFR 264.193(f)(3) and the secondary containment structure meets the applicable requirements of 40 CFR 264.193.

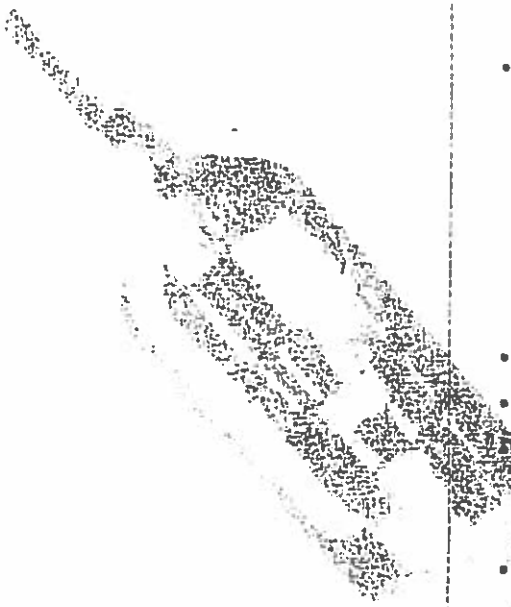
ATTACHMENT A

PIPING AND INSTRUMENTATION DIAGRAMS

AND

ANCILLARY EQUIPMENT DESIGN INFORMATION

BELLOWS SEAL DESIGN FEATURES



- Wall Thickness and General Design :
  API 602 for forged gate valves
  ASME B16.34/BS 5352 for forged globe valves
  API 600 for cast valves
- Bellows Inspection and Test : MSS SP-117
- Cycle Life upto and including class 800 Forged Valves
  : as per BS 5352
  Min. 10,000 Cycles for Globe Valves
  Min. 2,000 Cycles for Gate Valves
- Cycle Life for class 1500 Forged Valves
  & all classes Cast Valves
  : as per MSS SP-117

Size(inch)	upto and including class 600		above class 900	
	Gate Valve	Globe Valve	Gate Valve	Globe Valve
≤ 2	2,000	5,000	2,000	2,000
2-1/2 ~ 4	2,000	5,000	1,000	2,000
> 4	1,000	2,000	1,000	1,000

- Cycle Life Test is performed under the max. pressure condition.
- Non-Rotating stem prevents torsion of bellows.
- Two Secondary Stem Seals :
  Stem backseat and stem packing ensure the perfect sealing when a bellows is damaged.
- Long Life Seating Surface :
  Stellite 6 faced both seat and wedge/disc to prevent seizing and galling.
- End Flange Dimension : ASME B16.5
- Butt Weld End Dimension : ASME B16.25
- Face to Face & End to End : ASME B16.10
- Helium Leak Test is performed for each bellows assembly using an Helium detector with sensitivity of 10 cc/sec.
- Bellows Materials : 321SS, Inconel 625, Hastelloy, Monel etc
- Two or Three Section Assembly
- Multi-Ply Bellows : minimum two plies bellows
- Soft Seat Insert on Globe Disc :
  Soft seat also available for Gas or Vacuum Service
- Hammer Blow Handwheel for Globe Valve
  is used to give the higher closing force 3 ~ 10 times the closing force of standard handwheel and it is the most mechanism

SWI FIGURE NUMBER SYSTEM

GATE GLOBE CHECK VALVES

CODE TABLE B C E F G H I J

SAMPLE VALVE CODE AA-H-24-AN-CA-GA-2-GA

GATE 1500 316L 316 STELLITE TRIM SOCKET WELD BOLTED BONNET FULL PORT GRAPHOIL PACKING AND GASKET

B VALVE TYPE

AA	GATE
AB	GLOBE
AC	LIFT CHECK
AD	SWING CHECK
AE	BALL CHECK
AF	NEEDLE GLOBE
AG	ANGLE GLOBE
AH	STOP CHECK GLOBE
AJ	LIFT CHECK (SPRING LOADED)
AK	BALL CHECK (SPRING LOADED)
AL	BOILER BLOWDOWN
BA	BELLOWS GATE (321 BELLOWS)
BB	BELLOWS GLOBE (321 BELLOWS)
BC	BELLOWS GATE (316 BELLOWS)
BD	BELLOWS GLOBE (316 BELLOWS)
BE	BELLOWS GATE (HAST-C BELLOWS)
BF	BELLOWS GLOBE (HAST-C BELLOWS)
BG	BELLOWS GATE (INCONEL 625 BELLOWS)
BH	BELLOWS GLOBE (INCONEL 625 BELLOWS)
CG	TILTING DISC CHECK
CH	ANGLE GLOBE STOP CHECK
DB	Y-GLOBE
DC	Y-LIFT CHECK
DD	Y-NEEDLE
DE	Y-BALL CHECK
DF	Y-GLOBE STOP CHECK
ZZ	SPECIAL

C CLASS

A	125
B	150
C	200
D	300
E	600
F	800
G	900
H	1500
J	2500
K	4500
L	1000
M	2500
Z	SPECIAL

E SHELL MATERIAL

A	A105, WCB
B	LF2, LC2
C	LF3, LC3
D	F5, C5
E	F9, C12
F	F11, WC6
G	F22, WC9
H	F304, CF8
J	F304L, CF3
K	F304H,
L	F316, CF8M
M	F316L, CF3M
N	F316H,
P	F321
R	F321H
S	F347, CF8C
T	F91
U	F53
V	F51, C12A
W	MONEL
X	INCOLOY 800
Y	INCOLOY 800H
Z	INCOLOY 800HT
1	HASTELLOY-B
2	HASTELLOY-C
3	ALLOY-20
4	TITANIUM
5	F317, CG8M
6	F317L, CG3M
7	LCC
99	SPECIAL

F TRIM MATERIAL

	STEM	WEDGE/DISC	SEAT
AA	CR13	CR13	CR13
AB	CR13	CR13	STELLITE 6
AC	CR12	CR13+ST 6	STELLITE 6
AD	304	304/CF8	STELLITE 6
AE	304	304/CF8+ST 6	STELLITE 6
AF	316	316/CF8M	316/CF8M
AG	316	316/CF8M	STELLITE 6
AH	316	316/CF8M+ST 6	STELLITE 6
AJ	321	321+ST 6	STELLITE 6
AK	347	347+STELLITE 6	STELLITE 6
AL	DUPLEX	DUPLEX+ST 6	STELLITE 6
BB	F91	F91+ST 6	STELLITE 6
BC	MONEL	MONEL	MONEL
BD	MONEL	MONEL	STELLITE 6
BE	INCOLOY	INCOLOY	INCOLOY
BF	HASTELLOY-B	HASTELLOY-B	HASTELLOY-B
BG	HASTELLOY-C	HASTELLOY-C	HASTELLOY-C
BH	ALLOY 20	ALLOY 20	ALLOY 20
BJ	TITANIUM	TITANIUM	TITANIUM
BK	CR13 (1)	CR13	STELLITE 6
BL	CR13 (1)	CR13+ST 6	STELLITE 6
BM	316 (1)	316/CF8M+ST 6	STELLITE 6
BY	MONEL (1)	MONEL	MONEL
BZ	MONEL (1)	MONEL	STELLITE 6
ZC	SAME AS BODY	SAME AS BODY	SAME AS BODY (INTEGRAL)
ZZ	SPECIAL		

(1) Trims for NACE service. With grade M bolting, RC22 Hardness

G END CONNECTION

A	SOCKET WELD (ASME)
B	BW (SPECIFY BORE)
C	NIPPLE
D	EXTENDED BODY BSW x FNPT
E	EXTENDED BODY BSW x FSW
F	SW x NIPPLE (STUB END)
G	NPT x NIPPLE (STUB END)
L	EXTENDED BODY MNPT x FNPT
M	EXTENDED BODY MNPT x FSW
N	FNPT
P	PT
Q	FLAT FACE
R	RAISED FACE
S	SOCKET WELD x FNPT
T	RING TYPE JOINT
V	SW (JIS)
W	SW (JIS) x PT
ZZ	SPECIAL

H BONNET STYLE

A	OS&Y BOLTED BONNET
B	OS&Y WELDED BONNET
C	OS&Y SEAL WELDED BONNET
D	OS&Y PRESSURE SEAL BONNET
R	NO BONNET JOINT
S	EXTENDED BOLTED BONNET
T	EXTENDED WELDED BONNET
U	CRYOGENIC BOLTED BONNET
W	CRYOGENIC WELDED BONNET
Z	SPECIAL

I BORE TYPE

R	REDUCED BORE
F	FULL BORE
Z	SPECIAL

J

GASKET	PACKING
304 SPIRAL WOUND+GRAPHITE	GRAPHOIL
304L SPIRAL WOUND+GRAPHITE	GRAPHOIL
316 SPIRAL WOUND+GRAPHITE	GRAPHOIL
316L SPIRAL WOUND+GRAPHITE	GRAPHOIL
MONEL SPIRAL WOUND+GRAPHITE	GRAPHOIL
A20 SPIRAL WOUND+GRAPHITE	GRAPHOIL
304 SPIRAL WOUND+TEFLON	TEFLON
304L SPIRAL WOUND+TEFLON	TEFLON
316 SPIRAL WOUND+TEFLON	TEFLON
316L SPIRAL WOUND+TEFLON	TEFLON
MONEL SPIRAL WOUND+TEFLON	TEFLON
A20 SPIRAL WOUND+TEFLON	TEFLON
304 SPIRAL WOUND+TEFLON	BRAIDED TEFLON
304L SPIRAL WOUND+TEFLON	BRAIDED TEFLON
316 SPIRAL WOUND+TEFLON	BRAIDED TEFLON
316L SPIRAL WOUND+TEFLON	BRAIDED TEFLON
MONEL SPIRAL WOUND+TEFLON	BRAIDED TEFLON
A20 SPIRAL WOUND+TEFLON	BRAIDED TEFLON
SPECIAL	SPECIAL

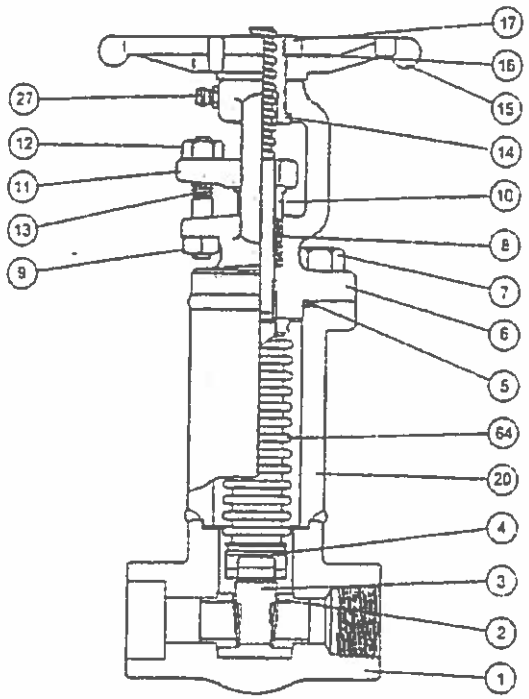
UNLESS SPECIFIED CODE "A" IS SUPPLIED AS STANDARD

/2001

Revision 3 5/27/2015

SWI FORGED STEEL BELLOWS SEAL GATE VALVE

API 602 / ASME B16.34 – BOLTED / WELDED BONNET – REDUCED / FULL PORT



No.	Parts	Material	A.S.T.M
1	Body	Forged Steel	A105N
2	Seat Ring	Stellite 6 faced A276–316	
3	Wedge	Stellite 6 faced A351–CF8M	
4	Stem	Stainless Steel	A276–316
5	Gasket	304 Spiral Wound Graphite	
6	Bonnet	Forged Steel	A105N
7	Bonnet Bolt	Alloy Steel	A193–B7M
8	Gland Packing	Graphoil	
10	Gland	Stainless Steel	A276–316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194–2H
13	Gland Bolt	Stainless Steel	A193–B6
14	Yoke Sleeve	13Cr Stainless Steel	A582–416
15	Handwheel	Malleable Iron	A47
16	Name Plate	Aluminum	
17	Handwheel Nut	Carbon Steel	A563A
20	Connector	Forged Steel	A105N
27	Grease Nipple	Cr Plated Carbon Steel	
64	Bellows	321 Stainless Steel or Inconel 625	

CLASS 600 / 800

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	End to End	Center to Top (Open)	Dia. of Port Openings	Approx. Wt Kg(Lb)
Reduced	1/2	86 (3.39)	76 (2.99)	210 (8.27)	9.8 (0.39)	2.4 (5.3)
	3/4	86 (3.39)	86 (3.39)	227 (8.94)	13.0 (0.51)	3.1 (6.8)
	1	99 (3.90)	102 (4.02)	306 (12.05)	18.0 (0.71)	4.0 (8.8)
	11/4	124 (4.88)	117 (4.61)	400 (15.75)	31.0 (1.22)	8.1 (17.9)
	11/2	124 (4.88)	117 (4.61)	400 (15.75)	31.0 (1.22)	8.1 (17.9)
	2	138 (5.43)	133 (5.24)	500 (19.69)	37.0 (1.46)	12.9 (28.5)
Full	1/2	86 (3.39)	86 (3.39)	227 (8.94)	13.0 (0.51)	3.1 (6.8)
	3/4	99 (3.90)	102 (4.02)	306 (12.05)	18.0 (0.71)	4.0 (8.8)
	1	124 (4.88)	117 (4.61)	400 (15.75)	23.0 (0.91)	8.1 (17.9)
	11/4	138 (5.43)	133 (5.24)	500 (19.69)	37.0 (1.46)	12.9 (28.5)
	11/2	138 (5.43)	133 (5.24)	500 (19.69)	37.0 (1.46)	12.9 (28.5)
	2	157 (6.18)	218 (8.58)	610 (24.02)	50.8 (2.00)	18.5 (40.8)

CLASS 1500

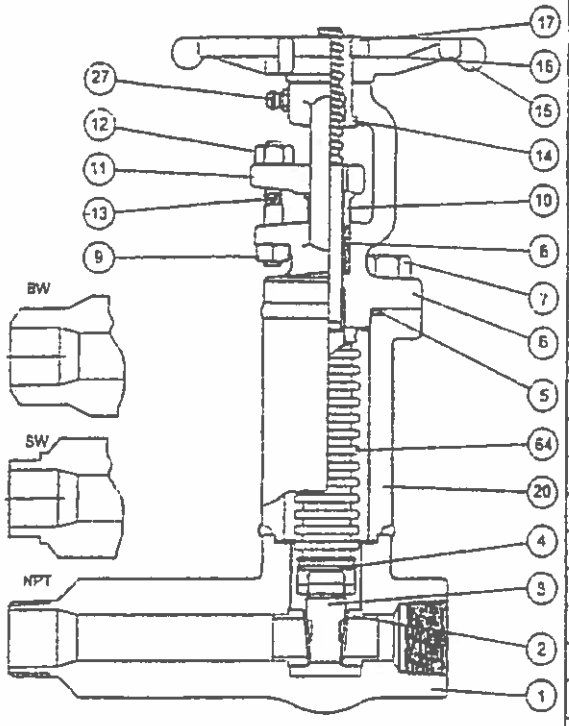
Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	End to End	Center to Top (Open)	Dia. of Port Openings	Approx. Wt Kg(Lb)
Reduced	1/2	157 (6.16)	86 (3.39)	316 (12.44)	9.8 (0.39)	4.0 (8.8)
	3/4	157 (6.18)	102 (4.02)	348 (13.70)	13.0 (0.51)	5.5 (12.1)
	1	157 (6.18)	117 (4.61)	410 (16.14)	16.0 (0.71)	9.0 (19.9)
	11/4	200 (7.87)	133 (5.24)	550 (21.65)	31.0 (1.22)	16.0 (35.3)
	11/2	200 (7.87)	133 (5.24)	550 (21.65)	31.0 (1.22)	16.0 (35.3)
	2	230 (9.06)	210 (8.27)	620 (24.41)	37.0 (1.46)	20.0 (44.1)

Revision 3 5/27/2015

SWI FORGED STEEL BELLOWS SEAL GATE VALVE

API 602 / ASME B16.34 – BOLTED / WELDED BONNET – REDUCED PORT



No.	Parts	Material	A.S.T.M
1	Body	Forged Steel	A105N
2	Seat Ring	Stellite 6 faced A276-316	
3	Wedge	Stellite 6 faced A351-CF8M	
4	Stem	Stainless Steel	A276-316
5	Gasket	304 Spiral Wound Graphite	
6	Bonnet	Forged Steel	A105N
7	Bonnet Bolt	Alloy Steel	A193-B7M
8	Gland Packing	Grapholl	
10	Gland	Stainless Steel	A276-316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Gland Bolt	Stainless Steel	A193-B6
14	Yoke Sleeve	13Cr Stainless Steel	A582-416
15	Handwheel	Malleable Iron	A47
16	Name Plate	Aluminum	
17	Handwheel Nut	Carbon Steel	A563A
20	Connector	Forged Steel	A105N
27	Grease Nipple	Cr Plated Carbon Steel	
64	Bellows	321 Stainless Steel or Inconel 625	

CLASS 800

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	End to End	Center to Male End	Center to Top (Open)	Dia. of Port Openings	Approx. Wt Kg(Lb)
Reduced	1/2	86 (3.39)	142 (5.59)	104 (4.10)	210 (8.27)	9.8 (0.39)	2.5 (5.5)
	3/4	86 (3.39)	157 (6.18)	114 (4.49)	227 (8.94)	13.0 (0.51)	4.8 (10.6)
	1	99 (3.90)	165 (6.50)	114 (4.49)	306 (12.05)	18.0 (0.71)	8.8 (19.4)
	11/2	124 (4.88)	193 (7.60)	135 (5.32)	400 (15.75)	31.0 (1.22)	11.8 (26.0)
	2	138 (5.43)	212 (8.35)	146 (5.75)	500 (19.69)	37.0 (1.46)	15.0 (33.1)

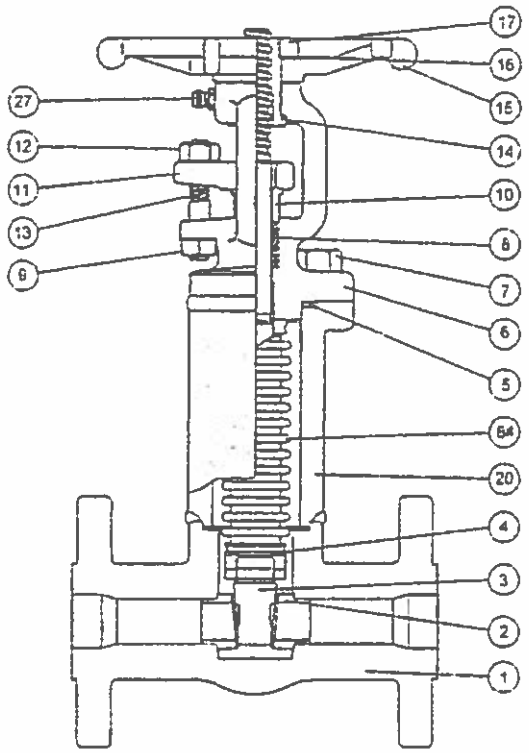
CLASS 1500

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	End to End	Center to Male End	Center to Top (Open)	Dia. of Port Openings	Approx. Wt Kg(Lb)
Reduced	1/2	157 (6.18)	157 (6.18)	114 (4.49)	316 (12.44)	9.8 (0.39)	4.8 (10.6)
	3/4	157 (6.18)	165 (6.50)	114 (4.49)	348 (13.70)	13.0 (0.51)	8.2 (18.1)
	1	157 (6.18)	193 (7.60)	135 (5.32)	410 (16.14)	18.0 (0.71)	11.2 (24.7)
	11/2	200 (7.87)	212 (8.35)	146 (5.75)	550 (21.65)	31.0 (1.22)	15.0 (33.1)

SWI FORGED STEEL BELLOWS SEAL GATE VALVE

API 602 / ASME B16.34 – BOLTED / WELDED BONNET – REDUCED PORT



No.	Parts	Material	A.S.T.M
1	Body	Forged Steel	A105N
2	Seat Ring	Stellite 6 faced A276-316	
3	Wedge	Stellite 6 faced A351-CF8M	
4	Stem	Stainless Steel	A276-316
5	Gasket	304 Spiral Wound Graphite	
6	Bonnet	Forged Steel	A105N
7	Bonnet Bolt	Alloy Steel	A193-B7M
8	Gland Packing	Graphoil	
10	Gland	Stainless Steel	A276-316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Gland Bolt	Stainless Steel	A193-B6
14	Yoke Sleeve	13Cr Stainless Steel	A582-416
15	Handwheel	Malleable Iron	A47
16	Name Plate	Aluminum	
17	Handwheel Nut	Carbon Steel	A563A
20	Connector	Forged Steel	A105N
27	Grease Nipple	Cr Plated Carbon Steel	
64	Bellows	321 Stainless Steel or Inconel 625	

CLASS 150 – 300 – 600

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	Center to Top (Open)	Dia. of Port Openings	Face to Face			Approx. Wt , Kg(Lb)		
					Class 150	Class 300	Class 600	Class 150	Class 300	Class 600
Reduced	1/2	86 (3.39)	210 (8.27)	9.8 (0.39)	108 (4.25)	140 (5.50)	165 (6.50)	3.4 (7.5)	3.9 (8.6)	4.2 (9.3)
	3/4	86 (3.39)	227 (8.94)	13.0 (0.51)	117 (4.62)	152 (6.00)	190 (7.50)	4.2 (9.3)	5.1 (11.3)	5.7 (12.6)
	1	99 (3.90)	306 (12.05)	18.0 (0.71)	127 (5.00)	165 (6.50)	216 (8.50)	5.9 (13.0)	7.2 (15.9)	7.8 (17.2)
	11/2	124 (4.88)	400 (15.75)	31.0 (1.22)	165 (6.50)	190 (7.50)	241 (9.50)	11.6 (25.6)	13.9 (30.7)	15.1 (33.3)
	2	138 (5.43)	500 (19.69)	37.0 (1.46)	178 (7.00)	216 (8.50)	292 (11.50)	16.9 (37.3)	18.7 (41.2)	20.5 (45.2)

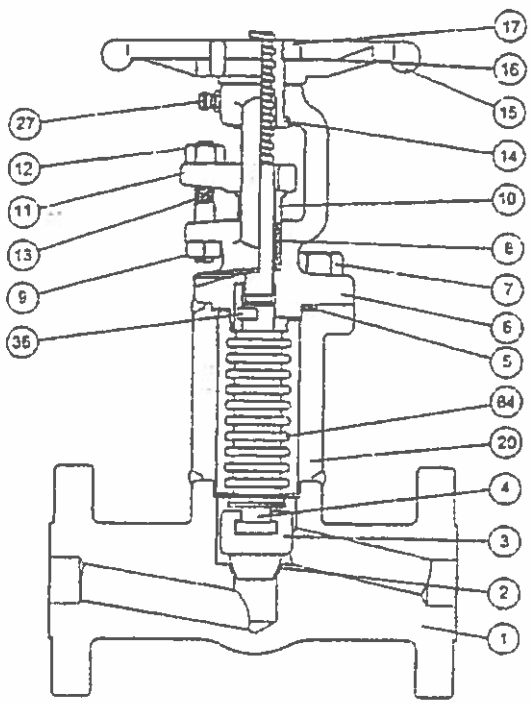
CLASS 1500

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	Center to Top (Open)	Dia. of Port Openings	Face to Face	Approx. Wt , Kg(Lb)
Reduced	1/2	157 (6.18)	316 (12.44)	9.8 (0.39)	216 (8.50)	8.5 (18.7)
	3/4	157 (6.18)	348 (13.70)	13.0 (0.51)	229 (9.00)	11.1 (24.5)
	1	157 (6.18)	410 (16.14)	18.0 (0.71)	254 (10.00)	17.0 (37.5)
	11/2	200 (7.87)	550 (21.65)	31.0 (1.22)	305 (12.00)	29.7 (65.5)
	2	200 (7.87)	620 (24.41)	37.0 (1.46)	368 (14.25)	41.5 (91.5)

SWI FORGED STEEL BELLOWS SEAL GLOBE VALVE

ASME B16.34 / BS 5352 – BOLTED / WELDED BONNET – REDUCED PORT



No.	Parts	Material	A.S.T.M
1	Body	Forged Steel	A105N
2	Seat	Integral Hardfaced Stellite 6	
3	Disc	Stellite 6 faced A351–CF8M	
4	Stem	Stainless Steel	A276–316
5	Gasket	304 Spiral Wound Graphite	
6	Bonnet	Forged Steel	A105N
7	Bonnet Bolt	Alloy Steel	A193–B7M
8	Gland Packing	Graphoil	
10	Gland	Stainless Steel	A276–316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194–2H
13	Gland Bolt	Stainless Steel	A193–B6
14	Yoke Sleeve	13Cr Stainless Steel	A582–416
15	Handwheel	Malleable Iron	A47
16	Name Plate	Aluminum	
17	Handwheel Nut	Carbon Steel	A563A
20	Connector	Forged Steel	A105N
27	Grease Nipple	Cr Plated Carbon Steel	
36	Guide Pin	13Cr Stainless Steel	A276–410
64	Bellows	321 Stainless Steel or Inconel 625	

CLASS 150 – 300 – 600

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	Center to Top (Open)	Dia. of Port Openings	Face to Face			Approx. Wt. Kg(Lb)		
					Class 150	Class 300	Class 600	Class 150	Class 300	Class 600
Reduced	1/2	86 (3.39)	202 (7.95)	9.5 (0.37)	108 (4.25)	152 (6.00)	165 (6.50)	2.8 (6.2)	3.3 (7.3)	3.6 (7.9)
	3/4	86 (3.39)	202 (7.95)	12.7 (0.50)	117 (4.62)	178 (7.00)	190 (7.50)	3.6 (7.9)	4.5 (9.9)	5.1 (11.2)
	1	99 (3.90)	233 (9.17)	17.5 (0.69)	127 (5.00)	203 (8.00)	216 (8.50)	5.4 (11.9)	6.7 (14.8)	7.3 (16.1)
	11/2	124 (4.88)	269 (10.59)	29.5 (1.16)	165 (6.50)	229 (9.00)	241 (9.50)	10.8 (23.8)	12.0 (26.5)	13.3 (29.3)
	2	138 (5.43)	351 (13.82)	35.0 (1.38)	203 (8.00)	267 (10.50)	292 (11.50)	15.9 (35.1)	17.4 (38.4)	18.3 (40.4)

CLASS 1500

Unit : mm(inch)

Port	Valve Size	Handwheel Diameter	Center to Top (Open)	Dia. of Port Openings	Face to Face	Approx. Wt. Kg(Lb)
Reduced	1/2	86 (3.39)	290 (11.42)	9.5 (0.37)	216 (8.50)	7.4 (16.3)
	3/4	99 (3.90)	290 (11.42)	12.7 (0.50)	229 (9.00)	10.8 (23.8)
	1	124 (4.88)	300 (11.81)	17.5 (0.69)	254 (10.00)	15.6 (34.4)
	11/2	136 (5.43)	332 (13.07)	29.5 (1.16)	305 (12.00)	27.4 (60.4)
	2	157 (6.18)	420 (16.54)	35.0 (1.38)	368 (14.25)	37.0 (81.6)

ISSUE FOR CONS JCTION 03-26-09

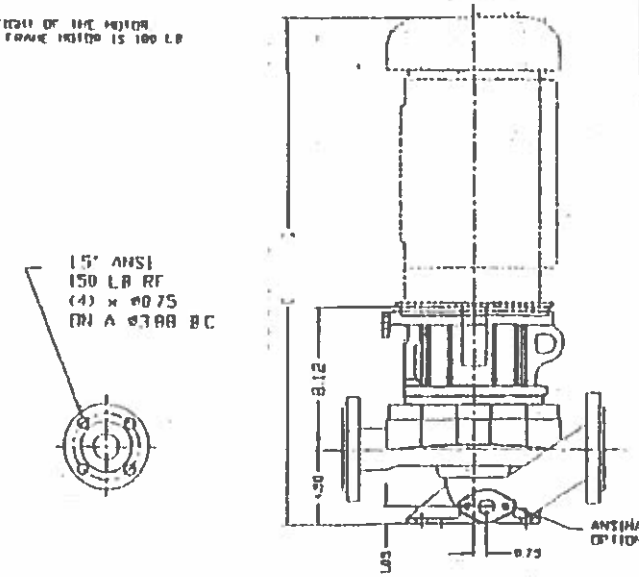
NOTES:

1. SHIPPING WEIGHT DOES NOT INCLUDE THE WEIGHT OF THE MOTOR.
2. APPROXIMATE WEIGHT OF THE 213/5TC NEMA FRAME MOTOR IS 100 LB

REVISIONS

REV	ECN #	DESCRIPTION	APPROVED	DATE
		INITIAL ISSUE		03/10/00

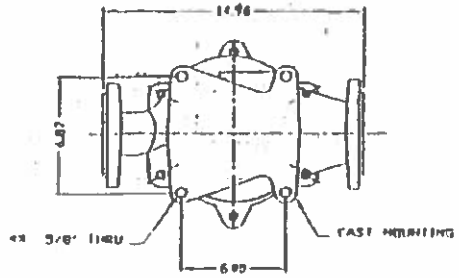
Flange to Flange & foot print appl.



1.5" ANSI 150 LB RF (4) x Ø0.75 ON A Ø3.88 BC

2" ANSI 150 LB RF (4) x Ø0.75 ON A Ø4.75 BC





MOTOR DIMENSIONS CERTIFIED BY: _____ DATE: _____

PUMP DIMENSIONS CERTIFIED BY: M. MARINOVA DATE: 09/10/00

APPROVALS:	DATE:
M.MARINOVA	09/10/00
D.CAMP	09/10/00
	09/10/00
	09/10/00

ANSIMAG INCORPORATED
BLOOMINGDALE, IL 60108 USA

KV+2156 ANSI-NEMA PUMP
213/5TC NEMA FRAME MOTORS

SIZE	TYPE	DWG NO	REV
	IP	IP1136	00

SCALE | DATE 09/10/00 | SHEET 1 OF 1

Revision 3 5/27/2015

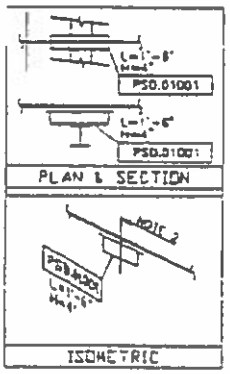
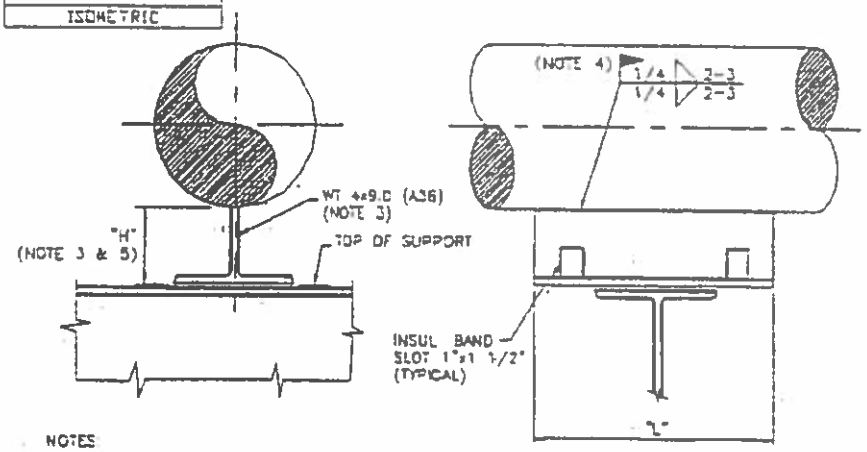


CHART 1

	"L"	AMOUNT OF LINE MOVEMENT
A	1'-6"	0" TO 5 15/16"
B	2'-0"	6" TO 8"



NOTES

1. "H" & "L" DIMENSION TO BE SPECIFIED ON PIPING DRAWING AND/OR ISOMETRIC. SEE CHART 1 FOR LENGTH BASED ON MOVEMENT ANCHOR REQUIREMENTS MAY AFFECT LENGTH ALSO.
2. LOCATE SHOE WITH A DIMENSION IF SHOE IS INSTALLED IN THE SHOP
3. FOR HEIGHT GREATER THAN 4" AND LESS THAN 7" CUT SHOE FROM WBx18 (A36)
4. ON STRESS RELIEVED LINES, SHOES SHALL BE WELDED TO PIPE BEFORE STRESS RELIEVING
5. THE SHOE HEIGHT IS TO BE 1" HIGHER THAN THE INSULATION THICKNESS OR 4" MIN. OTHER HEIGHT SHOES MAY BE USED FOR DE REQUIREMENTS AND SLOPING LINES.
6. PAINT TO MATCH THE SYSTEM SPECIFIED FOR THE MAIN LINE.
7. FOR GALVANIZED PIPE USE SHOE LYO.STD.0523.PSD.01003

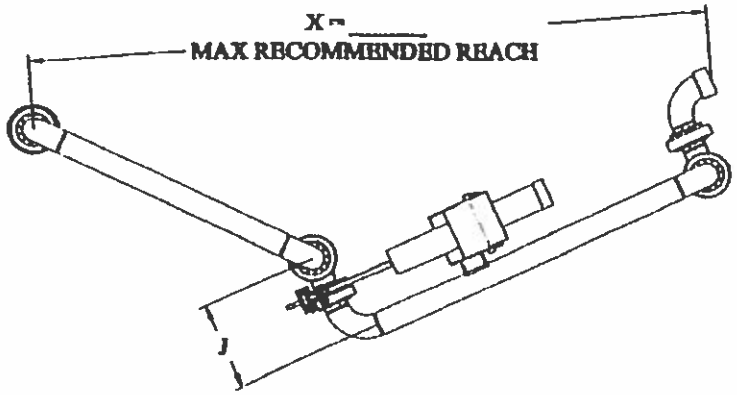
Lyondell Petrochemical Company

NO.	DATE	REVISIONS	DRN	DATE
4				
3			JMA	1/97
2			CHK	DATE
1			MAM	1/97
0	4/1/97	Issued For Design	APP	DATE
			CMP	4/97

PIPE SHOE FOR
3/4" THRU 12" C.S. PIPE

DRAWING NUMBER	REV
LYO.STD.0523.PSD.01001	0

E2033 WORLD SERIES BOTTOM TRANSFER LOADING ARM: UP FEED RIGHT HAND DOWN FEED
(STANDARD ARRANGEMENT FOR QUOTING PURPOSES ONLY)



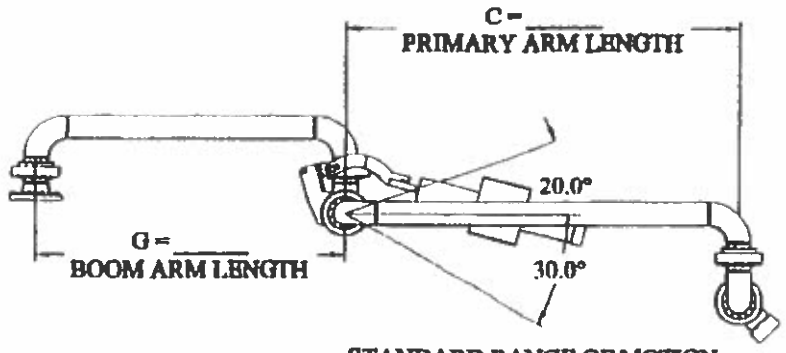
	APPROX. WEIGHT	TYPICAL "C"	TYPICAL "G"	"J"	REACH "X"
3"	280 lbs	60"	48"	13.1"	96"
4"	350 lbs	60"	60"	16.1"	108"
6"	410 lbs	60"	60"	24.5"	108"

Swivel Joints: All D2000 World Series
Balance Mechanism: Spring Cylinder

MATERIAL OPTIONS
- STAINLESS STEEL
- CARBON STEEL
- ALUMINUM

SEAL OPTIONS
- VITON
- BUNA
- PTFE

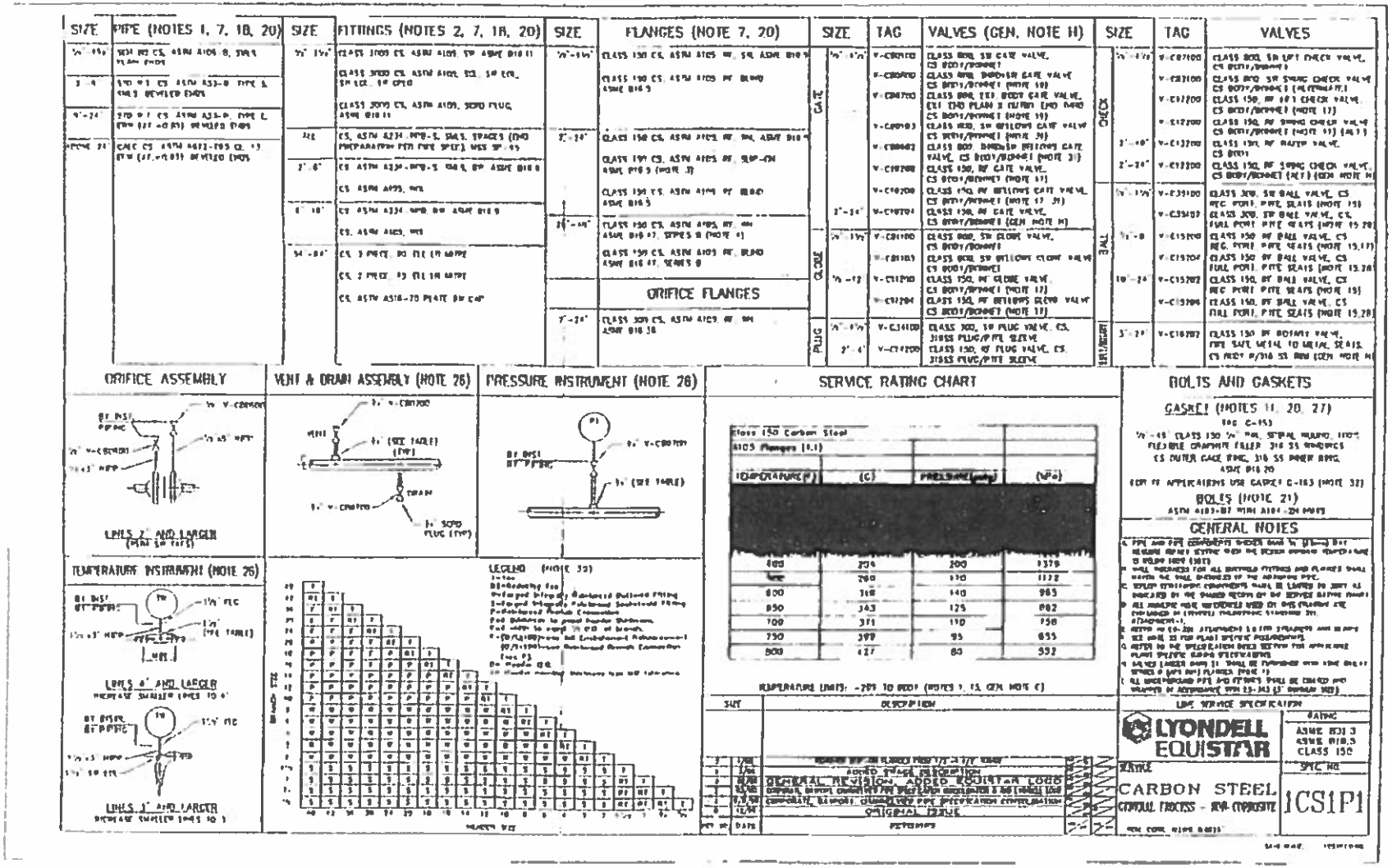
SWIVEL OPTIONS
- D2000
- D1070
- D2001
- D0116



STANDARD RANGE OF MOTION

EMCO WHEATON
A Gardner Denver Product

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Revision 3 5/27/2015

SIZE	PIPE (NOTE 7)
½"–1½"	SCH 80 CS, ASTM A106-B SMLS PLAIN ENDS
2"–12"	STD WT CS, ASTM A106-B, SMLS BEVELED ENDS
14"–20"	SCH 10 CS, ASTM A106-B SMLS BEVELED ENDS

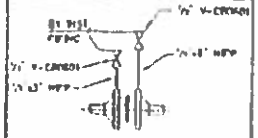
SIZE	FITTINGS (NOTES 2, 7)
½"–1½"	CLASS 3000 CS, ASTM A105, SW, ASME B16.11 CLASS 3000 CS, ASTM A105, SCL, SW END, SW STYLE CLASS 3000 CS, ASTM A105, W/NO FLUID, ASME B16.11
ALL	CS, ASTM A234-WPB-S SMLS, SWAGES W/NO PREPARATION PER PIPE SPEC'L, MSS SP-95
3"–24"	CS, ASTM A234-WPB-S SMLS, BW, ASME B16.9 CS, ASTM A105, WN

SIZE	FLANGES (NOTE 7)
½"–1½"	CLASS 300 CS, ASTM A105, RF, SW, ASME B16.5 CLASS 300 CS, ASTM A105, RF, BLIND, ASME B16.5
2"–24"	CLASS 300 CS, ASTM A105, RF, SW, ASME B16.5 CLASS 300 CS, ASTM A105, RF, BLIND, ASME B16.5
	ORIFICE FLANGES
2"–24"	CLASS 300 CS, ASTM A105, RF, WN, ASME B16.36

	SIZE	TAG	VALVES (NOTE 16)
GATE	½"–1½"	V-C00001	CLASS 800, SW GATE VALVE, CS BODY/BONNET
		V-C00001	CLASS 800, THREADED GATE VALVE, CS BODY/BONNET (NOTE 19)
		V-C30201	CLASS 300, RF GATE VALVE, CS BODY/BONNET (NOTE 17)
	2"–24"	V-C30205	CLASS 300, RF GATE VALVE, CS BODY/BONNET
GLOBE	½"–1½"	V-C01107	CLASS 800, SW GLOBE VALVE, CS BODY/BONNET
	½"–12"	V-C31201	CLASS 300, RF GLOBE VALVE, CS BODY/BONNET (NOTE 17)
CHECK	½"–1½"	V-C07105	CLASS 800, SW LIFT CHECK VALVE, CS BODY/BONNET
		V-C02101	CLASS 800, SW SWING CHECK VALVE, CS BODY/BONNET (ALTERNATE)
	½"–24"	V-C31201	CLASS 300, RF SWING CHECK VALVE, CS BODY/BONNET (NOTE 17)
	3"–24"	V-C31201	CLASS 300, RF WAFER CHECK VALVE, CS BODY (ALTERNATE)

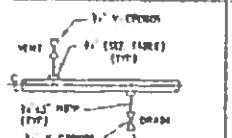
SIZE	TAG	VALVES
3"–24"	V-C30205	CLASS 300, RF BUTTERFLY VALVE, PIPE SAFE METAL TO METAL SEATS CS BODY AND BONNET TRIM

ORIFICE ASSEMBLY

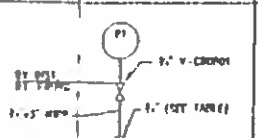


LINES 2" AND LARGER

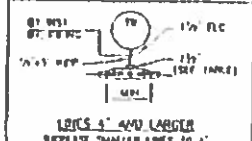
VENT & DRAIN ASSEMBLY (NOTE 28)



PRESSURE INSTRUMENT (NOTE 26)

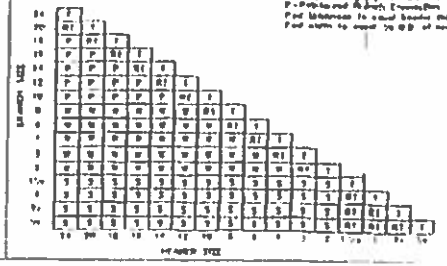


TEMPERATURE INSTRUMENT (NOTE 26)



LINES 4" AND LARGER

LINES 3" AND LARGER



SERVICE RATING CHART

Class 300 Carbon Steel			
A105 Flanges (1.1)			
TEMPERATURE(F)	(C)	PRESSURE(psig)	(kPa)
-20	-29	740	5103
100	38	740	5102
300	93	675	4654
330	110	669	4613

TEMPERATURE LIMITS, -20F TO AREA 'B' (GENERAL NOTE 4)

BOLTS AND GASKET

GASKET (NOTES 14, 27)

ASME B16.20
½"–24" CLASS 300 ½" THK SPIRAL WOUND, 304SS FLEXIBLE GRAPHITE FILLER, 316 SS WINDINGS, CS CENTER GUIDE RING 316 SS INNER RING, ASME B16.20

BOLTS (NOTE 21)

ASTM A193-B7 W/M A194-2H NUTS

GENERAL NOTES

SIZE	DESCRIPTION	DATE
3	ADDED SPARE DESCRIPTION	2/09
2	GENERAL REVISIONS PER DRAWING 1000	02/09
1	ORIGINAL REVISIONS	01/09
0	ISSUED FOR REVIEW (REVISED TO INCLUDE CONSIDERATIONS AS LISTED HERE	12/08
	CORPORATE TEMPLATE, CHANGED FROM PDF SPECIFICATION CONSIDERATION	11/08
	ORIGINAL ISSUE	10/08
NO. BY	REVISIONS	DATE

LYONDELL EQUISTAR

LINE SERVICE SPECIFICATION

RATING	ASME B31.3 ASME B16.5 CLASS 300
SERVICE	A106-B CARBON STEEL AREA 'A' CAUSTIC - STRESS RELIEVED
SPEC NO	3CB1C1

Revision 3 5/27/2015

REQUESTOR	Robby Talbert
COMPANY	CDI Corp
AFC / WO#	91514697
DATE	1/0/1900
PROJECT TITLE	FLEX D-4383 RCRA PROJECT

lyondellbasell

MISCELLANEOUS SPECIALTY ITEM NUMBER REQUEST FORM

MSP	AREA	TEMP NO.	PERM NO.	VENDOR	MODEL / PART NO.	DESCRIPTION	SIZE	ASSOCIATED LINE, EQUIPMENT No. or P&ID No.			REMARKS
								P&ID	LINE NO.	EQUIP NO.	
~~MSP~~	~~43~~	XX1	001	MGM	189	EXCESS FLOW VALVE	2"	E43M022	HL-48025	D-4801A	THIS IS AN EXAMPLE LINE
MSP	43	XX1	001	HATFIELD			3"	E-43-M-034	P-43256 SHT 4		
MSP	43	XX2	11	SUNBELT	V-C10208	BELLOWS GATE VALVES	2"	E-43-M-034			RCRA 2" 150#RF
MSP	43	XX3	12	SUNBELT	V-C10207	LIVE LOAD PACKED GATE VALVES	3"	E-43-M-034			RCRA 3" 150#RF
MSP	43	XX4	13	SUNBELT	V-C10207	LIVE LOAD PACKED GATE VALVES	4"	E-43-M-034			RCRA 4" 150#RF

Document Control Signature _____

FORM NO. CVO DC 1104-4

Note: A marked up P&ID must be included with this request (use temporary numbers: XX1, XX2, XX3, ec.) until final numbers are assigned by Document Control.
Caution: A completed copy of this form MUST be returned with your 'Issued For Records' (IFR), see CVC.DC.1109.

ISSUE FOR CONSTRUCTION 03-26-09

Revision 3 5/27/2015

ITEM NO.	D 4333	D 4335	P 4332A/B
TITLE	BUTENE/CAUSTIC SEPARATOR (V)	VENT CAUSTIC FLASH DRUM	CAUSTIC CIRCULATION PUMP (MOT. TE
DESCRIPTION	6'-4" I.D. 22'-4" T/T 150 PSIG FULL 150 PSIG V CAPACITY: WATER	4'-6" I.D. 21'-0" T/T 150 PSIG FULL 150 PSIG V CAPACITY: WATER	50 HP 3 PH 60 CYCLE 1 PH 460 V 1.1 SF

DWG. NO.	REFERENCE DRAWINGS
E-43-A-002	PIPING SYMBOLS, GEN. NOTES & KEY SHEET
E-43-A-001	EQUIPMENT SYMBOLS, SHT. 1 OF 2
E-43-A-001	EQUIPMENT SYMBOLS, SHT. 1 OF 2
E-43-A-003	INSTRUMENT SYMBOLS AND NOTES

NOTES:

1. LOCATE VALVE ABOVE THE FLARE HEADER.
2. "Y" STRAINER WITH 1/8" SCREEN.
3. PROVIDE 1"DIA. DRAIN HOLE AT LOW POINT OF THE BAFFLE.
4. DELETED.
5. SEE VENDOR DRAWINGS FOR DETAILS.
6. DELETED.
7. LOCATE CLOSE TO TC ON D-4335.
8. LOCATE SPEC 31B/H1A BREAK AFTER FIRST ELBOW FROM VESSEL D-4335.
9. LOCATE ONE (1) U AT EACH DRAIN-OFF NOZZLE STATION FOR D-4333, D-4335 & D-4334.
10. VALVES TO BE ACCESSIBLE FOR FREQUENT OPERATION. LOCATE AT CENTRAL LOCATION.
11. INSULATE WITH CELLULAR GLASS INSULATION.
12. DO NOT STEAM OUT D-4333
13. SWITCHES NOT CONNECTED

ISSUE FOR DEMO ONLY!

THIS IS A DUPLICATE DRAWING TO BE USED ON PROJECT 91314697 ONLY DO NOT REMOVE THIS NOTE

NO.	DATE	REVISIONS	BY	APP.
1	10/08/08	[illegible]	[illegible]	[illegible]
2	08/29/08	[illegible]	[illegible]	[illegible]
3	08-14-08	[illegible]	[illegible]	[illegible]
4	08/05/08	[illegible]	[illegible]	[illegible]
5	07-11-08	[illegible]	[illegible]	[illegible]
6	06-06-08	[illegible]	[illegible]	[illegible]
7	05-01-08	[illegible]	[illegible]	[illegible]
8	03-18-08	[illegible]	[illegible]	[illegible]
9	12-18-07	[illegible]	[illegible]	[illegible]
10	10-15-07	[illegible]	[illegible]	[illegible]
11	11/05	[illegible]	[illegible]	[illegible]

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LyondellBasell

LOCATION CHANNELVIEW ENGINEERING DEPARTMENT

PIPING AND INSTRUMENT DIAGRAM
BUTENE/CAUSTIC SEPERATION

DRAWN	CHECKED	DESIGN	DRAWING NUMBER	REV.
		NTS	E 43 M 010	X

CAD FILE: E-43M010 REV1.dwg

ISSUE FOR CONSTRUCTION 03-26-09

Revision 3 5/27/2015

ITEM NO.

TITLE

DESCRIPTION

D 4382

E 4382X

NOTES

1.

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DEMO ONLY!

D-4382

E-4382X

NO TRACE

EQUISTAR

LOCATION: CHANNELVIEW ENGINEERING DEPARTMENT

PIPING AND INSTRUMENT DIAGRAM
CATALYST FLARE SYSTEM

SCALE: NTS | E 43 M C31 | REV. X

ISSUE FOR CONSTRUCTION 03-26-09

Revision 3 5/27/2015

NOTES:

1. START-STOP STATION WITH RUN (GREEN) AND STOP (RED) INDICATING LIGHTS AT TRUCK LOADING STATION. LOW LEVEL STOPS THE PUMP.
2. "Y" STRAINER WITH 6 MESH TO BE LOCATED IN A HORIZONTAL PUMP SUCTION LINE AND PARALLEL TO GRADE.
3. LOCATE VALVE ABOVE THE FLARE HEADER.
4. "Y" STRAINERS WITH 1/8" OPENINGS TO BE LOCATED IN A HORIZONTAL PUMP SUCTION LINE AND PARALLEL TO GRADE.
5. INSULATE WITH CELLULAR GLASS.
6. SEE DWG E-43-M-004 FOR PUMP ***DELIVERY CONNECTION.

D-4383
TANK C1A

D-4384
TANK H1A

SP-4340A

SP-4340B

P-4382
WASTE CAUSTIC/RAG LAYER TRANSFER PUMP

P-4383
GASOLINE PRODUCT PUMP

P-4381
GASOLINE PRODUCT PUMP

DEMO ONLY!

ISSUE FOR DEMO ONLY!

THIS IS A DUPLICATE FLOW SHEET TO BE USED ON PROJECT 01514877 ONLY DO NOT REMOVE THIS NOTE

ENG. NO.	REFERENCE DRAWINGS	NO.	DATE	REVISIONS
			08/15/08	
			10/10/08	
E-43-M-010	DINOR. REACT CLEANING SYS. & INTERMED. STOR.		01/31/08	
E-43-M-001	INSTRUMENT SYMBOLS SHEET 1 OF 2		01/18/08	
E-43-M-002	INSTRUMENT SYMBOLS SHEET 2 OF 2		01/18/08	
E-43-M-003	PIPING SYM., GEN. NOTES, AND KEY DIAGS.		11/08	

Lyondell Petrochemical Company
LOCATION: CHANNELVIEW ENGINEERING DEPARTMENT

PIPING AND INSTRUMENT DIAGRAM
PLANT STORAGE SYSTEM

DRN.	DATE	SCALE	DRAWING NUMBER				REV.
CHK.	DATE	NONE	E	43	M	034	X
APP.	DATE						

ISSUE FOR CONSTRUCTION 03-26-09

Revision 3 5/27/2015

D-4333

D-4335

D-4332B

P-4332A

NOTES:

1. LOCATE VALVE ABOVE THE FLARE HEADER.
2. "Y" STRAINER WITH 1/8" SCREEN.
3. PROVIDE 1"DIA. DRAIN HOLE AT LOW POINT OF THE BAFFLE.
4. DELETED.
5. SEE VENDOR DRAWINGS FOR DETAILS.
6. DELETED.
7. LOCATE CLOSE TO TIE IN 1-4333.
8. LOCATE SPOOL -HS/HA BREAK AFTER FIRST ELBOW FROM VESSEL 1-4335.
9. LOCATE ONE (1) U.T. AT EACH DRAW-OFF NOZZLE STATION FOR 3-CS, 6-CS & 8-CS.
10. VALVES TO BE ACCESSIBLE FOR FREQUENT OPERATION. LOCATE AT CENTRAL LOCATION.
11. INSULATE WITH CELLULAR GLASS INSULATION.
12. DO NOT STEAM OUT D-4333
13. DELETED.
14. THE BORA PROLL WILL CHANGE VALVES FROM PIPE SPEC C1A TO 1C81C1.

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LYONDELL PETROCHEMICAL COMPANY

LOCATION CHANNELVIEW ENGINEERING DEPARTMENT

PIPING AND INSTRUMENT DIAGRAM
BUTENE/CAUSTIC SEPERATION

SCALE	NTS	E	43	M	010

CAD FILE: F43M010 REV10.dwg

10/08/08

ISSUE FOR CONSTRUCTION 03-26-09

Revision 3 5/27/2015

D-4382

E-4382X

NOTES

1. THE ROSEMOUNT 3051 CFA WILL CHANGE VALVES FROM PIPE SPEC CLA TO 1CS1C1

THIS IS A DUPLICATE DRAWING TO BE USED ON PROJECT [redacted] ONLY DO NOT REMOVE THIS NOTE

EQUISTAR CHEMICAL LP

EQUISTAR

LOCATION CHANNELVIEW ENGINEERING DEPARTMENT

PIPING AND INSTRUMENT DIAGRAM
CATALYST FLARE SYSTEM

E 43 N 031 15A

ISSUE FOR CONSTRUCTION 03-26-09

Revision 3 5/27/2015

NOTES:

1. START-STOP STATION WITH RUN (GREEN) AND STOP (RED) INDICATING LIGHTS AT TRUCK LOADING STATION. LOW LEVEL STOPS THE PUMP.
2. "T" STRAINER WITH 6 MESH TO BE LOCATED IN A HORIZONTAL PUMP SUCTION LINE AND PARALLEL TO GRADE.
3. LOCATE VALVE ABOVE THE FLARE HEADER.
4. "T" STRAINERS WITH 1/8" OPENINGS TO BE LOCATED IN A HORIZONTAL PUMP SUCTION LINE AND PARALLEL TO GRADE.
5. INSULATE WITH CELLULAR GLASS
6. SEE DWG E-43-M-004 FOR PUMP AUXILIARY CONNECTION.
7. THE RICHA PANEL WILL CHANGE VALVES FROM PIPE SPEC. C1A TO 1C01C1.

THIS IS A DUPLICATE FLOW SHEET TO BE USED ON PROJECT 81264697 ONLY DO NOT REMOVE THIS NOTE

D-4383 TANK H1A

D-4384 TANK H1A

SP-4340A

SP-4340B

P-4382 WASTE CAUSTIC/BAG LAYER TRANSFER PUMP

P-4383 GASOLINE PRODUCT PUMP

P-4381 GASOLINE PRODUCT PUMP

FLT-4395A

FLT-4395B

REVISIONS					
NO.	DATE				
11	08/10/09				
10	10/10/08				
9	01/21/08				
8	01/19/08				
7	01/19/08				
6	01/16/08				
5	11/08				

REFERENCE DRAWINGS

DWG. NO.	
E-43-M-010	EMER. REACT. CLEANING SYS. & INTERMED. STOR.
E-43-M-001	INSTRUMENT SYMBOLS SHEET 1 OF 2
E-43-M-002	INSTRUMENT SYMBOLS SHEET 2 OF 2
E-43-M-003	PIPING SYM., GEN. NOTES, AND REF. DWGS.

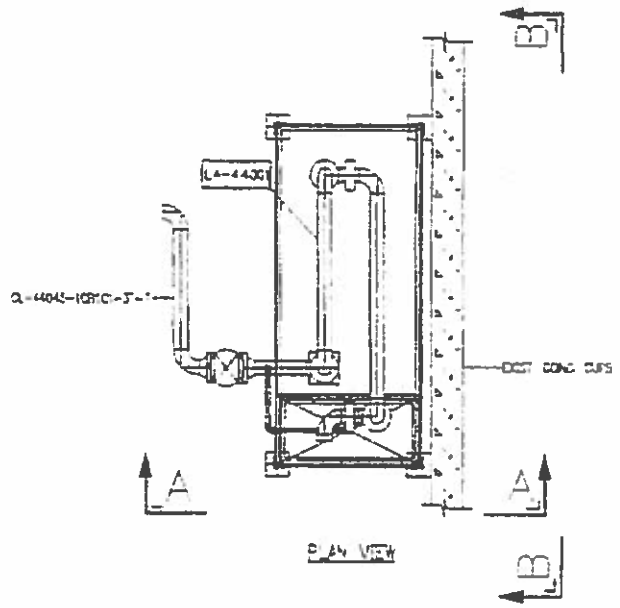
Lyondell Petrochemical Company
LOCATION: CHANNELVIEW ENGINEERING DEPARTMENT

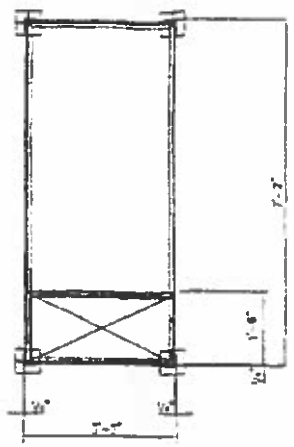
PIPING AND INSTRUMENT DIAGRAM
PLANT STORAGE SYSTEM

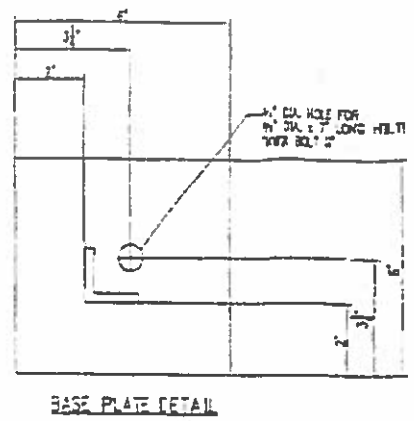
DRN.	DATE	SCALE	DRAWING NUMBER				REV
CHK.	DATE	NONE	E	43	M	034	26B
APP.	DATE						

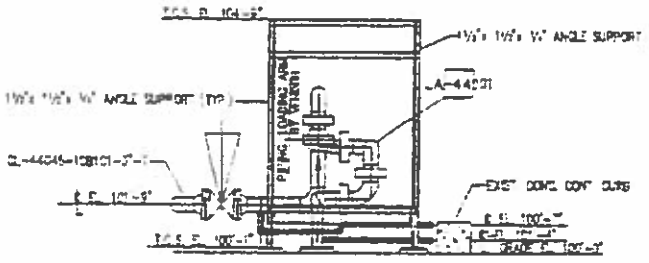
ISSUE FOR CONSTRUCTION 03-19-2009

Revision 3 5/27/2015

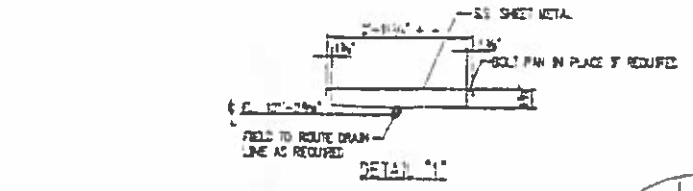




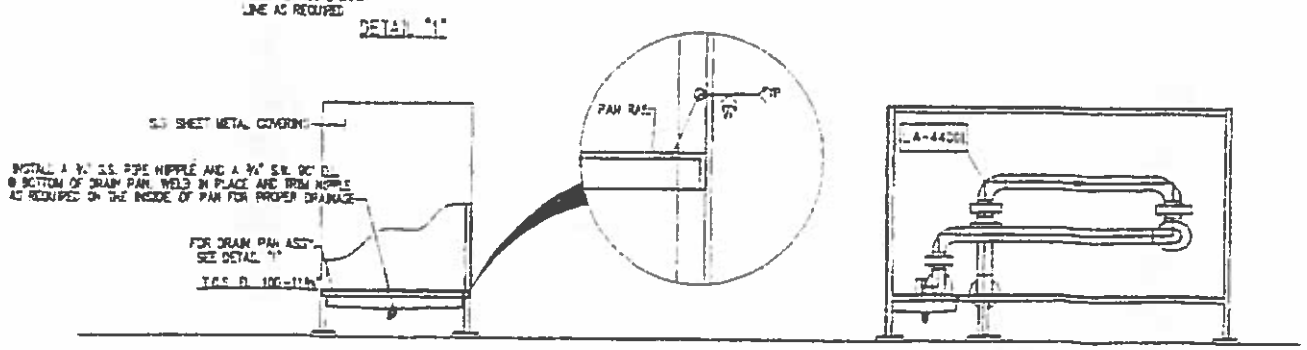




SECTION "A-A"



DETAIL "1"



DRAIN PAN DETAIL

SECTION "B-B"

COMPANY CONFIDENTIAL NOTICE

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LYONDELL

LOCATION: CHANNELVIEW

ENGINEERING DEPARTMENT

No.	DATE	REVISIONS	E.C. No	DR	AF
				DRN RE	DATE 01/09
				CHK KM	DATE 01/09
0	01/09	IFC	9514697	APP BC	DATE 01/09

LOADING ARM CABINET FOR LA-44001

SCALE	DRAWING NUMBER				REV
NTS	B	44	S	005	0

Equistar Chemical
LOCATION CHANNELVIEW ENGINEERING DEPARTMENT

D-4383 CONTAINMENT AREA
PLAN, SECTIONS & DETAILS

DRAWING NUMBER							REV
E	43	C	086				3

DRAWN AL. DATE mm/dd/yy | SCALE 3/8"=1'-0" | DATE

CHKD BC DATE mm/dd/yy

APP'D DATE

NO.	DATE	DESCRIPTION	APP'D
1	04/09/09	ADDED TYP. DRAWDOWN	
2	04/09/09	CHANGED DRAWDOWN LOCS.	
3	04/09/09	CHANGED GRADING AT CONT. AREA	
4	04/09/09	ADDED TYP. SECTION	
5			
6			
7			

DWG NO.	DESCRIPTION OR REMARKS	NO.	DATE
E-43-C-086	D-4383 CONTAINMENT AREA-STEEL DETAIL	1	04/09/09
		2	04/09/09
		3	04/09/09
		4	04/09/09
		5	
		6	
		7	

SAB ENGINEERS and CONSTRUCTORS, LTD.
HOUSTON, TEXAS

JOB NO. E-5082

EQUISTAR

NOTES:

1. ALL WORK TO BE PERFORMED IN ACCORDANCE WITH TYPICAL STANDARDS LPC 571, 702 AND 704.
2. MANHOLE BOLTS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM A153 STANDARD.
3. ALL CONCRETE SURFACES (WALL, SLAB AND PEDESTALS) TO BE COATED W/ SIKATONE 149-5 (PER MANUF. SPECIFICATIONS) (INSTALLATION MUST BE PERFORMED BY MANUFACTURER APPROVED APPLICATION CONTRACTOR) BASE COATING: AREA.
4. FOR CONSTRUCTION OF TRENCH USE PRECAST "NO SWAY" HH ICC CHANNEL COMPONENTS AND HIGH GALVANIZED STEEL GRATING (ON EQUAL PER MANUF. SPEC'S)
5. FOR WATERTOP USE GREENSTREAK PVC (OR EQUAL PER MANUF. SPEC'S)
6. CAULK AROUND ALL BASE PLATES & LADDER CONNECTIONS TO WALL USING SIKATONE 80S.

SECTION A-A
N.T.S.

TYPICAL
LEDGE ANGLE DETAIL
SCALE 1 1/2"=1'-0"
(TYP.)

DETAIL 1
SCALE 1"=1'-0"

SECTION C-C
SCALE 3/4"=1'-0"
(TYP 4 PLACES)

PLAN
SCALE 3/4"=1'-0"

SECTION B-B
SCALE 3/4"=1'-0"

TYPICAL SECTION THRU WALL
SCALE 3/4"=1'-0"

ANCHOR BOLT SCHEDULE

MK. NO.	NO. REQ'D	DIA.	A	B	C	NO. NUTS REQ'D	SLEEVE SIZE
AB-1	18	3/4	12	3	11 3/8	1	NA

NOTE: PREFIX ALL A. BOLT MK NO.'S THIS DWG. WITH E43C086
ALL DIMENSIONS ARE IN INCHES

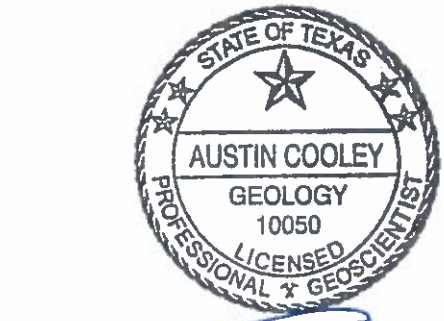
Revision 3 5/27/2015

Appendix VI: Geology Report

Brown AND Caldwell

Addendum to Section VI

The site is underlain by the Gulf Coast Regional Aquifer. However, in accordance with 30 TAC 335.204(a)(4)(A), the regional aquifer is separated from the facility by a minimum of ten feet of material with a hydraulic conductivity toward the aquifer not greater than 10^{-7} centimeters per second (cm/sec), or a thicker interval of more permeable material which provides equivalent or greater retardation to pollutant migration. . The site is vertically isolated from the Gulf Coast Regional Aquifer by what is reported in literature to be approximately 400-600 feet of clays that have permeabilities ranging from 10^{-7} to 10^{-5} cm/sec. These clays contain low permeability groundwater bearing units (GWBUs) that are not interconnected with the Gulf Coast Regional Aquifer. The presence of these massive impermeable clays and low permeability GWBUs is confirmed by on-site hydrogeologic studies, including a groundwater resource classification study. The low permeability GWBUs, include the uppermost GWBU, Transmissive Zone 1 (TZ-1) and the GWBU immediately below it, Transmissive Zone 2 (TZ-2). This groundwater resource classification was performed in accordance with the TRRP (30TAC350) and associated guidance as documented in the January 16, 2004 report Groundwater Resource Classification: Transmissive Zones 1 and 2 (TZ-1 & TZ-2) , Equistar Chemicals, LP, Channelview Complex, Channelview, Texas. The class 3 groundwater resource classifications for TZ-1 and the class 2 resource classification for TZ-2 was approved by TCEQ in its letter of June 24, 2004. In accordance with TRRP, these groundwater resource designations cannot be approved if the GWBUs are interconnected with class 1 groundwater, including the Gulf Coast Regional Aquifer. TZ-1, TZ-2, the other low permeability GWBUs and the substantial impermeable clay layers and all act as an effective barrier to downward migration, effectively isolating the Gulf Coast Regional Aquifer from the site. These clays and low-permeability GWBUs provide a greater retardation to pollutant migration than ten feet of material with a hydraulic conductivity toward the aquifer not greater than 10^{-7} cm/sec. Additional information on the regional geology can be found in Kreitler, C.W. and others, 1977 *Hydrogeology of Gulf Coast Aquifers, Houston-Galveston Area*, Texas Geologic Circular 77-4, University of Texas, Austin, Texas Bureau of Economic Geology and the Geologic Report submitted as Section VI of this permit application.



05/27/15

Austin I. Cooley, P.G., P.E.

Brown and Caldwell is Texas Registered Geosciences Firm No. 50332.

SECTION VI.A.

GEOLOGY REPORT

LYONDELL PETROCHEMICAL COMPANY

CHANNELVIEW COMPLEX

CHANNELVIEW, TEXAS

ORIGINAL: SEPTEMBER, 1991

RESUBMITTED: JANUARY, 1997

RESUBMITTED: MAY, 2014

No changes have been made to the Geology Report since initial submittal in 1991; however, the OP-1 and OP-2 Aeration Basins have since been closed and groundwater monitoring is no longer required at the Channelview Facility per TCEQ approval letter dated December 23, 2000.

GEO ASSOCIATES

Geotechnical Engineering & Groundwater Consulting

CERTIFICATION STATEMENT

Lyondell Petrochemical Company
Channelview Operations
P. O. Box 777
8280 Sheldon Road
Channelview, TX 77530

ATTN: Mr. Terry Sain

With respect to the facility known as Lyondell Petrochemical Company Channelview Operations

This is to certify that the September 1991 GEOLOGY REPORT for Lyondell Petrochemical Company Channelview Operations was prepared under the direction of the undersigned, a geotechnical engineer registered as a professional engineer in the State of Texas.



Submitted this 14th day of September 1993.

Wayne S. Pollard, Ph.D., P.E.
Principal

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GEOLOGY REPORT

Lyondell Petrochemical Company - Channelview

8280 Sheldon Road
Channelview, Texas

Site Description

Lyondell Petrochemical Company operates a synthetic organic chemicals manufacturing facility in Channelview, Harris County, Texas. It is located approximately five miles north of Interstate Highway 10, on Sheldon Road, as more specifically shown on Exhibit 1. A railroad spur enters the facility and terminates within the plant. The San Jacinto River forms the property boundary on the northeast.

Surface impoundments designated Basins N and O in the northeastern portion of the facility (see Exhibit 1) are the specific hazardous waste management units at this location which will be the focus of this report.

Topography

The topography on the plant property is generally flat, with a sharp break in slope at the bank of the San Jacinto River. The average slope across the property is 0.7% to the east-northeast. An intermittent drainage feature, Wallisville Gully, bisects the eastern portion of the property and drains into the San Jacinto River. Maximum elevation of the property is approximately forty-six feet above mean sea level (msl); the lowest is approximately five feet above msl along the San Jacinto River. Nearly all of the plant operations lie above the forty-foot contour (see Exhibit 2).

The facility lies within the Gulf of Mexico Coastal Plain. This plain is flat with a gradual regional slope of approximately 0.09% to the south-southeast. Broad, incised river valleys and low relief domes formed by salt diapirs are the most notable topographic features on the Gulf Coastal Plain.

The vegetation on the site consists of grasses indigenous to the area. Wildlife on the site appears to be limited to rodents, snakes and birds native to the Harris County area.

Physiography

The site lies on the coalesced Brazos and Trinity deltaic plains of the Western Gulf Coast Plain physiographic province, as shown on Exhibit 3. The site area also contains alluvial and deltaic sediments from the smaller San Jacinto River.

The relatively flat coastal plain dips gently gulfward where it merges into coastal mud flats, marshes, and beaches. The physiography consists primarily of a relatively flat coastal plain located inland from coastal marshes and inclined gulfward at about five feet or less per mile. The site is composed of surficial clays (compacted fill) underlain by a relict fluvial-deltaic complex which consists of clay, silt, sand and clayey sand deposits.

Regional Geology

General

Surface and near surface sediments of this region are deposits of a Pleistocene to Holocene (Recent) fluvial-deltaic system (Exhibit 4). The Pleistocene system consists of fluvial-deltaic and associated marginal marine sediments deposited during interglacial stages of rising sea level, ten thousand to two million years ago. Specifically, sediments include distributary sand, interdistributary mud, and marine deltaic sand. In general, Pleistocene deposits crop out in a band between Recent formations near the coast and the youngest Tertiary formation inland.

Holocene (Recent) fluvial systems are composed of sand, silt and clay deposited as the Brazos, San Jacinto, and Trinity rivers cut across the relict Pleistocene age coastal plain during the last ten thousand years. These fluvial systems remain active today.

Local stratigraphic units of Pleistocene age include the Beaumont, Montgomery, Bentley, and Willis formations. A generalized stratigraphic column for the region is shown in Exhibit 5. The Willis Formation (lowermost Pleistocene) is composed of alluvial sand and gravel. Meanderbelt sands and muds comprise the Montgomery and Bentley formations. The uppermost Pleistocene Beaumont Formation is primarily distributary channel silts and sands, and interdistributary mud. In general, these formations are all comprised of similar lithologic material and for the most part do not have persistent individual characteristics that can be recognized in the subsurface. Consequently, they have not been correlated satisfactorily in the subsurface of the Harris-Galveston County area.

Shallow Stratigraphy

The interpretation of shallow stratigraphy for this site was derived from the review of logs resulting from borings completed by Geo Associates and others. The borings ranged from about twenty- to eighty-foot depth. The boring location plan is included as Exhibit 6. Copies of logs of selected borings are included in Attachment A.

Selected historical borings have been used in combination with borings drilled by Geo Associates to provide stratigraphic interpretations across major portions of the Channelview facility. While some variation in soil classification occurs from one boring log to another, major strata breaks were assumed to be adequately determined by each logger.

A stratigraphic cross section has been prepared for the site. A cross section location map is included as Exhibit 7, while the cross-section is noted as Exhibit 8.

The uppermost soil found in most of the facility is a clay fill that was probably placed during initial plant site preparation. In borings H, 204 and 207, an organic layer with odor was noted within the fill at about El 38. Otherwise, the fill was generally clay, stabilized clay, or stabilized shell material.

Beneath the fill, heterogeneous deposits of crevasses splays are evident in the western part of the plant, with massive clay bodies and meanderbelt deposits dominating the eastern area. On Exhibit 8, Profile A-A' shows the dramatic change from splay deposit at boring H to the filled-in oxbow clay body at B-68. This interpretation shows the clay body to be some thirty to thirty-five feet deep and to include sand and silt lenses (see B-68 and B-63).

A previous study conducted in 1984 reported that no major sand was observed within the upper forty feet of the massive clay body beneath the Environmental Control Facilities which include Basins N and O. The 1984 report speculated that the few included silts and sands might be isolated, discontinuous features. More detailed evaluation of this area, including electric-logged boreholes to eighty-foot depth accomplished in September 1991, indicates that there is a shallow, apparently continuous, silt and sand layer within the upper twenty-foot depth below Basins N and O. This Shallow Silt zone is some one to two feet thick in the area northwest of the two basins and some nineteen feet thick southeast of the two basins.

The sandy portions of the splay deposits may occur as relatively thin layers near the edges of the splays (e.g. boring 201), or as thick wedges near the channels at the crevasse in the channel levee (borings Q and H). Intervening filled distributary channels show primarily silty clay or clayey silt strata through shallow depths (boring 203).

In the upper forty feet of the western portion of the plant, two principal crevasse splays occurred, one depositing sand from about El 3 to El 25 msl (borings Q and H) and another depositing shallower sands, perhaps directly on the older splays (borings Q, H, 201, 202, and B-130). These interpretations are indicated on Exhibit 8.

The splay-deposited sands are generally thicker and more continuous than the meanderbelt sands. In the meanderbelt area, the shallow natural stratigraphy is typically a sandy or silty clay underlain at about El 20 to El 25 by a tan or gray clay containing little sand. At about El 5, a red clay is often found beneath the gray clay. The splay-deposited sands may extend to as deep as El 3 before encountering a clay stratum.

Deeper Stratigraphy

The Beaumont Formation is considered the uppermost portion of the Chicot Aquifer, whose base is at about -400 feet msl in this area. Local groundwater production in the vicinity of the site is exclusively industrial, with two wells screened between 580' and 750' and five wells screened between 710' and 1591' in the Evangeline Aquifer of Pliocene age.

The generalized deeper stratigraphy near the site is shown on Exhibit 9 as adapted from the HGCSD Water Resource Management Program - Phase II. The data shown is based on the interpretation of electric logs of water wells in the Sheldon Subsector. The stratigraphic records of these local logs extend to depths of 1640 feet.

Exhibit 9 indicates depths, thickness, hydraulic conductivity and compressibility of clay layers. The intervals between the clay layers represent sand or silt deposits. The local transmissivities of the pumped aquifer is up to about 13000 ft^2/day in the Evangeline Aquifer.

Active Geologic Processes

The active geologic processes of faulting, subsidence and erosion were examined with respect to the surface impoundment area. As observed, the site is well sodded with indigenous vegetation , showing no serious evidence of erosion across the surface or adjacent to the site. The principal active geologic processes in this vicinity which could affect the site would be subsidence and faulting. Subsidence in this portion of Harris County, while once substantial, has been minimized in recent years by the action of the Harris-Galveston Coastal Subsidence District (HGCSD) in limiting groundwater pumpage. Fault displacement information collected by the USGS locally has indicated that fault movement in the eastern portion of Harris County has been minimal in the years since major conversions to surface water were accomplished by the Houston Ship Channel industries during 1976-1977.

Subsidence

In its Water Management Studies, the HGCSD used the measured rate of subsidence at Benchmarks BL-352 (USE) and F690 as typical of subsidence throughout the Sheldon subsector (which includes the northern portion of the plant) during the period 1973 through 1978. According to the HGCSD Phase II Water Management Study, the rate of subsidence at these Benchmarks was about 0.16 feet per year during the period 1973 through 1976 and approximately 0.08 feet per year between 1976 and 1978. These benchmarks are located approximately 2.5 miles north of the site and would approximate the probable rate of subsidence in the site area.

The HGCSD Phase II study predicted future subsidence in the Sheldon subsector during the 1980-2020 period based upon two different scenarios. In the first scenario, the future supply and demand for water usage was estimated; any deficit between available surface water and total water requirements was designed to be met by groundwater pumpage. This scenario predicts less than one-half foot of subsidence during the forty year period. The second scenario assumes that future groundwater pumpage will remain the same as that in 1980. This scenario predicts about 0.8 foot of subsidence over the same forty year period.

The subsidence indicated as occurring between 1978 and 1987 by the USGS Report of Investigations No. 90-01 is on the order of 0.25 foot.

Faulting

Aerial photo interpretation identified several lineations that could have been associated with surface (i.e. natural ground surface prior to site filling) expressions of geologic fault(s). These lineations were identified based on tonal contrasts primarily associated with abrupt soil moisture changes in the upper few feet of the soil near fault scarps. In the northwestern corner of the plant, rice field levees were visible in the 1944 and 1953 photos that could coincide with one lineation and indicate a downthrown block to the southwest. Other evidence in this portion of the photos indicates a fairly wide (500 to 600 feet) "sag" zone on the downthrown side of this lineation.

In 1984 an attempt was made to further examine these tonal variations. Lineations were field-checked at locations where they crossed roads to locate any evidence of pavement damage or movement which could confirm the lineations as surface expressions of faults. Detailed interpretations of available deep well logs on and around the property were made to find evidence of the fault(s) at depth. Public agency individuals who had been active in mapping surface fault lines were also contacted to discover whether they had recent, unpublished data relative to these lineations or other faults in the local area, since faults often tend to connect the salt domes in the Gulf Coast area and the facility is located between the Goose Creek salt dome and the Humble salt dome.

One lineation was suspected as being the surface expression of a geologic fault, crossing the plant from northwest to southeast, downthrown to the southwest (Exhibit 10). The deep stratigraphy was reevaluated from the available logs in the an attempt to locate missing strata in wells with respect to adjacent wells. Such missing strata could be evidence of a normal geologic fault, although other processes could also account for such findings. Missing and/or thinner strata were found in several well logs on the southwest side of the surface trace of this probable fault. The depths to these missing beds were plotted and an interpreted fault plane drawn. The interpreted fault was shown to have an average dip angle of about 51° from the ground surface to the 2200 foot depth where it is interpreted to cross the Oxirane Chemical No. 1 log.

The rate of fault movement at the surface was reviewed. The historical displacement of this fault was apparent in the 1944 photos as rice levee patterns; these appeared to indicate a substantial amount of movement occurring on the fault at the surface prior to major groundwater withdrawals and prior to plant construction. Some of the movement may have been over geologic time (thousands of years) and some may have been associated with the 1971-1918 beginning of production of oil at Goose Creek. A paper given in 1983 by Mr. Thomas Holzer correlated local fault displacement in recent years directly to groundwater withdrawal such that if groundwater withdrawals in the area are not substantially increased, one would not expect major fault movement to occur. Fault displacement information collected by the USGS locally has indicated that fault movement in the eastern portion of the Harris County has been minimal since industry conversions to surface water were accomplished in 1977-1978. The present rate of fault movement at the surface appears to be minimal, with the major surficial displacement believed to have occurred before 1944.

This fault would be expected to have limited impact on the shallow groundwater hydrology, since the groundwater flow is generally controlled by ditches and fresh water impoundments. The surface vertical displacement of the fault prior to site filling is estimated to have been less than about three feet. The boring logs do not appear to show consistent thin sand beds which could be truncated at shallow depth to block flow. Additionally, the fault trace is roughly parallel to the assumed natural shallow groundwater gradient to the southeast.

Erosion

The property is located on the cut bank of the San Jacinto River, with no plant facilities except a barge dock located within approximately eighteen hundred feet of the river. Overland flow of flood waters is not expected to endanger the facility as it is thirty-five to forty feet above the San Jacinto River. Storm surge from Hurricane Carla (1961) inundated some seven hundred square miles in the Houston-Galveston area, but did not reach the Channelview facility. The one-hundred year design hurricane centered on Galveston Bay would not inundate the active plant area by storm surge.

Wetlands

No wetlands have been identified at the facility.

Regional Aquifers

Aquifer Names

According to the latest nomenclature by the U.S. Geological Survey, the formations which supply water wells in the Harris County area are from the oldest to youngest: the Fleming Formation of Miocene Age; the Goliad Sand of Pliocene Age; the Willis Sand, Bentley Formation, Montgomery Formation, and Beaumont Clay of Pleistocene Age; and Alluvium of Pleistocene and Recent Ages. Three of these four subdivisions are identified as aquifers and one is identified as a confining layer. From oldest to youngest, and deepest to shallowest, the subdivisions are the Jasper Aquifer, the Burkeville Confining Layer, the Evangeline Aquifer, and the Chicot Aquifer.

The Jasper Aquifer and the Burkeville Confining Layer are considered to be parts of the Fleming Formation. The Evangeline Aquifer includes the upper part of the Fleming Formation and the Goliad Sand. The Chicot aquifer includes the remaining formations up to the land surface. These aquifers are indicated on Exhibit 5.

Constituent Materials

Exhibits 11 and 12 show an interpreted geologic section in the area of the site, taken from the HGCSD Phase I Water Resource Management Program. The interpreted bases of the Chicot and the Evangeline aquifers are shown on Exhibits 13 and 14. Relative proportions of sand and clay beds in the Evangeline and the Chicot Aquifers vary throughout the area; generally, they average half sands and half clays. The Alta Loma Sand (not present at this location) of the Chicot Aquifer is a massive unit. The Evangeline Aquifer consists of less massively bedded sands.

Aquifer Description

The hydraulic conductivity (coefficient of permeability) of sands in the Evangeline Aquifer is generally in the range of one hundred fifty to four hundred gallons per day per square foot. The storage coefficient used in the HGCSD Phase II model for the Evangeline Aquifer was estimated to be approximately 0.004. The local transmissivity of the Evangeline Aquifer is about 13000 ft^2/day.

Aquifer Conditions

The Chicot and the Evangeline Aquifers are under artesian conditions in the area of the Lyondell Petrochemical Company Channelview facility.

Hydraulic Connection

Sand beds in the Chicot Aquifer are hydraulically connected to some extent with the sand beds in the underlying Evangeline Aquifer and water moves slowly through circuitous routes from one aquifer to another in response to head differences between the aquifers. The two aquifers have been separately identified by the USGS on the basis of production screenings, and the degree of hydraulic connection between the aquifers is not high.

Regional Water Table Contour Map

The USGS has maintained records of the potentiometric surface elevations in wells in this area over a period of years. The potentiometric surface elevations shown on Exhibits 15 and 16 for Spring 1986 are those interpreted for the Chicot and Evangeline Aquifers in this part of the region.

The potentiometric surface elevations in aquifers beneath the facility have risen somewhat since 1977. Chicot potentiometric surfaces have risen approximately sixty (60) feet during the period 1977 - 1990, and Evangeline potentiometric surfaces have risen approximately sixty (60) to eighty (80) feet in the same period, according to USGS Open File Report 90-132.

Flow Rate

The flow rate in aquifers is often dominated by the extent of well pumpage. The Chicot and Evangeline aquifers are extensively screened and since most groundwater flow is toward production in wells, the calculation of flow rates in feet per year is not a meaningful exercise. A more useful measurement would be the total groundwater production for the area. Total pumpage in Harris-Galveston Coastal Subsidence District for 1976 was 457 million gallons per day, dropping to 354 million gallons per day in 1987. The closed surface impoundment is located on the northeastern edge of HGCSD area two, which showed pumpage rates dropping from 115.8 million gallons per day in 1976 to 65.5 million gallons per day in 1990. HGCSD records reflect a total annual pumpage of six hundred thirty-three million gallons during 1990 in an area within one mile radius of the site.

Dissolved Solids Content of Groundwater

Generally, the water from these aquifers is of good chemical quality. Water is considered to be fresh if its total solids content is 1,000 mg/l or less. The general range for total dissolved solids in the water from the producing zones of the Chicot and Evangeline is 200 to 600 mg/l.

Recharge Areas

The Chicot Aquifer recharge area is in northwestern Harris County, southern Montgomery County, and adjacent areas. The Evangeline recharges farther northwest in Grimes, Walker, and northern Montgomery counties (see Exhibit 17). The Beaumont Clay near land surface in much of southern Harris County restricts the amount of recharge to the Chicot Aquifer from the land directly above it.

Groundwater Withdrawal

All of the currently known pumpage in the vicinity of Lyondell Petrochemical Company - Channelview is from the Evangeline Aquifer. Water withdrawn from this aquifer is for industrial use.

The listing of water wells within a one mile radius of the center of the facility (latitude 29°49'36" and longitude 95°06'30") as reported by HGCSD is included in Table 1. The records of HGCSD show total pumpage from these wells during 1990 of 632,778,000 gallons.

Waste Management Area Subsurface Conditions

Subsurface Soils Investigation

Historical Borings

Four subsurface investigations are known to have been conducted in the vicinity of Basins N and O. The investigations and information reviewed for this report were performed by McClelland Engineers, Inc., 1974 and 1975 and Geo Associates in 1984 and 1991. Information from investigations of areas adjacent to the waste management area was also reviewed. This information was from reports prepared by McClelland Engineers, Inc. 1967, 1980 and 1975 and by Dames & Moore, Inc., 1973.

McClelland Engineers, Inc.

During April 1974, McClelland Engineers, Inc. drilled ten soil borings to twenty and thirty-foot depths Soils tests were conducted on recovered samples. Engineering analysis of the test results led to recommendations for foundation design and earthwork for the construction of the basins and ponds. Basin N currently occupies the 1974 area of investigation. In a 1975 investigation, McClelland Engineers, Inc. drilled eleven soil borings to twenty-foot depth. Recommendations for foundation design and construction of ponds and basins were developed. Basin O currently occupies the area investigated at that time. Copies of boring logs from both reports are included in Attachment A.

Geo Associates

During October 1983, Geo Associates drilled and logged a series of sixteen borings in which piezometers were subsequently installed. The study was undertaken to provide additional shallow stratigraphic and groundwater information and to recommend monitor well locations for multiple wastewater management units. Two of the piezometers (P-206 and P-207), drilled to thirty-four and sixteen-foot depths, respectively, are located adjacent to the waste management area.

Drilling techniques used in the investigation were wet rotary with continuous sampling throughout the boring depth. Cohesive soils were generally sampled by pushing a three-inch diameter shelby tube and cohesionless soils were generally sampled by driving a two-inch diameter split spoon with a one hundred forty pound hammer to obtain standard penetration tests (SPT).

Each boring was terminated within the first silt or sand encountered that was considered capable of significant groundwater transport, or the boring was terminated at about thirty-five foot depth if no such unit was encountered.

During the period July through September 1991, Geo Associates drilled and set five monitoring wells and three piezometers in the vicinity of Basins N and O. This study was undertaken to better define the stratigraphic and hydrogeologic conditions at the waste management area. Monitoring wells 20, 21, 22, 23 and 24 were set in the uppermost permeable zone with total depths ranging from eighteen to twenty-five feet. Piezometer borings 301 and 302 were drilled to eighty-foot depths. Piezometer boring 303 was terminated at twenty-foot depth.

Drilling techniques used in the investigation were wet rotary with continuous sampling throughout the monitor well boring depth and continuous sampling to twenty feet for piezometer borings and every five feet thereafter. Cohesive soils were generally sampled by pushing a three-inch diameter shelby tube and cohesionless soils were generally sampled by driving a one and one-half inch diameter split spoon with a one hundred forty pound hammer to obtain standard penetration tests (SPT).

The installed wells and piezometers were single cased. Supervision of drilling was provided by an engineer or geologist who manually logged all borings and electric logged the piezometer borings.

A list of monitor wells are included on Table 2. Boring logs are included in Attachment A . Soils geotechnical laboratory data is included in Attachment B.

Other Studies

Information from subsurface investigations of areas adjacent to the waste management unit were also reviewed. These include reports prepared by McClelland Engineers, Inc. 1967, 1970 and 1975 and by Dames & Moore, Inc. 1973. Selected boring logs and soil test results are included in Attachments A and B.

Stratigraphic Interpretations and Cross Sections

Air photo interpretation, review of available geologic data and review of available historical and recent boring logs have been used to interpret the site's shallow stratigraphy. Most historical borings terminate at thirty-five foot depth; the recent investigation included six soil borings to approximately twenty-foot depths and two borings to eighty-foot depths, with electric logs available for the eighty-foot borings and one shallower boring. Based on these data, the following strata have been defined:

Stratum 1	Fill and disturbed surficial clays. This layer varies in character from clayey sand to sandy and silty clays and is generally four to five feet thick.

Stratum 2 — Tan and gray silty clay. Generally thinning from north to south across the waste management area; comprised of a stiff silty clay or clay. Portions of this stratum are sandy, especially in the area north of Basin O, where a clayey sand was noted.

Stratum 3 — Red and gray clay to silty clay. As medium stiff, highly plastic clay this layer appears to thicken to the south. It is encountered at depths of twelve to six feet and varies in thickness from one and one-half to nine feet.

Stratum 4 — Shallow silt. This medium dense, red and gray silt and silty sand was encountered at depths between about eleven to sixteen feet, at about El 29 to El 24 msl. This silt shows a general thickening trend from about one half to two feet in the Basin O area to nineteen feet south of Basin N.

Stratum 5 — Brown and black clay. This stratum was encountered at fifteen and one-half to twenty-seven foot depth and thins southward from twenty-two and one-half to eight and one-half feet thick. It is a highly plastic, stiff clay.

Note: deeper strata are interpreted from two boring locations.

Stratum 6 — El +5 ft Silt. This gray and red silt layer was encountered at depths of thirty five and one-half to thirty eight feet, at El +5 msl. The silty or clayey silt is approximately four to six feet thick.

Stratum 7 — Gray silty and sandy clay. This very stiff clay was encountered at about forty-foot depth, at approximately mean sea level. The layer appears to be approximately ten feet thick.

Stratum 8 — El -15 ft sand. This sand layer was encountered at approximately fifty-foot depth, at about El -15 msl. The unit varies in thickness from ten to twenty-five feet and appears to contain discontinuous clay layers.

Stratum 9 — Red and brown clay to silty clay. This very stiff clay layer was encountered at depths of sixty-two and one-half to sixty eight feet and varies in thickness from eight to fifteen feet. The stratum appears to become siltier toward the south.

Stratum 10 — El -35 ft silt. This two foot thick stratum was encountered at about seventy-five to eighty-foot depth, at El -35 msl.

Stratum 11 — Gray silty clay. This stiff clay was encountered at about seventy-eight foot depth and is of unknown thickness. Available boring information does not establish the base of this stratum.

A previous study conducted in 1984 reported that no major sand was observed within the upper forty feet of the massive clay body beneath the Environmental Control Facilities which include Basins N and O. The 1984 report speculated that the few included silts and sands might be isolated, discontinuous features. More detailed evaluation of this area, including electric-logged boreholes to eighty-foot depth accomplished in September 1991, indicates that there is a shallow, apparently continuous, silt and sand layer within the upper twenty-foot depth below Basins N and O. This Shallow Silt zone is some one to two feet thick in the area northwest of the two basins and some nineteen feet thick southeast of the two basins.

Excavations for Basins N and O are believed to have terminated in the clays of Stratum 3, several feet above the Shallow Silt layer (Stratum 4). This uppermost permeable zone is currently being monitored for groundwater quality by wells 20, 21, 22, 23 and 24.

Electric logs and soil samples collected from borings in the area of the basins show some eight to twenty-two feet of highly plastic clays separate the Shallow Silt from the next deeper permeable zone, the El +5 ft Silt. Southeast of the basins, more massive shallow sand bodies exist that may provide hydraulic connection between the Shallow Silt and the deeper permeable zones.

It is similarly anticipated that the hydraulic connection between the deeper permeable zones (strata 6, 8 and 10) in the area of the waste management site may be poor due to the intervening thick clay layers.

Two stratigraphic cross sections have been prepared for the site. Their locations are included on Exhibit 18, with the cross-sections shown on Exhibits 19 and 20. The interpretations shown on these exhibits supersede those shown on cross-sections of this area included in the 1984 report prepared by Geo Associates. As with all interpretations, actual conditions may vary from those shown on the exhibits.

Engineering Data

Laboratory testing programs have been undertaken during the soils investigation by several consultants to assist in classification of the soils and to determine the grain size, compressive strength, Atterberg Limits, and permeability of some of the retrieved samples. Hand penetrometer tests were performed in the field on the retrieved samples to assist in classification of the consistency of the clay soils. Sieve analyses were accomplished on retrieved samples of the silts and sands. Clays were tested for compressive strength. Permeability tests on selected samples of the clays were run to determine their laboratory permeability. Atterberg limits, moisture contents, and visual classifications were also conducted in the laboratory to better define the various soils on the site. Laboratory testing was accomplished in accordance with ASTM methods.

The results of laboratory tests complied by stratum are included in Attachment B.

Groundwater Investigation Report

Records of Water Level Measurements in Borings and Wells

Groundwater has been monitored at eleven shallow well locations(Exhibit 21) at Lyondell Petrochemical - Channelview since 1984 These readings were converted to elevation msl and the tabulated results included on Table 3. The shallow groundwater flow is influenced by drainage ditches and fresh water surface impoundments, with flow being generally to the southeast. Ground surface elevation is some 35 to 42 ft msl and the monitored zone is typically found at El 25 to El 35 ft msl.

In September 1991, five additional wells were installed around Basins N and O for monitoring these two surface impoundments. Siting of these wells was based on historical water level data and on the water levels in monitor wells and in three piezometers placed in the immediate vicinity of Basins N and O. Contour maps for the three measurement intervals in the three piezometers and nearby monitor wells located near the basins have been prepared and are included as Exhibits 22, 23 and 24.

Since initial encountering of groundwater is shallow on this site, and since drilling at this location is most appropriately accomplished by wet rotary methods, no initial encountering of the groundwater was reported for well installations.

Hydraulic Gradients

Hydraulic gradients within the Shallow Silt have been calculated for the three water level measurement period in the three piezometers. Flow is generally toward the southeast. Calculated groundwater velocities range in value from 1.97 to 2.23 feet per year with an average of about 2.09 feet per year using the Darcy Equation with an assumed porosity of 30% and an assumed hydraulic conductivity of 1×10^{-4} cm/sec. The hydraulic gradients and velocities are summarized in Table 4.

Since deeper piezometers have not been installed in this area, no data is available to determine the vertical gradient. However, the direction of groundwater flow between permeable zones is typically downward, for permeable zones located above the aquifers pumped for water supply (in this case the Evangeline Aquifer). Example calculations of horizontal flow gradients and velocities are included in Attachment C.

Pathways for Pollution Migration

If the primary barrier liner system were breached, the most likely pathway for pollution migration into the groundwater at this site would be via vertical movement through several feet of highly plastic silty clay into the Shallow Silt. Migration within the Shallow Silt would be expected to be parallel to the direction of groundwater flow, i.e. toward the southeast.

Identification of Uppermost Aquifer

On the basis of the investigations carried out at the site, the Shallow Silt has been identified as the uppermost aquifer. It is found at some fifteen or more feet below the dike crest elevation. Deeper aquifers are indicated by data available from the eighty-foot deep electric logs taken during piezometer installation. These logs indicate that the top of permeable zones exist at approximate depths of: 35 to 38 ft; 50 ft; and 75 to 80 ft. The approximate thicknesses of these sands are 4 to 5 ft; 10 to 25 ft; and 2 ft, respectively.

Interpreted surface contour maps for the top and bottom of the uppermost aquifer are included as Exhibits 25 and 26.

Groundwater Flow Direction and Rate

The Shallow Silt in the immediate vicinity of Basins N and O is not believed to be in in good hydraulic connection with deeper sands. Electric logs and soil samples collected from borings in the area of the basins show some eight to twenty feet of highly plastic clays separate the Shallow Silt from the next deeper permeable zone. Southeast of the basins, more massive shallow sand bodies exit that may provide hydraulic connection between the Shallow Silt and the deeper permeable zones.

The shallow groundwater flow in the vicinity of Basins N and O is generally to the southeast. Flow rates have been calculated to be approximately two feet per year using Darcy Equation with an assumed porosity of 30% and an assumed hydraulic conductivity of 1×10^{-4} cm/sec.

TABLES

GEOLOGY REPORT

Table 1

WATER PRODUCTION WELLS WITHIN ONE MILE OF LYONDELL PETROCHEMICAL COMPANY - CHANNELVIEW

8280 Sheldon Road
Channelview, Texas

WELL NUMBER	OWNERS NAME	LATITUDE	LONGITUDE	STATE #	DIST	ELEV	DIAM	DTFS	TOTAL DEPTH	YEAR DRILLED	APPROXIMAT 1990 PUMPAG
1795	EXXON CHEMICAL COMPANY	29-49-17	95- 6-42	65-16-4	0.43	37	24	580	750	65	87,500
1796	EXXON CHEMICAL COMPANY	29-49-15	95- 6-44	65-16-4	0.48	36	24	580	750	65	87,500
1350	LYONDELL PETROCHEMICAL CO.	29-49-51	95- 6-51	65-16-4	0.49	41	20	710	1529	56	150,150,750
1358	ARCO CHEMICAL COMPANY	29-50- 3	95- 6-38	65-16-1	0.53	39	20	770	1510	55	0
1351	LYONDELL PETROCHEMICAL CO	29-50- 6	95- 6-53	65-16-1	0.72	41	20	780	1575	56	150,150,750
1354	LYONDELL PETROCHEMICAL CO.	29-49-48	95- 7-10	65-16-4	0.78	41	20	820	1891	75	150,150,750
1352	LYONDELL PETROCHEMICAL CO	29-50- 5	95- 7-13	65-16-1	0.98	40	20	807	1578	75	150,150,750

TOTAL 1990 PUMPAGE FOR THE WELLS ABOVE IS 632,778,000

Table 2

SCREENED INTERVALS OF MONITOR WELLS

Lyondell Petrochemical Company
Channelview Facility

WELL NO.	TOP OF SCREEN	BOTTOM OF SCREEN	TOP OF PVC CASING
	Historic Facility Monitor Wells		
1	32.2	27.2	43.68
2	33.8	28.8	43.80
3	33.0	28.0	42.47
4	32.0	27.0	43.99
5	34.4	14.4	43.91
6	36.2	-3.8	42.18
7	8.7	3.7	42.68
8	25.2	22.2	37.23
9	25.6	20.6	41.56
10	24.7	19.7	40.69
16	27.6	22.6	43.55
	Monitor Well System for Basins N and O		
20	27.22	24.72	42.22
21	27.23	24.73	42.23
22	26.74	16.74	40.74
23	27.96	17.96	41.96
24	25.72	23.22	41.72

Note: All elevations are referenced to mean sea level (msl) as furnished by Lyondell Petrochemical Company - Channelview

MEASUREMENTS OF PARAMETERS DOMAIN 1

CLIENT: LYONDELL (CH)
PARAMETER: WATERLEV
UNITS: FT MSL

	WELL NAME						
DATE	1	2	3	4	5	6	7
1084	35.20	36.20	36.10	37.30	36.40	34.50	32.00
0185	39.00	38.20	38.30	38.90	37.40	37.60	33.70
0685	37.00	36.70	37.90	38.30	37.10	37.30	33.00
0986	34.40	35.20	35.60	36.20	36.00	36.00	32.70
0187	39.70	38.80	38.60	39.40	37.90	38.20	35.00
0687	37.30	38.10	37.90	38.50	37.60	37.70	34.90
0188	38.15	38.12	38.52	38.93	37.86	37.78	33.87
0688	35.48	35.90	36.44	37.42	36.67	36.84	32.84
1288	29.85	31.43	32.24	33.45	34.15	34.22	30.16

Table 3

WATER LEVEL ELEVATIONS
IN WELLS and PIEZOMETERS
Lyondell Petrochemical Company
Channelview

MEASUREMENTS OF PARAMETERS DOMAIN 1

CLIENT: LYONDELL (CH)
PARAMETER: WATERLEV
UNITS: FT MSL

	WELL NAME						
DATE	1	2	3	4	5	6	7
0689	36.41	36.93	37.62	38.47	36.99	37.29	33.35
1289	32.19	33.84	35.92	35.39	35.96	36.08	31.80
0690	33.60	35.18	35.59	35.99	36.03	36.08	32.86
1290	33.78	35.08	35.77	37.28	36.72	36.83	32.73
0691	38.55	38.58	38.71	39.44	38.17	38.36	34.88

Table 3

WATER LEVEL ELEVATIONS
IN WELLS and PIEZOMETERS
Lyondell Petrochemical Company
Channelview

MEASUREMENTS OF PARAMETERS DOMAIN 3

CLIENT: LYONDELL (CH)
PARAMETER: WATERLEV
UNITS: FT MSL

WELL NAME

DATE	8	9	10
1084	21.20	25.70	23.30
0185	21.60	25.40	25.50
0685	21.10	25.20	24.50
0986	NOT RUN	24.60	22.40
0187	24.50	31.80	32.00
0687	23.20	35.40	28.40
0188	NOT RUN	30.33	24.77
0688	NOT RUN	25.39	22.45
1288	NOT RUN	24.34	20.28

Table 3

WATER LEVEL ELEVATIONS
IN WELLS and PIEZOMETERS
Lyondell Petrochemical Company
Channelview

MEASUREMENTS OF PARAMETERS DOMAIN 3

CLIENT: LYONDELL (CH)
PARAMETER: WATERLEV
UNITS: FT MSL

WELL NAME

DATE	8	9	10
0689	NOT RUN	24.71	NOT RUN
1289	NOT RUN	24.81	NOT RUN
0690	NOT RUN	24.66	NOT RUN
0690	NOT RUN	24.66	NOT RUN
1290	NOT RUN	24.77	NOT RUN
0691	21.77	27.01	28.79

Table 3

WATER LEVEL ELEVATIONS
IN WELLS and PIEZOMETERS
Lyondell Petrochemical Company
Channelview

MEASUREMENTS OF PARAMETERS DOMAIN 2

CLIENT: LYONDELL (CH)
PARAMETER: WATERLEV
UNITS: FT MSL

DATE	16
1084	33.40
0185	38.80
0685	35.10
0986	32.10
0187	39.20
0687	36.90
0288	38.20
0888	34.10
1288	28.68

WELL NAME

Table 3

WATER LEVEL ELEVA[illegible]
IN WELLS and PIEZ[illegible]
Lyondell Petrochemi[illegible]
Channelview

MEASUREMENTS OF PARAMETERS DOMAIN 2

CLIENT: LYONDELL (CH)
PARAMETER: WATERLEV
UNITS: FT MSL

DATE	WELL NAME 16
0689	33.49
1289	30.07
0690	31.71
1290	31.75
0691	38.23

Table 3

WATER LEVEL ELEVATIONS
IN WELLS and PIEZOMETERS
Lyondell Petrochemical Company
Channelview

WATER LEVEL ELEVATION IN WELLS AND PIEZOMETERS

Piezometer Study

Lyondell Petrochemical Company - Channelview

	WELL NUMBER											PIEZOMETER NUMBER		
DATE	1	2	3	4	5	6	7	8	9	10	16	P301	P302	P303
8/7/91	36.63	37.43	37.81	38.53	37.67	37.80	34.64	dry	25.08	26.24	35.87	31.77	36.08	37.68
8/12/91	36.06	37.00	37.32	37.99	37.47	37.64	34.43	dry	24.97	25.59	35.09	31.34	35.65	37.51
8/19/91	35.43	36.65	36.95	37.43	37.25	37.45	34.09	dry	24.84	24.99	34.25	30.94	35.30	36.94

Table 3

WATER LEVEL ELEVATIONS
IN WELLS and PIEZOMETERS
Lyondell Petrochemical Company
Channelview

Table 4

Summary of

HORIZONTAL GRADIENTS AND VELOCITIES

Shallow Silt Zone

Lyondell Petrochemical Company - Channelview

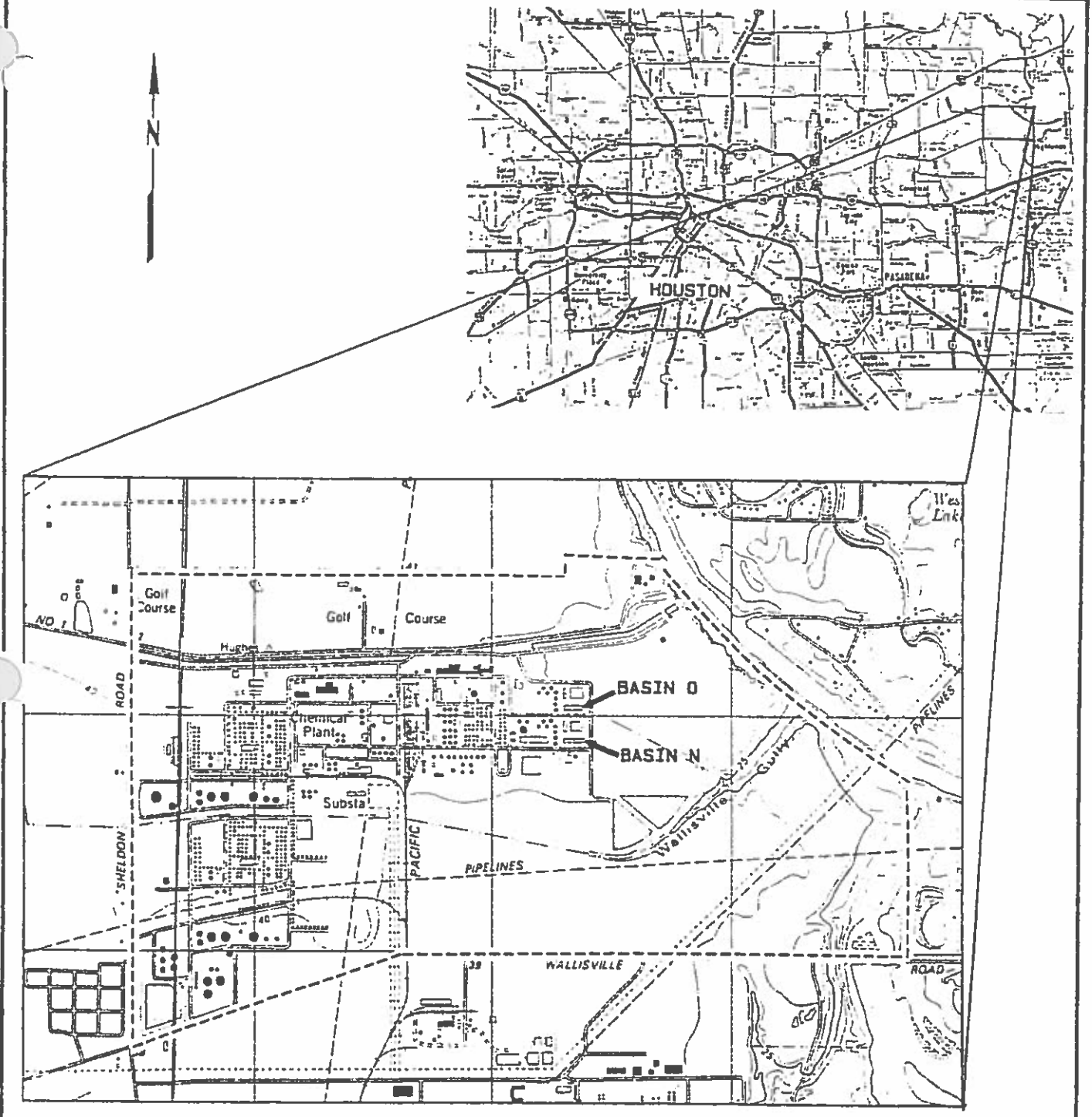
	GRADIENT	VELOCITY (feet per year)
MAXIMUM	0.00645	2.23
MINIMUM	0.00571	1.97
AVERAGE	0.00607	2.09

NOTE

Gradients calculated from three intervals of piezometer readings taken in August 1991.
Velocities calculated using Darcy's Equation.

EXHIBITS

GEOLOGY REPORT



0 1.0

APPROXIMATE SCALE
(Miles)

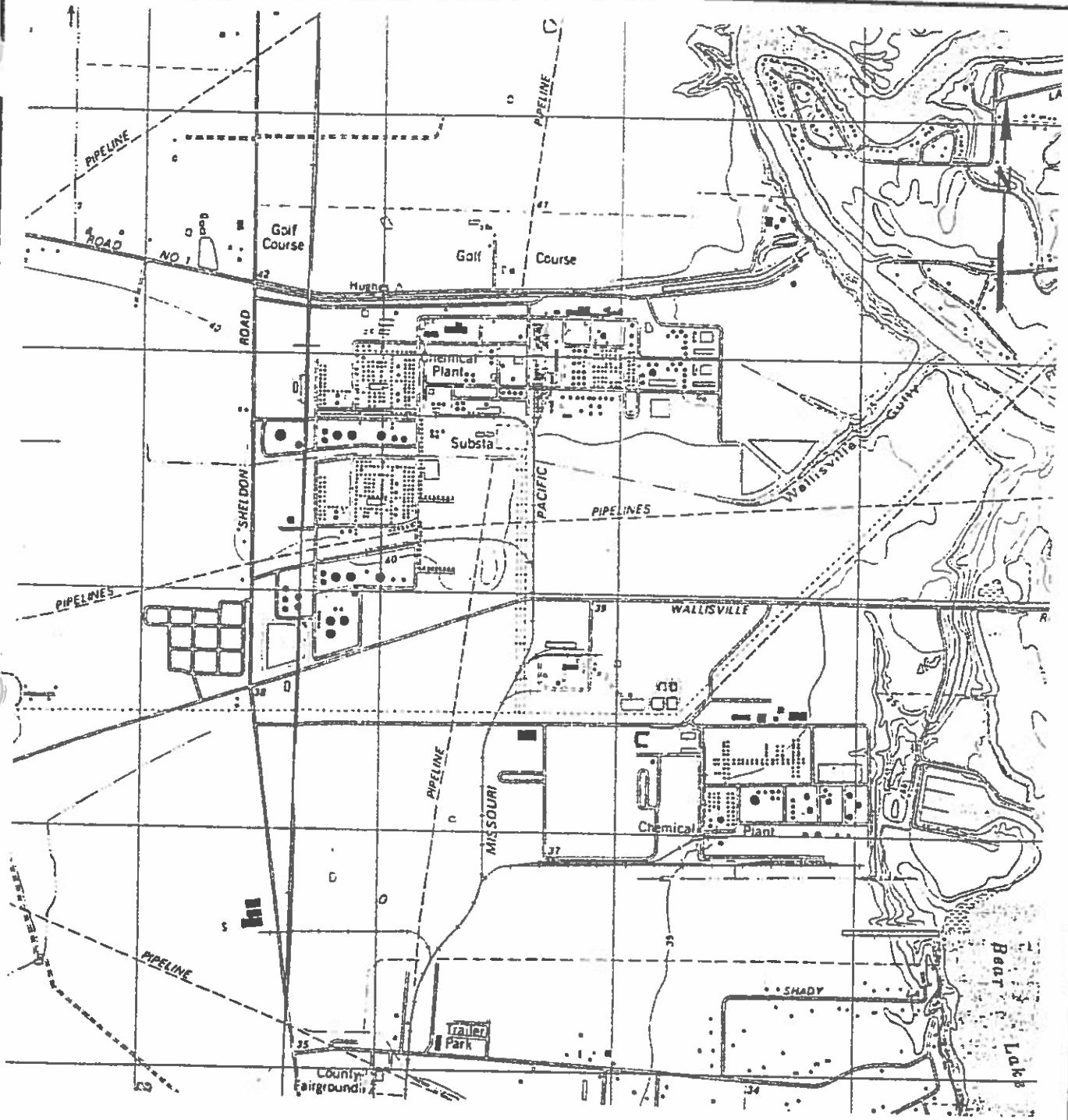
GEO ASSOCIATES

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SITE LOCATION MAP

LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	SEPTEMBER 1991	1



0 1.0

APPROXIMATE SCALE
(Miles)

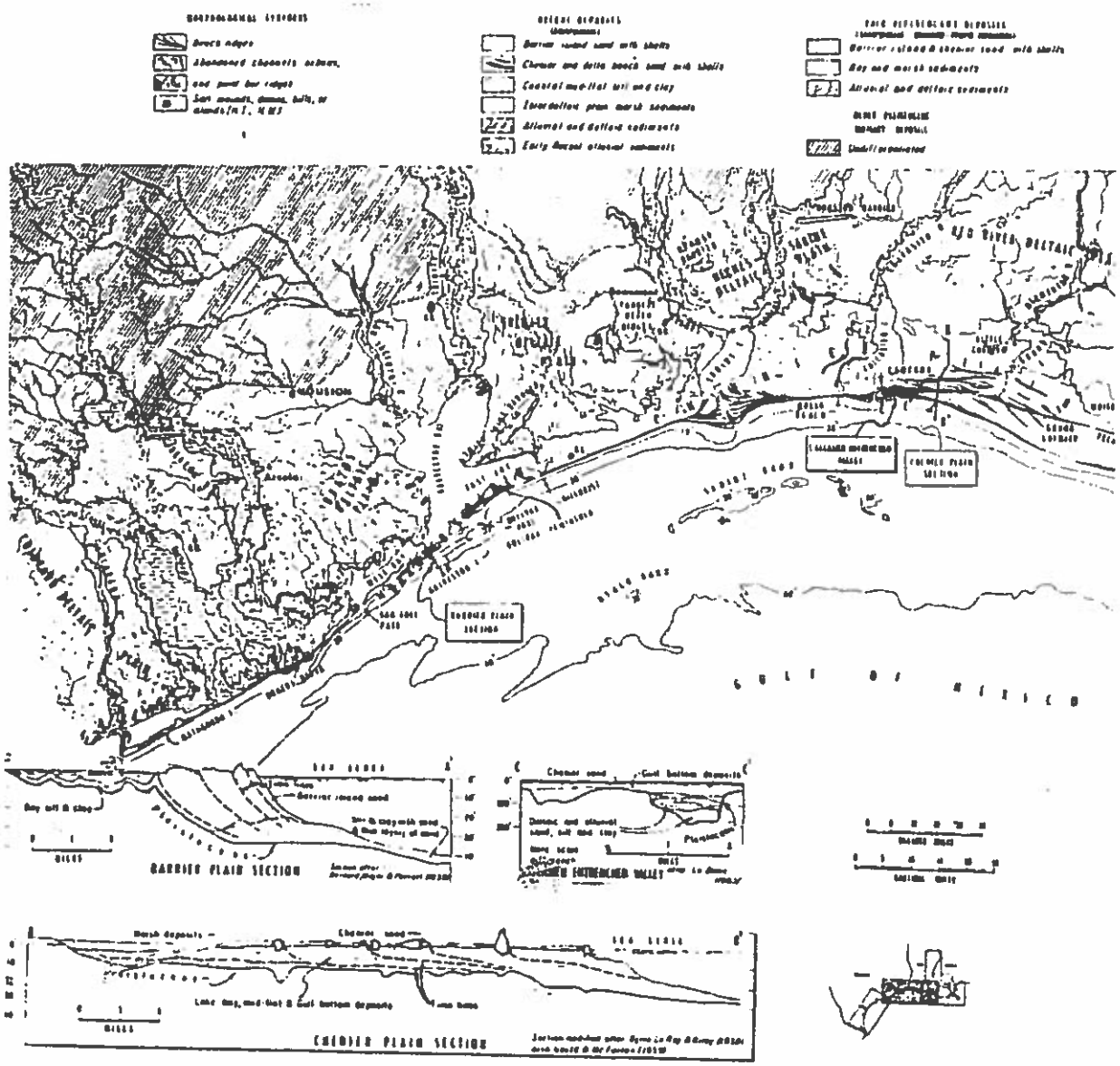
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TOPOGRAPHIC MAP

LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	SEPTEMBER 1991	2



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REGIONAL PHYSIOGRAPHY
LATE QUATERNARY GEOLOGIC MAP
WESTERN GULF COAST PLAIN
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILIY

NO.	DATE	EXHIBIT NUMBER
254	SEPTEMBER 1991	3

Geologic classification			Hydrologic unit		
System	Series	Stratigraphic unit	Houston district (Long, Winslow, and White, 1950)	Houston district (Jorgensen, 1975)	This report
Quaternary	Holocene	Quaternary alluvium	Alluvial deposits	Chicot aquifer: Upper unit	Chicot aquifer: Upper unit
	Pleistocene	Beaumont Formation	Beaumont Clay		
		Montgomery Formation			
		Bentley Formation	"Alta Loma Sand"	Chicot aquifer: Lower unit	Chicot aquifer: Lower unit
		Willis Sand	Zone 7		
			Zone 6		
Tertiary	Pliocene	Goliad Sand	Zone 5	Evangeline aquifer	Evangeline aquifer
			Zone 4		
			Zone 3		
	Miocene	Fleming Formation	Zone 2	Burkeville confining layer	Burkeville confining layer
		Oakville Sandstone	Zone 1	Jasper aquifer	Jasper aquifer

Adapted from USGS Water Resources Investigations Report 90-4012 p. 41

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GENERALIZED STRATIGRAPHIC COLUMN
TEXAS GULF COAST
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO	DATE	EXHIBIT NUMBER
254	SEPTEMBER 1991	5

EXHIBIT 6

of the Geology Report

GEOTECHNICAL STRATIGRAPHY AND PARAMETERS
FOR SHELDON SUBSECTOR SUBSIDENCE MODEL
EXHIBIT 4-32

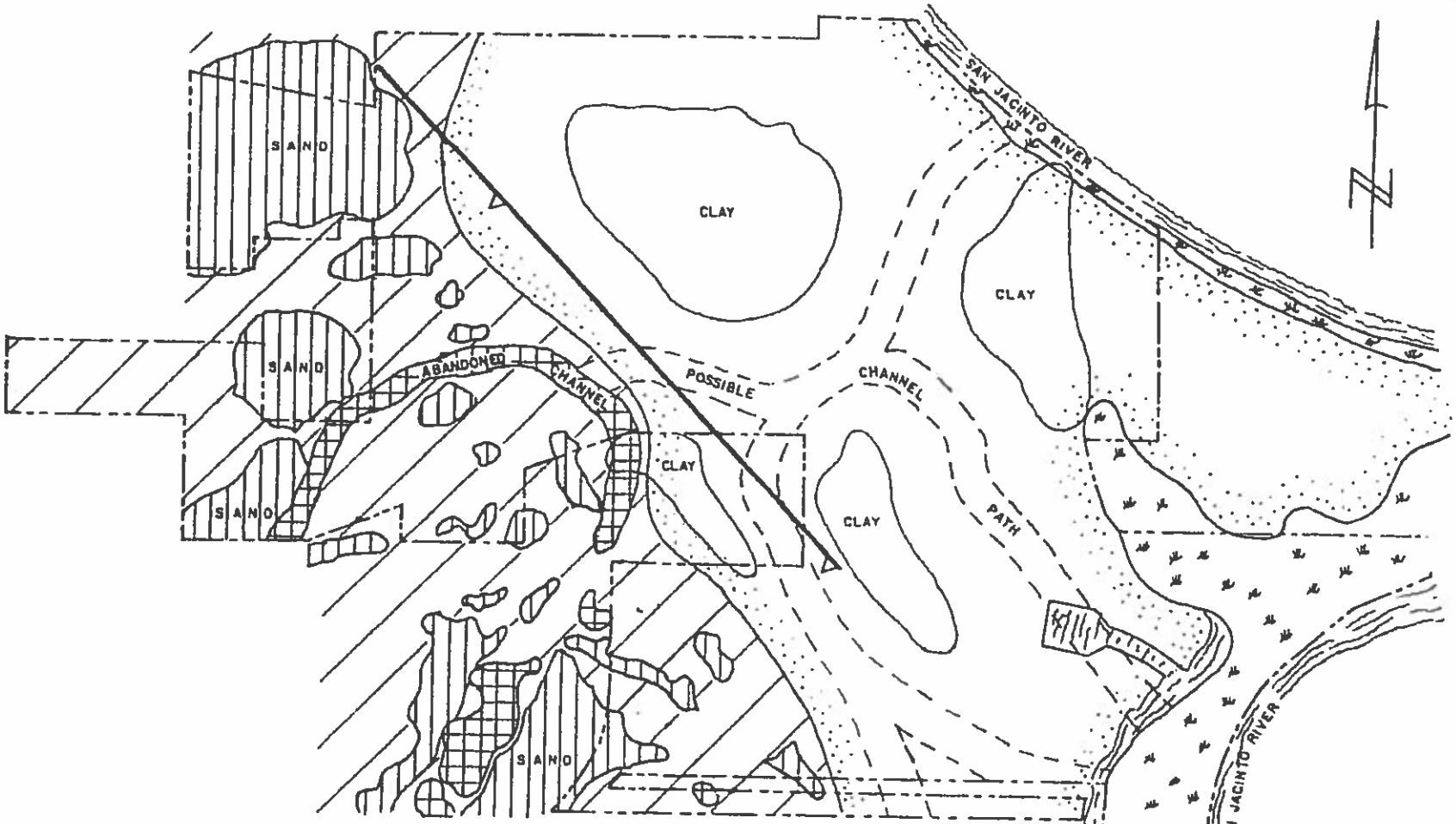
Compacting Interval No.	Depth Interval Ft.	Total Clay Thickness Ft.	Equivalent Clay Layer Thickness Ft.	Hydraulic Conductivity $Ft./yr^{-1}$	Virgin Compressibility $Ft.^{-1}$	Elastic Compressibility $Ft.^{-1}$
1	90-160	70	70	2.6×10^{-3}	3.3×10^{-4}	3.3×10^{-5}
2	230-242	12	12	1.9×10^{-3}	1.9×10^{-4}	1.9×10^{-5}
3	290-340	50	50	1.6×10^{-3}	1.3×10^{-4}	1.3×10^{-5}
4	350-500	150	150	1.2×10^{-3}	1.1×10^{-4}	1.1×10^{-5}
5	600-735	34	17	6.5×10^{-4}	8.6×10^{-5}	8.6×10^{-6}
6	785-920	124	62	4.1×10^{-4}	7.3×10^{-5}	6.2×10^{-6}
7	925-1175	112	28	2.5×10^{-4}	6.2×10^{-5}	6.2×10^{-6}
8	1220-1290	70	70	1.4×10^{-4}	5.0×10^{-5}	5.0×10^{-6}
9	1440-1640	80	20	7.3×10^{-5}	4.0×10^{-5}	4.0×10^{-6}

Adapted from HGCSD Water Resource Management Program Phase II

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SUBSURFACE STRATIGRAPHY
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	SEPTEMBER 1991	9



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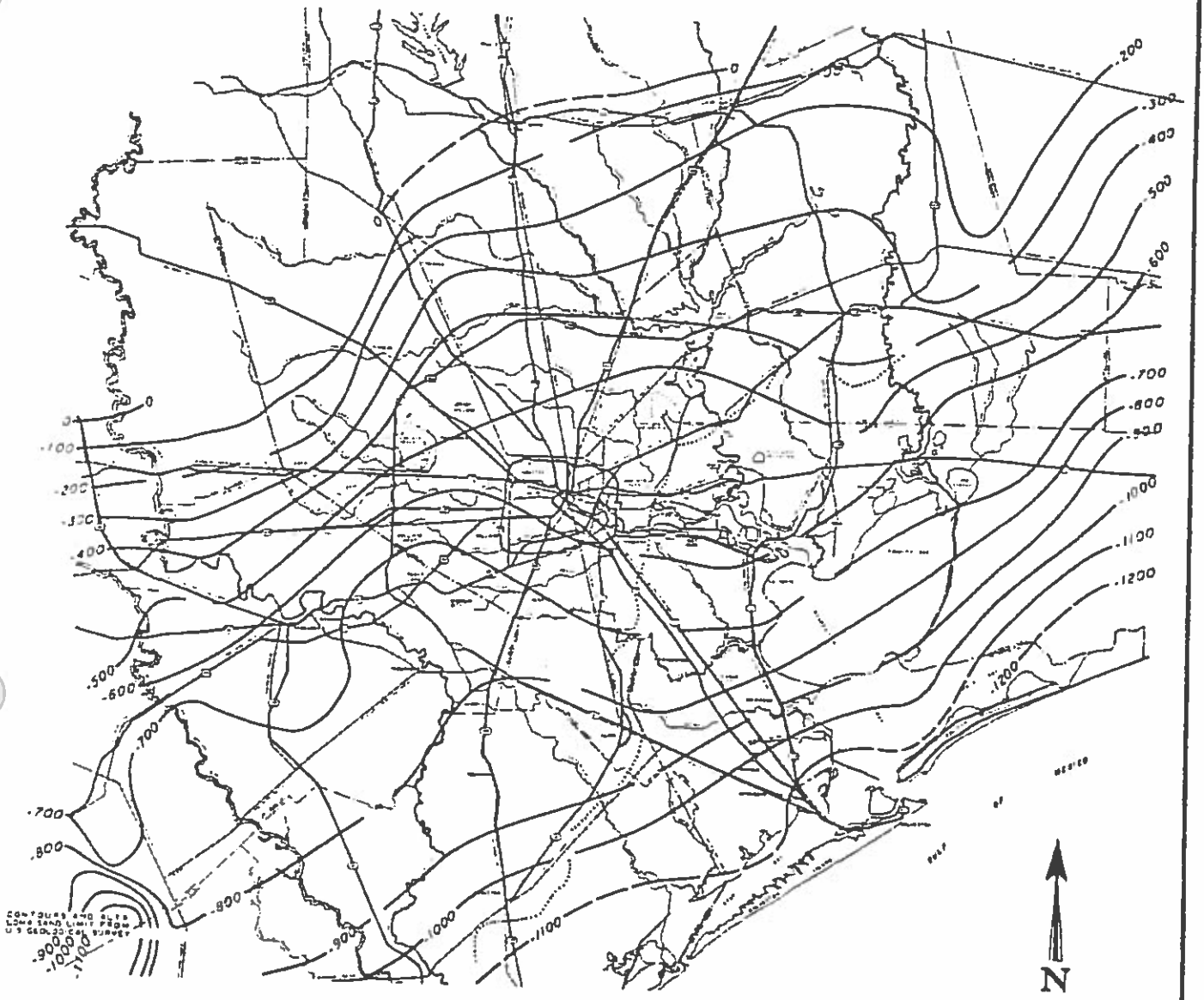
GENERALIZED INTERPRETATION
OF SHALLOW GEOLOGY

LYONDELL PETROCHEMICAL COMPANY

NO.	DATE	EXHIBIT NUMBER
254	SEPT. 1991	10

LEGEND

- SWAMP LAND
- SAN JACINTO MEANDERBELT
- DISTRIBUTARY SANDS
- INTERDISTRIBUTARY MUD & SAN JACINTO FLOODPLAIN MUD
- ABANDONED CHANNEL
- SURFACE TRACE OF GEOLOGIC FAULT WITH DOWNTHROWN SIDE INDICATED



EXPLANATION

—-600— BASE OF CHICOT CONTOUR, FEET BELOW SEA LEVEL

APPROXIMATE LOCATION OF SALT DOME

APPROXIMATE NORTHWESTERN LIMIT OF ALTA LOMA SAND

-5 0 5 10 15 20

APPROXIMATE SCALE
(Statute Miles)

Adapted from HGCSD Water Resource Management Program Phase I

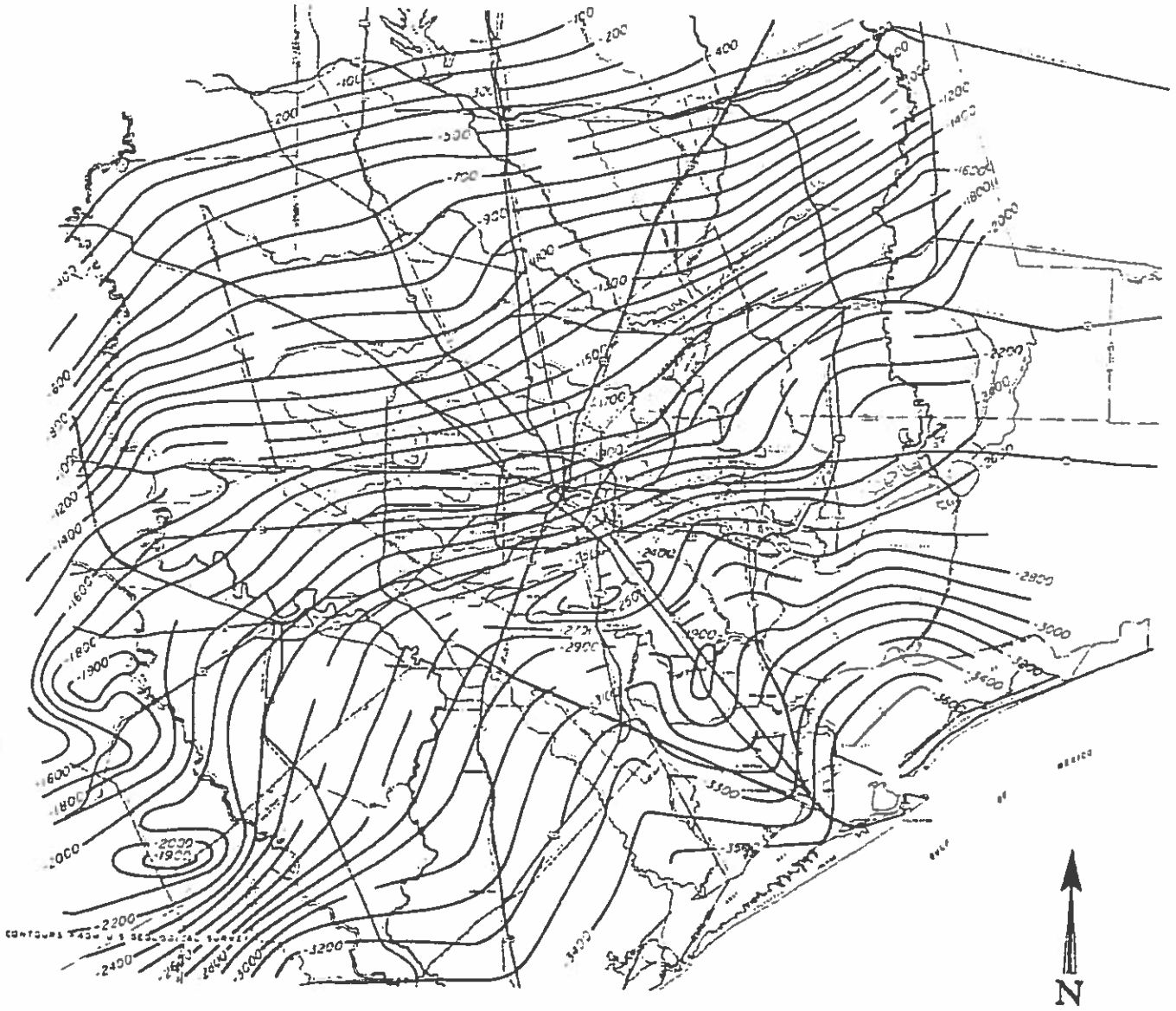
GEO ASSOCIATES

Geotechnical Engineering & Groundwater Hydrology

ALTITUDE OF BASE OF CHICOT AQUIFER

LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	SEPTEMBER 1991	13



EXPLANATION

—2400— BASE OF EVANGELINE CONTOUR, FEET BELOW SEA LEVEL

APPROXIMATE LOCATION OF SALT DOME

-5 0 5 10 15 20

APPROXIMATE SCALE
(Statute Miles)

Adapted from HGCSD Water Resouce Management Phase I

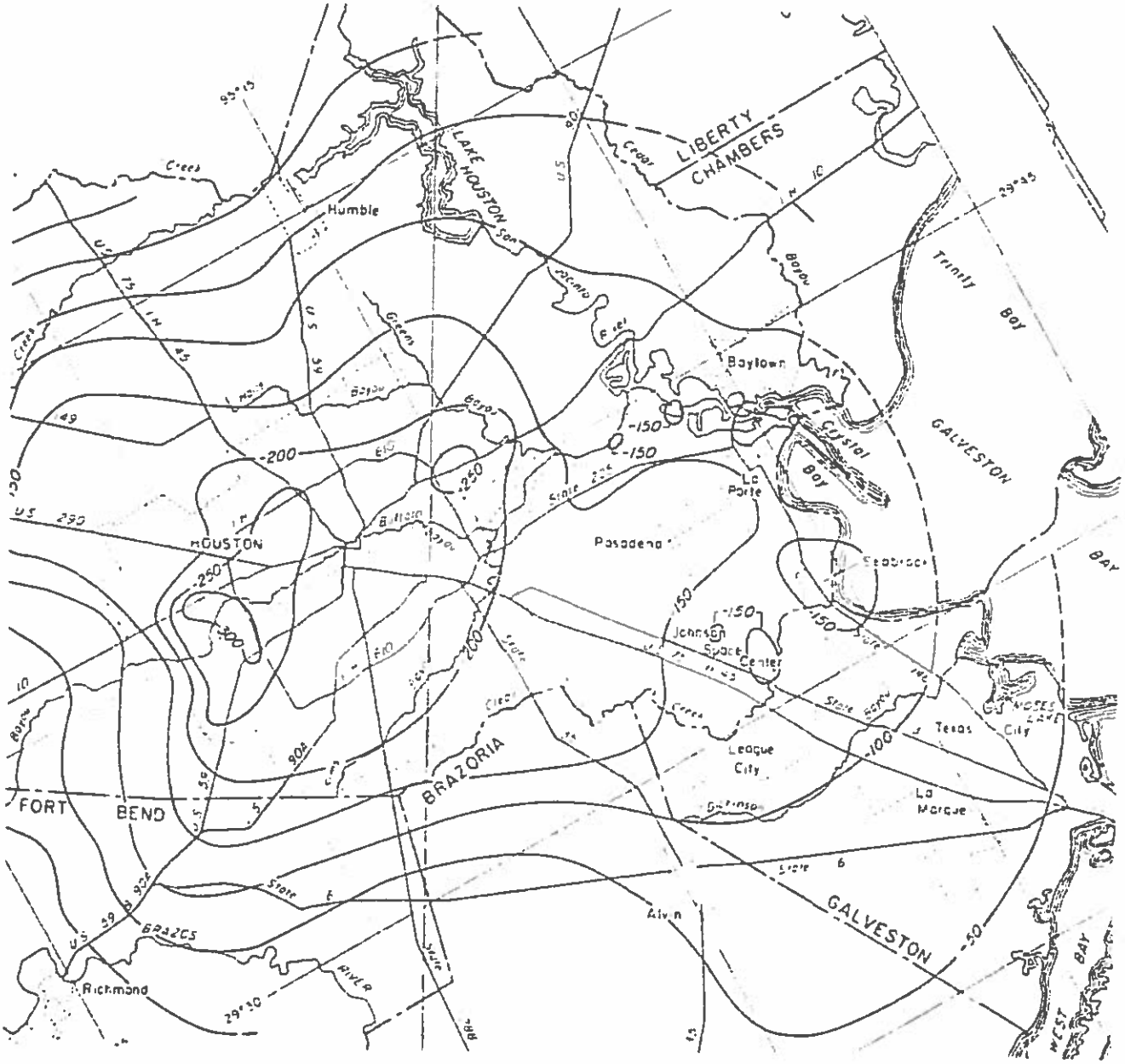
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ALTITUDE OF BASE OF EVANGELINE AQUIFER

LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO	DATE	EXHIBIT NUMBER
254	SEPTEMBER 1991	14



0 4 8 12 16 20 MILES

0 4 8 12 16 20 KILOMETERS

EXPLANATION

—100— WATER-LEVEL CONTOUR--Shows altitude at which water level would have stood in tightly cased wells. Dashed where approximately located. Contour interval 50 feet. National Geodetic Vertical Datum of 1929

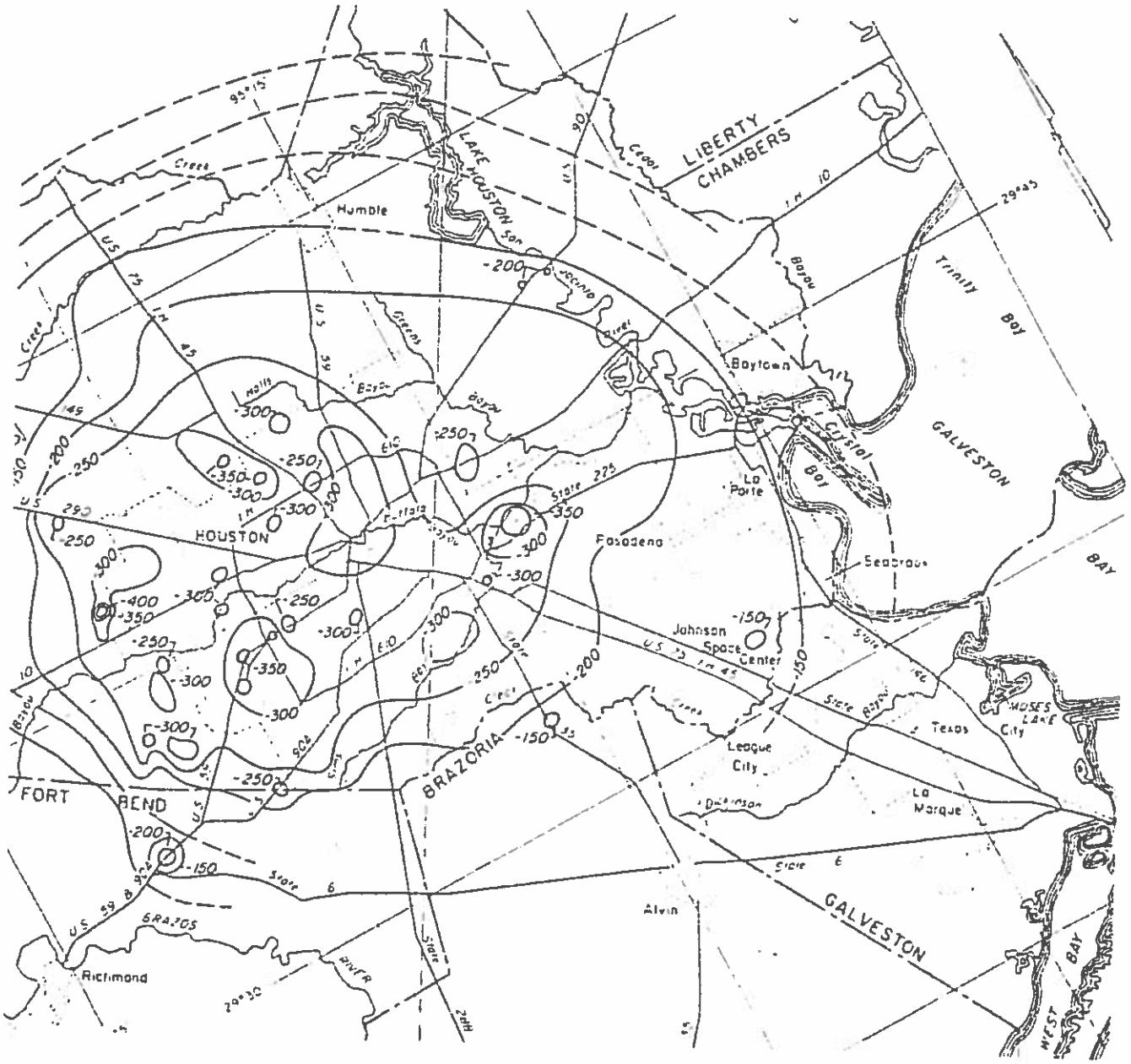
Adapted from USGS Open-File Report 86-306

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APPROXIMATE ALTITUDE OF WATER LEVELS IN WELLS IN THE CHICOT AQUIFER, SPRING 1986
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO	DATE	EXHIBIT NUMBER
254	SEPTEMBER 1991	15



0 4 8 12 16 20 MILES

0 4 8 12 16 20 KILOMETERS

EXPLANATION

---100--- WATER-LEVEL CONTOUR--Shows altitude at which water level would have stood in tightly cased wells. Dashed where approximately located. Contour interval 50 feet. National Geodetic Vertical Datum of 1929

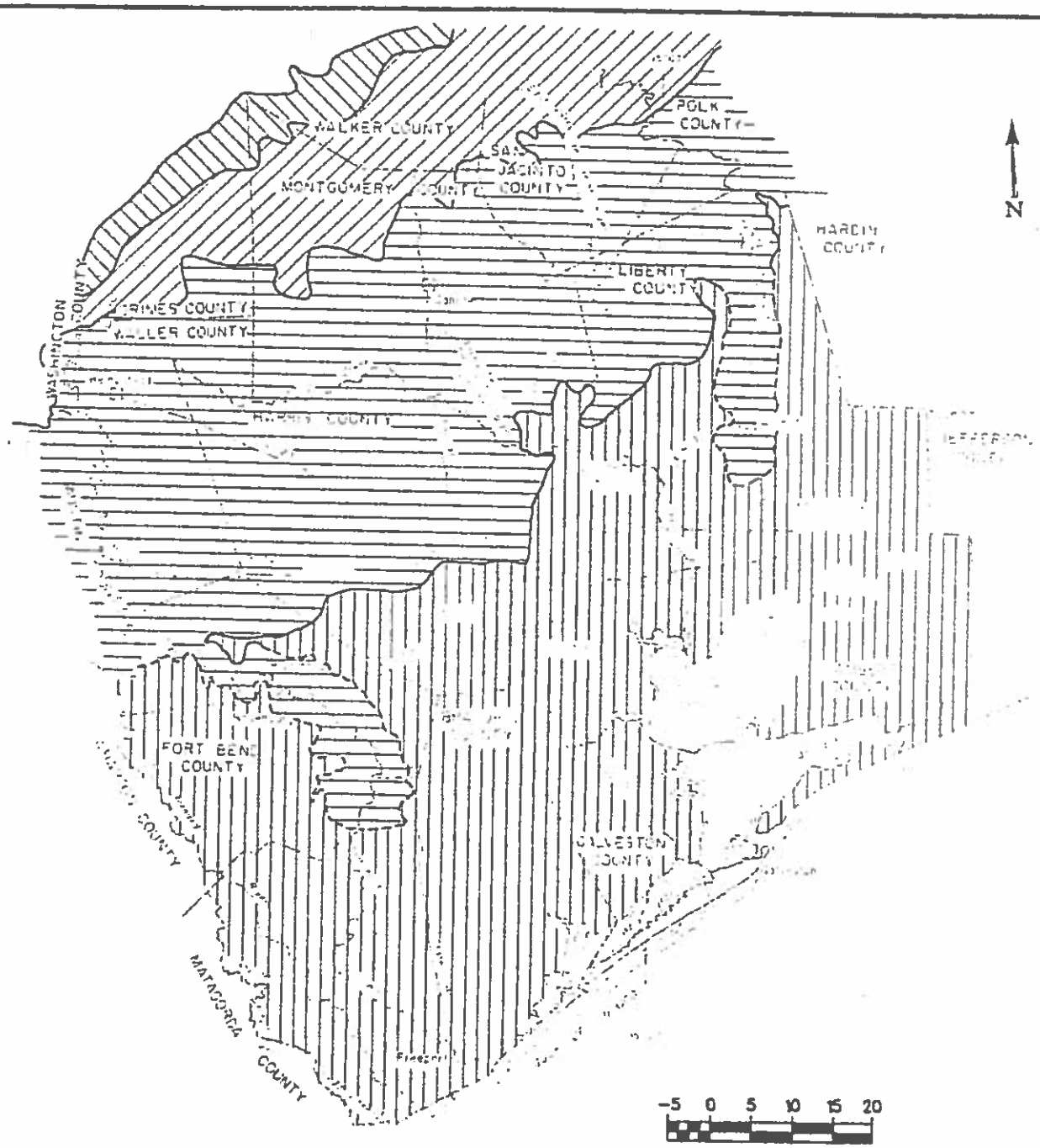
Adapted from USGS Open-File Report 86-306

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Geotechnical Engineering & Groundwater Hydrology

APPROXIMATE ALTITUDE OF WATER LEVELS IN WELLS IN THE EVANGELINE AQUIFER, SPRING 1986
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	SEPTEMBER 1991	16



EXPLANATION

- BURKEVILLE CONFINING SYSTEM (Basal part of Fleming Formation, area of little or no recharge)
- RECHARGE AREA OF THE EVANGELINE AQUIFER SYSTEM (Includes the landward Willis Formation and coastward part of Fleming Formation)
- RECHARGE AREA OF THE CHICOT AQUIFER SYSTEM (Includes Montgomery and Bentley Formations and coastward Willis Formation)
- BEAUMONT CLAY (Area of little or no recharge)
- COASTWARD EXTENT OF INCISION IN THE BEAUMONT CLAY

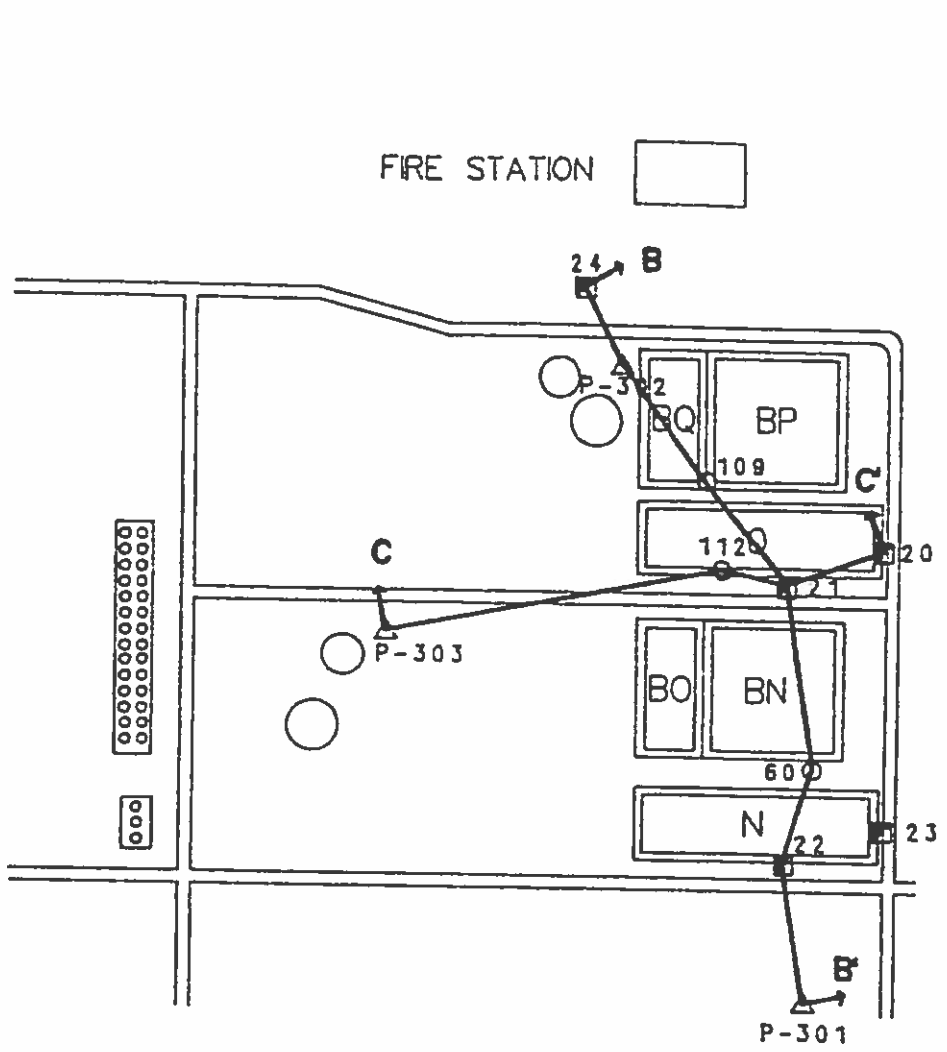
Adapted from HGCSD Water Resource Management Program Phase I

GEO ASSOCIATES

Geotechnical Engineering & Groundwater Hydrology

APPROXIMATE RECHARGE AREAS
OF CHICOT AND EVANGELINE AQUIFERS
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO	DATE	EXHIBIT NUMBER
254	SEPTEMBER 1991	17



NOTE: BORINGS 60, 109 AND 112, BY OTHERS

LEGEND

- ▣ MONITORING WELL
- △ PIEZOMETER
- O BORING

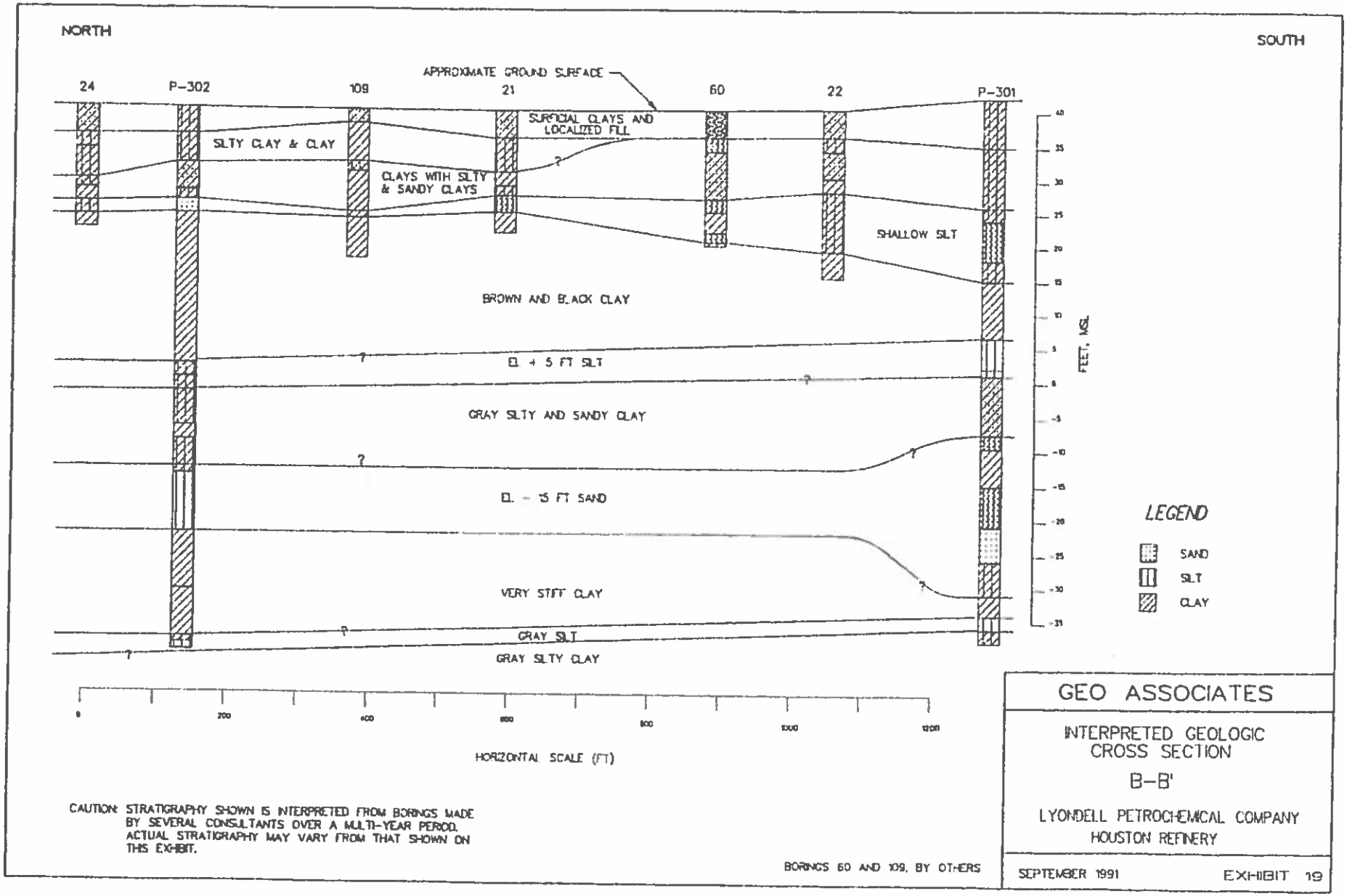
SCALE: 1 INCH = 300 FEET

GEO ASSOCIATES

CROSS SECTION LOCATION MAP

LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

SEPT. 1991 EXHIBIT 18



CAUTION: STRATIGRAPHY SHOWN IS INTERPRETED FROM BORINGS MADE BY SEVERAL CONSULTANTS OVER A MULTI-YEAR PERIOD. ACTUAL STRATIGRAPHY MAY VARY FROM THAT SHOWN ON THIS EXHIBIT.

BORINGS 60 AND 109, BY OTHERS

GEO ASSOCIATES

INTERPRETED GEOLOGIC CROSS SECTION

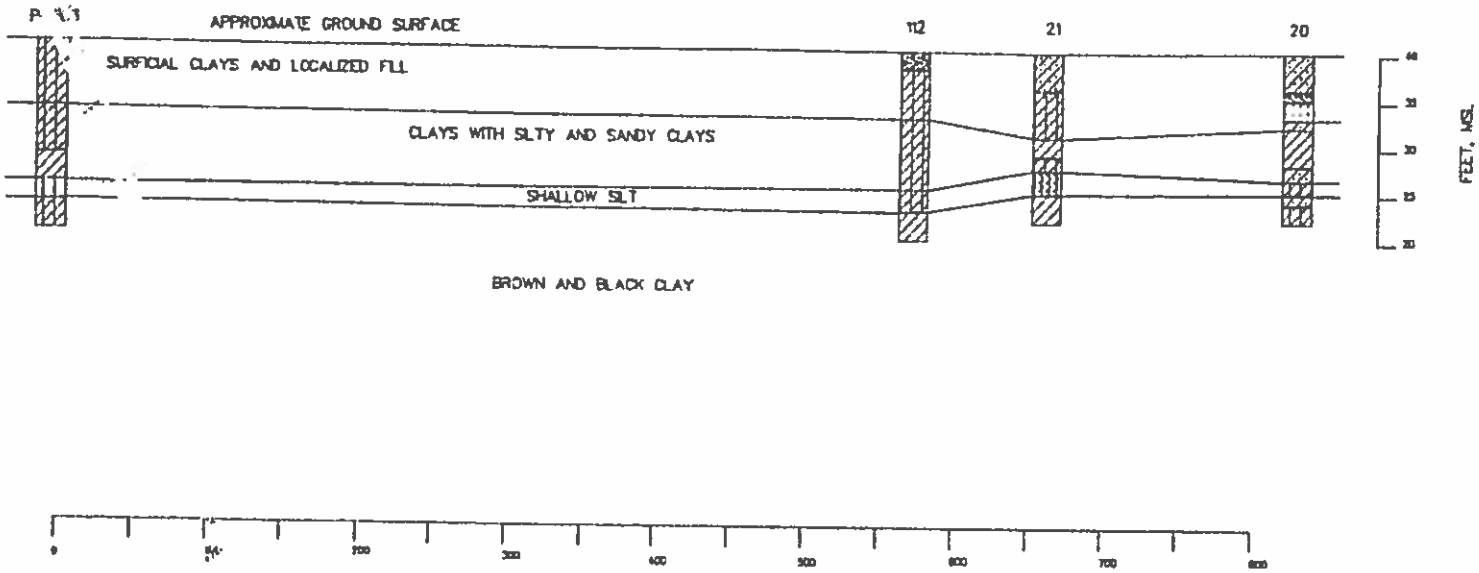
B-B'

LYONDELL PETROCHEMICAL COMPANY
HOUSTON REFINERY

SEPTEMBER 1991 EXHIBIT 19

WEST

EAST



LEGEND

SAND

SILT

CLAY

BORING 112, BY OTHERS

CAUTION: STRATIGRAPHY SHOWN IS INTERPRETED FROM BORINGS MADE BY SEVERAL CONSULTANTS OVER A MULTI-YEAR PERIOD. ACTUAL STRATIGRAPHY MAY VARY FROM THAT SHOWN ON THIS EXHIBIT.

GEO ASSOCIATES

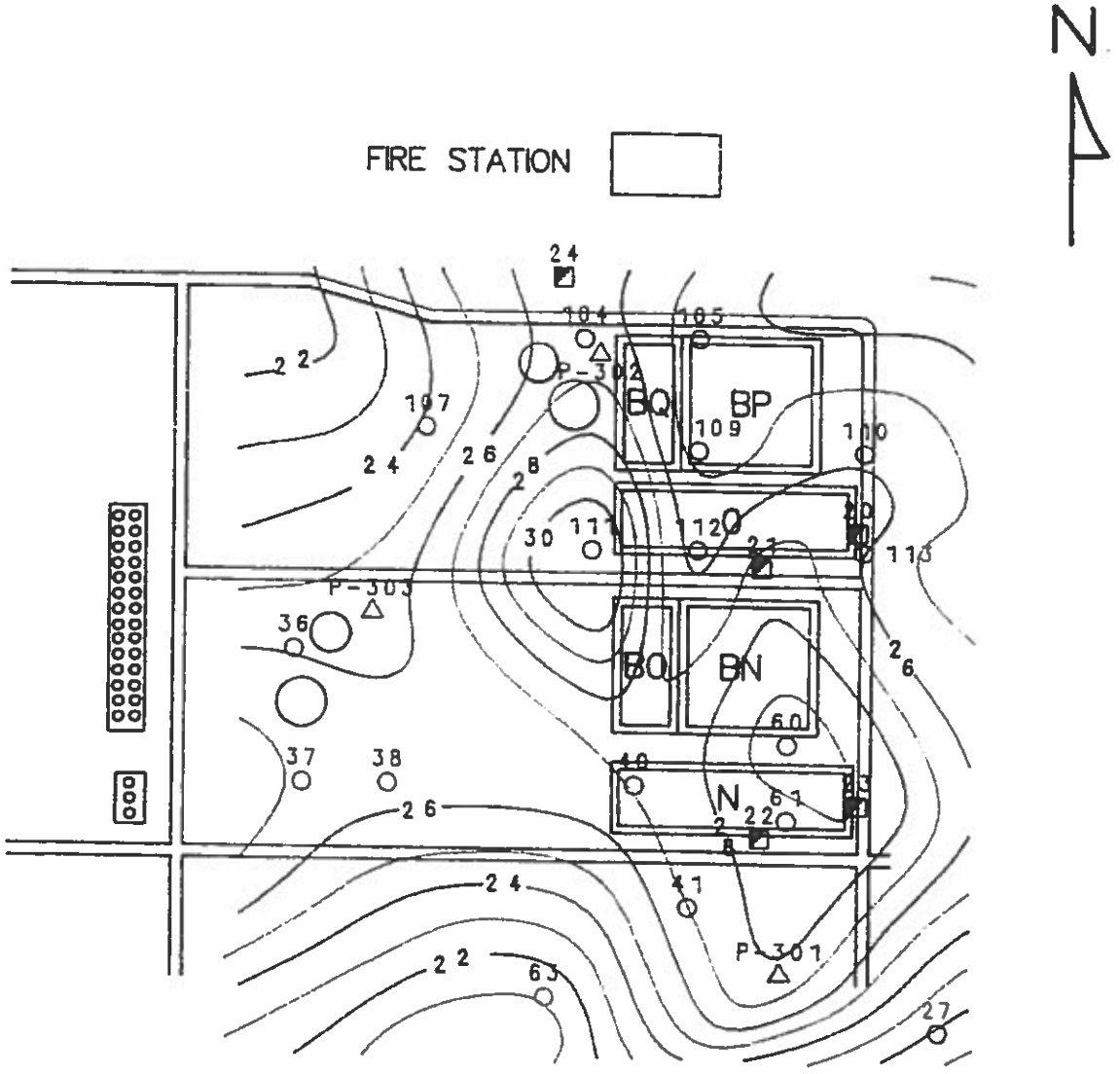
INTERPRETED GEOLOGIC CROSS SECTION

C–C'

LYONDELL PETROCHEMICAL COMPANY
HOUSTON REFINERY

SEPT. 1991

EXHIBIT 20



LEGEND

- ◪ MONITORING WELL
- △ PIEZOMETER
- ○ BORING

NOTES:
1. ELEVATIONS ARE IN FT, MSL
2. NOMINAL GROUND SURFACE ELEVATION IS 40
3. INTERPRETATION IS MADE FROM BORINGS DRILLED AT DIFFERENT TIMES BY DIFFERENT INDIVIDUALS. ACTUAL CONDITIONS MAY VARY FROM THOSE ILLUSTRATED.

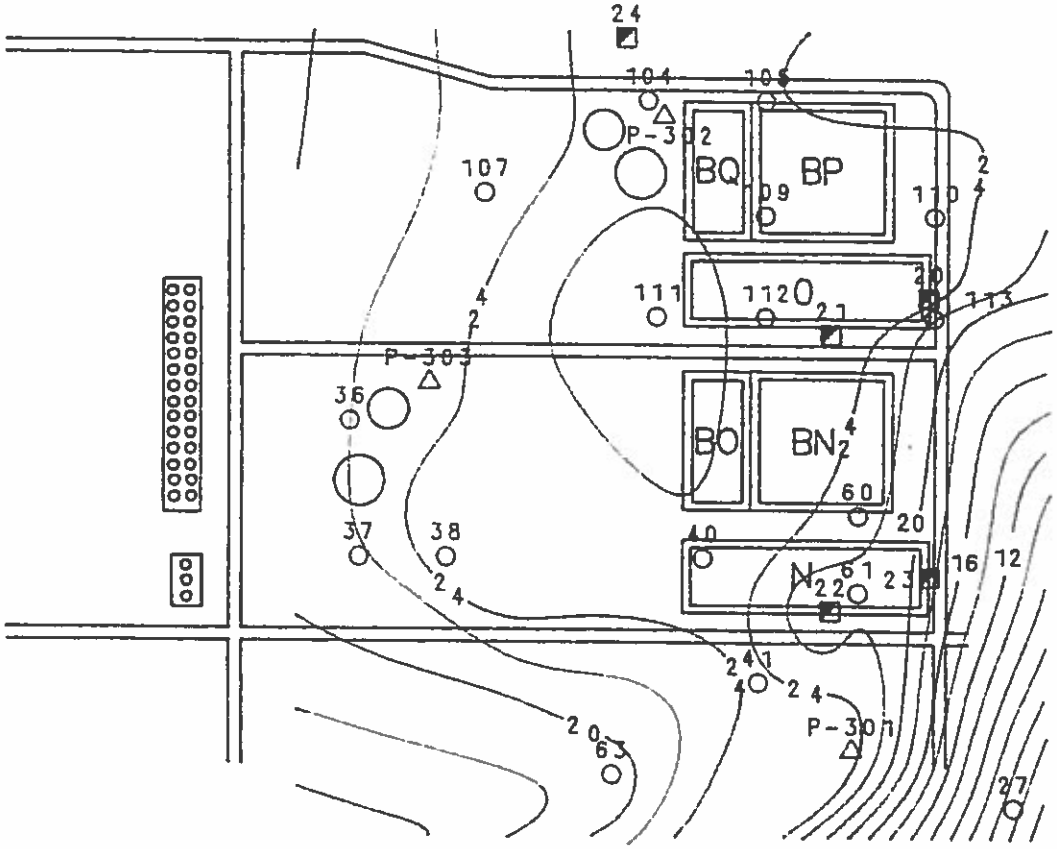
SCALE: 1 INCH = 300 FEET

GEO ASSOCIATES

INTERPRETED ELEVATION OF TOP OF UPPERMOST AQUIFER

LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

SEPT. 1991 EXHIBIT 25



LEGEND

- ▣ MONITORING WELL
- △ PIEZOMETER
- ○ BORING

NOTES: 1. ELEVATIONS ARE IN FT, MSL
2. NOMINAL GROUND SURFACE ELEVATION IS 40
3. INTERPRETATION IS MADE FROM BORINGS DRILLED AT DIFFERENT TIMES BY DIFFERENT INDIVIDUALS. ACTUAL CONDITIONS MAY VARY FROM THOSE ILLUSTRATED.

SCALE: 1 INCH = 300 FEET

GEO ASSOCIATES

INTERPRETED ELEVATION OF BOTTOM OF UPPERMOST AQUIFER

LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

SEPT. 1991 EXHIBIT 26

ATTACHMENTS

GEOLOGY REPORT

ATTACHMENT A

SELECTED BORING LOGS

LOG OF BORING NO. 10
SINCLAIR PETROCHEMICALS, INC.
EXPANSION OF LYONDELL PLANT
CHANNELVIEW, TEXAS

TYPE: 3" shelby-tube LOCATION: See Plate 1

DEPTH, FT	SYMBOL	SAMPLE NO.	DESCRIPTION OF MATERIAL	
			SURF. EL:	
5			Stiff dark gray clay -grass roots to 0.5' -dark gray & tan below 2' -light gray & tan below 6' -with calcareous & ferrous nodules and sand pockets, 6' to 12.5'	100 105
10			-tan & light gray, slickensided below 12.5'	
15				
20			Stiff tan & light gray sandy clay -sand seams & pockets, 20' to 24'	
25			-very stiff light gray & tan with calcareous nodules below 24'	
30				
35				
40				
45				
50				

COMPLETION DEPTH: 30'
DATE: July 20, 1965

DEPTH TO WATER IN BOR. HOL.: Caved at: 3.8' DATE: July 22, 1965

MCCLELLAND

PLATE 2

LOG OF BORING NO. 11
SINCLAIR PETROCHEMICALS, INC.
EXPANSION OF LYONDELL PLANT
CHANNELVIEW, TEXAS

TYPE: 3" shelby-tube LOCATION: See Plate 1

DEPTH, FT. | SYMBOL | DESCRIPTION OF MATERIAL | SURF. EL: | Qu, TSF: 0.2 0.4 0.6 1 2 4

Fill: very stiff gray sandy clay
-roots to 0.5'

Stiff gray & tan clay
-tan & light gray below 6.5'
-with calcareous & ferrous nodules below 6.5'
-slickensided below 12.5'

Stiff light gray & tan sandy clay with calcareous nodules
-tan & light gray below 28'
-sand seams below 30'
-increasingly sandy with depth

Depth	Qu, TSF
5	
10	113
15	100
20	102
25	96
30	
35	
40	
45	
50	

COMPLETION DEPTH: 40'
DATE: July 19, 1965

DEPTH TO WATER IN BORING: 8.8'

Caved at: 33.7'

DATE: July 20, 1965

MCCLELLAND

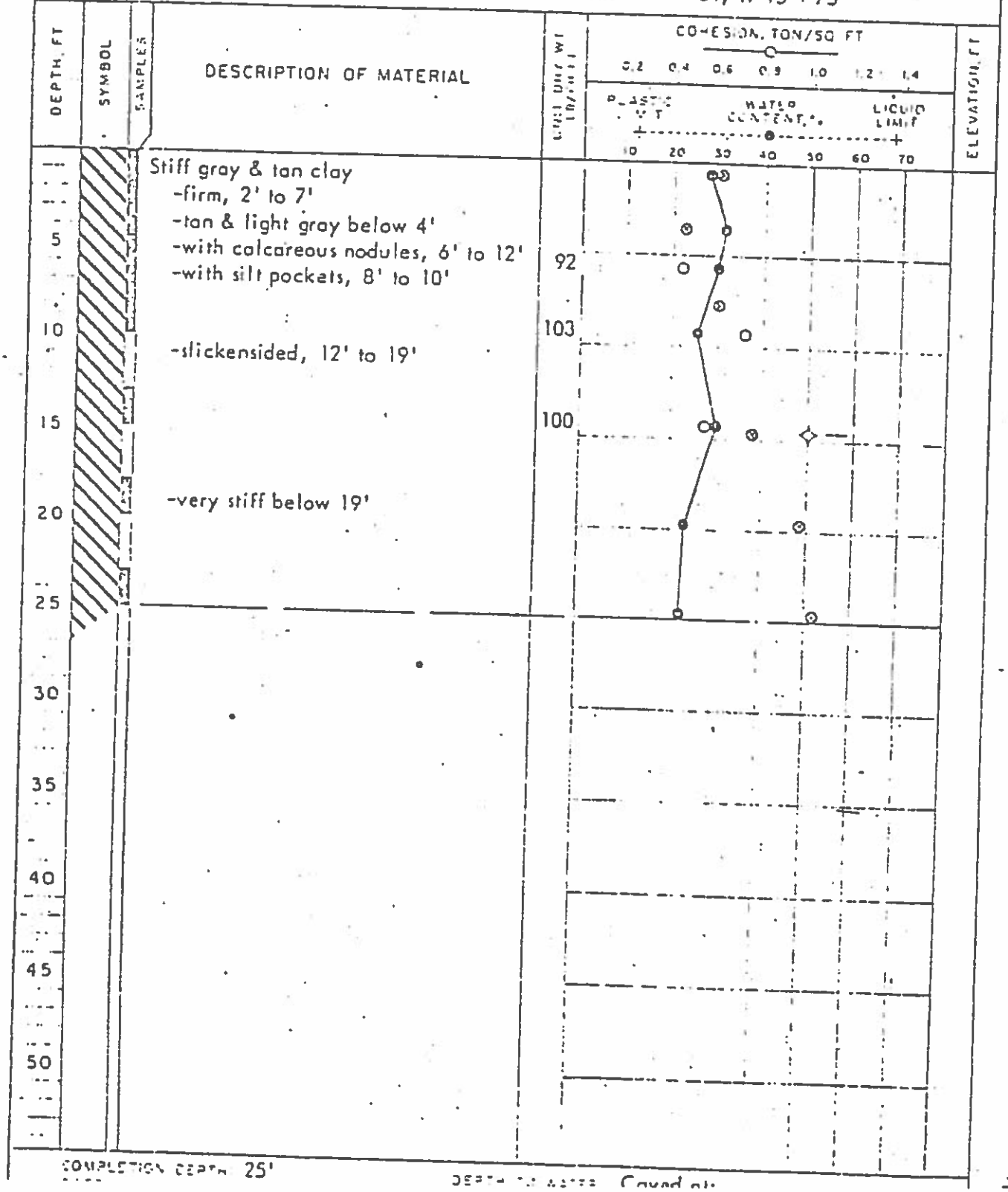
PLATE 7

LOG OF BORING NO. 18

SINCLAIR PETROCHEMICALS, INC.
NEW FACILITIES AT THE LYONDELL PLANT
CHANNELVIEW, TEXAS

TYPE: 3" shelby-tube

LOCATION: N 7 + 61; W 15 + 75



COMPLETION DEPTH 25'

DEPTH TO WATER Caved at

LOG OF BORING NO. 23
PROPOSED DRYING BEDS
LYONDELL PLANT

TYPE: 3" shelby-tube

LOCATION: N 4+30, W 0+74

SURF. EL: 99.4'

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	UNIT DRY WT LB/CU FT
0			Stiff gray clay	
			-with organic matter to 2'	
			-gray & tan, 4' to 6'	
5				98
			-tan & light gray with calcareous nodules, 6' to 15'	
10				112
			-with silty clay seams, 10' to 13'	
15			-very stiff, 15' to 18'	
			-red & light gray below 15'	
20			-with silty clay seams below 18'	
25				
30				
35				
40				
45				
50				

COHESION, TON/SQ FT: 0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT: 10 20 30 40 50 60 70

ELEVATION, FT

COMPLETION DEPTH: 20'
DATE: April 24, 1967

DEPTH TO WATER IN BORING: 7.8'
Caved at: 8.0'
DATE: April 25, 1967

LOG OF BORING NO. 24
PROPOSED LAGOON
LYONDELL PLANT

TYPE: 3" shelby-tube

LOCATION: N 4+40, E 1+00

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (10 20 30 40 50 60 70)	ELEVATION, FT
			SURF. EL: 99.4'			
0			Stiff gray & tan clay -with organic matter to 2' -with ferrous nodules, 4' to 10'			
5			-tan & light gray, 6' to 13' -with calcareous nodules, 8' to 15' -with silty clay seams below 8'	97		
10						
15			-very stiff, red & light gray, 13' to 18'			
20						
25						
30						
35						
40						
45						
50						

COMPLETION DEPTH: 20'
DATE: April 24, 1967

DEPTH TO WATER IN BORING: Dry

Caved at: 9.0'

DATE: April 25, 1967

McCLELLAND ENGINEERS

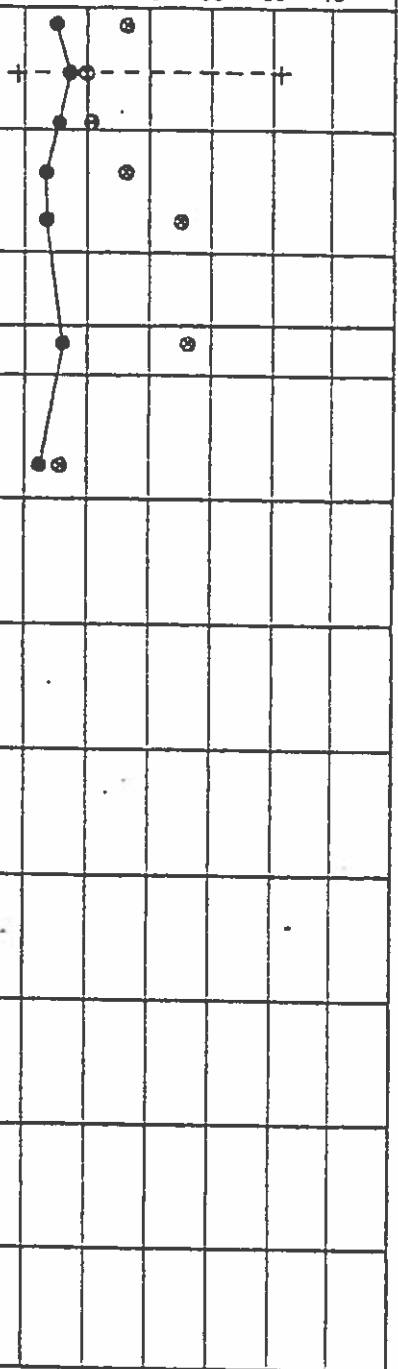
PLATE 5

LOG OF BORING NO. 25
PROPOSED LAGOON
LYONDELL PLANT

TYPE: 3" shelby-tube

LOCATION: N 1+70, E 1+00

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (10 20 30 40 50 60 70)	ELEVATION, FT
			SURF. EL: 99.4'			
5			Stiff gray & tan clay -with organic matter to 2' -with calcareous nodules to 13' -tan & light gray below 6'			
10			-with silty clay seams below 8'			
15			Stiff tan & light gray silty clay with clay & sand seams			
20						
25						
30						
35						
40						
45						
50						



COMPLETION DEPTH: 20'
DATE: April 24, 1967

DEPTH TO WATER IN BORING: 9.9' Caved at: 11.9'
DATE: April 25, 1967

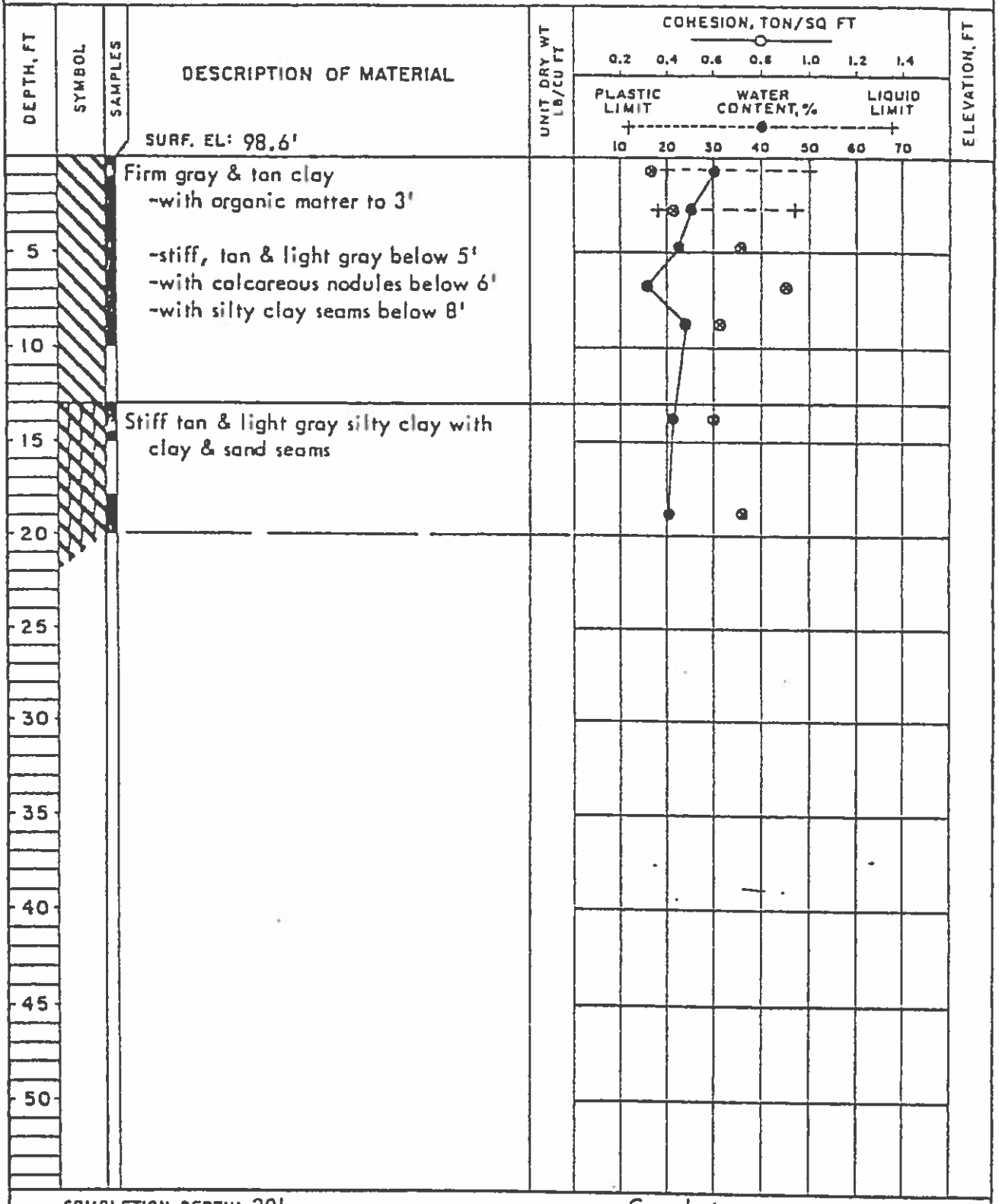
McCLELLAND ENGINEERS

PLATE 6

LOG OF BORING NO. 26
PROPOSED LAGOON
LYONDELL PLANT

TYPE: 3" shelby-tube

LOCATION: N 3+10, E 4+10



COMPLETION DEPTH: 20'
DATE: April 24, 1967

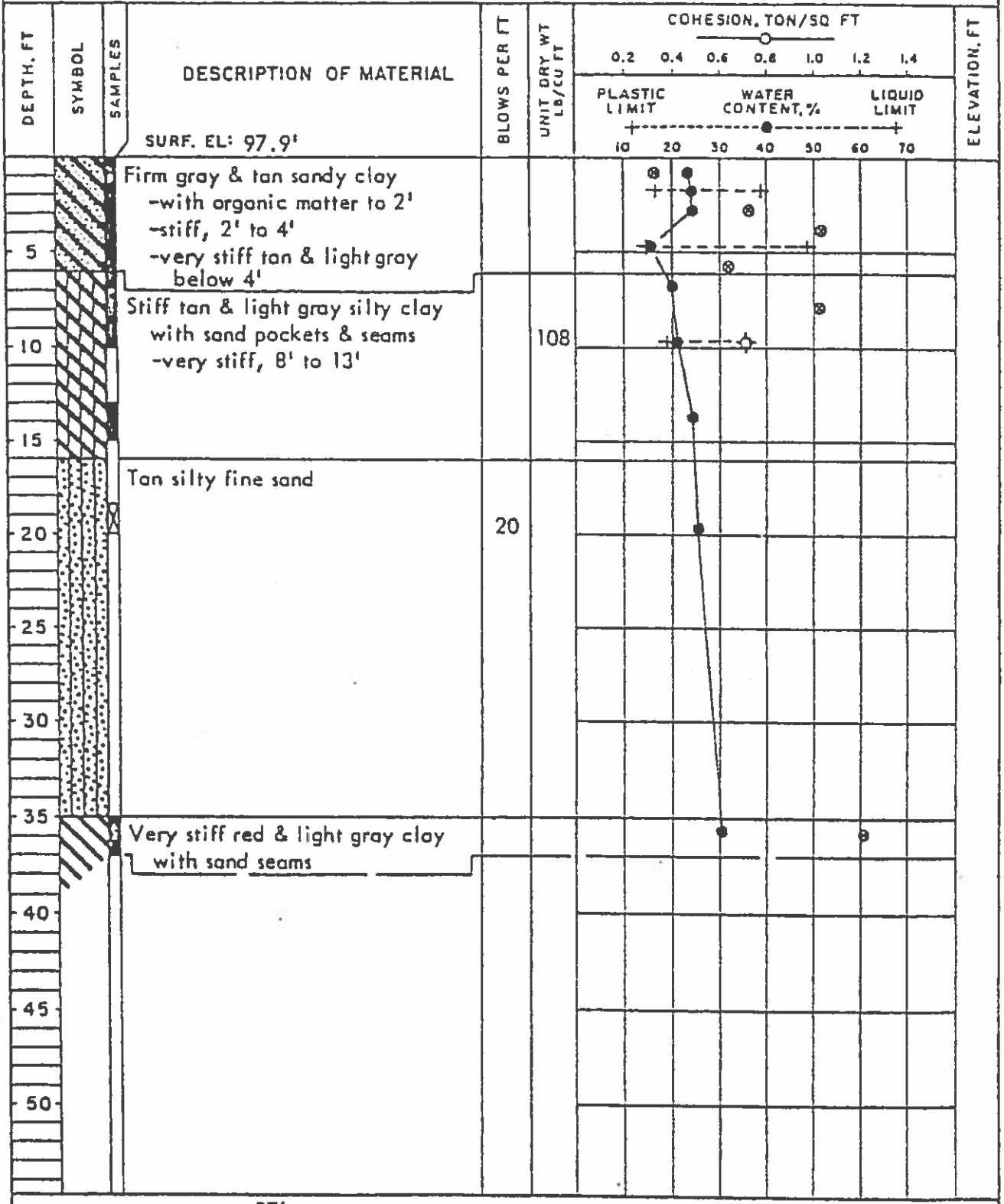
DEPTH TO WATER IN BORING: Dry
Caved at: 8.7'
DATE: April 25, 1967

McCLELLAND ENGINEERS

PLATE 7

LOG OF BORING NO. 27
PROPOSED LAGOON
LYONDELL PLANT

TYPE: 3" shelby-tube & 2" split-spoon LOCATION: N 3+10, E 12+40



COMPLETION DEPTH: 37'
DATE: April 24, 1967

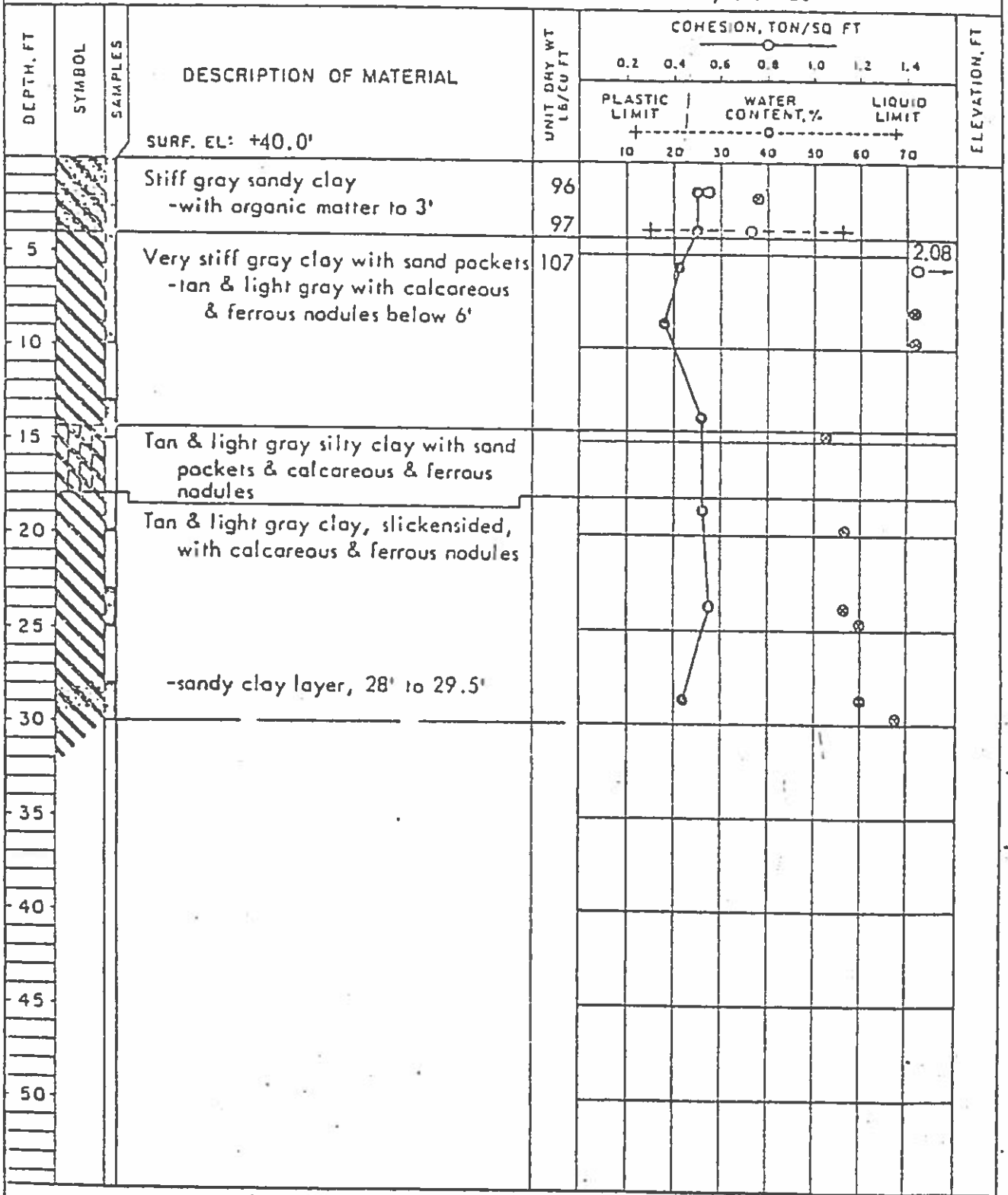
DEPTH TO WATER IN BORING: 10.7' Caved at: 11.5' DATE: April 25, 1967

McCLELLAND ENGINEERS

PLATE 8

LOG OF BORING NO. 36
EQUALIZATION POND
WASTE TREATMENT PLANT
CHANNELVIEW, TEXAS

TYPE: 3" thin-wall-tube LOCATION: N 8 + 50; E 2 + 00



COMPLETION DEPTH: 30'
DATE: Feb. 3, 1970

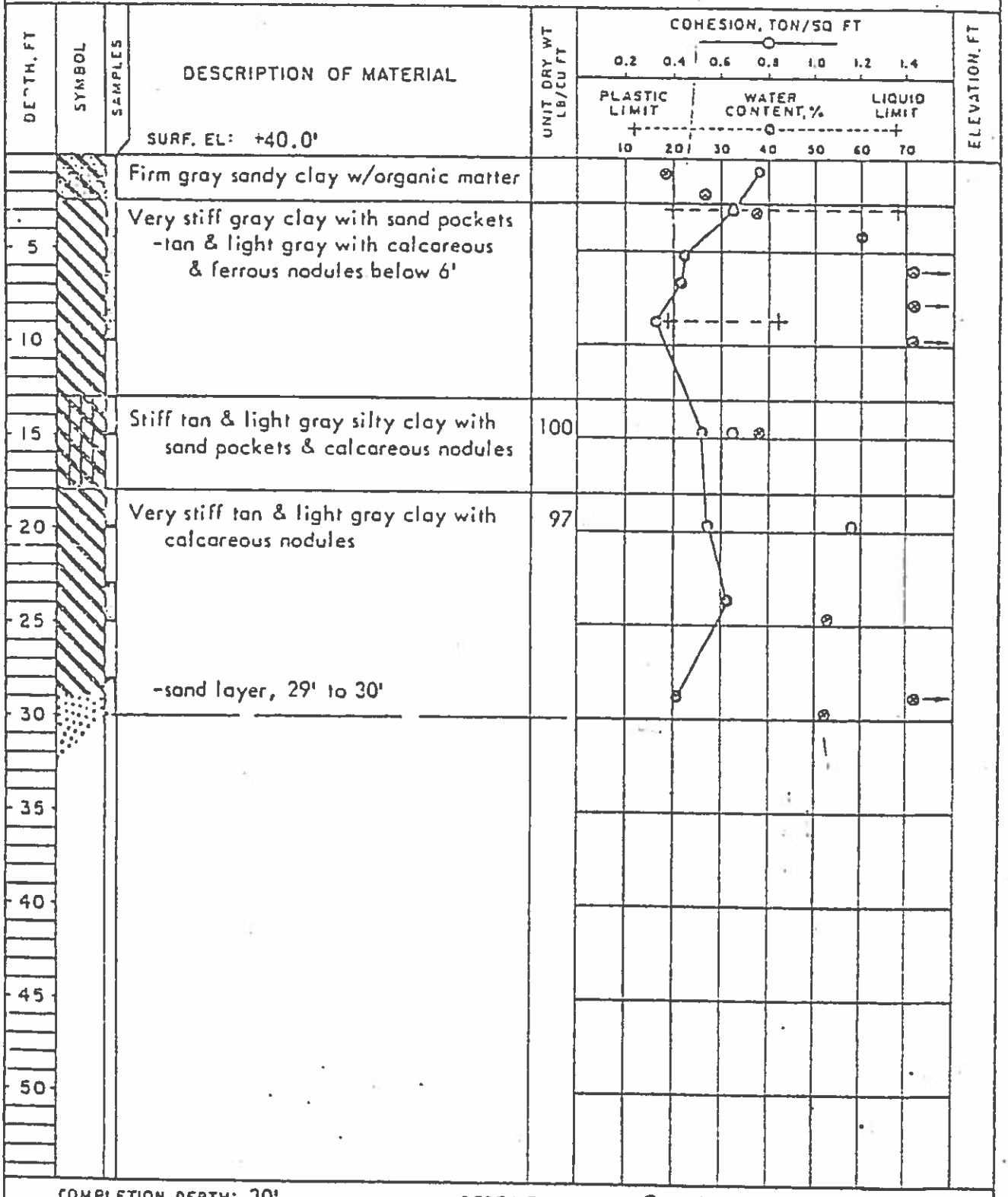
DEPTH TO WATER IN BORING: Dry Caved at: 8.4'
DATE: Feb. 4, 1970

McCLELLAND ENGINEERS

PLATE A-1

LOG OF BORING NO. 37
AERATION BASIN
WASTE TREATMENT PLANT
CHANNELVIEW, TEXAS

TYPE: 3" thin-wall-tube LOCATION: N 6 + 50; E 2 + 00



COMPLETION DEPTH: 30'
DATE: Feb. 3, 1970

DEPTH TO WATER IN BORING: Dry Caved at: 8.5' DATE: Feb. 4, 1970

McCLELLAND ENGINEERS

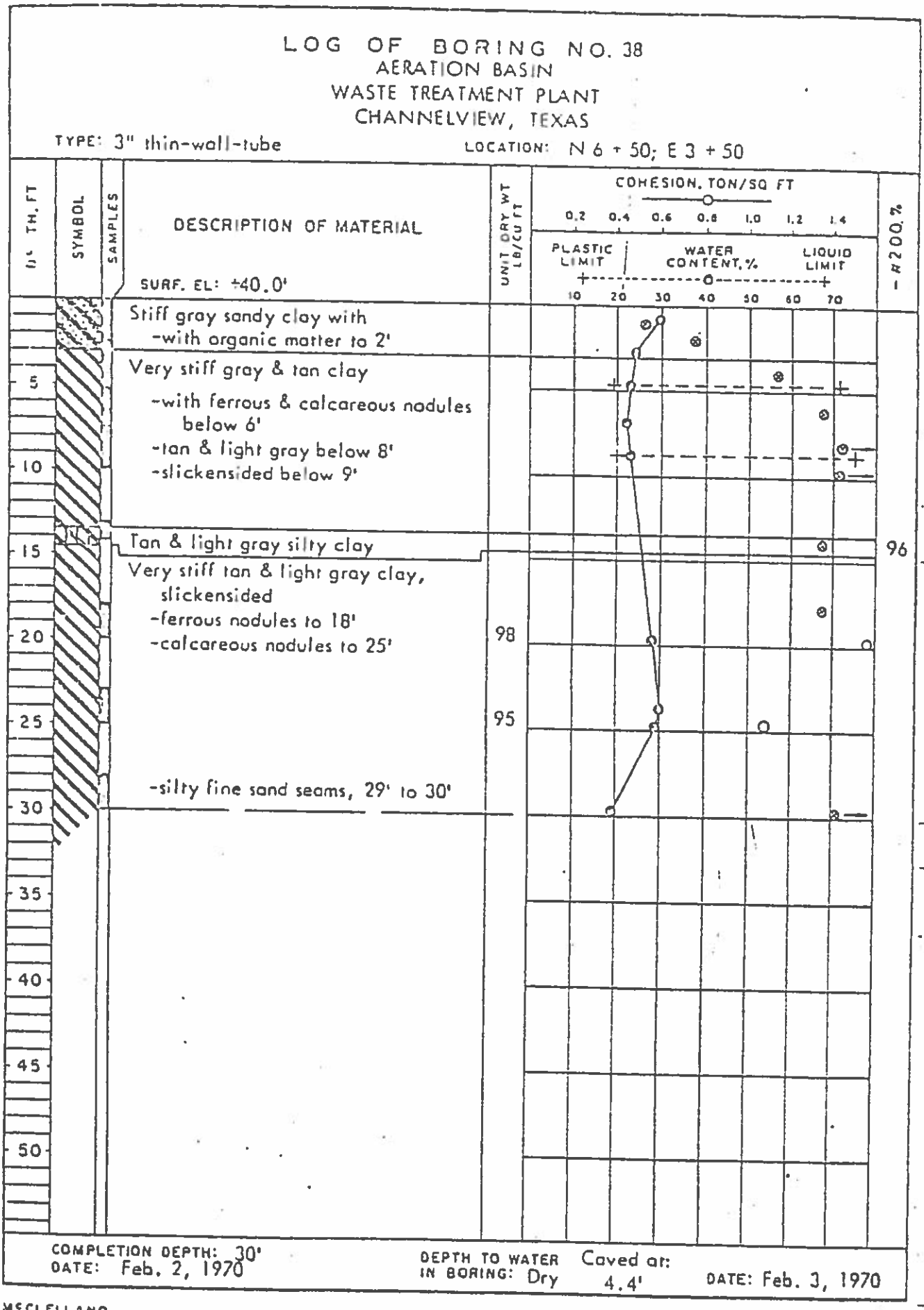
PLATE A-2

LOG OF BORING NO. 38

AERATION BASIN
WASTE TREATMENT PLANT
CHANNELVIEW, TEXAS

TYPE: 3" thin-wall-tube

LOCATION: N 6 + 50; E 3 + 50



COMPLETION DEPTH: 30'
DATE: Feb. 2, 1970

DEPTH TO WATER IN BORING: Dry
Caved at: 4.4'
DATE: Feb. 3, 1970

McCLELLAND ENGINEERS

PLATE A-3

LOG OF BORING NO. 39

AERATION BASIN
WASTE TREATMENT PLANT
CHANNELVIEW, TEXAS

TYPE: 3" thin-wall-tube

LOCATION: N 6 + 50; E 5 + 00

SURF. EL: +40.0'

DEPTH, FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	UNIT DRY WT LB/CU FT
0			Stiff gray sandy clay with organic matter to 2.5'	
5			Very stiff tan & light gray clay -with sand pockets below 2.5' -ferrous nodules, 3.5' to 13' -calcareous nodules below 6'	
10			-slickensided below 13'	
15			-silty sand seams at 15.5'	100
20				97
25				
30				
35				
40				
45				
50				

COHESION, TON/SQ FT: 0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT: 10 20 30 40 50 60 70

1.86

ELEVATION, FT

COMPLETION DEPTH: 30'
DATE: Feb. 2, 1970

DEPTH TO WATER IN BORING: Dry — Caved at: 9.9'
DATE: Feb. 3, 1970

McCLELLAND ENGINEERS

PLATE A-4

LOG OF BORING NO. 40

SLUDGE DIGESTER
WASTE TREATMENT PLANT
CHANNELVIEW, TEXAS

TYPE: 3" thin-wall-tube & 2" split-barrel LOCATION: N 6 + 50; E 7 + 50

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (10 20 30 40 50 60 70)	% -#200
			SURF. EL: +40.0'				
5			Firm gray sandy clay -with organic matter to 4' -very stiff below 2' -gray & tan, 3.5' to 6' -with calcareous deposits below 6' -light gray & tan fine sand layers, 8.5' to 9'	15	109	3.35	
10			Very stiff tan & light gray clay				
15			Tan & light gray sandy silt				64
20			Very stiff tan & light gray clay -with sand partings & seams to 23'				
25			-calcareous nodules below 23' -slickensided below 24'				
30							
35							
40							
45							
50							

COMPLETION DEPTH: 30'
DATE: Feb. 2, 1970

DEPTH TO WATER IN BORING: Dry Caved at: 15.1'
DATE: Feb. 3, 1970

McCLELLAND ENGINEERS

PLATE A-5

LOG OF BORING NO. 41

CLARIFIER
WASTE TREATMENT PLANT
CHANNELVIEW, TEXAS

TYPE: 3" thin-wall-tube LOCATION: N 4 + 70; E 8 + 50

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (10 20 30 40 50 60 70)	ELEVATION, FT
			SURF. EL: +40.0'			
5			Stiff gray sandy clay -with organic matter to 4' -clay layer, 4' to 6' -very stiff tan & light gray with ferrous nodules below 6'	88 99		
10			-calcareous nodules below 9'			
15			Tan & light gray silty fine sand			
20			Very stiff tan & light gray clay with sand pockets & seams to 23' -silty fine sand layer, 19' to 20'			
25			-slickensided below 23'			
30						
35						
40						
45						
50						

COMPLETION DEPTH: 30'
DATE: Feb. 4, 1970

DEPTH TO WATER IN BORING: 12.9'

DATE: 4 hours after completion

McCLELLAND ENGINEERS

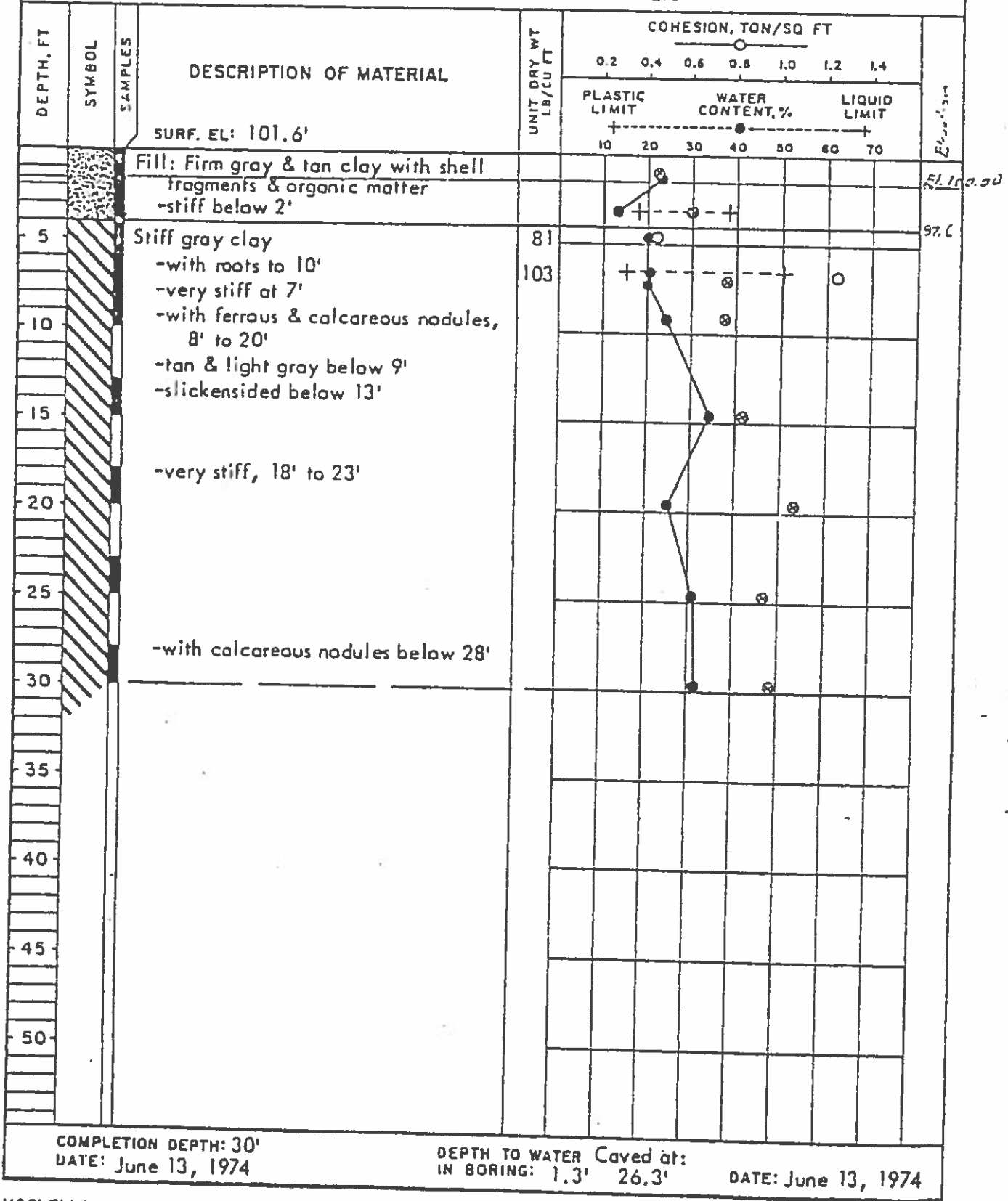
PLATE A-6

LOG OF BORING NO. 54

OLEFINS ENVIRONMENTAL CONTROL UNIT
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1



COMPLETION DEPTH: 30'
DATE: June 13, 1974

DEPTH TO WATER IN BORING: Caved at: 1.3' 26.3'
DATE: June 13, 1974

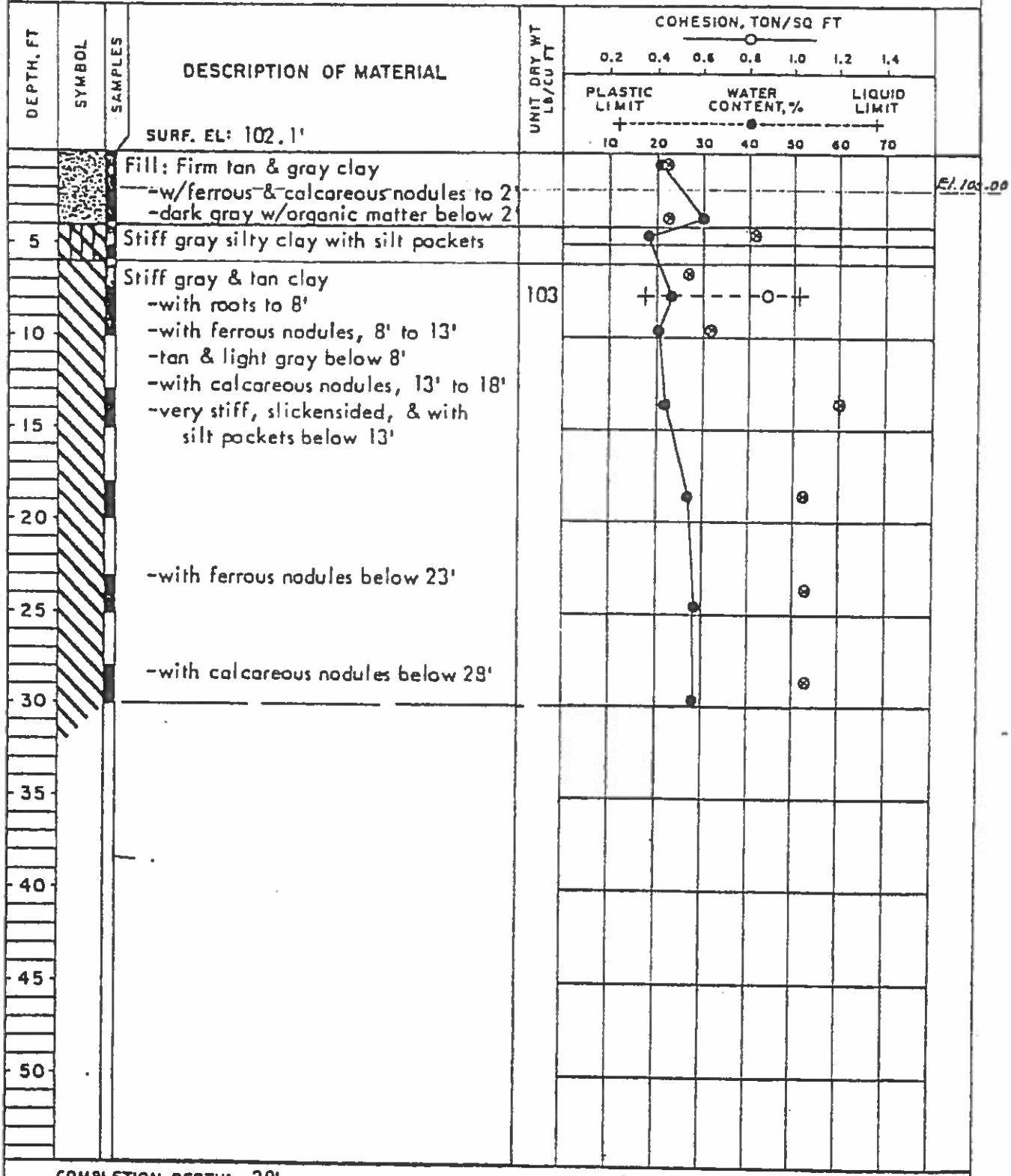
McCLELLAND ENGINEERS

PLATE 2

LOG OF BORING NO. 55

OLEFINS ENVIRONMENTAL CONTROL UNIT
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube LOCATION: See Plate 1



COMPLETION DEPTH: 30'
DATE: June 12, 1974

DEPTH TO WATER IN BORING: 4.0' Caved at: 15.0'
DATE: June 13, 1974

McCLELLAND ENGINEERS

PLATE 3

LOG OF BORING NO. 56

OLEFINS ENVIRONMENTAL CONTROL UNIT
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL
			SURF. EL: 102.0'
			Fill: Intermixed tan sand, clay & shell fragments
			Fill: Firm gray & tan clay with rocks & shell fragments
5			Stiff dark gray silty clay with roots
			Stiff gray & tan sandy clay
			-very stiff below 8'
10			
			-with sand pockets below 13'
15			Stiff gray & tan clay with sand pockets
			-tan & light gray with silt pockets below 18'
20			
25			
30			
35			
40			
45			
50			

UNIT DRY WT LB/CU FT

COHESION, TON/SQ FT
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT
10 20 30 40 50 60 70

COMPLETION DEPTH: 20'
DATE: June 13, 1974

DEPTH TO WATER IN BORING: 4.2' Caved at: 17.6'
DATE: June 13, 1974

McCLELLAND ENGINEERS

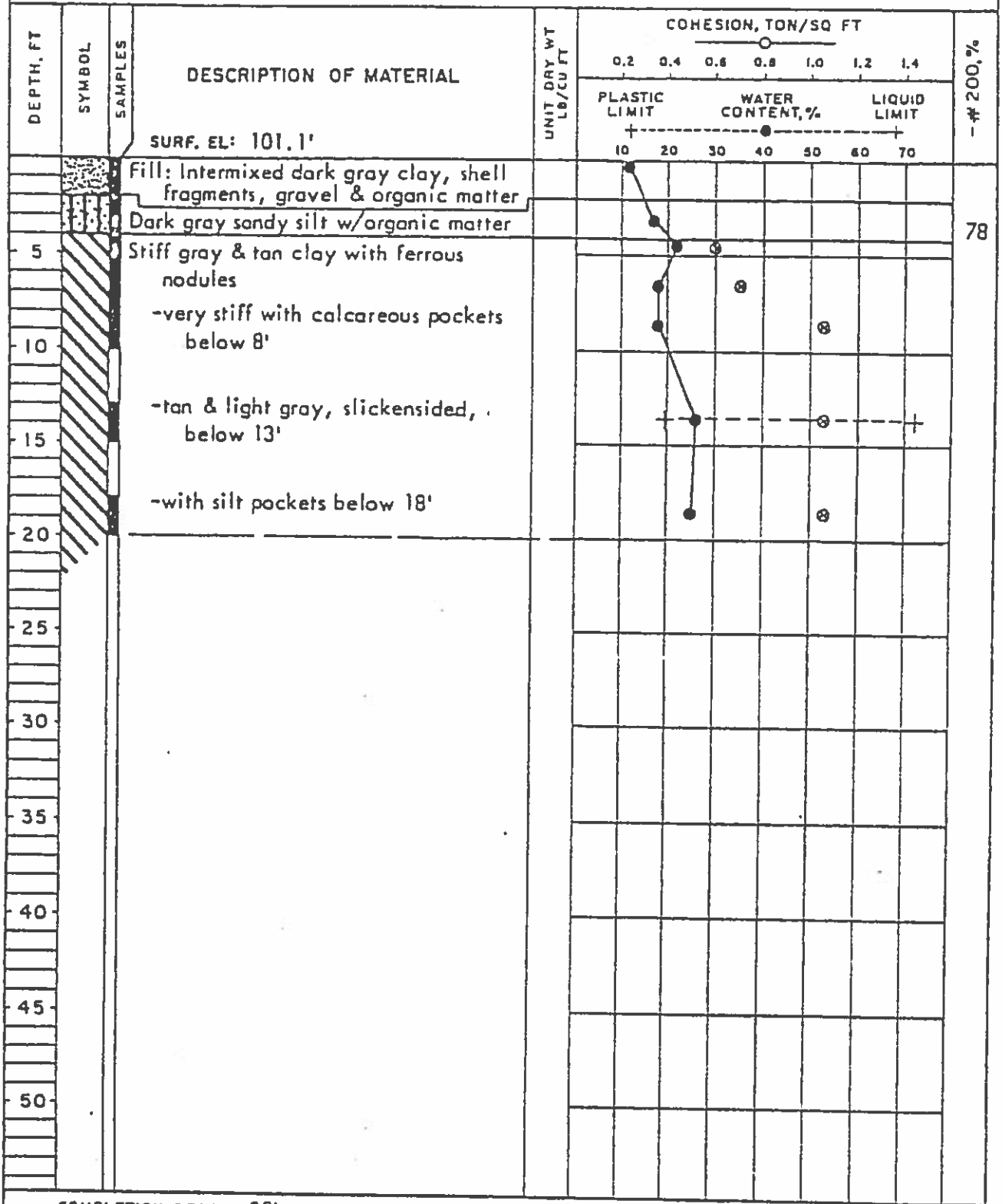
PLATE 4

LOG OF BORING NO. 57

OLEFINS ENVIRONMENTAL CONTROL UNIT
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1



COMPLETION DEPTH: 20'
DATE: June 12, 1974

DEPTH TO WATER IN BORING: 4.0' Caved at: 15.3'
DATE: June 13, 1974

McCLELLAND ENGINEERS

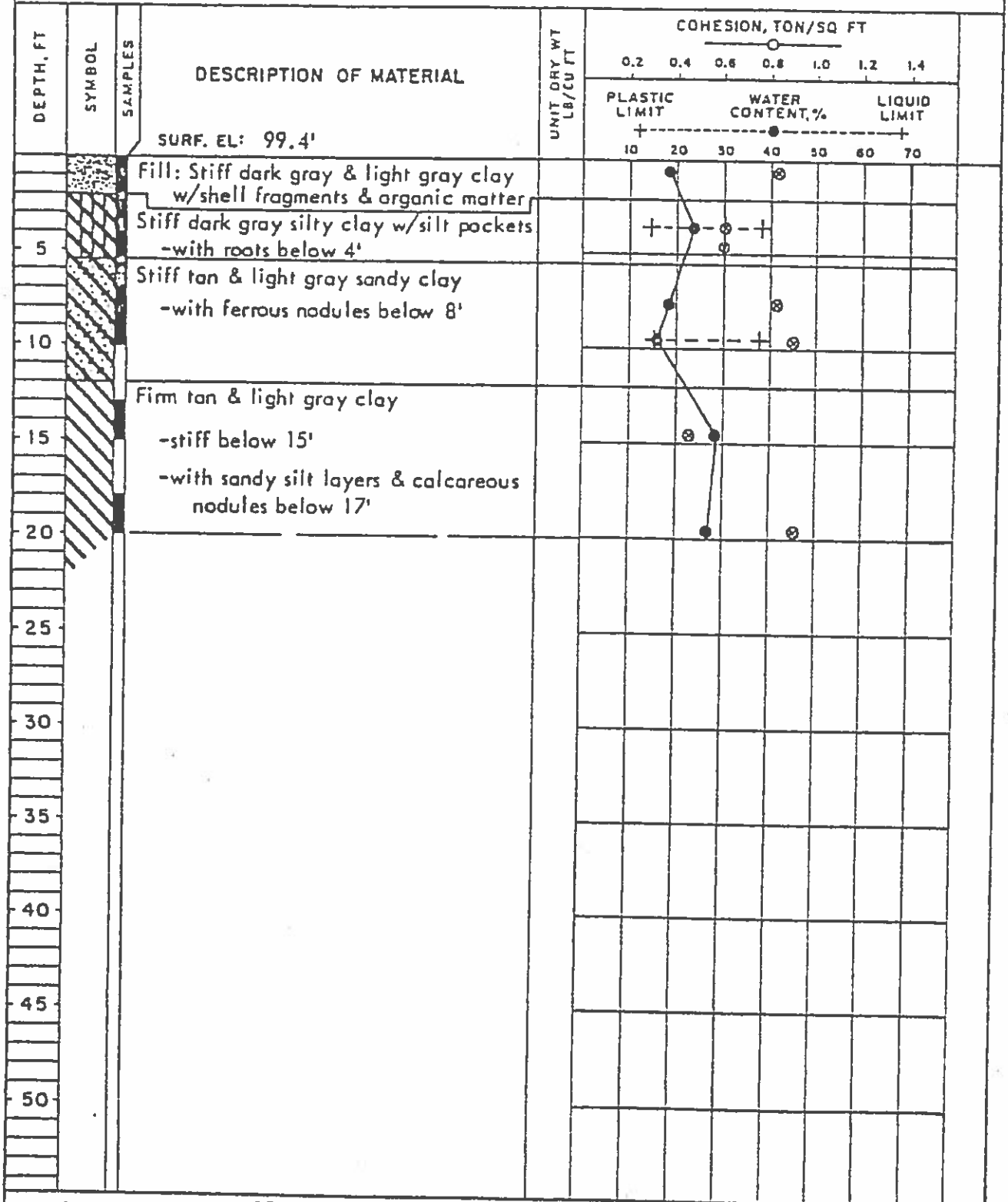
PLATE 5

LOG OF BORING NO. 58

OLEFINS ENVIRONMENTAL CONTROL UNIT
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1



COMPLETION DEPTH: 20'
DATE: June 12, 1974

DEPTH TO WATER IN BORING: 2.2' Caved at: 13.1'
DATE: June 13, 1974

McCLELLAND ENGINEERS

PLATE 6

LOG OF BORING NO. 59

OLEFINS ENVIRONMENTAL CONTROL UNIT
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube LOCATION: See Plate 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (10 20 30 40 50 60 70)
			SURF. EL: 105.5'		
5		100	Fill: Firm dark gray silty clay with roots & sandy clay pockets -with shell fragments to 4'		
10			Firm gray & tan sandy clay -with roots to 10'		
15		91	-very stiff, tan & light gray with ferrous nodules below 13'		
20			Stiff tan & light gray clay with silty sand seams & pockets		
25					
30					
35					
40					
45					
50					

COMPLETION DEPTH: 20'
DATE: June 13, 1974

DEPTH TO WATER IN BORING: 6.7' Caved at: 15.4'
DATE: June 13, 1974

McCLELLAND ENGINEERS

PLATE 7

LOG OF BORING NO. 60

OLEFINS ENVIRONMENTAL CONTROL UNIT
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (10 20 30 40 50 60 70)	-#200, %
			SURF. EL: 102.8'				
			Fill: Intermixed clay, organic matter & shell fragments				
100			Fill: Firm gray & tan clay with rock & shell fragments				
5			Dark gray sandy silt with organic matter				79
96			Stiff gray & red sandy clay -with ferrous nodules below 8'				
10							
91			Tan & gray silty fine sand	18			37
15			Stiff tan & light gray clay with calcareous nodules -w/sandy silt layer, 18' to 19.5'				
20							
25							
30							
35							
40							
45							
50							

COMPLETION DEPTH: 20'
DATE: June 13, 1974

DEPTH TO WATER IN BORING: 6.3' Caved at: 18.2'
DATE: June 13, 1974

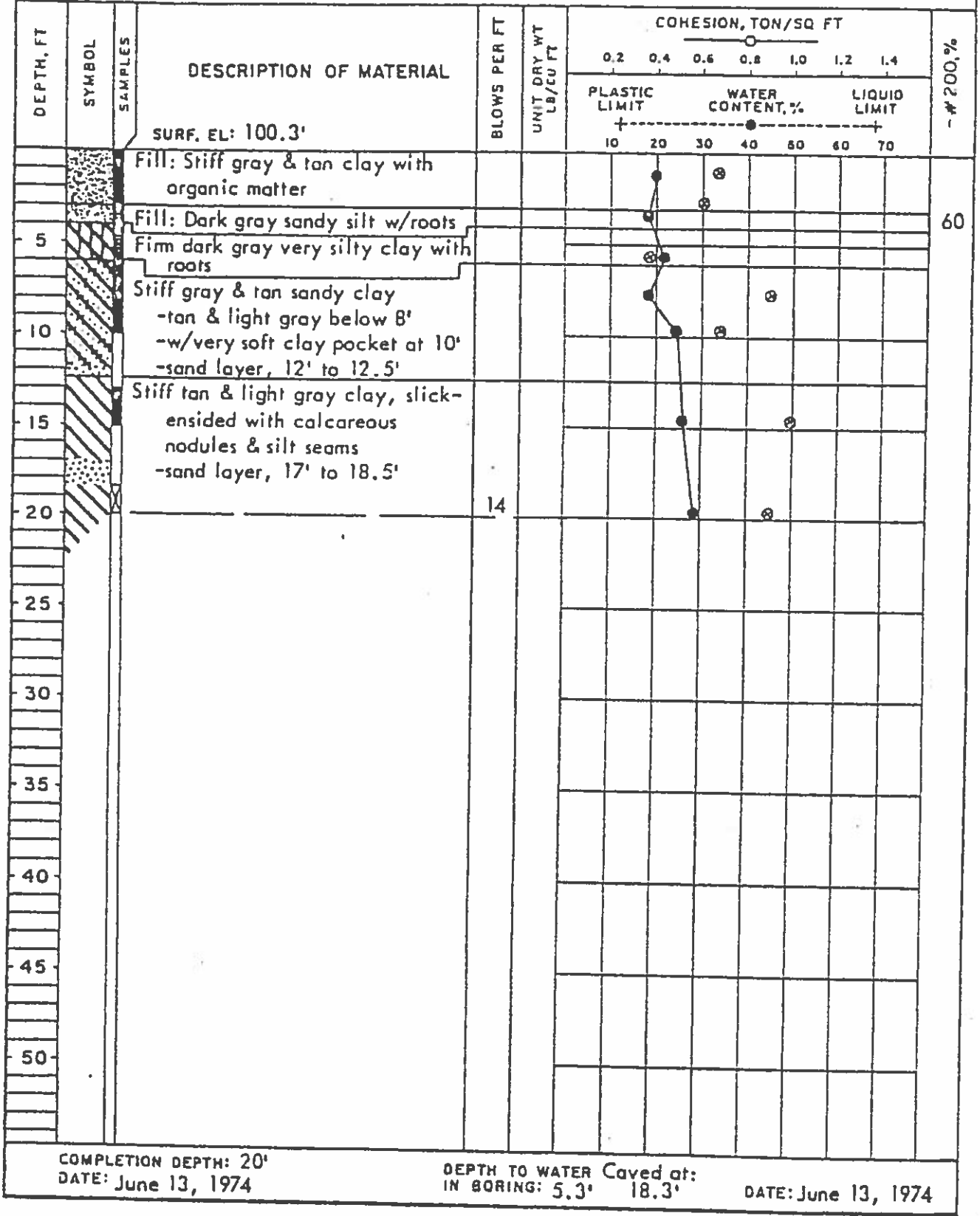
McCLELLAND ENGINEERS

PLATE 8

LOG OF BORING NO. 61

OLEFINS ENVIRONMENTAL CONTROL UNIT
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube & 2" split-barrel LOCATION: See Plate 1



COMPLETION DEPTH: 20'
DATE: June 13, 1974

DEPTH TO WATER IN BORING: Caved at: 5.3' 18.3'
DATE: June 13, 1974

McCLELLAND ENGINEERS

PLATE 9

LOG OF BORING NO. 62

OLEFINS ENVIRONMENTAL CONTROL UNIT
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube & 2" split-barrel LOCATION: See Plate 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT (10 20 30 40 50 60 70)	-#200, %
			SURF. EL: 102.3'				
0			Fill: Firm dark gray & light gray clay with shell fragments & organic matter		84		
5							
			-tan & light gray below 8'		89		
10			-soft at 10'				
					93		
15							
20			Tan silty fine sand				
			-with sandy silt layer, 23' to 25'	9			62
25							
30				14			
35							
40							
45							
50							

COMPLETION DEPTH: 30'
DATE: June 12, 1974

DEPTH TO WATER IN BORING: 4.7' Caved at: 26.1'

DATE: June 13, 1974

McCLELLAND ENGINEERS

PLATE 10

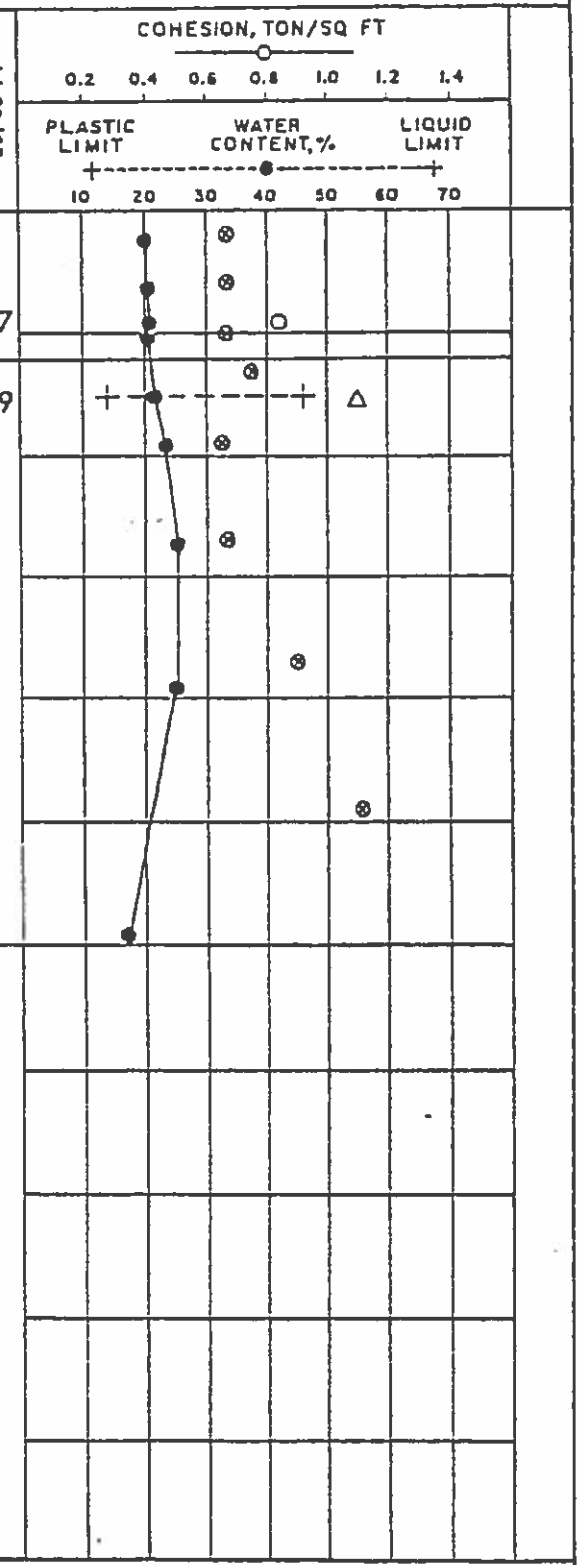
LOG OF BORING NO. 63

OLEFINS ENVIRONMENTAL CONTROL UNIT
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	UNIT DRY WT LB/CU FT
			SURF. EL: 98.7'	
5			Fill: Stiff dark gray & tan clay with organic matter & silt pockets -dark gray, 2' to 4' -dark gray & tan below 4'	117
10			Stiff tan & light gray clay -slickensided & with ferrous & calcareous nodules to 10'	99
15			-with silty clay & silt seams & pockets & 4" clayey silt layer at 13'	
20			-silty sand with clay seams, 18' to 20'	
25			-very stiff & slickensided below 23'	
30			-red & light gray with ferrous & calcareous nodules below 28'	
35				
40				
45				
50				



COMPLETION DEPTH: 30'
DATE: June 12, 1974

DEPTH TO WATER IN BORING: Caved at: 2.7' 13.9'
DATE: June 13, 1974

McCLELLAND ENGINEERS

PLATE 11

LOG OF BORING NO. 65

ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: N780; W2665

SURF. EL: 100.83'

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	UNIT DRY WT LB/CU FT
0			Stiff dark gray clay -with shell fragments to 4'	
5			-tan & light gray below 7.5'	98
10			Stiff tan & light gray silty clay with calcareous nodules	
15			Stiff tan & light gray clay -with silt pockets & seams to 15'	104
20			-slickensided below 20'	95
25				91
30			Stiff tan & light gray silty clay with calcareous nodules	112
35			Stiff red & light gray clay with calcareous nodules & sand partings	
40			Stiff light gray sandy clay with calcareous nodules & deposits	
45			Very stiff red & light gray clay, slickensided, with calcareous nodules	
50				107

COHESION, TON/SQ FT: 0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT: 10 20 30 40 50 60 70

COMPLETION DEPTH: 50'
DATE: Dec. 23, 1974

DEPTH TO WATER IN BORING: 4'
DATE: Dec. 24, 1974

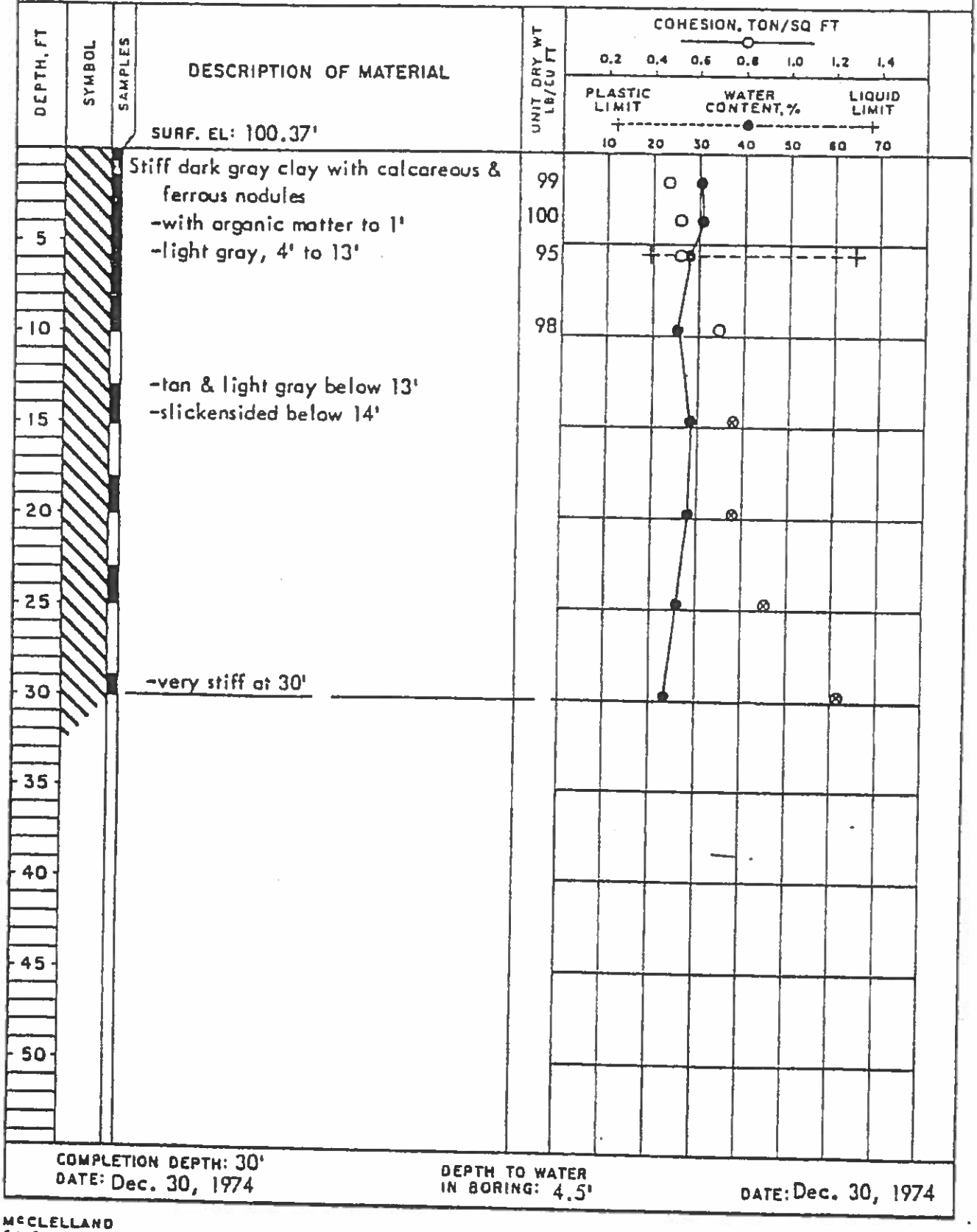
McCLELLAND ENGINEERS

PLATE 3

LOG OF BORING NO. 68
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: N 792; W 2240



COMPLETION DEPTH: 30'
DATE: Dec. 30, 1974

DEPTH TO WATER IN BORING: 4.5'

DATE: Dec. 30, 1974

McCLELLAND ENGINEERS

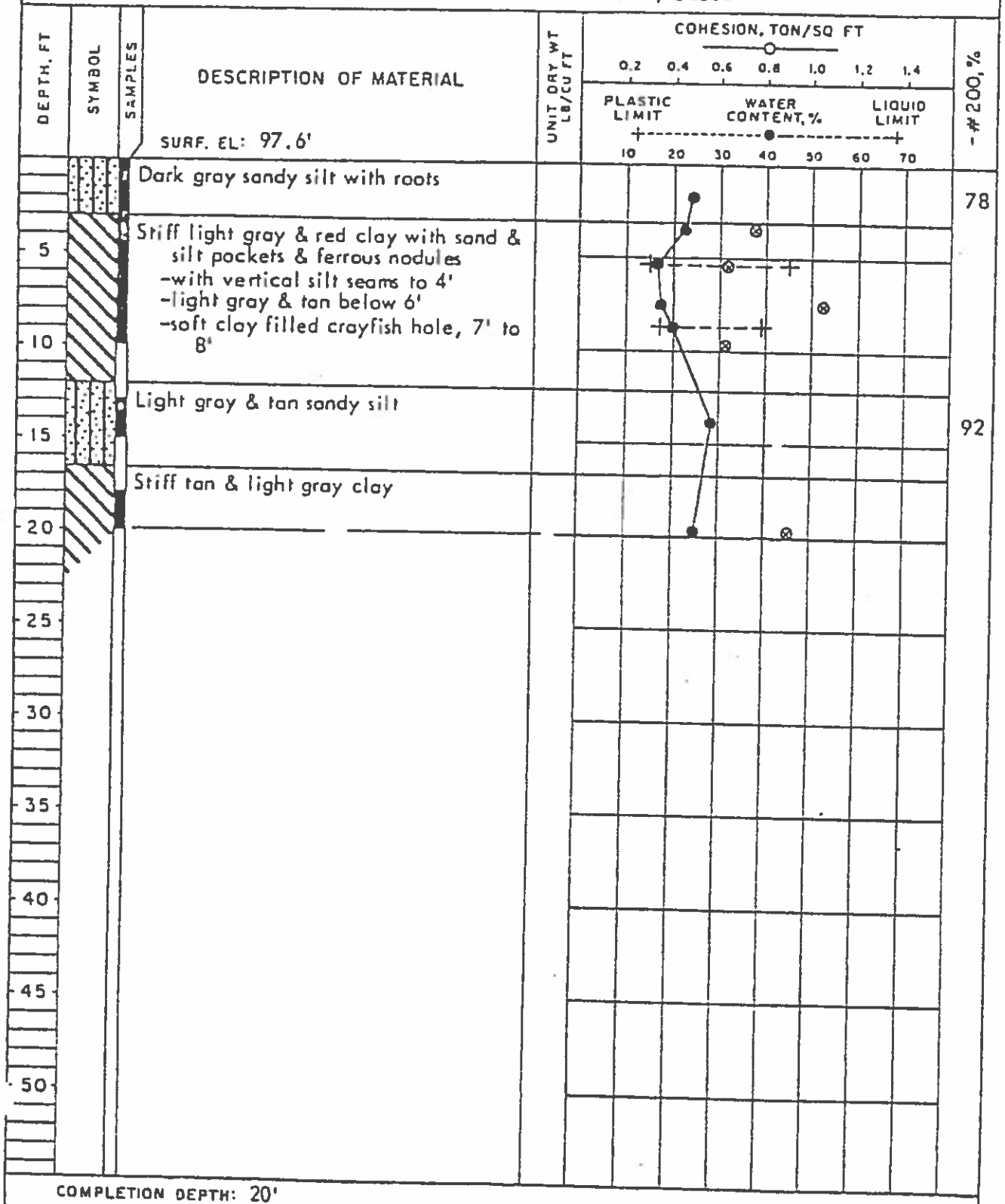
PLATE 6

LOG OF BORING NO. 75

SLUDGE LAGOON
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: S 70; E 2350



COMPLETION DEPTH: 20'
DATE: April 30, 1975

LOG OF BORING NO. 79

SLUDGE LAGOON
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube & 2" split-barrel LOCATION: S 400; E 2000

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT
			SURF. EL: 98.8'		
0			Very soft brown & tan clay with roots		
			-with sand seams & partings to 13'		
5			-with calcareous & ferrous nodules, 1.5' to 10'		
			-very stiff brown & tan sandy clay below 1.5'		
10			-with sand layer, 9' to 10'	20	
			Tan silty fine sand	9	
15					
			Very stiff brown & tan clay		
20					
			Note: Top 2' of soil (Soft dark gray sandy clay) was removed by dozer.		
25					
30					
35					
40					
45					
50					

COHESION, TON/SQ FT
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT
10 20 30 40 50 60 70

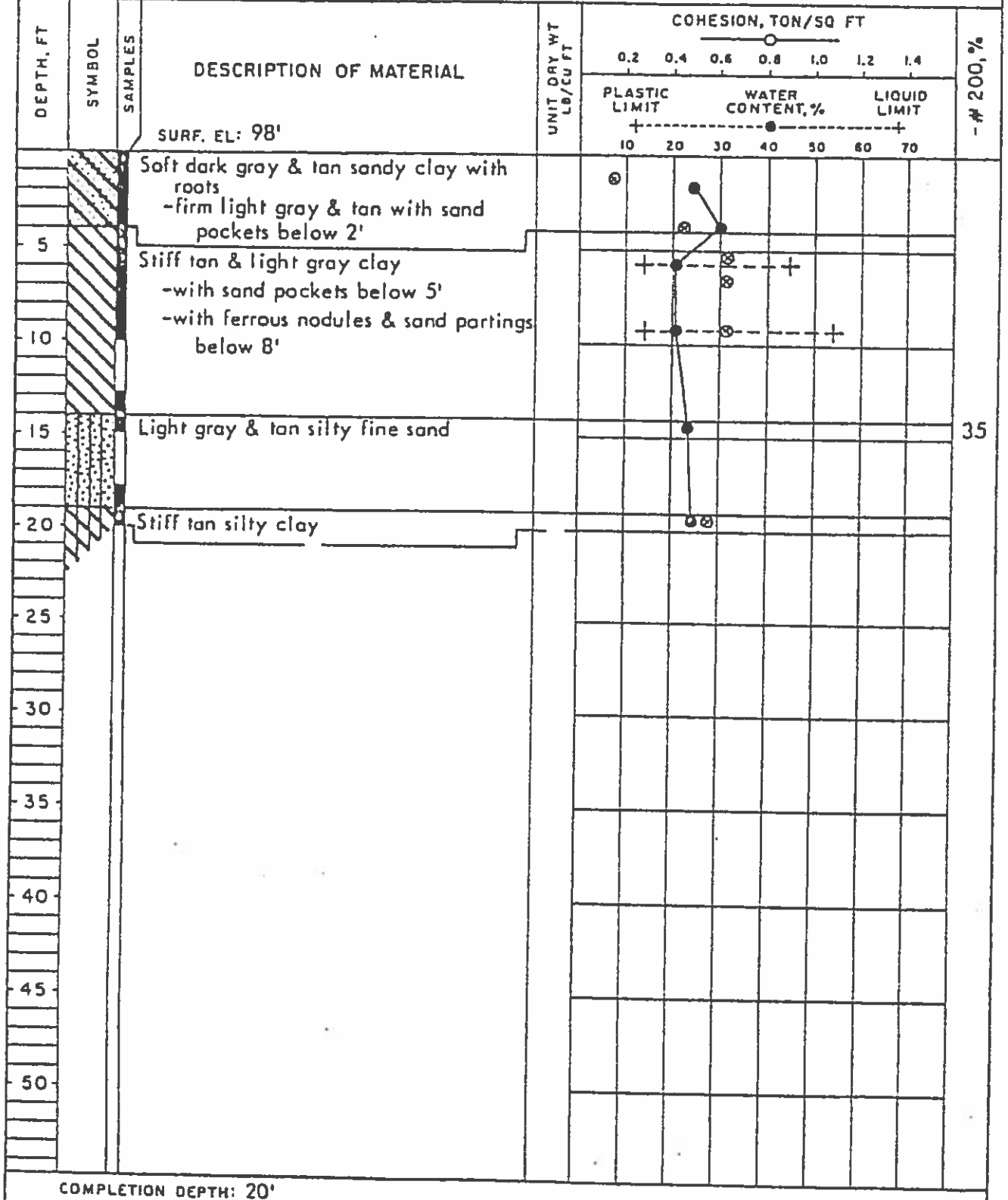
COMPLETION DEPTH: 20'
DATE: May 2, 1975

LOG OF BORING NO. 86

SLUDGE LAGOON
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: S 870; E 1400

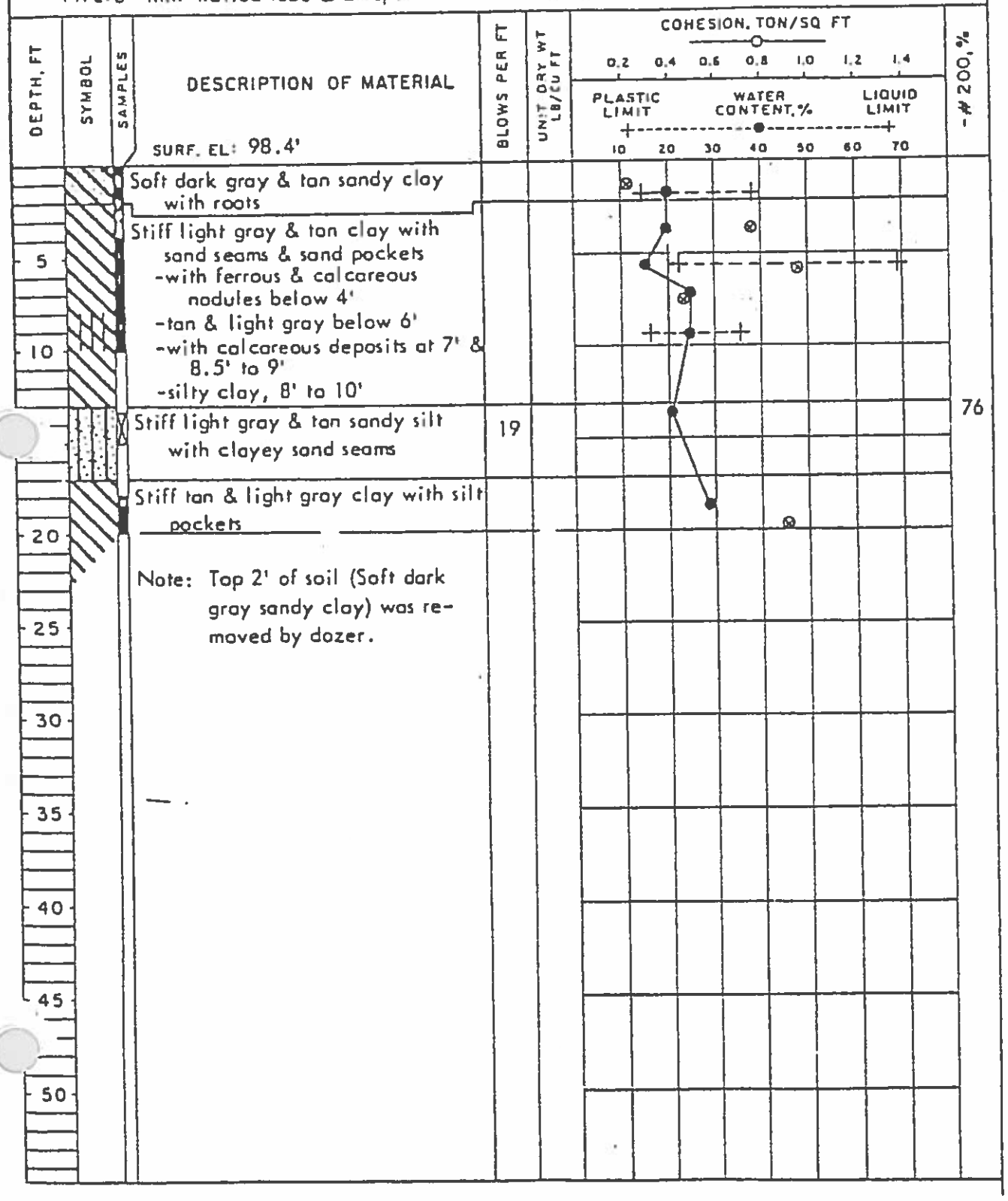


COMPLETION DEPTH: 20'
DATE: April 28, 1975

LOG OF BORING NO. 87

SLUDGE LAGOON
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube & 2" split-barrel LOCATION: S 670; E 1400



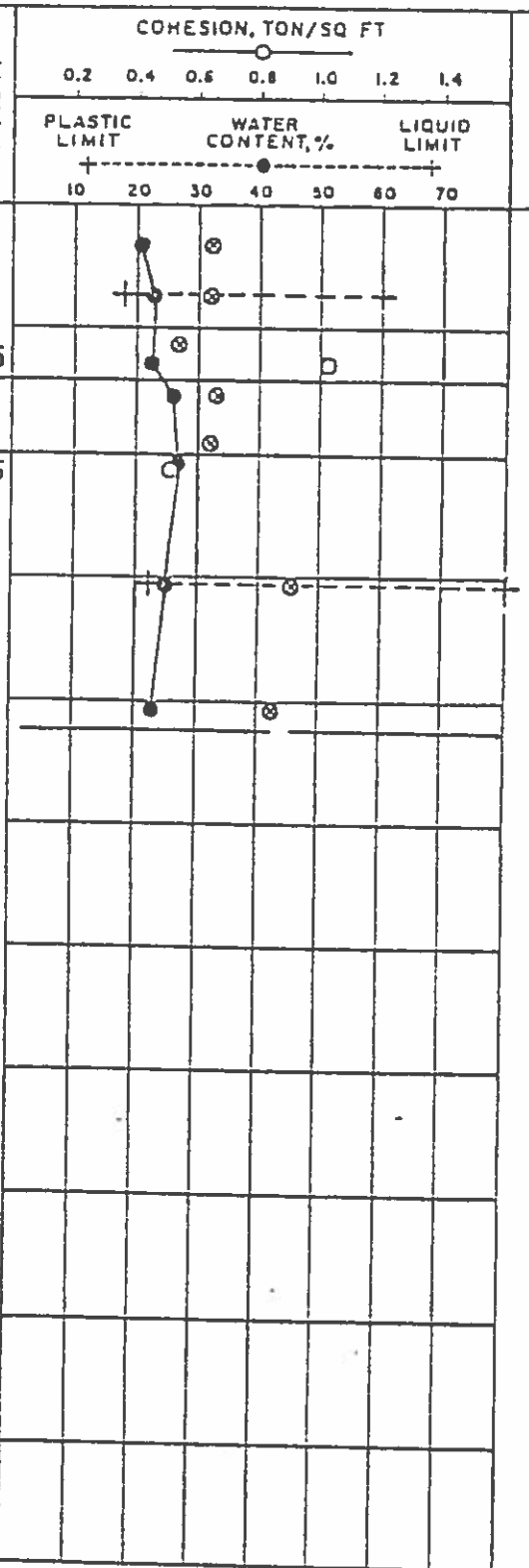
LOG OF BORING NO. 103

CP II - ECU
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	UNIT DRY WT LB/CU FT
0			Firm dark gray clay -stiff with ferrous nodules below 2' -tan & light gray below 3'	105
10			Stiff tan & light gray silty clay with calcareous & ferrous nodules	
15			Stiff tan & light gray clay with calcareous nodules -slickensided below 14.5'	95
20				
25			Note: Top 1.5 ft of soil removed by dozer prior to drilling borings.	
30				
35				
40				
45				
50				



COMPLETION DEPTH: 21'
DATE: April 17, 1975

DEPTH TO WATER IN BORING: Surface
Caved at: 6.5'
DATE: April 18, 1975

McCLELLAND ENGINEERS

PLATE 2

LOG OF BORING NO. 104

OP II - ECU

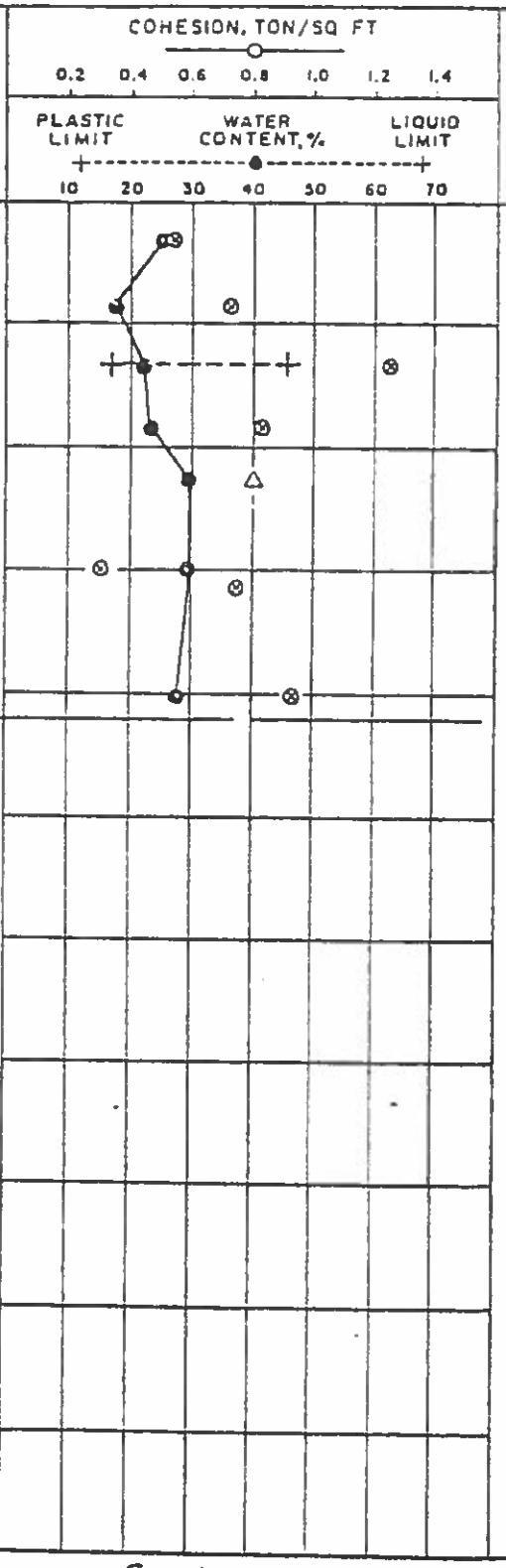
ARCO CHEMICAL COMPANY

CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	UNIT DRY WT LB/CU FT
0			Stiff gray & tan clay	
			-firm gray sandy clay to 1'	
			-with vertical sand seams to 2'	
			-with roots to 8.5'	
5			-light gray & tan below 3.5'	
			-with calcareous nodules below 4'	
			-very stiff, 6' to 8'	
10			-tan & light gray silty clay layer, 9' to 10.5'	94
			-firm tan & light gray silty clay layer, 13.5' to 15.5'	
15				
			-slickensided below 19.5'	
20				
			Note: Top 1.5 ft of soil removed by dozer prior to drilling boring.	
25				
30				
35				
40				
45				
50				



COMPLETION DEPTH: 21'
DATE: April 17, 1975

DEPTH TO WATER IN BORING: 0.2'

Caved at: 5.7'
DATE: April 18, 1975

McCLELLAND ENGINEERS

PLATE 3

LOG OF BORING NO. 105

OP II - ECU
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	UNIT DRY WT LB/CU FT
0			Firm dark gray clay	
			-with roots to 10'	
5			-tan & light gray below 2'	108
			-stiff with calcareous & ferrous nodules below 4'	
			-firm silty clay layer, 8.5' to 10'	93
10				
15			-with tan silty clay layer, 15.5' to 16'	
20			-slickensided below 20'	
25			Note: Top 2 ft of soil removed by dozer prior to drilling boring.	
30				
35				
40				
45				
50				

COHESION, TON/SQ FT
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT
10 20 30 40 50 60 70

COMPLETION DEPTH: 21.5'
DATE: April 17, 1975

DEPTH TO WATER IN BORING: 0.5'
Caved at: 10.6'
DATE: April 18, 1975

McCLELLAND ENGINEERS

PLATE 4

LOG OF BORING NO. 106
OP II - ECU
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

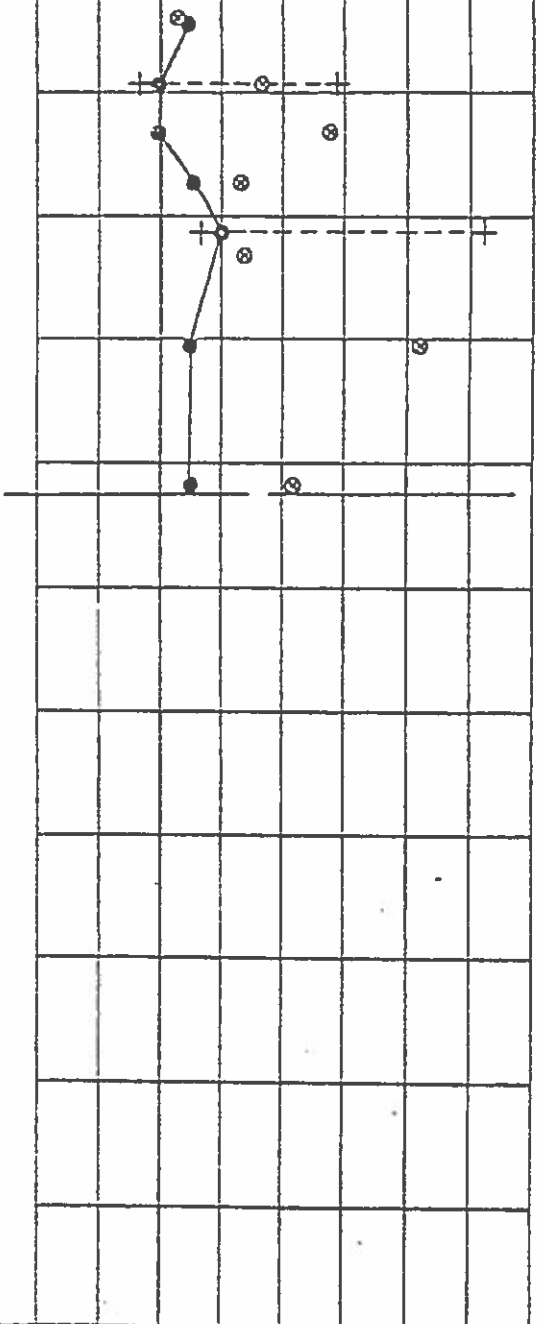
LOCATION: See Plate 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL
0			Stiff gray clay
			-firm to 2'
			-with roots to 8'
5			-light gray & tan, 2.5' to 5'
			-with calcareous nodules below 4'
			-tan & light gray, 5' to 20'
10			-with ferrous nodules, 6' to 11'
			-silty clay layer, 7.5' to 9'
			-with silty clay seams, 10' to 14'
15			-very stiff at 15.5'
			-light gray & tan below 20'
20			
			Note: Top 2 ft of soil removed by dozer prior to drilling boring.
25			
30			
35			
40			
45			
50			

UNIT DRY WT LB/CU FT

COHESION, TON/SQ FT
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT
10 20 30 40 50 60 70



COMPLETION DEPTH: 21.5'
DATE: April 17, 1975

DEPTH TO WATER IN BORING: Surface 5' Caved at:
DATE: April 18, 1975

McCLELLAND ENGINEERS

PLATE 5

LOG OF BORING NO. 107

OP II - ECU

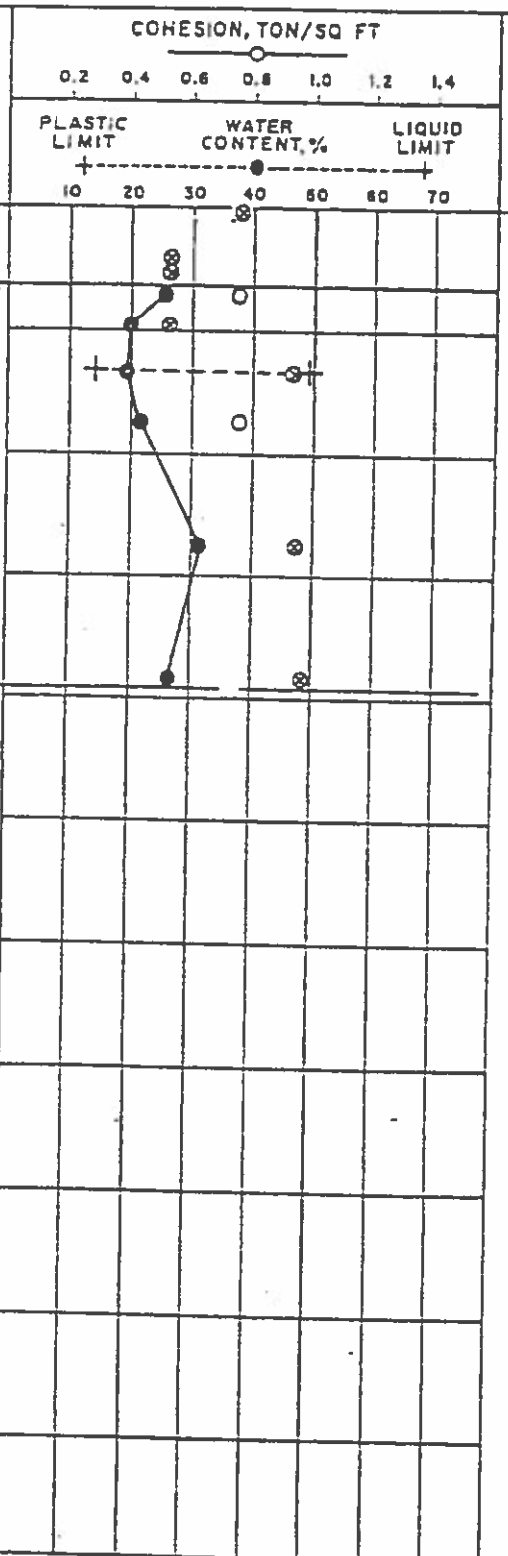
ARCO CHEMICAL COMPANY

CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	UNIT DRY WT LB/CU FT
			Stiff gray silty clay	
5			Stiff tan & light gray clay	97
			-with vertical silty clay seams to 5'	
			-with calcareous nodules below 5.5'	
			-with ferrous nodules below 6.5'	106
10			-with vertical sand partings below 8'	
			-slickensided below 12'	
15			-with sand layer, 16' to 17'	
20				
25				
30				
35				
40				
45				
50				



COMPLETION DEPTH: 19.5'

DATE: April 16, 1975

DEPTH TO WATER IN BORING: 1.2'

Caved at: 9.8'

DATE: April 18, 1975

McCLELLAND ENGINEERS

PLATE 6

LOG OF BORING NO. 108

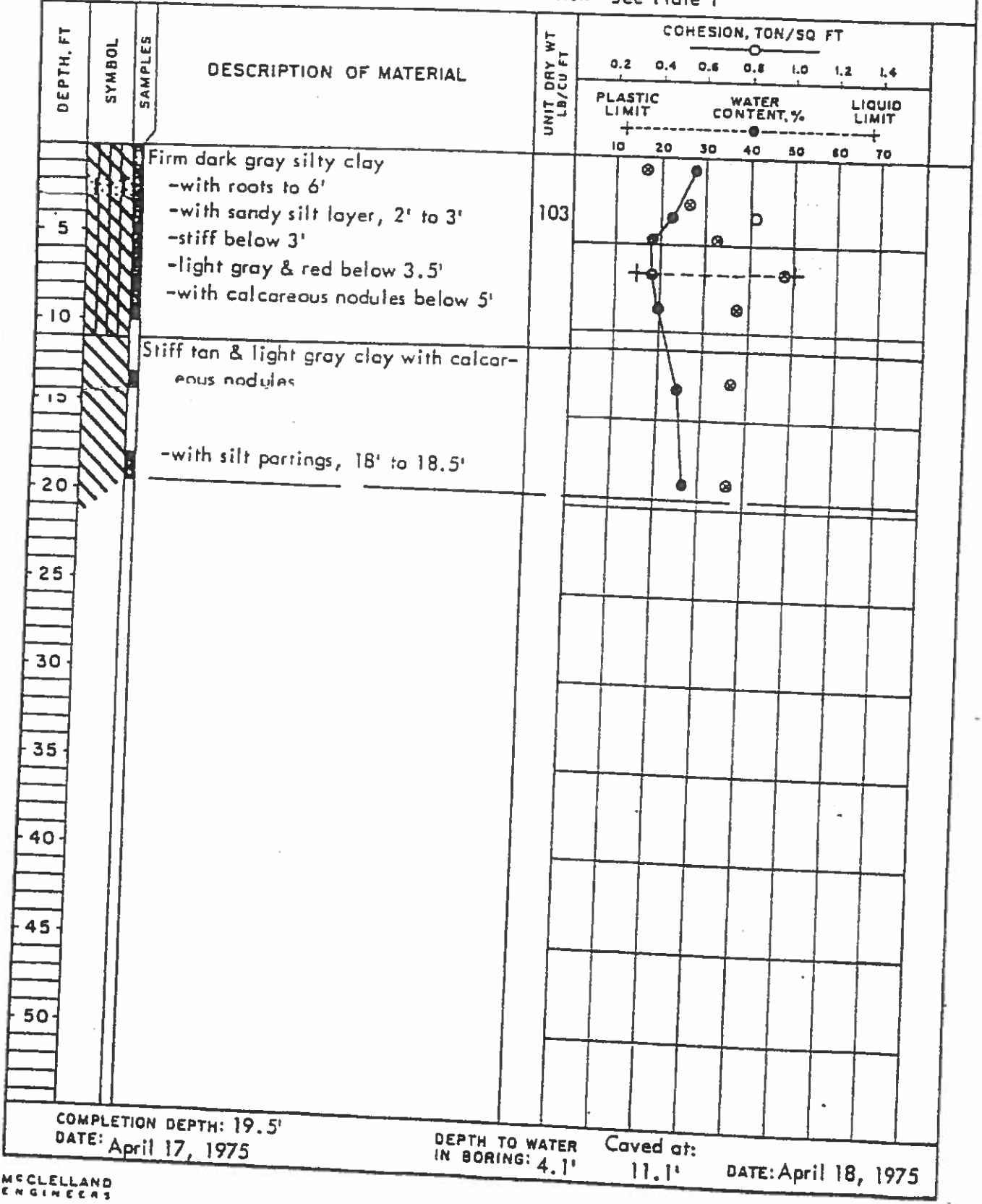
OP II - ECU

ARCO CHEMICAL COMPANY

CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1



COMPLETION DEPTH: 19.5'

DATE: April 17, 1975

DEPTH TO WATER IN BORING: 4.1'

Caved at: 11.1'

DATE: April 18, 1975

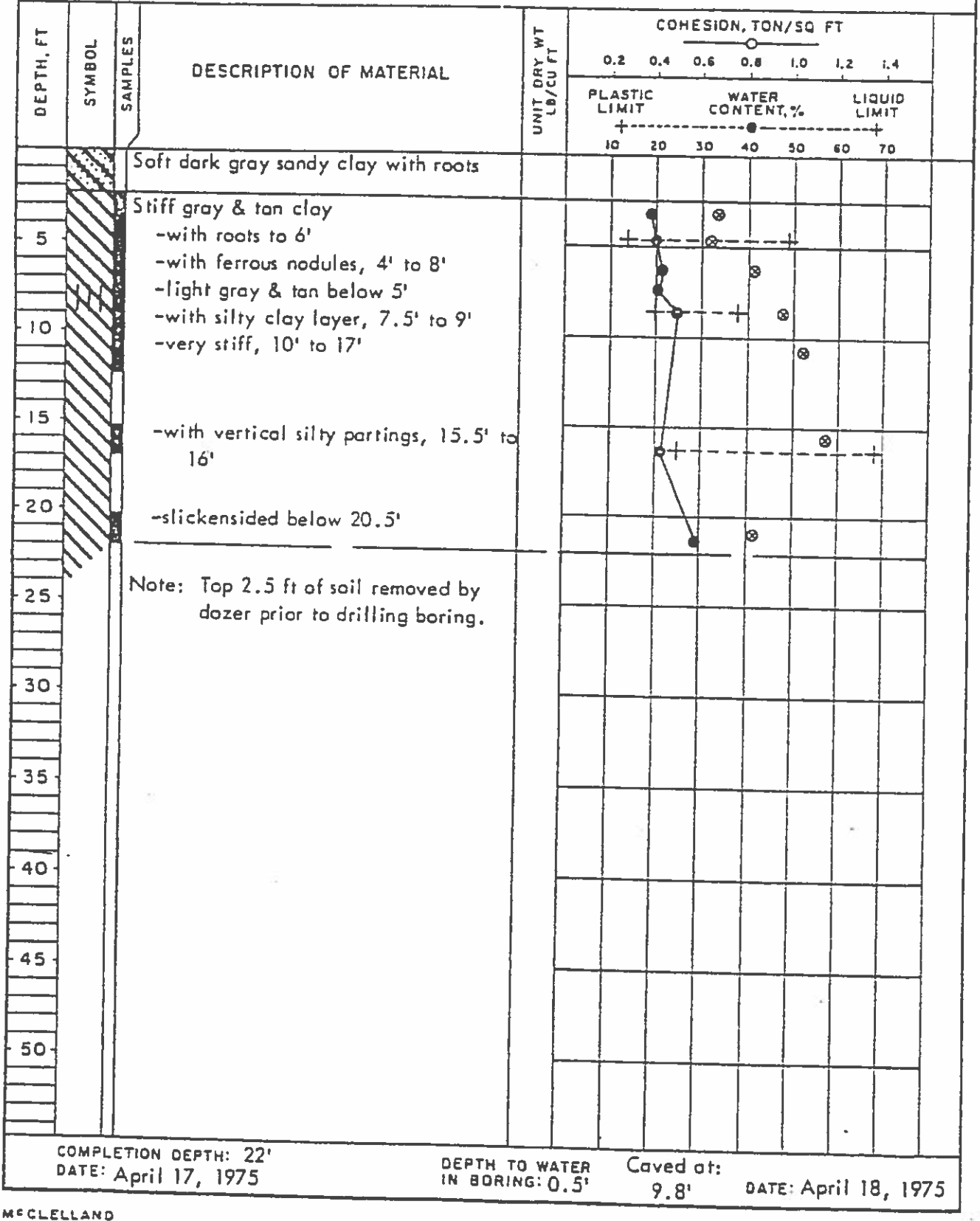
McCLELLAND ENGINEERS

PLATE 7

LOG OF BORING NO. 109
OP II - ECU
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1



COMPLETION DEPTH: 22'
DATE: April 17, 1975

DEPTH TO WATER IN BORING: 0.5'

Caved at: 9.8'

DATE: April 18, 1975

McCLELLAND ENGINEERS

PLATE 8

LOG OF BORING NO. 110

OP II - ECU

ARCO CHEMICAL COMPANY

CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL
0			Stiff gray & tan clay
			-firm gray silty clay to 1'
			-with roots to 3'
5			-with ferrous nodules, 2.5' to 7.5'
			-light gray & tan, 3' to 10'
			-with calcareous nodules below 4.5'
10			-tan & light gray below 10'
			-with tan silty clay layer, 14' to 15.5'
15			-slickensided below 15'
20			
			Note: Top 2 ft of soil removed by dozer prior to drilling boring.
25			
30			
35			
40			
45			
50			

UNIT DRY WT LB/CU FT

COHESION, TON/SQ FT

0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT

10 20 30 40 50 60 70

COMPLETION DEPTH: 21.5'
DATE: April 18, 1975

DEPTH TO WATER IN BORING: 1'

Caved at: 16.8'

DATE: April 18, 1975

McCLELLAND ENGINEERS

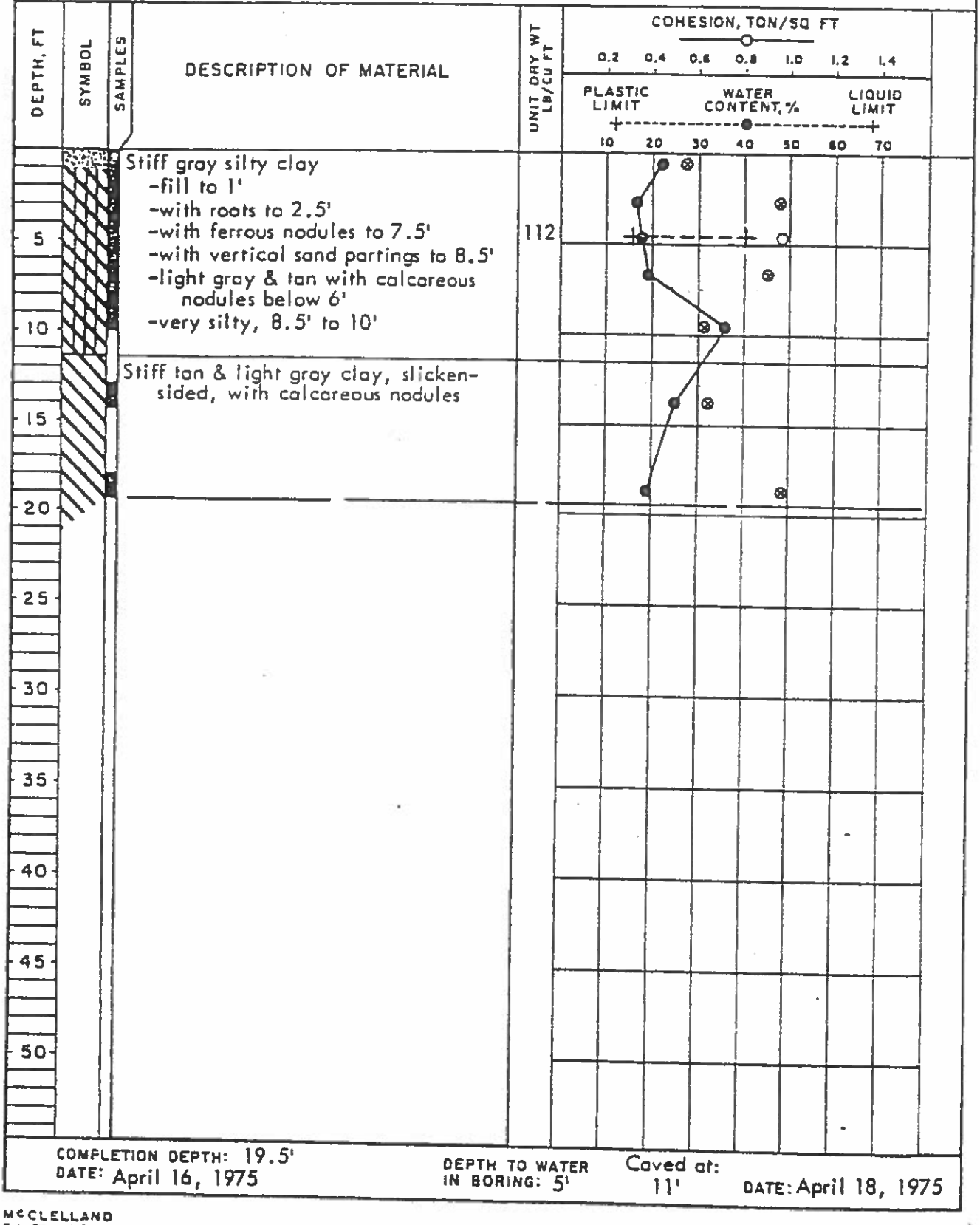
PLATE 9

LOG OF BORING NO. 111

OP II - ECU
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1



COMPLETION DEPTH: 19.5'
DATE: April 16, 1975

DEPTH TO WATER IN BORING: 5'

Caved at: 11'

DATE: April 18, 1975

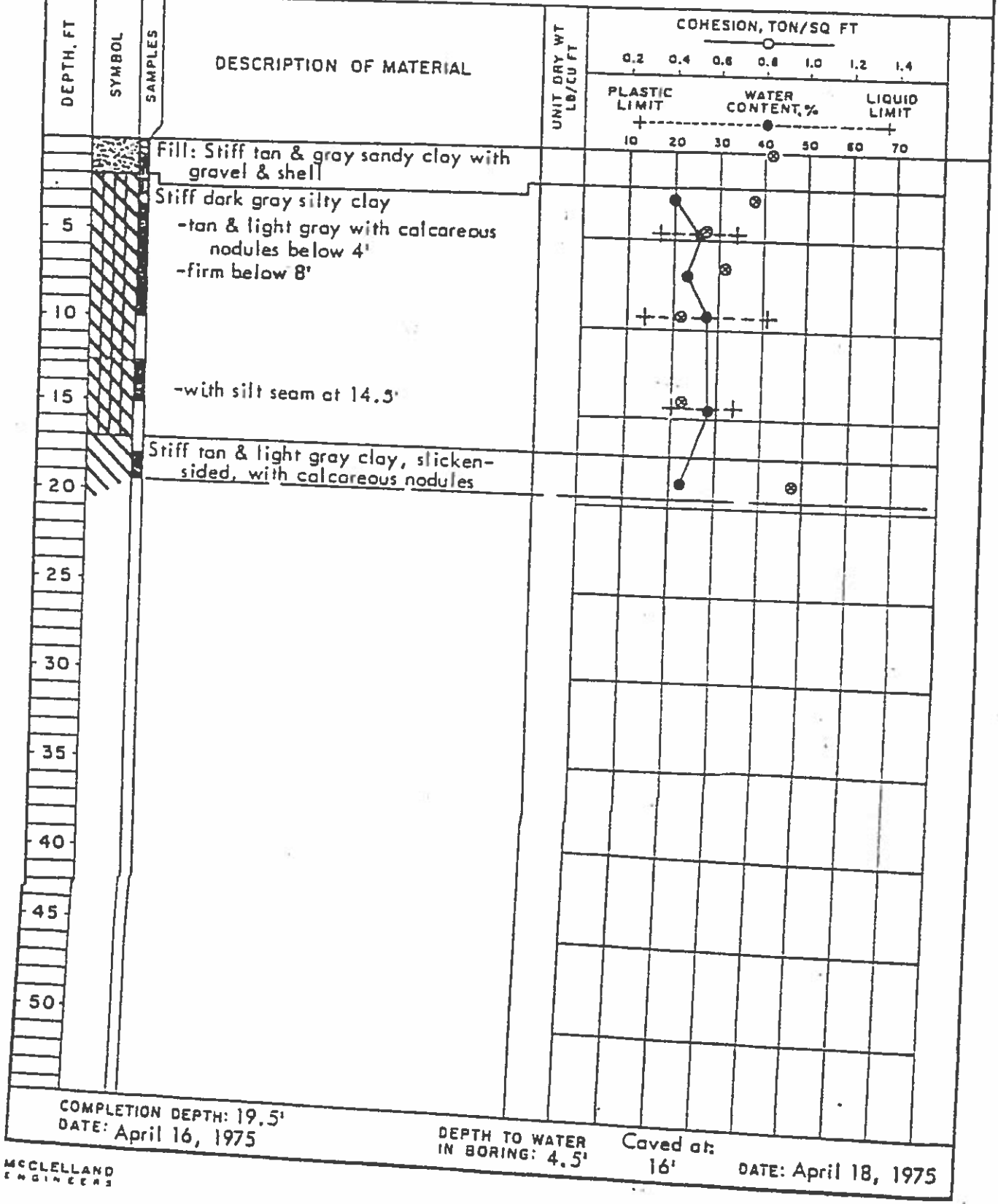
McCLELLAND ENGINEERS

PLATE 10

LOG OF BORING NO. 112
OP II - ECU
ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

LOCATION: See Plate 1



COMPLETION DEPTH: 19.5'
DATE: April 16, 1975

DEPTH TO WATER IN BORING: 4.5'

Caved at: 16'

DATE: April 18, 1975

McCLELLAND ENGINEERS

PLATE 11

LOG OF BORING NO. 113
OP II - ECU

ARCO CHEMICAL COMPANY
CHANNELVIEW, TEXAS

TYPE: 3" thin-walled tube

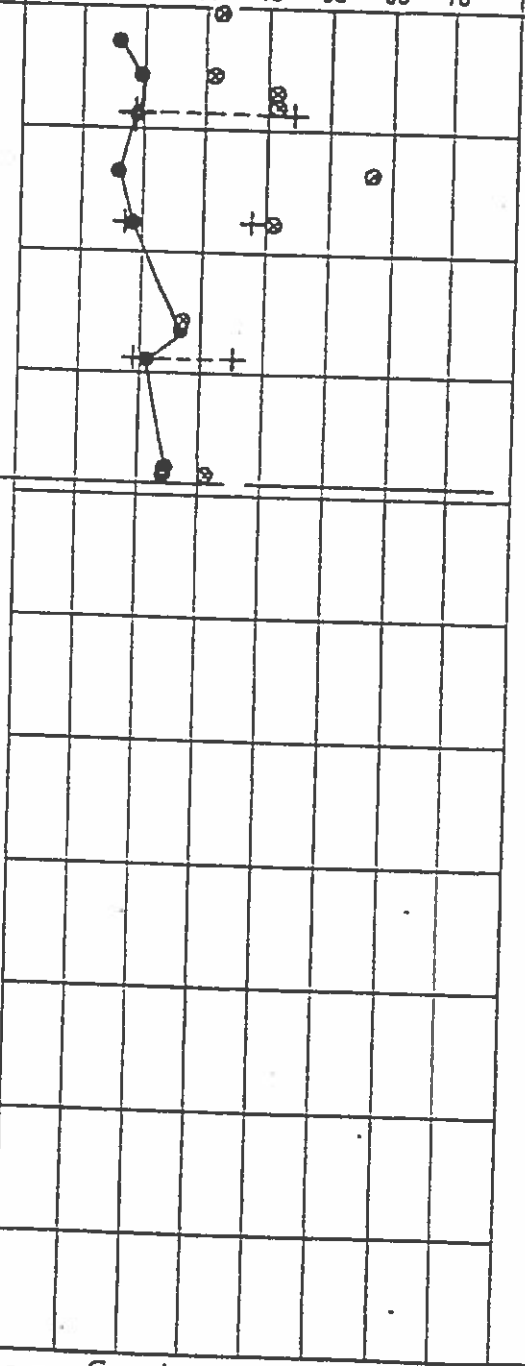
LOCATION: See Plate 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL
0			Stiff dark gray silty clay
			-with roots to 4'
			-with sandy silt seam at 1.5'
			-with fine sand seams, 2' to 3'
5			-with ferrous nodules, 2' to 11.5'
			-red & light gray, 3' to 6'
			-very stiff, 6' to 8.5'
10			-light gray & tan, 6' to 11.5'
			-tan & light gray with calcareous nodules below 11.5'
15			-with tan sandy silt seams below 14.5'
			-with tan sandy silt layer, 18.5' to 19'
20			
25			
30			
35			
40			
45			
50			

UNIT DRY WT LB/CU FT

COHESION, TON/SQ FT
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT, % — LIQUID LIMIT
10 20 30 40 50 60 70



COMPLETION DEPTH: 19.5'
DATE: April 16, 1975

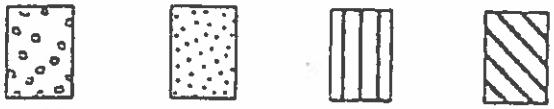
DEPTH TO WATER IN BORING: 4.5' Caved at: 6.8'
DATE: April 18, 1975

McCLELLAND

PLATE 12

SYMBOLS AND TERMS USED ON BORING LOGS

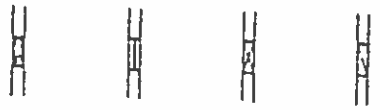
SOIL TYPES
(SHOWN IN SYMBOL COLUMN)



Gravel | Sand | Silt | Clay

Predominant type shown heavy

SAMPLER TYPES
(SHOWN IN SAMPLES COLUMN)



Shelby Tube | Piston | Split Spoon | No Recovery

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on No. 200 sieve): Includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as determined by laboratory tests.

DESCRIPTIVE TERM	RELATIVE DENSITY
Loose	0 to 40%
Medium dense	40 to 70%
Dense	70 to 100%

FINE GRAINED SOILS (major portion passing No 200 sieve): Includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings or by unconfined compression tests.

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH TON/SQ FT
Very soft	less than 0.25
Soft	0.25 to 0.50
Firm	0.50 to 1.00
Stiff	1.00 to 2.00
Very stiff	2.00 to 4.00
Hard	4.00 and higher

Note: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil. The consistency ratings of such soils are based on penetrometer readings.

TERMS CHARACTERIZING SOIL STRUCTURE

Slickensided – having inclined planes of weakness that are slick and glossy in appearance.

Fissured – containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.

Laminated – composed of thin layers of varying color and texture.

Interbedded – composed of alternate layers of different soil types.

Calcareous – containing appreciable quantities of calcium carbonate.

Well graded – having wide range in grain sizes and substantial amounts of all intermediate particle sizes.

Poorly graded – predominantly of one grain size, or having a range of sizes with some intermediate size missing.

Terms used in this report for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in Technical Memorandum No. 3-357, Waterways Experiment Station, March 1953.

PROJECT ARCO WATER SUPPLY & TREATMENT BORING NO B-130

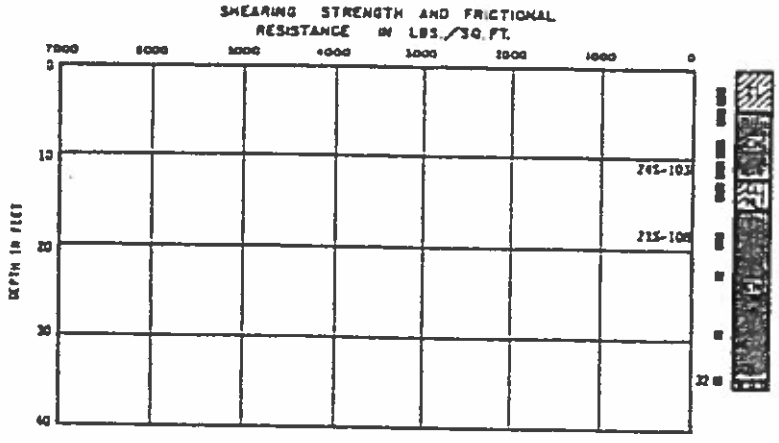
N = NO RECOVERY
C = UNDISTURBED CORE
P = PENETRATION TEST
J = JAR

DATE 6-18-75
LOCATION 53100 W4500
ELEVATION
BORING TYPE 3" Core

DEPTH IN FEET	SAMPLE TYPE	PENETROMETER READING, TSF	BLOWS/ FOOT	DESCRIPTION OF STRATUM	
0	C	0.5		Plastic Dark Gray Sandy Clay with Fill	(CL)
	C	1.7		Plastic Dark Gray & Yellow Sandy Clay	
5	C	1.5		Stiff Yellow & Light Gray Clay with Calcareous Nodules	(CH)
	C	2.6			
10	C	1.5			
15	C	1.8		Plastic Yellow & Light Gray Sandy Clay with Calcareous Nodules	(CL)
20	C	2.6		Stiff Tan & Light Gray Silty Clay with Calcareous Nodules	
25	C	2.2		Stiff Light Gray & Tan Clay	(CH)
30	C	3.2		Stiff Tan, Gray & Red Sandy Clay	(CL)
35	C	3.7		Stiff Tan, Gray & Red Clay	(CH)
	C	2.4		Stiff Light Gray & Tan Sandy Clay	(CL)
40				BOTTOM AT 40 FEET	

1. Boring drilled to 20 feet without water.
2. No water encountered in the upper 20 feet at time of drilling.

BORING H



ELEVATION 100.2'

DARK GRAY VERY SILTY CLAY WITH PETROLEUM WASTE AND ORGANIC MATERIAL

GRADING GRAY (STIFF)

MOTTLED YELLOW BROWN AND LIGHT GRAY SILTY CLAY (MEDIUM STIFF)

GRADING STIFF

GRADING SILTIER

MOTTLED YELLOW BROWN AND LIGHT GRAY VERY SILTY CLAY (STIFF)

RED BROWN SLIGHTLY SILTY CLAY (STIFF)

GRADING LIGHT GRAY, VERY SILTY

GRADING GREEN (VERY STIFF)

GRADING RED BROWN

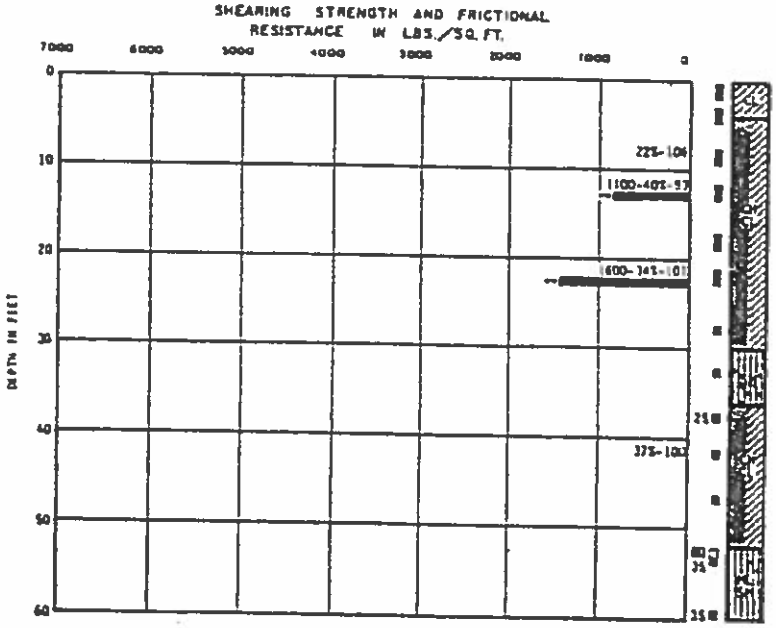
GRADING SLIGHTLY SILTY (VERY STIFF)

RED BROWN AND LIGHT GRAY VERY SILTY SAND (MEDIUM DENSE)

BORING COMPLETED AT 35' ON 10/30/73

WATER LEVEL AT 1'10" ON 11/14/73

BORING J



ELEVATION 99.3

DARK GRAY SILTY CLAY WITH ORGANIC MATERIAL TO 1' DEPTH (SOFT TO MEDIUM STIFF)

MOTTLED YELLOW BROWN AND LIGHT GRAY SILTY CLAY (STIFF)

GRADING LIGHT RED BROWN

GRADING LIGHT RED BROWN WITH LITTLE LIGHT GRAY (VERY STIFF)

GRADING LIGHT GRAY AND GRAY BROWN

GRADING RED BROWN

GRADING RED BROWN WITH LITTLE MOTTLED LIGHT GRAY

RED BROWN AND LIGHT GRAY SILTY SAND (DENSE)

GRADING SANDY WITH CLAY

LIGHT GRAY VERY SILTY CLAY (MEDIUM STIFF)

GRADING BROWN

GRADING MOTTLED LIGHT GRAY AND YELLOW BROWN, CRUMBLY TEXTURE (STIFF)

GRADING RED BROWN AND LIGHT GRAY

RED BROWN AND YELLOW BROWN CLAYEY FINE SAND (DENSE)

GRADING RED BROWN AND GRAY, SILTY

BORING COMPLETED AT 60' ON 11/6/73

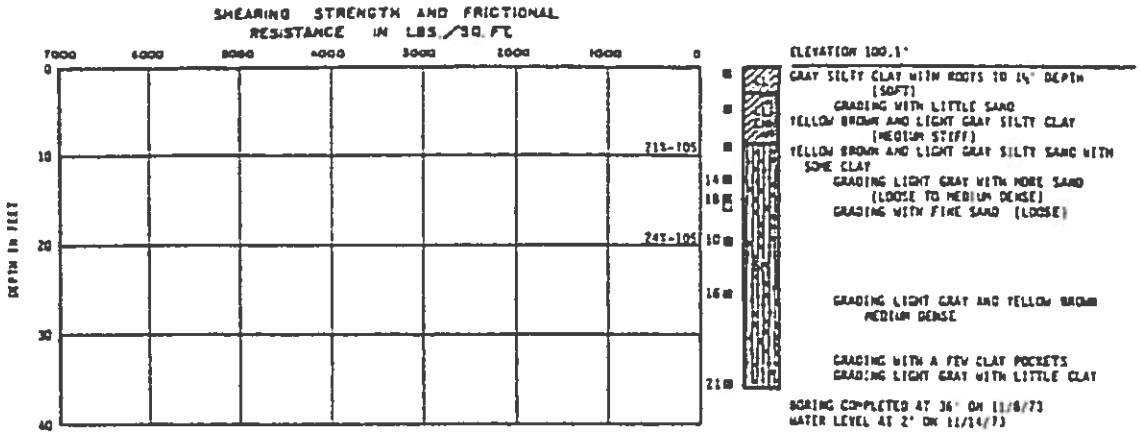
BORING LOCATION COVERED WITH STANDING WATER

LOG OF BORINGS

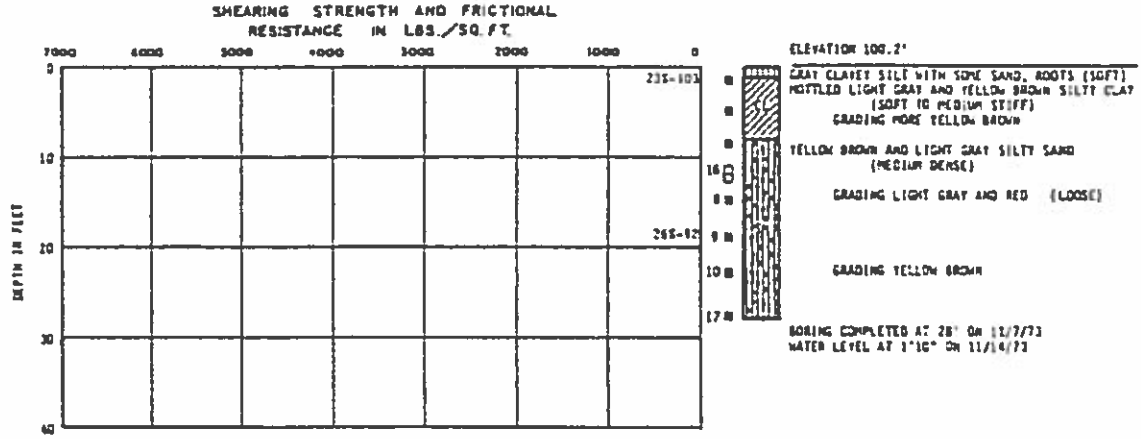
DAMES & MOORE
APPLIED EARTH SCIENCES

PLATE A-1F

BORING Q



BORING R

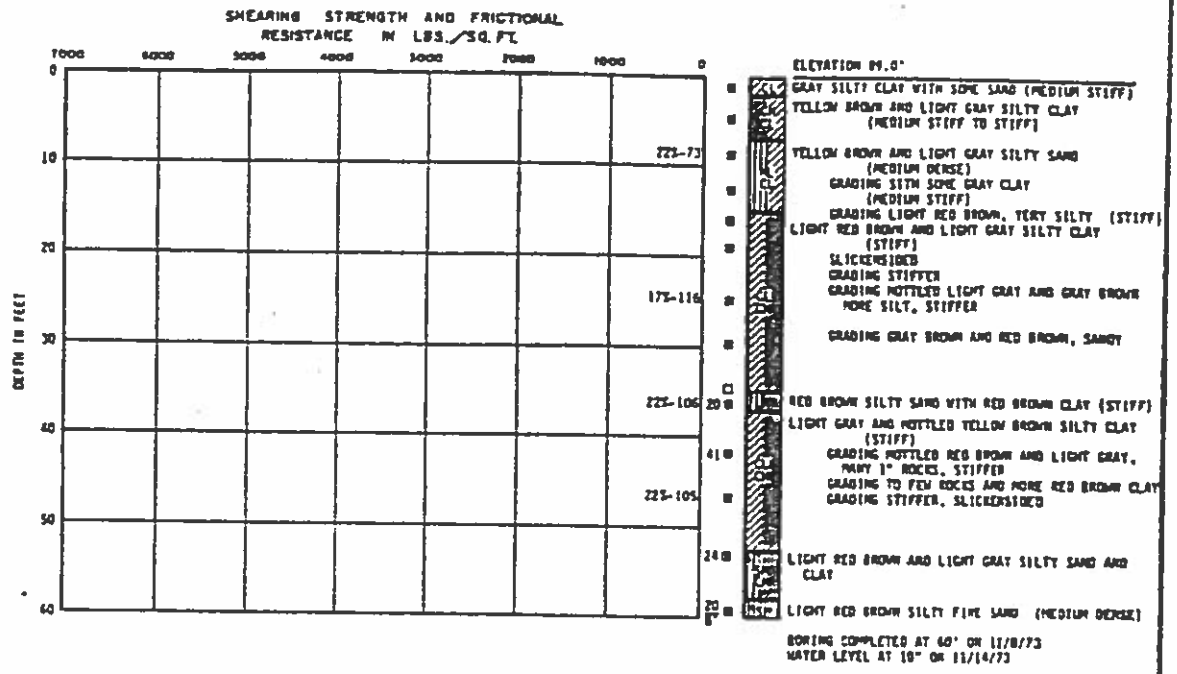


LOG OF BORINGS

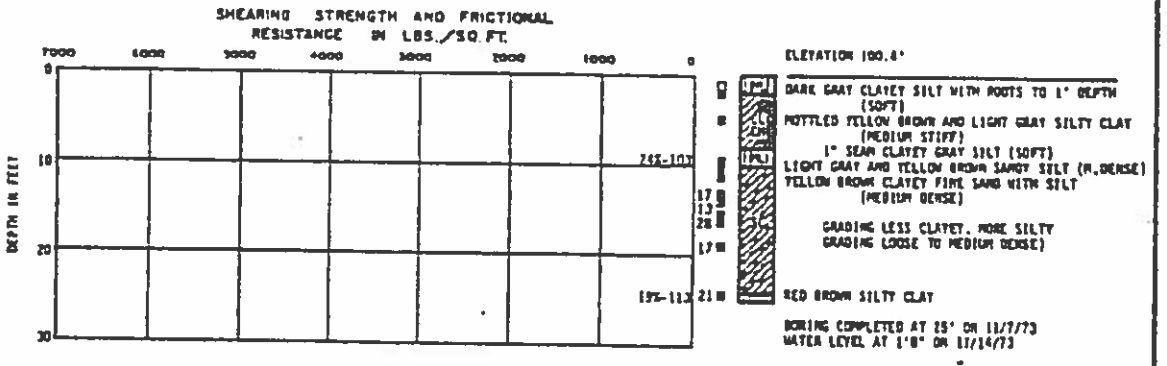
DAMES & MOORE
APPLIED EARTH SCIENCES

PLATE A-IX

BORING S



BORING T

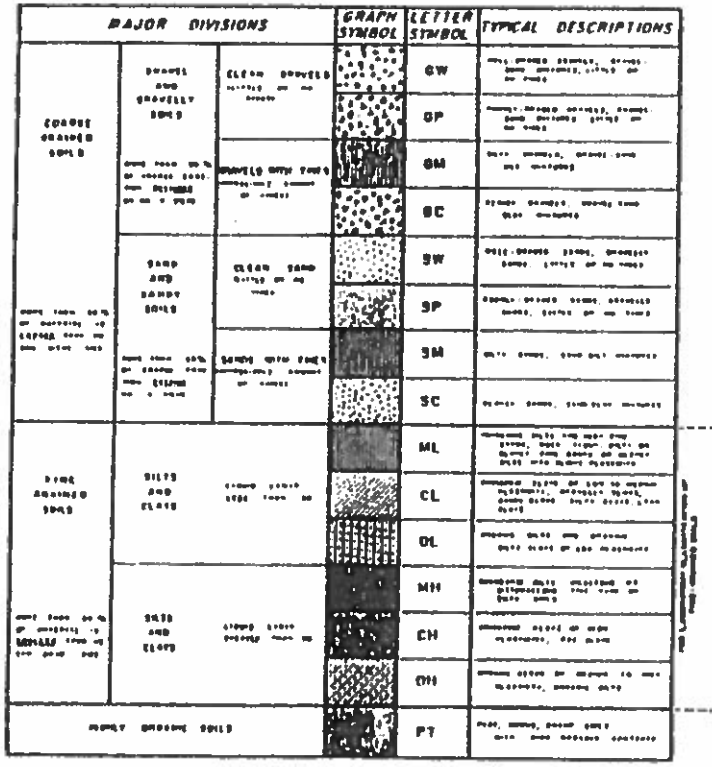


LOG OF BORINGS

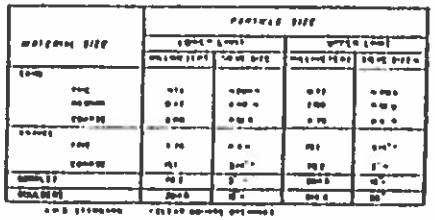
DAMES & MOORE
APPLIED EARTH SCIENCES

PLATE A-1L

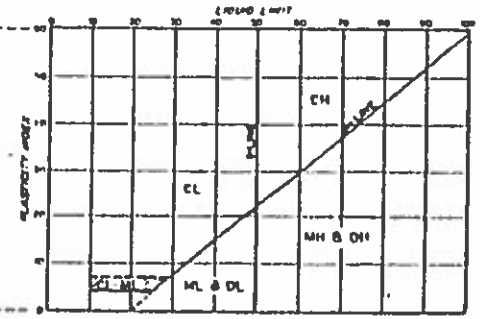
UNIFIED SOIL CLASSIFICATION SYSTEM



SOIL CLASSIFICATION CHART



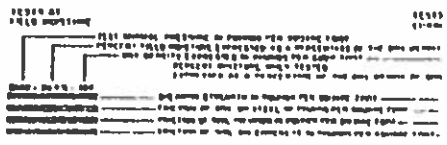
GRADATION CHART



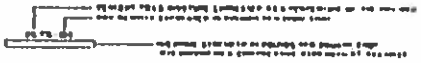
PLASTICITY CHART

NOTES

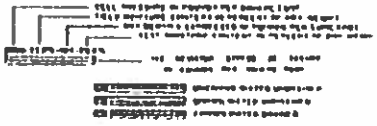
KEY TO TEST DATA



DIRECT SHEAR AND FRICTION TESTS



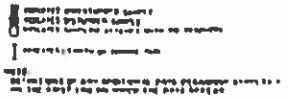
UNCONFINED COMPRESSION TESTS



TRIAXIAL COMPRESSION TESTS



SHEAR TEST RESULTS



SAMPLES

UNIFIED SOIL CLASSIFICATIO
AND
KEY TO TEST DAT.

Client: ARCO CHEMICAL COMPANY
Date: October 18, 1983
Location: Lyondell, North Plant
Ground Elev.: 41.8' msl
Boring Type: 3" Shelby Tube/2" Split Spoon

LOG OF BORING No. 200

Geo Associates
Job No. 034
Water Level at ft. On
Caving Depth ft.
Sheet 1 of 1

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	Plastic Index	Unit Dry Wt. Lb/Ft.3	% Passing #200	Blows/Ft.	UNDRAINED SHEAR STRENGTH (TSF) 0.2 0.4 0.6 0.8 1.0 1.2 / Plastic Limit — Water Content % — Liquid Limit 10 20 30 40 50 60
			GRAVEL AND SILTY CLAY (FILL)					
5			BROWN AND RED BROWN SILTY CLAY -with Fe nodules, 4'-6' -with organics and roots, 6'-10' -firm clayey silt layer, 10'-11'					
10			TAN SILTY SAND					
			VERY STIFF RED BROWN SILTY CLAY					
			T.D. 14'					

Client: ARCO CHEMICAL COMPANY
Date: October 17, 1983
Location: Lyondell, North Plant
Ground Elev.: 40.6' msl
Boring Type: 3" Shelby Tube/2" Split Spoon

LOG OF BORING No. 201

Geo Associates
Job No. 034
Water Level at ft. On
Caving Depth ft.
Sheet 1 of 1

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	Plastic Index	Unit Dry Wt. Lb/Ft.3	% Passing #200	Blows/Ft.	UNDRAINED SHEAR STRENGTH (TSF) 0.2 0.4 0.6 0.8 1.0 1.2 / Plastic Limit + Water Content % ● Liquid Limit + 10 20 30 40 50 60
			STABILIZED SHELL (FILL)					
5			GRAY AND TAN SILTY CLAY -with roots, 2'-8' -with calcareous nodules and organics, 4'-10' -clay layer, 6'-8'					
10			TAN CLAYEY SAND -with gray mottles and calcareous nodules					
			T.D. 12'					

Client: ARCO CHEMICAL COMPANY
Date: October 17, 1983
Location: Lyondell, North Plant
Ground Elev.: 42.1' msl
Boring Type: 3" Shelby Tube/2" Split Spoon

LOG OF BORING No. 202

Geo Associates
Job No. 034
Water Level at ft. On
Caving Depth ft.
Sheet 1 of 1

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	Plastic Index	Unit Dry Wt. Lb/Ft3	% Passing #200	Blows/Ft.	UNDRAINED SHEAR STRENGTH (TSF) 0.2 0.4 0.6 0.8 1.0 1.2 / Plastic Limit + Water Content % ● Liquid Limit + / 10 20 30 40 50 60
			VERY STIFF STABILIZED SHELL (FILL)					○
5			TAN AND GRAY CLAYEY SILT -with gravels, roots and organics -firm silty clay layer, 5'					○
10			TAN AND GRAY SILTY SAND -with Fe staining -with calcareous nodules, 6'-8' -clayey sand layer, 9'-10' -with organics, 8'-10'					
		X	MEDIUM DENSE TAN AND BROWN CLAYEY SILT				13	
			T.D. 14'					

Client: ARCO CHEMICAL COMPANY
Date: October 18, 1983
Location: Lyondell, North Plant
Ground Elev.: 40.4' msl
Boring Type: 3" Shelby Tube/2" Split Spoon

LOG OF BORING No. 203

Geo Associates
Job No. 034
Water Level at ft. On
Caving Depth ft.
Sheet 1 of 1

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	Plastic Index	Unit Dry Wt. Lb/Ft3	% Passing #200	Blows/Ft.	UNDRAINED SHEAR STRENGTH (TSF) 0.2 0.4 0.6 0.8 1.0 1.2 / Plastic Limit + Water Content % ● Liquid Limit + 10 20 30 40 50 60
			GRAVEL AND CLAYEY SAND (FILL)					
5			GRAY BROWN SILTY CLAY -with Fe and calcareous nodules					O O O
10			RED BROWN AND TAN CLAYEY SILT -with tan silty sand layers, 8'-10' -with calcareous nodules, 8'-11.5'				7	
			T.D. 11.5'					

Client: ARCO CHEMICAL COMPANY
Date: October 19, 1983
Location: Lyondell, North Plant
Ground Elev.: 40.7' msl
Boring Type: 3" Shelby Tube/2" Split Spoon

LOG OF BORING
No. 204

Geo Associates
Job No. 034
Water Level at ft. On
Caving Depth ft.
Sheet 1 of 1

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	Plastic Index	Unit Dry Wt. Lb/Ft.3	% Passing #200	Blows/Ft.	UNDRAINED SHEAR STRENGTH (TSF) 0.2 0.4 0.6 0.8 1.0 1.2 / Plastic Limit + Water Content % ● Liquid Limit + 10 20 30 40 50 60
			ASPHALT AND SILTY CLAY (FILL) -with gravels					
			*STABILIZED SOIL					
5			STIFF GRAY SILTY CLAY -with abundant calcareous nodules -with orange brown mottles, 4'-6' -with few roots and organics, 6'-10' -red brown to tan, 10'-12' -with sandy silt layer, 11'-11.5'					
10								
			T.D. 12'					

*NOTE: material too stiff for Shelby tube recovery; black, smelly organic layer at 2'.

Client: ARCO CHEMICAL COMPANY
Date: October 17, 1983
Location: Lyondell, North Plant
Ground Elev.: 40.7' msl
Boring Type: 3" Shelby Tube/2" Split Spoon

LOG OF BORING No. 205

Geo Associates
Job No. 034
Water Level at ft. On
Caving Depth ft.
Sheet 1 of 1

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	Plastic Index	Unit Dry Wt. Lb/Ft3	% Passing #200	Blows/Ft.	UNDRAINED SHEAR STRENGTH (TSF) 0.2 0.4 0.6 0.8 1.0 1.2 / Plastic Limit — Water Content % — Liquid Limit 10 20 30 40 50 60
			CLAY AND GRAVEL FILL					
			BROWN AND TAN CLAYEY SILT					
			STIFF GRAY AND BROWN SILTY CLAY -with roots, 2'-6' -Fe stains, 4'-6' -soft, 6.5'					
5								
			MEDIUM DENSE GRAY SILT/CLAYEY SILT -with orange brown mottles, 8'-12'				17	
10								
			T.D. 13.5'					

Client: ARCO CHEMICAL COMPANY
Date: October 18, 1983
Location: Lyondell, North Plant
Ground Elev.: 40.4' msl
Boring Type: 3" Shelby Tube/2" Split Spoon

LOG OF BORING No. 206

Geo Associates
Job No. 034
Water Level at ft. On
Caving Depth ft.
Sheet 1 of 1

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	Plastic Index	Unit Dry Wt. Lb/Ft.3	% Passing #200	Blows/Ft.	UNDRAINED SHEAR STRENGTH (TSF) 0.2 0.4 0.6 0.8 1.0 1.2 — Plastic Limit — Water Content % — Liquid Limit — 10 20 30 40 50 60
			STABILIZED SHELL (FILL)					
			STIFF GRAY SILTY CLAY -with roots and very soft, 0.5'-4' -with yellow brown mottles, 0.5'-8' -with organics and slickensides, 6'-12' -firm, 4'-8' -red brown, 9'-28.4' -silt layer, 9.5'-10' -clayey silt layer, 15.5'-16' -very stiff, 18'-20' -with slickensides, 18'-28.4' -with calcareous nodules, 24'-28' -very stiff, 26'-28'					
30			VERY STIFF GRAY CLAY -with numerous large calcareous nodules, slickensides, and red brown clayey silt pockets					
			GRAY CLAYEY SILT -with red brown silty sand and clay -with calcareous nodules					
			T.D. 34'					

Client: ARCO CHEMICAL COMPANY
Date: October 19, 1983
Location: Lyondell, North Plant
Ground Elev.: 42.6' msl
Boring Type: 3" Shelby Tube/2" Split Spoon

LOG OF BORING No. 207

Geo Associates
Job No. 034
Water Level at ft. On
Caving Depth ft.
Sheet 1 of 1

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	Plastic Index	Unit Dry Wt. Lb/Ft3	% Passing #200	Blows/Ft.	UNDRAINED SHEAR STRENGTH (TSF) 0.2 0.4 0.6 0.8 1.0 1.2 / Plastic Limit + Water Content % ● Liquid Limit + 10 20 30 40 50 60
			GRAY SANDY CLAY (FILL) -with gravel, shell and roots					
		*						
5			-with 2" asphalt-like layer at 4'					
			STIFF GRAY SILTY CLAY -with roots and red brown mottles to 10' -with slickensides, 8'-10' -with abundant calcareous nodules, 10'-14'					
10								
15			RED BROWN CLAYEY SILT/SILT -with silt layer, 15'-15.5'					
			T.D. 16'					
			*NOTE: material too stiff for Shelby Tube recovery					

Client: ARCO CHEMICAL COMPANY
Date: October 19, 1983
Location: Lyondell, North Plant
Ground Elev.: 39.9' msl
Boring Type: 3" Shelby Tube/2" Split Spoon

LOG OF BORING No. 208

Geo Associates
Job No. 034
Water Level at ft. On
Caving Depth ft.
Sheet 1 of 1

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	Plastic Index	Unit Dry Wt. Lb/Ft.3	% Passing #200	Blows/Ft.	UNDRAINED SHEAR STRENGTH (TSF) 0.2 0.4 0.6 0.8 1.0 1.2 / Plastic Limit — Water Content % — Liquid Limit 10 20 30 40 50 60
			YELLOW BROWN SILTY CLAY					
			-with sand and red brown clay layers					
			FIRM GRAY CLAYEY SILT					
			-soft sandy clay layer at 3'					
5			STIFF GRAY SILTY CLAY					
			-with roots, 4'-8'					
			-firm, 6'-8'					
			-with orange brown mottles and organics, 8'-11'					
10								
			GRAY AND RED BROWN CLAYEY SILT					
			-silty sand layer, 12.5'-13'					
			STIFF GRAY SILTY CLAY					
			T.D. 14'					

Client: ARCO CHEMICAL COMPANY
Date: October 17, 1983
Location: Lyondell, North Plant
Ground Elev.: 40.6' msl
Boring Type: 3" Shelby Tube/2" Split Spoon

LOG OF BORING No. 210

Geo Associates
Job No. 034
Water Level at ft. On
Caving Depth ft.
Sheet 1 of 1

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	Plastic Index	Unit Dry Wt. Lb/Ft.3	% Passing #200	Blows/Ft.
			STABILIZED SHELL AND SILTY CLAY (FILL)				
5			*GREEN GRAY CLAY (FILL) -with calcareous nodules, 2'-8' -with gravels, 2'-16' -slightly silty, 6'-8' -with black organic mottles, 8'-16' -dark gray with shell material -very soft, 14'-16'				
10							
15							
			GRAY CLAYEY SILT -with stiff red brown clay at 17.8'				
			T.D. 18'				

UNDRAINED SHEAR STRENGTH (TSF)
0.2 0.4 0.6 0.8 1.0 1.2

Plastic Limit — Water Content % — Liquid Limit
10 20 30 40 50 60

*NOTE: probably fill material. Noted chemical odor at 11'; roots and part of rubber glove (?) at 13'; large lumps of hard, black material in soft clay matrix, 14'-16'.

Client: LYONDELL PETROCHEMICAL CO.- CHANNELVIEW

Date: 9/04/91

Location: 1072.65 N; 1110.74 E

Ground Elev. 40.20

Boring Type: WASH/SHELBY TUBE/SPLIT SPOON

LOG OF BORING

No. 20

GEO ASSOCIATES

Job No. 254

Water Level Depth-

Caving Depth-

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDG (ppm)	BLOW COUNTS
			VERY DENSE TAN CLAYEY SAND (FILL) -with calc. nodules and gravel		
5			TAN CLAYEY GRAVEL		
			LOOSE BLACK COARSE SAND (FILL)		
			STIFF GRAY VERY SANDY CLAY		
			STIFF LIGHT RED AND GRAY CLAY		
10					
			STIFF RED AND GRAY SANDY CLAY		
		SS	LIGHT RED CLAYEY SILT - sandy 13.5'-14'		12
15			STIFF GRAY SANDY CLAY		
			STIFF LIGHT RED AND GRAY SILTY CLAY -with calc. nodules		
20					
25					
30					
40					

FIELD OVA ppm: 0 100 200 300 400 500 600 700 800 900 1000; 0x 1 2

SHEAR STRENGTH ESTIMATE POCKETPEN tsf: 0

Total Depth= 18.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: LYONDELL PETROCHEMICAL CO.- CHANNELVIEW

Date: 9/06/91

Location: 1012.11 N: 955.75 E

Ground Elev. 40.10

Boring Type: WASH/SHELBY TUBE/SPLIT SPOON

LOG OF BORING

No. 21

GEO ASSOCIATES

Job No. 254

Water Level Depth=

Caving Depth=

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDG (ppm)	BLOW COUNTS
0			STIFF TAN SANDY CLAY (FILL) -with calc. nodules -very soft below 2' -red and gray silty clay below 3.5'		
5			STIFF LIGHT BROWN SILTY CLAY -with calc. nodules -with 4" gray sand below 8.5'		
10			STIFF LIGHT BROWN CLAY -w/ calc. nods and clayey silt pckts		
			STIFF LIGHT BROWN AND GRAY SILTY CLAY		
		SS	MEDIUM DENSE BROWN SANDY SILT -with 4" silt layer below 12.5'		15
15			STIFF BROWN CLAY -with calc. nodules		
20					
25					
30					
35					
40					

FIELD OVA ppm

0 100 200 300 400 500 600 700 800 900 1000

0x 1 2

SHEAR STRENGTH ESTIMATE POCKETPEN tsf

Total Depth= 18.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: LYONDELL PETROCHEMICAL CO.- CHANNELVIEW

Date: 9/04/91

Location: 565.68 N: 956.48 E

Ground Elev. 38.06

Boring Type: MASH/SHELBY TUBE/SPLIT SPOON

LOG OF BORING

No. 22

GEO ASSOCIATES

Job No. 254

Water Level Depth=

Caving Depth=

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDG (ppm)	BLOW COUNTS
			STIFF TAN SANDY CLAY (FILL) -with sand pockets -with calc. nodules, 2'-4'		
5			STIFF GRAY SILTY CLAY -with Fe stains and nodules		
			STIFF GRAY SANDY CLAY -with Fe stains and nodules -increasing silt with depth		
10			STIFF LIGHT RED AND GRAY CLAY -with gray silty clay pockets		
			LOOSE LIGHT RED AND GRAY CLAYEY SILT -with silt pockets, 12'-14' -with red and gray sandy silt seams -with 4" silty clay layers, 16'-18'		
15		SS			8
		SS			9
20			STIFF TAN CLAY -with slickensides		
25					
30					
35					
40					

FIELD OVA ppm

0 100 200 300 400 500 600 700 800 900 1000

0x 1 2

SHEAR STRENGTH ESTIMATE POCKETPEN tsf

Total Depth= 25.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: LYONDELL PETROCHEMICAL CO.- CHANNELVIEW

Date: 9/06/91

Location: 521.4 N; 1114.14 E

Ground Elev. 40.20

Boring Type: WASH/SHELBY TUBE/SPLIT SPOON

LOG OF BORING

No. 23

GEO ASSOCIATES

Job No. 254

Water Level Depth=

Caving Depth=

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDG (ppm)	BLOW COUNTS
0			BROWN SANDY CLAY AND CLAYEY SAND (FILL)		
			FIRM BROWN SILTY CLAY -with calc. nodules, 2'-4' -with Fe stains below 4'		
10			BROWN CLAY -/w silt parts and clay pckts		
			LOOSE BROWN CLAYEY SILT -with calc. nodules, 12'-14'.5' -with 10" silty clay layer at 13' -w/ silty clay & silt layers below 14'		9 10
15		SS			
20		SS			
25			STIFF GRAY AND BROWN CLAY -with 6" silty clay below 21.5'		
30					
35					
40					

FIELD OVA ppm: 0 100 200 300 400 500 600 700 800 900 1000; U_x: 1, 2

SHEAR STRENGTH ESTIMATE POCKETPEN TSF

Total Depth= 25.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: LYONDELL PETROCHEMICAL CO.- CHANNELVIEW

Date: 9/06/91

Location: 1490.53 N; 624.53 E

Ground Elev. 40.60

Boring Type: WASH/SHELBY TUBE/SPLIT SPOON

LOG OF BORING

No. 24

GEO ASSOCIATES

Job No. 254

Water Level Depth=

Caving Depth=

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDG (ppm)	BLOW COUNTS
			FIRM BROWN SANDY CLAY (FILL) -with sand pockets and Fe stains below 2'		
5			FIRM TAN AND GRAY SILTY CLAY		
			STIFF TAN AND GRAY SILTY CLAY -with silt and sand pockets -with increasing silt with depth -with silt seams below 11'		
10					
			STIFF TAN CLAY -with calc. nodules		
15			TAN AND GRAY CLAYEY SILT -with silt seams		
			VERY STIFF LIGHT BROWN CLAY		
20					
25					
30					
35					
40					

FIELD OVA ppm: 0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000; U_x; 1; 2

SHEAR STRENGTH ESTIMATE POCKETPEN tsf: 0

Total Depth= 18.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: LYONDELL PETROCHEMICAL CO.- CHANNELVIEW

Date: 11/23/93

Location: N 569.36, E 753.04

Ground Elev. 41.00

Boring Type: SHELBY TUBE/WASH

LOG OF BORING

No. 25

GEO ASSOCIATES

Job No. 254

Water Level Depth=

Caving Depth=

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDG (ppm)	BLOW COUNTS
			STIFF BROWN CLAY -with gravel and 4" of topsoil at surface	0	
5			FIRM BROWN AND GRAY CLAY -with gravel 4'-6'	0	
			FIRM GRAY CLAY -with Fe staining -stiff 10'-12'	0	
10			SOFT GRAY CLAYEY SILT -with Fe staining	0	
			FIRM GRAY CLAYEY SILT -with Fe staining	0	
15				0	
			FIRM BROWN AND RED CLAY -with calc. nodules, with 6" gray sand from 20'	0	
20			STIFF GRAY CLAY -with Fe staining -with calc. nodules	0	
25				0	
30					
35					
40					

FIELD OVA RDG (ppm) 0 500 1000

SHEAR STRENGTH ESTIMATE 0 1 2

Total Depth= 28.0

Logged By: BURRIER

Drilled By: GULF COAST CORING

Client: LYONDELL PETROCHEMICAL CO.- CHANNELVIEW

Date: 7/30/91

Location: N 340.67; E 991.47

Ground Elev. 42.10

Boring Type: WASH/SHELBY TUBE/SPLIT SPOON

LOG OF BORING

No. P-301

GEO ASSOCIATES

Job No. 254

Water Level Depth=

Caving Depth=

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDG (ppm)	BLOW COUNTS
0			STIFF BLACK SILTY CLAY -with calc. nodules -gray with Fe stains below 4'		
5					
10			VERY STIFF GRAY SILTY CLAY -with silt partings, 8'-10' and 12'-14' -stiff below 12' -with silt seams below 14'		
15			RED AND GRAY CLAYEY SILT -w/ silty clay pckts; 1' silt below 16.5'		
20			RED AND GRAY SILTY SAND		
25			RED CLAYEY SILT -with layered silty clay, 25'-27'		
30			STIFF LIGHT BROWN CLAY -with calc. nodules -with slickensides below 33'		
35			RED AND GRAY SILT -with 2" clayey silt seam at 39'		
40					

FIELD OVA ppm: 0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000; 0_x, 1, 2

SHEAR STRENGTH ESTIMATE POCKETPEN tsf: 0

Total Depth= 80.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: LYONDELL PETROCHEMICAL CO.- CHANNELVIEW

Date: 7/30/91

Location: N 340.67; E 991.47

Ground Elev. 42.10

Boring Type: WASH/SHELBY TUBE/SPLIT SPOON

LOG OF BORING

No. P-301

GEO ASSOCIATES

Job No. 254

Water Level Depth-

Caving Depth-

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDG (ppm)	BLOW COUNTS
40			RED AND GRAY SILT		
			VERY STIFF GRAY SANDY CLAY -with Fe stains and calc. nodules -red and gray, 48'-49.5' -with chalk pockets, 48'-49.5'		
50			RED SILTY SAND		
			VERY STIFF RED AND GRAY CLAY -with slickensides		
60			RED AND GRAY SILTY SAND -with layered silty clay, 55.5'-57'		
			RED AND GRAY SAND -with 1" cemented sand layers, 62'-66'		
70			RED CLAYEY SILT -with 1" cemented sand layers -with silt and sand layers		
78			VERY STIFF RED CLAY -with silt partings		
			SILT		
80			STIFF GRAY SILTY CLAY		

FIELD OVA ppm: 0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000; 0x, 1, 2

SHEAR STRENGTH ESTIMATE POCKETPEN tsf: 0

Total Depth= 80.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: LYONDELL PETROCHEMICAL CO.- CHANNELVIEW

Date: 7/30/91

Location: N 1364.31; E 686.21

Ground Elev. 40.40

Boring Type: WASH/SHELBY TUBE/SPLIT SPOON

LOG OF BORING

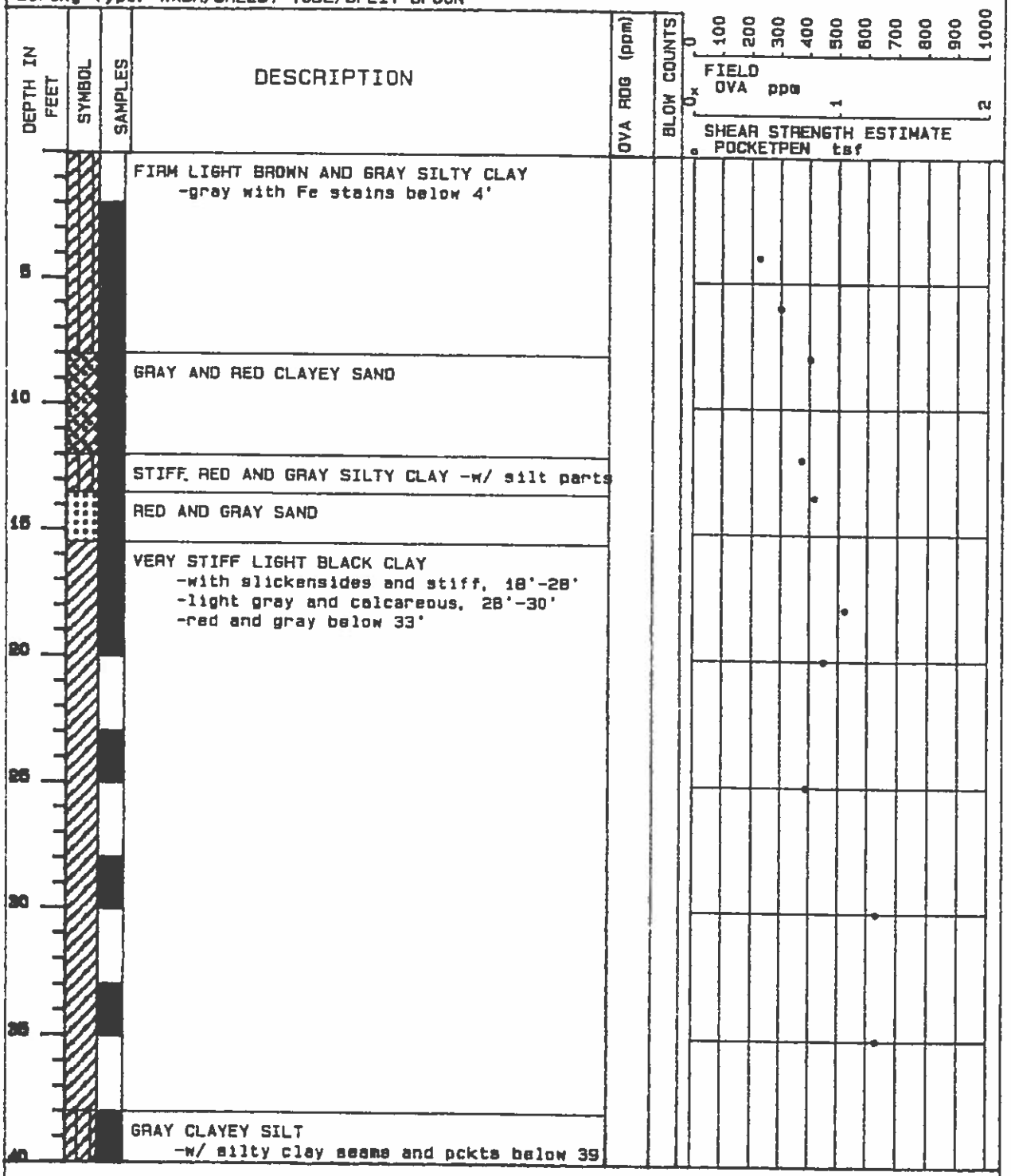
No. P-302

GEO ASSOCIATES

Job No. 254

Water Level Depth=

Caving Depth=



Total Depth= 80.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: LYONDELL PETROCHEMICAL CO.- CHANNELVIEW

Date: 7/30/91

Location: N 1364.31; E 686.21

Ground Elev. 40.40

Boring Type: MASH/SHELBY TUBE/SPLIT SPOON

LOG OF BORING

No. P-302

GEO ASSOCIATES

Job No. 254

Water Level Depth-

Caving Depth-

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDG (ppm)	BLOW COUNTS
40			GRAY CLAYEY SILT		
			VERY STIFF GRAY SILTY CLAY -with Fe stains		
45			VERY STIFF RED AND GRAY CLAY		
50			STIFF GRAY SILTY CLAY		
			RED AND GRAY CLAYEY SILTY		
55			RED AND GRAY SILT -with layered clayey silt, 54'-58'		
60					
			VERY STIFF RED CLAY -with silt partings and sand pockets 64'-65' -with 4" sand seam at 69'		
65					
70					
			VERY STIFF LIGHT BROWN CLAY -with 1" cemented sand & 6" sand at 71' -with silt and sand partings		
75					
			GRAY CLAYEY SILT		
80			GRAY SILT		

FIELD OVA ppm

0 100 200 300 400 500 600 700 800 900 1000

0x 1 2

SHEAR STRENGTH ESTIMATE POCKETPEN tsf

Total Depth= 80.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: LYONDELL PETROCHEMICAL CO.- CHANNELVIEW

Date: 7/30/91

Location: N 831.90; E 312.51

Ground Elev. 40.60

Boring Type: WASH/SHELBY TUBE/SPLIT SPOON

LOG OF BORING

No. P-303

GEO ASSOCIATES

Job No. 254

Water Level Depth=

Caving Depth=

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDB (ppm)	BLOW COUNTS	FIELD OVA ppm (0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000; O_x; 1; 2) / SHEAR STRENGTH ESTIMATE POCKETPEN tsf (0)
0			STIFF BLACK SILTY CLAY -with root hairs and Fe stains, 0-4' -dark gray below 4'			
8						
10			VERY STIFF LIGHT GRAY SILTY CLAY -with clac. nodules and Fe stains -with 6" red and gray clayey silt at 8.5' -with clayey silt pockets, 10'-12'			
15			STIFF LIGHT RED AND GRAY CLAY			
			LIGHT RED AND GRAY SILT -with 4" clayey silt layer at 16'			
20			STIFF LIGHT RED AND GRAY SILTY CLAY			
25						
30						
35						
40						

Total Depth= 20.0

Logged By: D. BRAGG

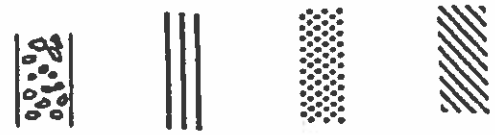
Drilled By: GULF COAST CORING

GEO ASSOCIATES

Geotechnical Engineering & Groundwater Consulting

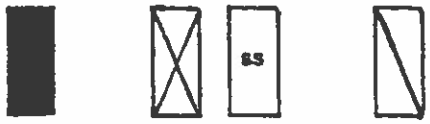
SYMBOLS AND TERMS USED ON BORING LOGS

SOIL TYPES
(shown in symbol column)



GRAVEL SILT SAND CLAY

SAMPLER TYPES
(shown in samples column)



SHELBY TUBE SPLIT SPOON NO RECOVERY

COARSE GRAINED SOILS (major portion retained on No. 200 sieve)

Includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is described by reference to the standard penetration test results obtained in the field.

DESCRIPTIVE TERM	NUMBER OF BLOWS PER FOOT (N)
LOOSE	0 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	over 50

FINE GRAINED SOILS (major portion passing No. 200 sieve)

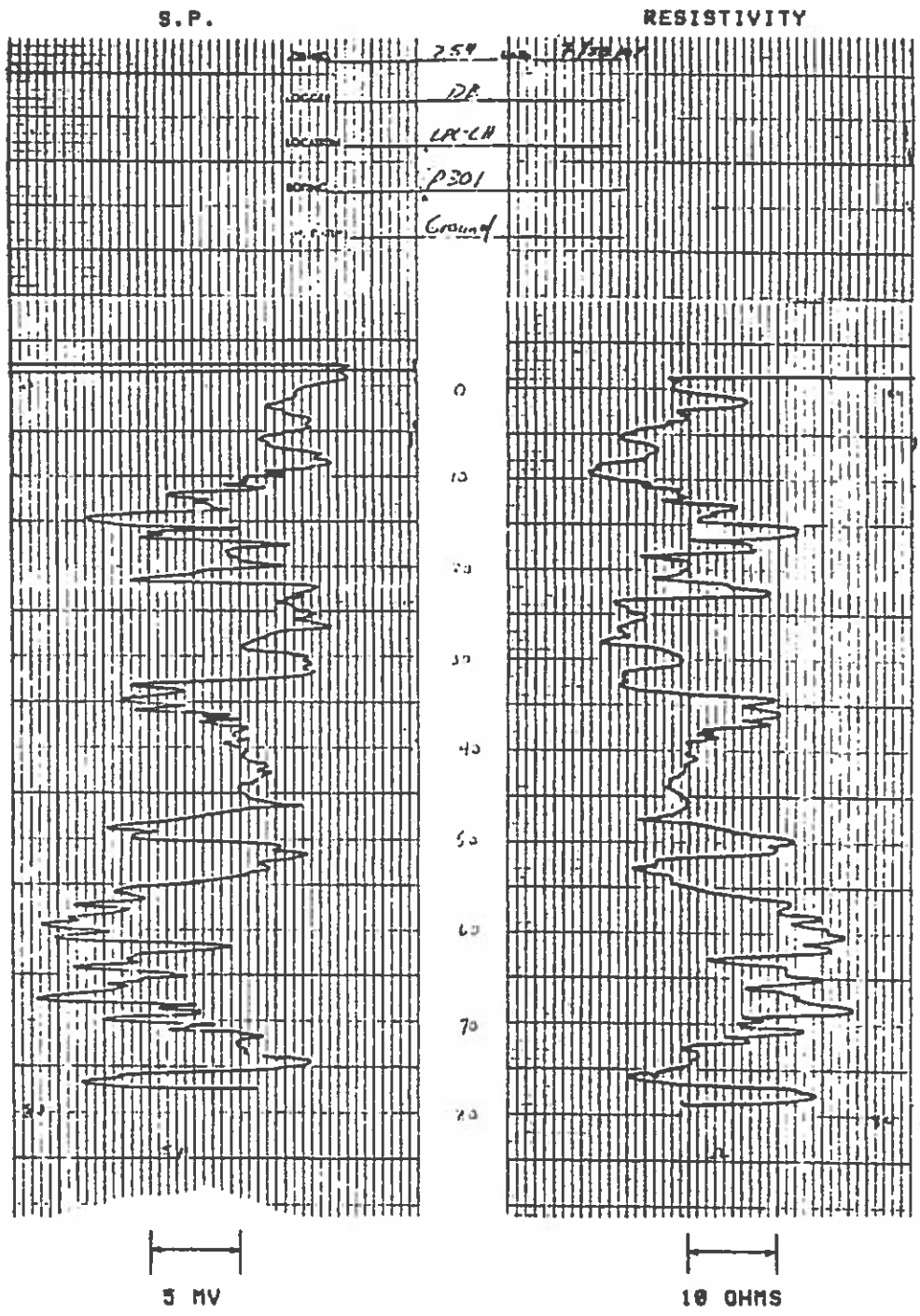
Includes (1) inorganic and organic silts and clays, (2) sandy or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength as indicated by penetrometer readings or by unconfined compression tests.

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH (tons per square foot)
VERY SOFT	less than 0.25
SOFT	0.25 TO 0.50
FIRM	0.50 TO 1.00
STIFF	1.00 TO 2.00
VERY STIFF	2.00 TO 4.00
HARD	4.00 and higher

TEST METHOD FOR INDICATING STRENGTH VALUES OF COHESIVE SOILS

- ○ Strength estimate by pocket penetrometer
- ◇ Strength estimate by torvane
- △ Strength estimate by unconfined compression test (U)
- ▲ Strength value by unconsolidated-undrained triaxial compression test (UU)

12810 Century Drive ... Stafford, Texas 77477 ... (713) 879-4626



DEPTH IN FEET BELOW GROUND SURFACE

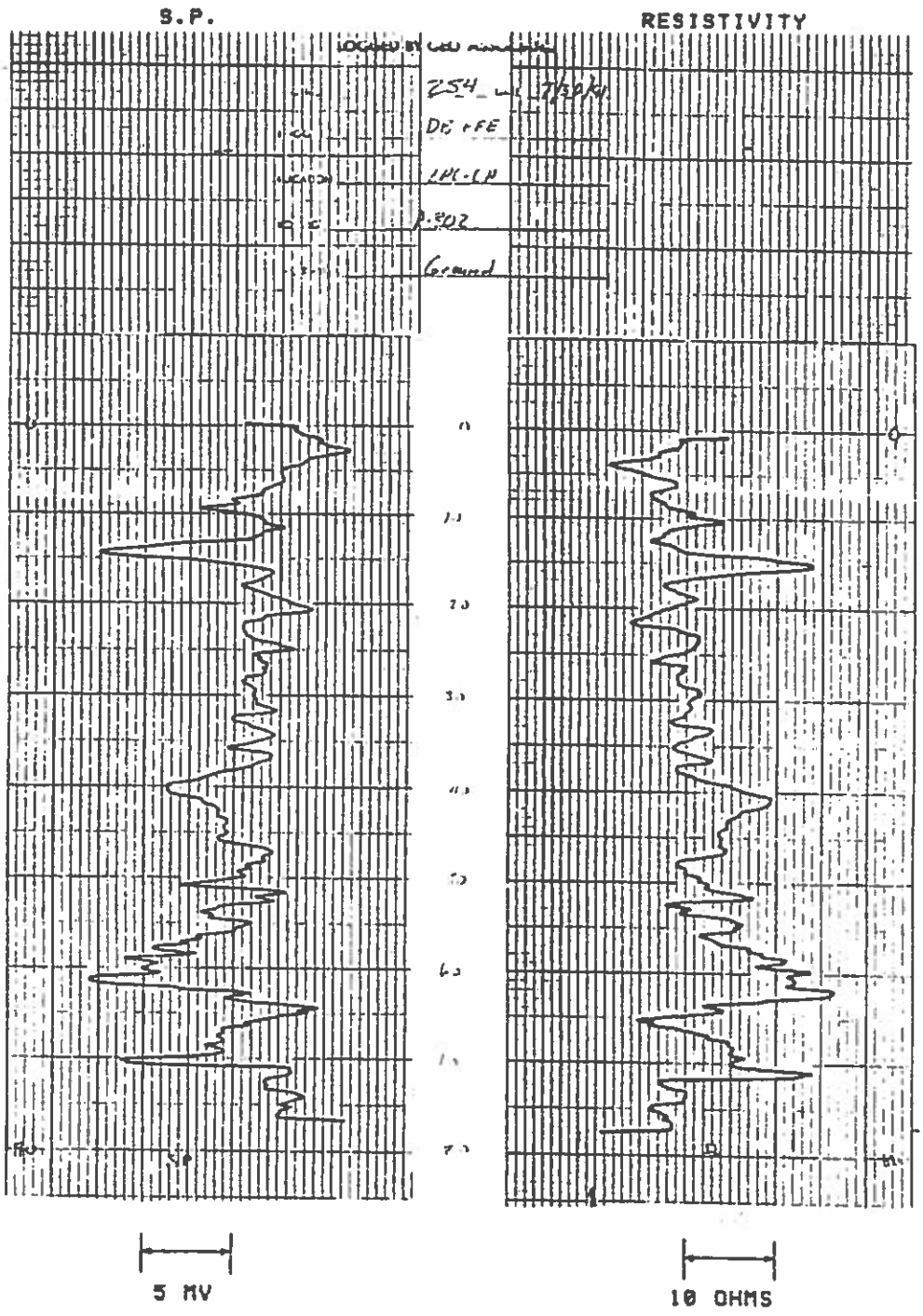
NOTE: LOG COPIED AT REDUCED SCALE

GEO ASSOCIATES

Geotechnical Engineering & Groundwater Hydrology

ELECTRIC LOG OF PIEZOMETER
P-301
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	7/30/91	



NOTE: LOG COPIED AT REDUCED SCALE

GEO ASSOCIATES

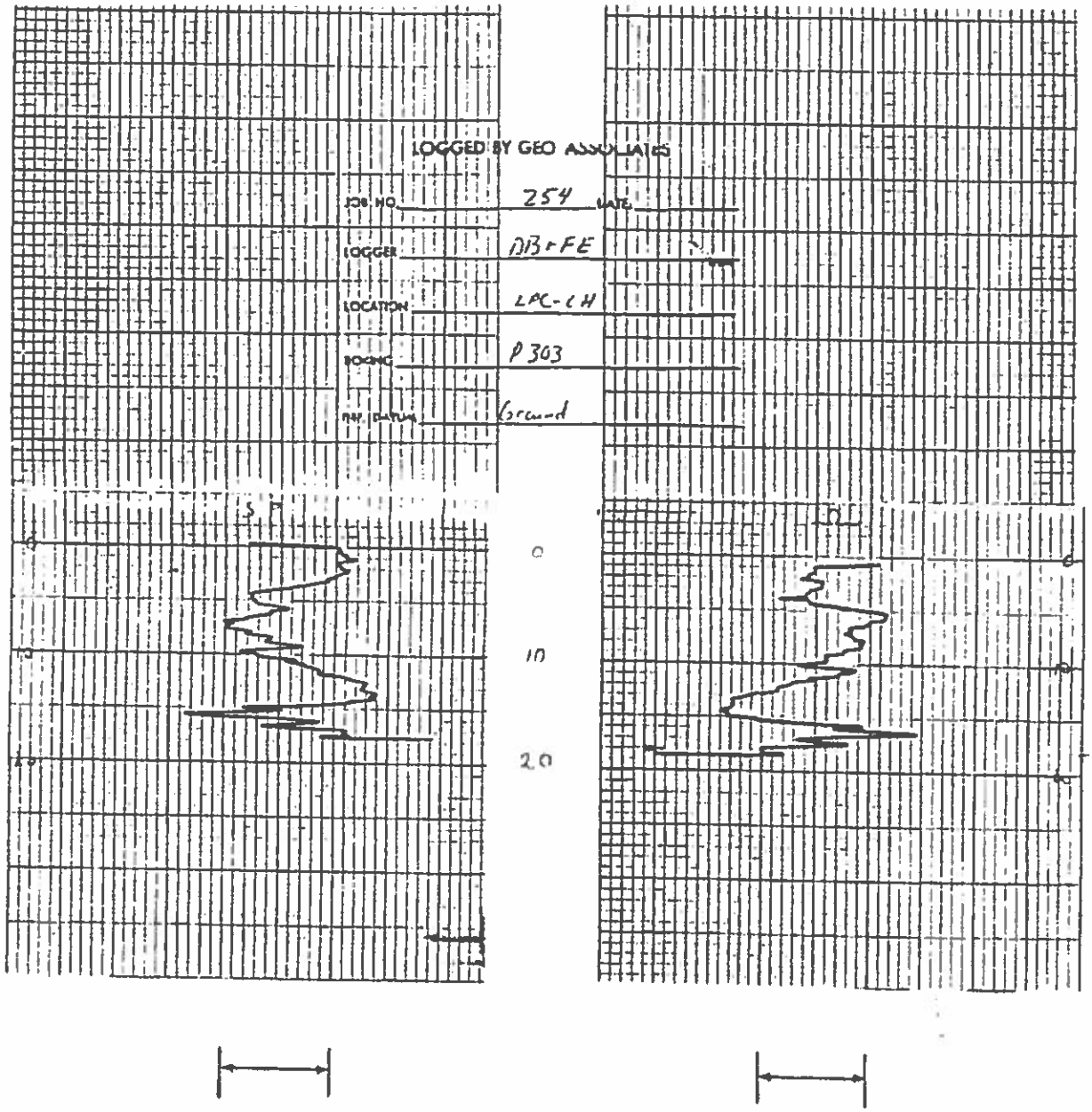
Geotechnical Engineering & Groundwater Hydrology

ELECTRIC LOG OF PIEZOMETER
P-302
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	7/30/91	

S.P.

RESISTIVITY



DEPTH IN FEET BELOW GROUND SURFACE

5 MV

10 OHMS

NOTE: LOG COPIED AT REDUCED SCALE

GEO ASSOCIATES

Geotechnical Engineering & Groundwater Hydrology

ELECTRIC LOG OF PIEZOMETER
P-303
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	7/31/91	

ATTACHMENT B

SOILS LABORATORY TESTING

Stratum #1 - FILL AND DISTURBED SURFICIAL CLAYS

Lyondell Petrochemical Company - Channelview

BORING NUMBER	DEPTH (FT)	WATER CONTENT (%)	UNIT DRY WEIGHT (pcf)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH (tsf)	% PASSING -200 SIEVE	K (cm/sec)
23	1	29							
24	1	29		65	24	41			
25	1	25							
26	1	30		50	20	30			
	3	25		18	48	30			
27	1	23							
	2	24		39	27	12			
	3	24							
	5	16		49	15	34			
36	2	25	96				0.55		
	4	25	97	56	15	41	0.75		
37	1	39							
38	1	29							
	3	24							
39	2	24							
	3	31		43	18	25			
40	1	35							
	3	18		43	18	25			
	4	19	109				3.35		
41	2	27	88	54	23	31	0.55		
54	2	23							
	4	14		39	18	21			
55	1	21							
	4	30							

Stratum #1 - FILL AND DISTURBED SURFICIAL CLAYS (continued)

Lyondell Petrochemical Company - Channelview

BORING NUMBER	DEPTH (FT)	WATER CONTENT (%)	UNIT DRY WEIGHT (pcf)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH (tsf)	% PASSING -200 SIEVE	K (cm/sec)
56	2	27							
	3	26							
57	1	12							
58	1	19							
59	1	23							
	4	30		43	15	28			
	8	27							
60	2	22							
	4	17							
61	2	20							
	4	18							
62	2	24						60	
	4	22							
	5	21							
	6	23	84	35	20	15	0.3		
63	2	20							
	4	21							
	5	21	117						
	6	20					0.85		
79	3								
103	2	21							4.8 X 10^{-8}
	4	23		60	18	42			
	6	23	105				1.05		
108	1	28							
111	1	22							
MW21	3	28.2	97	45	19	26	0.45		

Stratum #2 - TAN AND GRAY SILTY CLAY

Lyondell Petrochemical Company - Channelview

BORING NUMBER	DEPTH (FT)	WATER CONTENT (%)	UNIT DRY WEIGHT (pcf)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH (tsf)	% PASSING -200 SIEVE	K (cm/sec)
40	4	16		53	17	36			
	6	13		41	16	25			
	9	9							
55	5	18							
56	6	20							
57	4	18							
58	3	23		38	14	24		78	
60	6	21							
61	6	22						79	
87	6								
103	8	26							7.8×10^{-9}
104	2	25							
	5	18							
	7	22		46	17	29			
105	3	28							
	6	20	108	50	17	33	0.97		
	7	20							
	9	28	93	42	15	27	0.45		
106	3	25							
	5	20		48	17	31			
	7	20							
	9	26							
107	4	26	97						
	5	20					0.75		
	7	19		49	14	35			

Stratum #2 - TAN AND GRAY SILTY CLAY (continued)

Lyondell Petrochemical Company - Channelview

BORING NUMBER	DEPTH (FT)	WATER CONTENT (%)	UNIT DRY WEIGHT (pcf)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH (tsf)	% PASSING -200 SIEVE	K (cm/sec)
108	4	22	103				0.82		
	5	19							
	7	19		50	14	36			
	9	20							
109	3	19							
	5	20		49	13	36			
	7	21							
	8	20							
	9	25		38	20	18			
111	3	17							
	5	18	112	49	16	24	0.95		
112	3	20							
	5	26		33	17	16			
	7	23							
113	2	16							
	3	19							
	5	18		44	18	24			
MW21	6	23.4	110.2	56	16	40	1.54		

Stratum #3 - RED AND GRAY CLAY to SILTY CLAY

Lyondell Petrochemical Company - Channelview

BORING NUMBER	DEPTH (FT)	WATER CONTENT (%)	UNIT DRY WEIGHT (pcf)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH (tsf)	% PASSING -200 SIEVE	K (cm/sec)
23	3	26		75	22	53			
	6	26	98				1.05		
	10	20	112				0.48		
24	3	29							
	6	26	97	70	22	48	0.75		
	9	26							
25	3	28		61	19	42			
	5	25							
	7	24							
	9	24							
26	5	22							
	7	16							
	9	23							
27	7	20							
	10	21	108				0.72		
	14	24							
36	6	21	107				2.08		
	9	18							
	14	26							
37	3	33		68	20	48			
	6	22							
	7	21							
	9	17		42	19	23			
38	5	23		72	19	53			
	7	22							
	9	23		75	20	55			

Stratum #3 - RED AND GRAY CLAY to SILTY CLAY (continued)

Lyondell Petrochemical Company - Channelview

BORING NUMBER	DEPTH (FT)	WATER CONTENT (%)	UNIT DRY WEIGHT (pcf)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH (tsf)	% PASSING -200 SIEVE	K (cm/sec)
39	5	19		52	21	31			
	7	18							
	9	16							
	15	25	100				1.25		
41	6	25	99	65	19	46	0.65		
9		23							
54	5	20	81	50	15	35	0.45		
	7	21	103				1.25		
	8	20							
	10	24							
	15	34							
55	8	23	103	51	18	33	0.89		
	10	21							
56	8	18							
	10	18		46	13	33			
57	5	22							
	7	18							
	9	18							
58	8	18							
	10	16		38	15	23			
59	9	21		35	12	23			
	15	17							
60	7	21							
	10	18							

Stratum #3 - RED AND GRAY CLAY to SILTY CLAY (continued)

Lyondell Petrochemical Company - Channelview

BORING NUMBER	DEPTH (FT)	WATER CONTENT (%)	UNIT DRY WEIGHT (pcf)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH (tsf)	% PASSING -200 SIEVE	K (cm/sec)
61	8	18							
	10	24							
62	9	30							
	10	28	89				0.19		
	15	25	93				0.25		
63	8	21	99	46	13	33	1.10		
	10	23							
	14	25							
65	15								3.5×10^{-9}
75	5.5								1.2×10^{-8}
103	11	27	95				0.5		
	16	25		80	22	58			
	21	23							
104	11	29	94				0.8		
105	15	25		33	19	14			
106	11	30		72	26	46			
107	9	21	106				0.75		
	14	31							
108	13	25							
110	3	18							
	5	22		49	19	30			
	7	19							
	10	28		57	22	17			
	11	26							
111	7	19							

Stratum #3 - RED AND GRAY CLAY to SILTY CLAY (continued)

Lyondell Petrochemical Company - Channelview

BORING NUMBER	DEPTH (FT)	WATER CONTENT (%)	UNIT DRY WEIGHT (pcf)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH (tsf)	% PASSING -200 SIEVE	K (cm/sec)
112	10	28		41	13	28			
	14	28		34	20	14			
113	7	16							
	9	18		37	17	20			
	14	27							
	14.5	21		36	19	17			

vicinity of Basin N (depth unknown) performed by McClelland Lab

2×10^{-9}

5×10^{-7}

Stratum #4 - SHALLOW SILT

Lyondell Petrochemical Company - Channelview

BORING NUMBER	DEPTH (FT)		WATER CONTENT (%)	UNIT DRY WEIGHT (pcf)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH (tsf)	% PASSING -200 SIEVE	K (cm/sec)
26	14		21							
	19		20							
27	20	20	26							
37	15		26	100				0.65		
38	15									
40	14		24						96	
41	14		27						64	
60	15	18	28							
	19		21						37	
61	14		26							
62	20		26							
	25	9	26							
	30	14	29						62	
63			25							
104	15		30							
110	15		24		38	20	18			
	15.5		29							
111	10		36							
113	19		24							
	19.5		24							
T	11.5									1.6 X 10^{-6}

Stratum #5 - BROWN AND BLACK CLAY

Lyondell Petrochemical Company - Channelview

BORING NUMBER	DEPTH (FT)	WATER CONTENT (%)	UNIT DRY WEIGHT (pcf)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH (tsf)	% PASSING -200 SIEVE	K (cm/sec)
23	14	27							
	19	25							
24	14	23							
	19	21							
25	14	26							
	19	22							
27	36	30							
36	19	27							
	24	28							
	29	22							
37	20		97				1.15		
38	20	28	98				1.55		
	24	30							
	25	29	95				1.09		
	30	19							
39	20	28	97				1.86		
	24	27							
	29	27							
40	19	30							
	24	28							
	29	25							
41	19	24							
	24	28							
	29	29							
54	20	25							
	25	31							
	30	32							

Stratum #5 - BROWN AND BLACK CLAY

Lyondell Petrochemical Company - Channelview

BORING NUMBER	DEPTH (FT)	WATER CONTENT (%)	UNIT DRY WEIGHT (pcf)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH (tsf)	% PASSING -200 SIEVE	K (cm/sec)
55	14	22							
	19	27							
	25	28							
	30	28							
56	15	27							
	20	32		76	21	55			
57	14	26		73	20	53			
	19	25							
58	15	19							
	20	18							
59	20	22							
61	20	29							
63	29	18							
104	21	28							
105	21	30							
106	16	25							
	21	25							
107	19	27							
108	19	27							

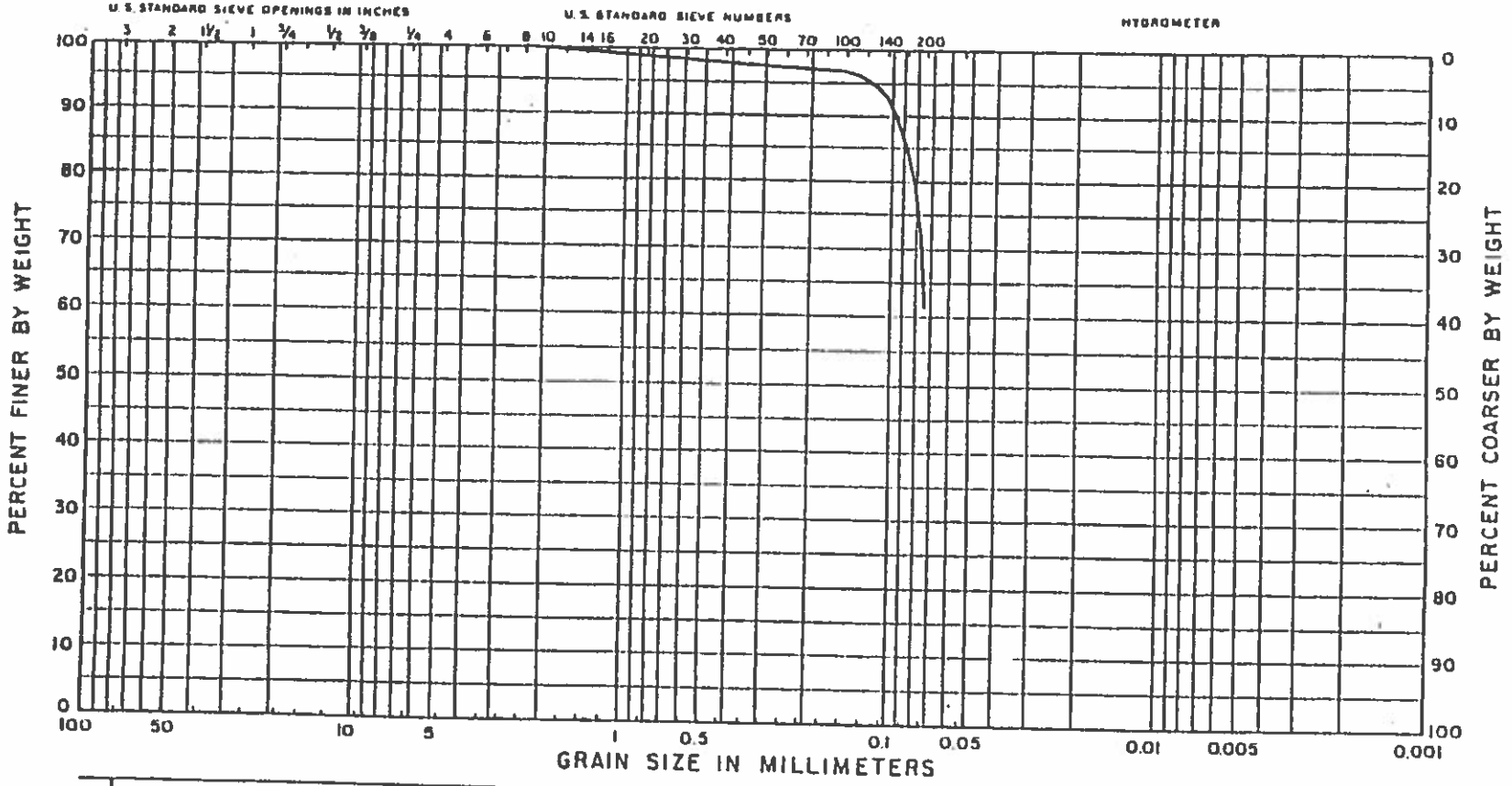
Stratum #5 - BROWN AND BLACK CLAY (continued)

Lyondell Petrochemical Company - Channelview

BORING NUMBER	DEPTH (FT)	WATER CONTENT (%)	UNIT DRY WEIGHT (pcf)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH (tsf)	% PASSING -200 SIEVE	K (cm/sec)
109	16	21		68	25	43			
	22	29							
110	21	18							
111	14	25							
	19	19							
112	19	22							

MCCLELLAND

GRAIN SIZE CURVES



Boring No.	Depth, Ft.	Material
62	25	Tan sandy silt

ATTACHMENT C

GRADIENT CALCULATIONS

GEO ASSOCIATES

Geotechnical Engineering & Groundwater Hydrology

JOB NO. 254
DATE:
CLIENT: LPC - Channelview
PAGE ____ OF ____

Subject: HORIZONTAL GRADIENT & VELOCITY CALC
File
By WSP

Δh = 2 ft for all cases

CALCULATE GRADIENTS FROM WATER LEVEL CONTOUR MAPS

DATE of READING	BASIN	FLOW DISTANCE (ft)	GRADIENT (ft/ft)
8/7/91	N	320	.00625
8/7/91	O	350	.00571
8/12/91	N	341	.00586
8/12/91	O	330	.00606
8/19/91	N	310	.00645
8/19/91	O	330	.00606

AVE GRADIENT = .00617

MAX GRADIENT = .00645

MIN GRADIENT = .00571

CALCULATE FLOW VELOCITY FROM DARCY EQN

Assume $k = 1 \times 10^{-4}$ cm/sec

$\eta = 0.3$

$$V = \frac{ki}{\eta} = \frac{(1\times10^{-4}\ \text{cm/sec})\left(\frac{1\ \text{in}}{2.54\ \text{cm}}\right)\left(\frac{1\ \text{ft}}{12\ \text{in}}\right)\left(60\ \frac{\text{sec}}{\text{min}} \times 60\ \frac{\text{min}}{\text{hr}} \times 24\ \frac{\text{hr}}{\text{day}} \times 365\ \frac{\text{day}}{\text{yr}}\right)}{0.3}\ i$$

$V = 345\ i$ (ft/yr)

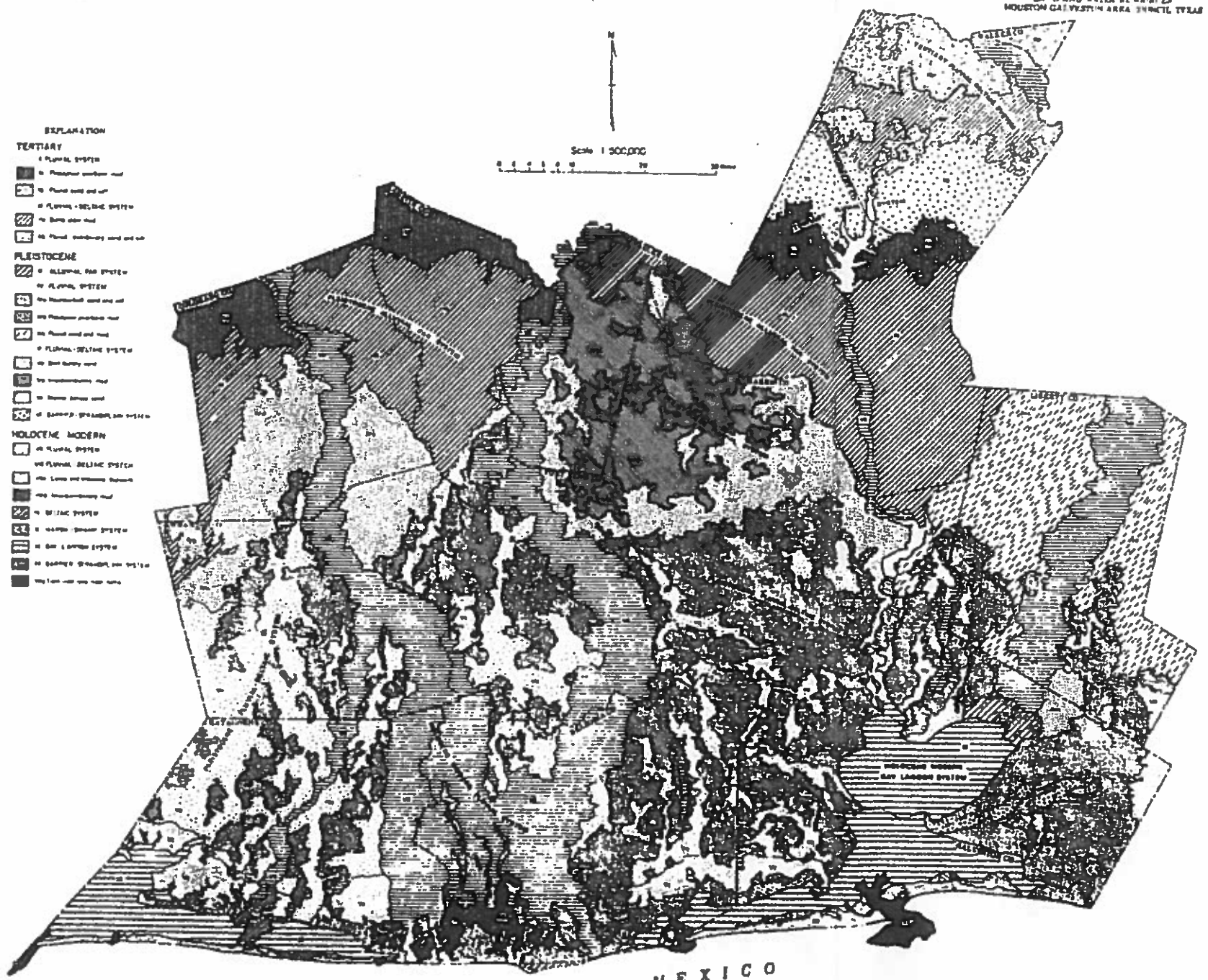
V_{AVE} = 2.09 ft/yr

V_{MAX} = 2.23

V_{MIN} = 1.97

THE UNIVERSITY OF TEXAS AT AUSTIN
BUREAU OF ECONOMIC GEOLOGY
W. L. FISHER, ACTING DIRECTOR

PLATE 1
LAND AND WATER RESOURCES
HOUSTON GALVESTON AREA COUNCIL TEXAS



GENERAL GEOLOGY
HOUSTON GALVESTON AREA COUNCIL, TEXAS

Adapted from Land and Water Resources
Houston-Galveston Area Council
by Bureau of Economic Geology
University of Texas at Austin, 1975

GEO ASSOCIATES
Geotechnical Engineering & Groundwater Hydrology

SURFICIAL GEOLOGY MAP

LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	SEPTEMBER 1991	4

BORING NO.	COORDINATES		PROJECT	COMPANY	REPORT NO.	DATE	DWG. NO.
P-2	N. 1775	W. 500	ORIGINAL PLANT	DAMES & MOORE	1598-A2	7-28-55	E-99-D-2580
1	N. 695	W. 420					
2	N. 780	W. 520					
3	N. 1055	W. 450					
4	N. 1230	W. 450					
5	N. 1400	W. 475					
6	N. 780	W. 300					
7	N. 620	W. 535					
8	N. 790	W. 790					
9	N. 1285	W. 790					
10	N. 315	W. 770					
11	N. 1595	W. 300					
12	N. 695	W. 1115	ORIGINAL PLANT	DAMES & MOORE	1598-A2	7-25-55	E-99-D-2580
B-1	N. 760	W. 1720	MEK	McCLELLAND	63-159	9-24-63	E-99-D-2580
B-2	N. 655	W. 1563					
B-3	N. 430	W. 1640					
B-4	N. 480	W. 1995					
B-5	N. 570	W. 1820	MEK	McCLELLAND	63-159	9-24-63	E-99-D-2580
B-6	N. 1200	W. 1780	SMA	McCLELLAND	65-152	9-3-65	E-99-D-2580
B-7	N. 850	W. 1855					
B-8	N. 850	W. 1650					
B-9	N. 260	W. 1625					
B-10	N. 180	W. 1920					
B-11	N. 240	W. 1980					
B-12	N. 180	W. 2090					
B-13	N. 180	W. 2220					
B-14	N. 380	W. 2375					
B-15	N. 260	W. 2530	SMA	McCLELLAND	65-152	9-3-65	E-99-D-2580
B-16	N. 770	W. 1855	MXB IPA	McCLELLAND	66-343	1-6-67	E-99-D-2580
B-17	N. 770	W. 1765					
B-18	N. 770	W. 1550					
B-19	N. 585	W. 2250					
B-20	N. 165	W. 2330					
B-21	N. 985	W. 1560	MXB IPA	McCLELLAND	66-343	1-6-67	E-99-D-2580
B-22	N. 1090	W. 1795	W.S. POLLUTION	McCLELLAND	6793	5-29-67	E-99-D-2580
B-23	N. 445	E. 100					
B-24	N. 450	E. 280					
B-25	N. 165	E. 280					
B-26	N. 245	E. 405					
B-27	N. 250	E. 1250	W.S. POLLUTION	McCLELLAND	6793	5-29-67	E-99-D-2580
B-28	N. 460	W. 2860	POLY B.D.	McCLELLAND	67-123	6-9-67	E-99-D-2580
B-29	N. 430	W. 2760					
B-30	N. 430	W. 2620					
B-31	N. 390	W. 2705					
B-32	N. 290	W. 2620					
B-33	N. 290	W. 2760					
B-34	N. 290	W. 2860					
B-35	N. 215	W. 2800	POLY B.D.	McCLELLAND	67-123	6-9-67	E-99-D-2580
B-1	N. 2520	E. 2295	RIVER BANK	McCLELLAND	69-101	7-18-69	E-99-D-2580
B-2	N. 2560	E. 2340					
B-3	N. 2590	E. 2390					
B-4	N. 2500	E. 2410	RIVER BANK	McCLELLAND	69-101	7-18-69	E-99-D-2580
B-36	N. 870	E. 185	E.S. POLLUTION	McCLELLAND	70-036	3-16-70	E-99-D-2580
B-37	N. 650	E. 200					
B-38	N. 650	E. 340					
B-39	N. 650	E. 500					
B-40	N. 630	E. 750					
B-41	N. 430	E. 840	E.S. POLLUTION	McCLELLAND	70-036	3-16-70	E-99-D-2580
42	N. 952	W. 461	Bd EXPANSION	McCLELLAND	70-142	7-21-70	E-99-D-2580
B-43	N. 1090	W. 430					
B-44	N. 1105	W. 267					
B-45	N. 1349	W. 574					
B-46	N. 627	W. 60					
B-47	N. 1130	W. 100	Bd. EXPANSION	McCLELLAND	70-142	7-21-70	E-99-D-2580
B-48	N. 222	W. 2374	I.P.A.	McCLELLAND	70-238	11-16-70	E-99-D-2580
B-49	N. 315	W. 2363	"	"	"	"	"
B-50	N. 840	W. 1970	IPOM TANK FARM	McCLELLAND	71-038	3-9-71	E-99-D-2580
B-51	N. 960	W. 1970					
B-52	N. 1090	W. 1970	IPOM TANK FARM	McCLELLAND	71-038	3-9-71	E-99-D-2580
B-42	N. 1175	W. 2550	ODI (PRELIM.)	DAMES & MOORE	5931-037	10-18-73	E-99-D-2580
B-43	N. 850	W. 3060					
B-44	N. 850	W. 3640					
B-45	N. 400	W. 3975					
B-46	N. 350	W. 4470					
B-47	S. 370	W. 4470					
B-48	S. 370	W. 3630					
B-49	S. 370	W. 2640	ODI (PRELIM.)	DAMES & MOORE	5931-037	10-18-73	E-99-D-2580
A	N. 300	W. 3120	ODI	DAMES & MOORE	5931-038	1-24-74	E-99-D-2580
B	N. 325	W. 3260					
C	N. 325	W. 3600					
D	N. 590	W. 3630					
E	N. 550	W. 3475					

BORING NO.	COORDINATES		PROJECT	COMPANY	REPT. NO.	DATE	DWG. NO.
F	N. 500	W. 3120	ODI (CONT)	DAMES & MOORE	5931-038	1-24-74	E-99-D-2580
G	N. 620	W. 3260					
H	N. 710	W. 3620					
I	S. 180	W. 3275					
J	N. 775	W. 3500					
K	N. 700	W. 3120					
L	N. 870	W. 3630					
M	N. 1070	W. 3638					
N	N. 1078	W. 3550					
P	N. 1070	W. 3300					
Q	N. 240	W. 4230					
R	N. 240	W. 4075					
S	S. 1000	W. 2430					
T	N. 625	W. 4090					
U	N. 850	W. 4025					
W	N. 725	W. 4050					
X	S. 350	W. 4660					
Y	S. 100	W. 4285					
Z	S. 100	W. 3660	ODI (CONT.)	DAMES & MOORE	5931-038	1-24-74	E-99-D-2580
B-50	N. 1240	W. 675	ODI OFFSITE	DAMES & MOORE	5931-053-12	5-28-74	E-99-D-2580
B-51	N. 250	W. 830					
B-52	N. 510	W. 1215					
B-53	N. 120	W. 1750	ODI OFFSITE	DAMES & MOORE	5931-053-12	5-28-74	E-99-D-2580
B-1	S. 60	W. 1240	DOCK FACILITY	FUGRO GULF	74-013	6-17-74	E-99-D-2580
B-2	S. 60	E. 1780					
B-3	S. 770	E. 3780					
B-4	N. 560	E. 4100					E-99-D-2580
B-5	N. 600	E. 4870					SEE REPORT
B-6	N. 540	E. 5240					
B-7	N. 260	E. 5800					SEE REPORT
B-8	S. 2340	W. 1180					E-99-D-2580
B-9	S. 2100	E. 1080					
B-10	S. 1200	E. 210					
B-11	S. 1750	E. 3450					E-99-D-2580
B-12	S. 2360	E. 4620	DOCK FACILITY	FUGRO GULF	74-013	6-17-74	SEE REPORT
B-54	N. 910	E. 650	ODI OFFSITE ECU	McCLELLAND	174-212	8-19-74	E-99-D-2580
B-55	N. 600	E. 680					
B-56	N. 910	E. 810					
B-57	N. 365	E. 800					
B-58	N. 595	E. 850					
B-59	N. 935	E. 1000					
B-60	N. 720	E. 1000					
B-61	N. 595	E. 1000					
B-62	N. 240	E. 1010					
B-63	N. 300	E. 605	ODI OFFSITE ECU	McCLELLAND	74-212	8-19-74	E-99-D-2580
A-1	S. 610	W. 3115	OP II	DAMES & MOORE	5931-067-12	11-1-74	E-99-D-2580
A-2	S. 915	W. 3115					
A-3	S. 1115	W. 3115					
A-4	S. 690	W. 3315					
A-5	S. 1180	W. 3315					
A-6	S. 535	W. 3510					
A-7	S. 775	W. 3510					
A-8	S. 900	W. 3560					
A-9	S. 1230	W. 3475					
A-10	S. 1230	W. 3640					
A-11	S. 535	W. 3830					
A-12	S. 775	W. 3830					
A-13	S. 1030	W. 3830					
A-14	S. 815	W. 4330					
A-15	S. 1270	W. 4320					
A-16	S. 1975	W. 2430					
A-17	S. 1270	W. 4050	OP II	DAMES & MOORE	5931-067-12	11-1-74	E-99-D-2580
A-18	S. 3080	W. 6160	OP II ADDENDUM I	DAMES & MOORE	5931-067-12	12-5-74	E-99-D-2581
A-19	S. 3255	W. 6700					
A-20	S. 2865	W. 6700					
A-21	S. 3180	W. 7190					
A-22	S. 2180	W. 6955					
A-23	S. 2180	W. 7540					
A-24	S. 3180	W. 7560					
A-25	S. 3680	W. 7410					
A-26	S. 3680	W. 6700					
A-27	S. 3340	W. 5640					
A-28	S. 2660	W. 5640					E-99-D-2581
A-29	S. 2580	W. 5120	OP II ADDENDUM I	DAMES & MOORE	5931-067-12	12-5-74	E-99-D-2580

BORING NO.	COORDINATES		PROJECT	COMPANY	REP'T. NO.	DATE	DWG. NO.
B-64	N. 780	W. 2810	BT	McCLELLAND	174-398	3-12-75	E-99-D-2580
B-65	N. 780	W. 2660					
B-66	N. 625	W. 2810					
B-67	N. 625	W. 2660					
B-68	N. 810	W. 2250					
B-69	N. 780	W. 2460					
B-70	N. 625	W. 2460	BT	McCLELLAND	174-398	3-12-75	E-99-D-2580
B-71	USED IN LATER REPORT						
B-72							
B-73	S. 70	E. 2600	ODI OFFSITE ECU	McCLELLAND	175-038	6-9-75	E-99-D-2583
B-74	S. 280	E. 2450					
B-75	S. 70	E. 2350					
B-76	S. 440	E. 2250					
B-77	S. 620	E. 2100					
B-78	S. 710	E. 1930					
B-79	S. 490	E. 2000					
B-80	S. 70	E. 2100					
B-81	S. 70	E. 1850					
B-82	S. 70	E. 1600					
B-83	S. 470	E. 1600					
B-84	S. 810	E. 1750					
B-85	S. 900	E. 1600					
B-86	S. 870	E. 1400					
B-87	S. 670	E. 1400					
B-88	S. 470	E. 1400					
B-89	S. 270	E. 1400					
B-90	S. 70	E. 1400	ODI OFFSITE ECU	McCLELLAND	175-038	6-9-75	E-99-D-258
B-91			RAW WATER TRANSPORT	MURILLO	164-75E	MAR. 75	SEE REPORT
B-92							
B-93							
B-94							
B-95			RAW WATER TRANSPORT	MURILLO	164-75E	MAR. 75	SEE REPORT
B-71	N. 314	E. 2600	ODI OFFSITES ECU	McCLELLAND	175-189	9-26-75	E-99-D-2580
B-72	N. 160	E. 2100					
B-96	N. 1650	E. 1400					
B-97	N. 1460	E. 1400					
B-98	N. 1210	E. 1400					
B-99	N. 930	E. 1400					
B-100	N. 775	E. 1700					
B-101	N. 670	E. 2000					
B-102	N. 470	E. 2300	ODI OFFSITES ECU	McCLELLAND	175-189	9-26-75	E-99-D-2580
B-103	N. 1390	E. 400	ODI II OFFSITES ECU	McCLELLAND	175-104	6-20-75	E-99-D-2580
B-104	N. 1390	E. 660					
B-105	N. 1390	E. 850					
B-106	N. 1390	E. 1120					
B-107	N. 1240	E. 400					
B-108	N. 1205	E. 660					
B-109	N. 1205	E. 850					
B-110	N. 1205	E. 1120					
B.111	N. 1040	E. 675					
B.112	N. 1040	E. 850					
B.113	N. 1040	E. 1120	ODI II OFFSITES ECU	McCLELLAND	175-104	6-20-75	E-99-D-2580
B-114	S. 1765	W. 7775	SURFACE WATER	MURILLO	203-75E	MAY-75	E-99-D-2581
B-115	S. 1780	W. 8330	TREATMENT PLANT				
B-116	S. 1945	W. 8330					
B-117	S. 1850	W. 8600					
B-118	S. 1985	W. 8615					
B-119	S. 2215	W. 8725					
B-120	S. 2010	W. 8935					
B-121	S. 1795	W. 9110					
B-122	S. 2215	W. 9205					
B-123	S. 2010	W. 9350					
B-124	S. 1765	W. 9575	SURFACE WATER				
B-125	S. 2215	W. 9575	TREATMENT PLANT	MURILLO	175-104	6-20-75	E-99-D-2581

FOR CONTINUATION SEE-E-99-D-2583

•COORDINATES SCALED FROM SOIL REPORT, PLOT PLAN

S.I.P. INC. & Co. HOUSTON, TEXAS

E-99-D-2580 SOIL BORING LOC. LYONSELL PLANT SITE
E-99-D-2581 SOIL BORING LOC. WEST OF SHELDON ROAD
E-99-D-2582 SOIL BORING INDEX

ISSUED FOR RECORD

ARCO Chemical Company
LOCATION: LYONSELL — ENGINEERING DEPARTMENT
E-1064 — 74-007

SOIL BORING INDEX

SCALE — DRAWING NUMBER: E 99 D 2582 — REVISION: 0

LYONDELL CONTINUED FROM E-99-D-2582

BORING NO.	COORDINATES		PROJECT	COMPANY	REP'T NO.	DATE	DWG. NO.
B-126	S.2400	W.4800	SURFACE WATER	MURILLO	235-75E	JUNE 75	E-99-D-2580
B-127	S.2800	W.5000	TREATMENT UNIT	"	"	"	"
B-128	S.2800	W.4500	"	"	"	"	"
B-129	S.3100	W.4800	"	"	"	"	"
B-130	S.3100	N.4500	"	"	"	"	"
B-131	S.3000	W.5000	"	"	"	"	"
B-132	S.3300	W.4500	"	"	"	"	"
B-133	S.3100	W.4300	"	"	"	"	"
B-134	S.2900	W.3900	"	"	"	"	"
B-135	S.2500	W.3900	"	"	"	"	"
B-136	S.2500	W.4800	"	"	"	"	"
B-137	S.2100	W.3380	SURFACE WATER	"	"	"	"
B-138	S.2100	W.3900	TREATMENT UNIT	MURILLO	235-75E	JUNE 75	E-99-D-2580
B-1	S.5050	E.5250	BARGE FACILITY	HARDING-LAWSON	6076.001.12	JUNE 75	SEE REPORT
B-2	S.5450	E.4050	"	"	"	"	"
B-3	S.5500	E.4470	"	"	"	"	"
B-4	S.5400	E.4690	"	"	"	"	"
B-5	S.5550	E.5290	"	"	"	"	"
B-6	S.5100	E.3730	"	"	"	"	"
B-7	S.5180	E.3730	"	"	"	"	"
B-8	S.5300	E.3730	"	"	"	"	"
B-9	S.5420	E.3690	"	"	"	"	"
C-1	S.5200	E.5125	"	"	"	"	"
C-2	NOT BORED						
C-3	S.5380	E.5840	"	"	"	"	"
F-1	S.4690	E.5155	"	"	"	"	"
F-2	S.4125	E.4450	"	"	"	"	"
F-3	S.4575	E.4395	"	"	"	"	"
F-4	S.5240	E.3800	"	"	"	"	"
F-5	S.4740	E.3600	"	"	"	"	"
F-6	S.4520	E.3965	"	"	"	"	"
P-1	S.5500	E.5825	"	"	"	"	"
P-2	S.5780	E.5925	"	"	"	"	"
P-3	S.5940	E.5940	"	"	"	"	"
P-4	S.5900	E.5940	"	"	"	"	"
P-5	S.6180	E.6000	"	"	"	"	"
P-6	S.6625	E.6050	"	"	"	"	"
P-6A	S.6625	E.6065	"	"	"	"	"
P-7	S.6800	E.6125	"	"	"	"	"
S-1	S.5030	E.4090	"	"	"	"	"
S-2	S.5080	E.4600	"	"	"	"	"
S-3	S.5190	E.4330	"	"	"	"	"
S-4	S.4860	E.4370	BARGE FACILITY	HARDING-LAWSON	6076.001.12	JUNE 75	SEE REPORT
B-139			NEW LIFT STATION	MURILLO	310-75E	9-75	SEE REPORT
B-140			"	"	"	"	"
B-141	N.1471	W.955	OPR Co.	McCLELLAND	175-288	NOV.-75	E-99-D-2580
B-142	N.1366	W.612	"	"	"	"	"
B-143	N.1089	W.2936	MEOH	McCLELLAND	0180-0340	AUG.80	E-99-D-2580
B-144	N.1040	W.2943	"	"	"	"	"
B-145	N.1040	W.2879	"	"	"	"	"
B-146	N.1078	W.2706	"	"	"	"	"
B-147	N.965	W.2857	"	"	"	"	"
B-148	N.980	W.2727	"	"	"	"	"
B-149	N.916	W.2781	"	"	"	"	"
B-150	N.855	W.2825	"	"	"	"	"
B-151	N.850	W.2907	"	"	"	"	"
B-152	N.844	W.2988	"	"	"	"	"
B-153	N.840	W.2890	"	"	"	"	"
B-154	N.806	W.2817	"	"	"	"	"
B-155	N.850	W.2440	"	"	"	"	"
B-156	N.950	W.2430	"	"	"	"	"
B-157	N.971	W.2566	"	"	"	"	"
B-158	N.1082	W.2268	"	"	"	"	"
B-159	N.1082	W.2168	"	"	"	"	"
B-160	N.964	W.2120	"	"	"	"	"
B-161	N.872	W.2120	"	"	"	"	"
B-162	N.495	W.2225	"	"	"	"	"
B-163	N.498	W.2146	"	"	"	"	"
B-164	N.420	W.2226	"	"	"	"	"
B-165	N.420	W.2146	"	"	"	"	"
B-166	S.650	W.1840	"	"	"	"	"
B-167	S.650	W.1720	"	"	"	"	"
B-168	S.600	W.1780	"	"	"	"	"
B-169	S.960	W.1780	"	"	"	"	"
B-170	S.950	W.1840	MEOH	McCLELLAND	0180-0340	AUG.80	E-99-D-2580
B-171	N.1226	W.1701	E.TRUCK DOCK BLDG	HARDING-LAWSON	6189.009.12	AUG.85	E-99-D-2580
B-172	N.1814.8	W.1187	"	"	"	"	"
B-173	N.1836	W.1209	E.TRUCK DOCK BLDG	HARDING-LAWSON	"	"	E-99-D-2580

BORING NO.	COORDINATES		PROJECT	COMPANY	REP'T. NO.	DATE	DWG. NO.
C-1	S.860	W.1018	PMOI	HARDING-LAWSON	6189,006.12	11-20-79	E-99-D-2580
C-2	S.670	W.1015					
C-3	S.1070	W.1015					
C-4	S.660	W.815					
C-5	S.460	W.815					
C-6	S.670	W.815					
C-7	S.870	W.815					
C-8	S.1070	W.783					
C-9	S.860	W.675					
C-12	S.870	W.675					
C-13	S.260	W.553					
C-14	S.460	W.535					
C-15	S.670	W.553					
C-16	S.870	W.535					
C-17	S.260	W.793					
C-18	S.340	W.169					
C-19	S.860	W.085					
C-20	S.340	E.107					
C-21	S.460	W.793					
C-22	S.460	W.093					
C-23	S.660	E.107					
C-24	S.580	W.793					
C-26	S.850	W.093					
C-26	S.550	E.107					
C-27	S.666	W.893					
C-28	S.665	W.093					
C-29	S.666	E.107					
C-30	S.789	W.893					
C-31	S.736	W.093					
C-32	S.736	E.107					
C-33	S.845	W.893					
C-34	S.648	W.093					
C-36	S.646	E.107					
C-36	S.935	W.893					
C-37	S.935	W.145					
C-39	S.935	W.063					
C-40	S.936	E.107					
C-45	S.998	E.582					
C-46	S.300	E.357					
C-47	S.693	E.357	PMOI	HARDING-LAWSON	6189.006.12	11-20-79	E-99-D-2580
CB-1	S.1490	W.1087	APCI	HARDING-LAWSON	6189.007.12	11-19-79	E-99-D-2580
CB-2	S.1498	W.787					
CB-3	S.1498	W.447					
CB-4	S.1648	W.662					
CB-5	S.1649	W.893					
CB-6	S.1788	W.1087					
CB-7	S.1788	W.787					
CB-8	S.1788	W.447					
CB-9	S.1933	W.662					
CB-10	S.1933	W.893					
CB-11	S.2078	W.1087					
CB-12	S.2078	W.787					
CB-13	S.2078	W.447					
CB-14	S.1678	W.787	APCI	HARDING-LAWSON	6189.007.12	11-19-79	E-99-D-2580

MONT BELVIEU

BORING NO.	COORDINATES		PROJECT	COMPANY	REP'T. NO.	DATE	DWG. NO.
CB-1	N.175	E.1135	M.B. TERMINAL	McCLELLAND	5632	3-24-56	E-98-D-631
CB-2	S.110	E.980	"	"	"	"	"
CB-3	S.118	E.1100	"	"	"	"	"
CB-4	S.370	E.815	M.B. TERMINAL	McCLELLAND	5632	3-24-56	E-98-D-631
B-1	N.500	W.1273	REMOTE BRINE	McCLELLAND	174-245	1-24-75	E-92-D-006
B-2	N.100	W.1273	STORAGE RESERV.	"	"	"	"
B-3	N.500	W.1600	"	"	"	"	"
B-4	N.100	W.1600	"	"	"	"	"
B-5	N.300	W.1900	"	"	"	"	"
B-6	N.500	W.2200	"	"	"	"	"
B-7	N.100	W.2200	"	"	"	"	"
B-8	N.300	W.2500	"	"	"	"	"
B-9	N.500	W.2800	"	"	"	"	"
B-10	N.100	W.2800	"	"	"	"	"
B-11	N.300	W.3100	"	"	"	"	"
B-12	N.500	W.3400	"	"	"	"	"
B-13	N.100	W.3400	"	"	"	"	"
B-14	N.200	W.1380	"	"	"	"	"
B-15	N.200	W.1600	"	"	"	"	"
B-16	N.200	W.1900	"	"	"	"	"
B-17	N.100	W.1930	"	"	"	"	"
B-18	N.200	W.2200	"	"	"	"	"
B-19	N.200	W.2500	REMOTE BRINE	"	"	"	"
B-20	N.200	W.2800	STORAGE RESERV.	McCLELLAND	174-245	1-24-75	E-92-D-006
B-21	N.450	W.2600	BRINE STORAGE	McCLELLAND	0176-369	12-17-76	
B-22	N.150	W.2600	RESERVOIR	"	"	"	"
B-23	N.300	W.2700	"	"	"	"	"
B-24	N.450	W.3000	"	"	"	"	"
B-25	N 250	W.3000	"	"	"	"	"
B-26	N.150	W.3000	"	"	"	"	"
B-27	N.450	W.3200	"	"	"	"	"
B-28	N.300	W.3200	"	"	"	"	"
B-29	N.150	W.3200	"	"	"	"	"
B-30	N.300	W.3400	"	"	"	"	"
B-31	N.450	W.3600	"	"	"	"	"
B-32	N.270	W.3600	"	"	"	"	"
B-33	N.450	W.3850	"	"	"	"	"
B-34	N.272	W.3800	"	"	"	"	"
B-35	N.450	W.4000	"	"	"	"	"
B-36	N.250	W.4000	BRINE STORAGE	"	"	"	"
B-37	N.150	W.4000	RESERVOIR	McCLELLAND	0176-369	12-17-76	
B-1	N.1208	W.280	M.T.B.E.	McCLELLAND		DEC.78	SEE REPORT
B-2	N.1208	W.219	"	"	"	"	"
B-3	N.1279	W.387	"	"	"	"	"
B-4	N.1279	W.219	"	"	"	"	"

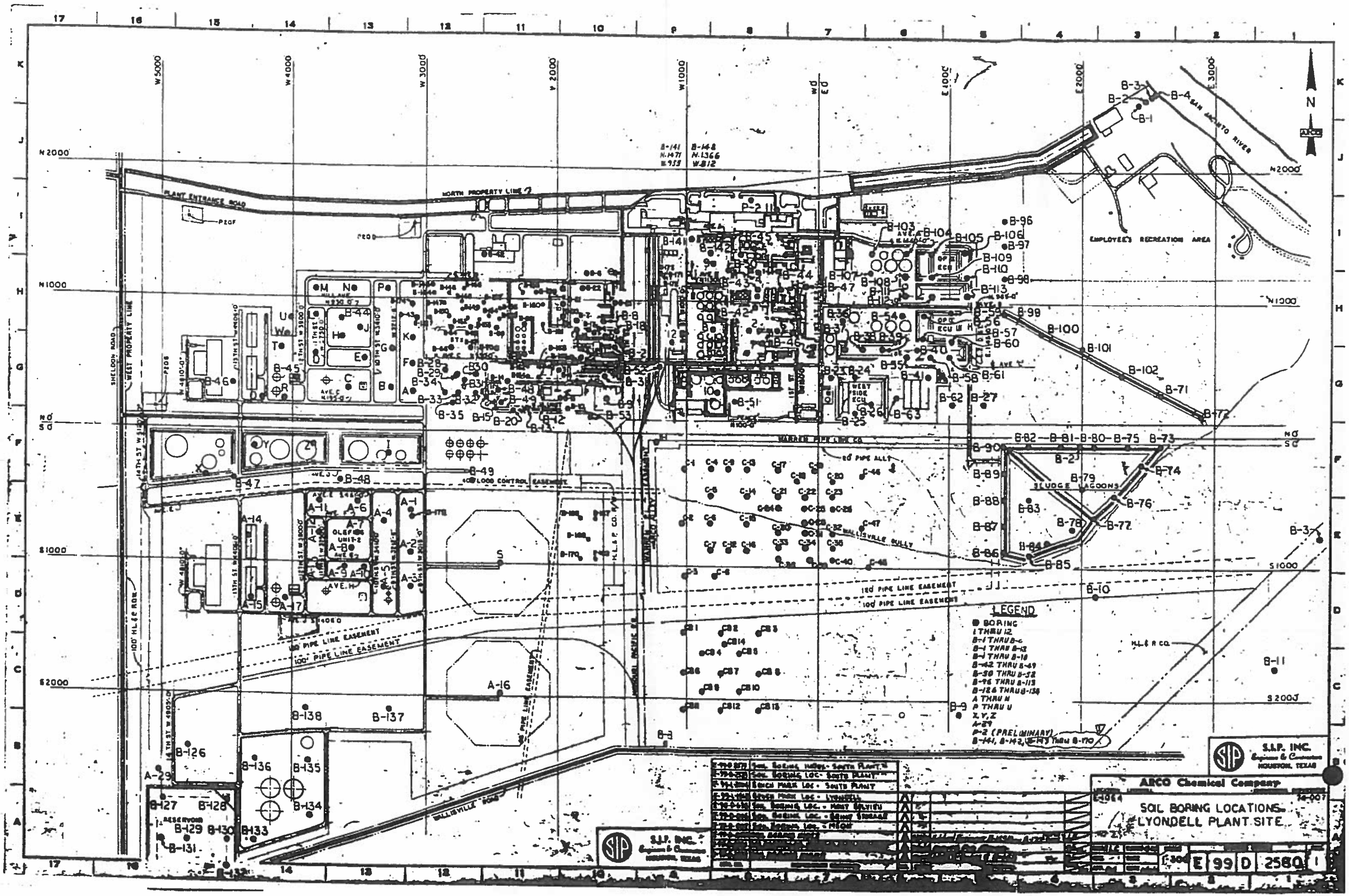
S.I.P. INC. HOUSTON, TEXAS

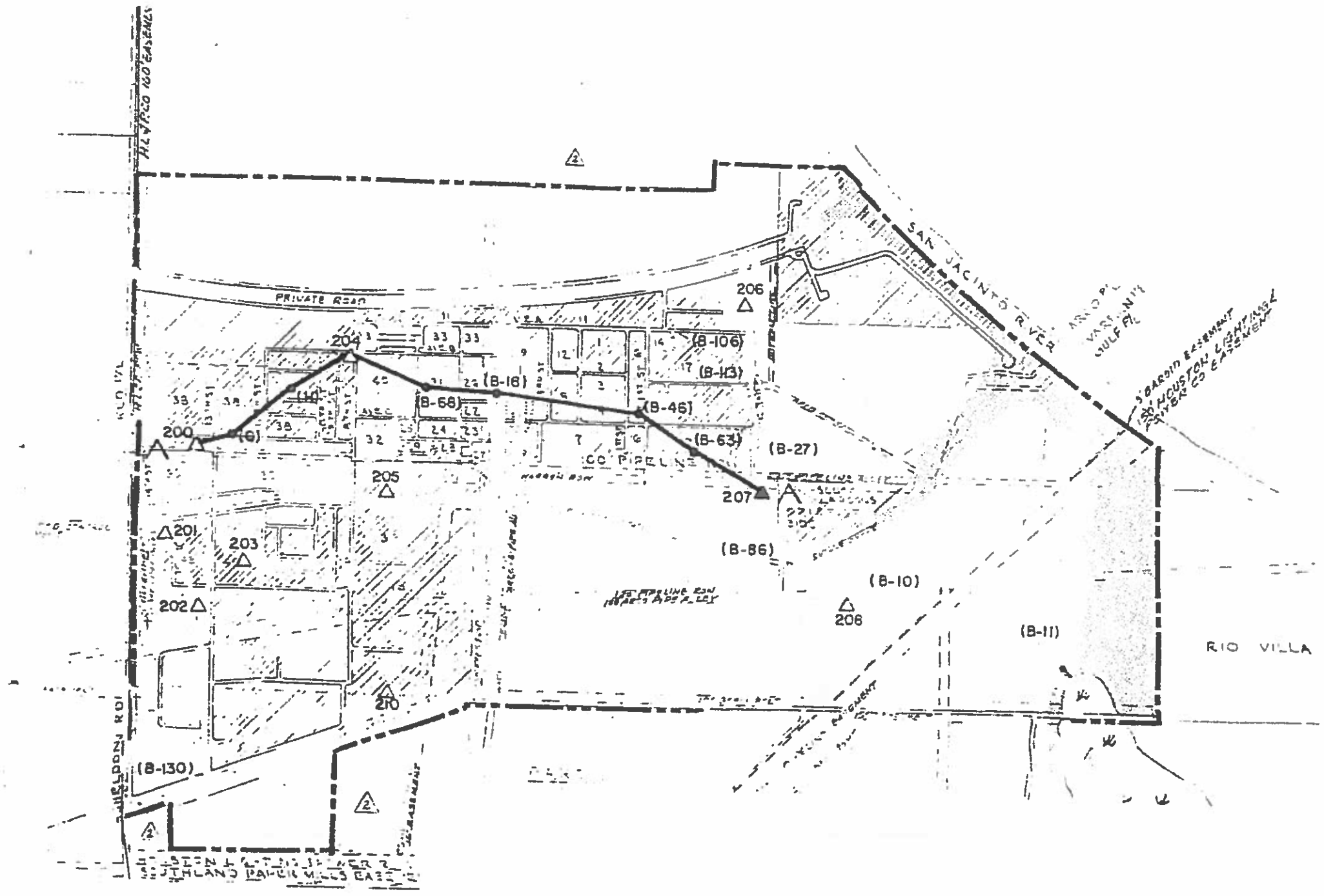
ARCO Chemical Company

E-1064 74-007

SOIL BORING INDEX

E 99 D 2583 4


PLANT ENTRANCE ROAD
NORTH PROPERTY LINE
WEST PROPERTY LINE
SHELDON ROAD
EMPLOYEE'S RECREATION AREA
SAN JACINTO RIVER
WARREN PIPE LINE CO.
HILL & R.O.W.
100' PIPE LINE EASEMENT
100' HL&P R.O.W.
HILL & R CO.
SLUDGE LAGOONS
BULLISVILLE ROAD
BULLISVILLE GULLY
LEGEND
BORING
1 THRU 12
B-1 THRU B-6
B-1 THRU B-13
B-1 THRU B-19
B-142 THRU B-149
B-30 THRU B-32
B-96 THRU B-113
B-126 THRU B-136
A THRU N
P THRU U
X, Y, Z
A-29
P-2 (PRELIMINARY)
B-141, B-142, B-145 THRU B-170
S.I.P. INC.
Engineers & Constructors
HOUSTON, TEXAS
ARCO Chemical Company
SOIL BORING LOCATIONS
LYONDELL PLANT SITE
14-007
E 99 D 2580 1

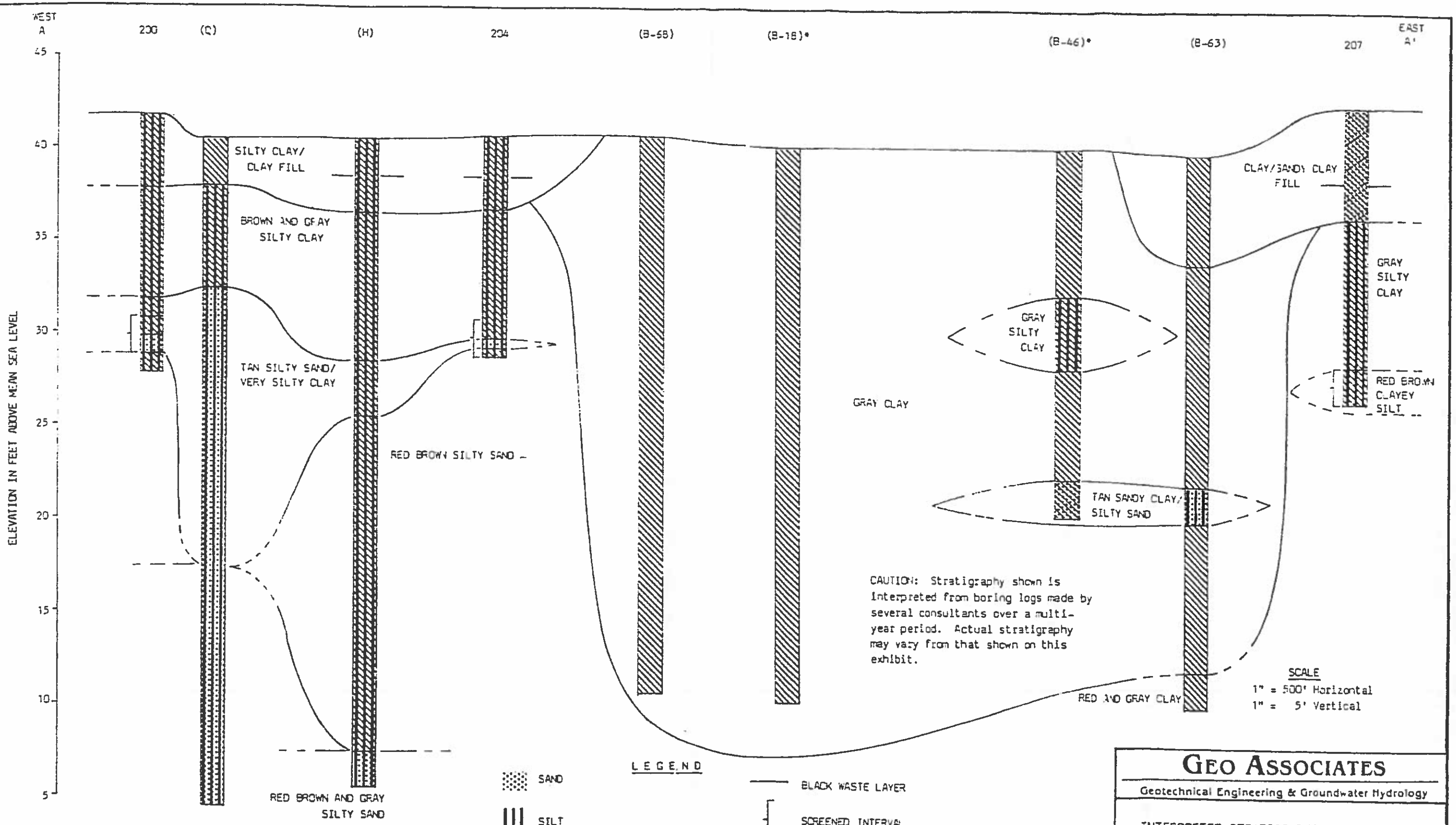


GEO ASSOCIATES

Geotechnical Engineering & Groundwater Hydrology

STRATIGRAPHIC CROSS SECTION
LOCATION MAP
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	SEPT. 1991	7



GEO ASSOCIATES

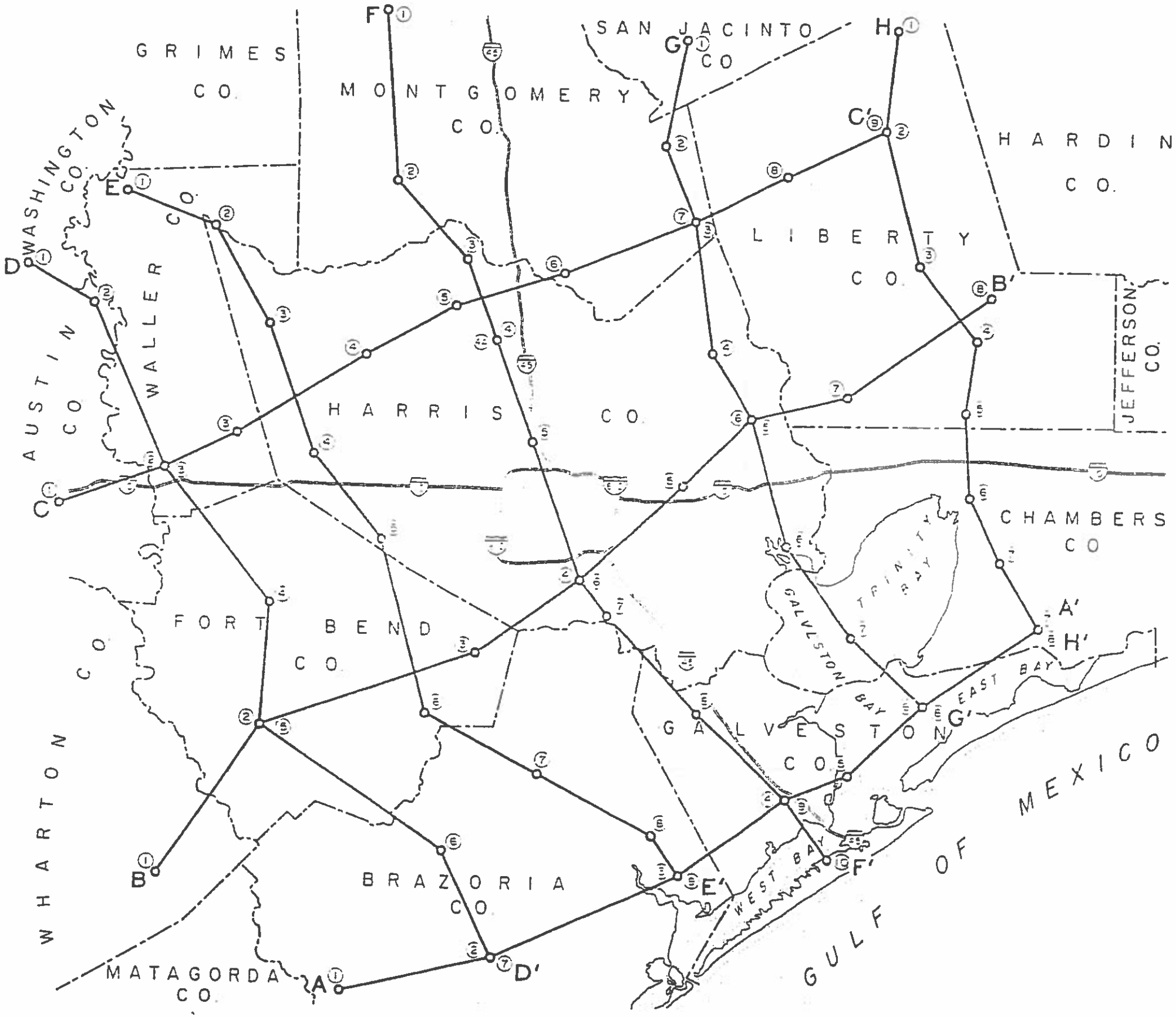
Geotechnical Engineering & Groundwater Hydrology

INTERPRETED STRATIGRAPHIC PROFILE A-A'

LYONDELL PETROCHEMICAL COMPANY

CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	SEPT. 1991	B



Adapted from HGCSD Water Resource Management Program Phase I

GEO ASSOCIATES

Geotechnical Engineering & Groundwater Hydrology

LOCATION OF GEOLOGIC SECTION B-B'

LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	SEPTEMBER 1991	11

B

B'

WHARTON CO. / FT. BEND CO.

FT. BEND CO. / HARRIS CO.

HARRIS CO. / LIBERTY CO.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

MEAN SEA LEVEL

-500

-1000

-1500

-2000

-2500

-3000

ELEVATION IN FEET

BASE OF CHICOT

BASE OF EVANGELINE

FRESH WATER

EXPLANATION

③ LOG NUMBER

WATER-BEARING SAND*

NON WATER-BEARING MATERIAL

(*principal sands shown on electric logs)

0 2 4 6 8 10

SCALE IN MILES

Adapted from HGCSD Water Resourse Management Program Phase I

PART OF ELECTRIC LOGS, AQUIFER CORRELATIONS, AND FRESH WATER IDENTIFICATION FROM U.S GEOLOGICAL SURVEY

GEO ASSOCIATES

Geotechnical Engineering & Groundwater Hydrology

GENERAL POSITION AND COMPOSITION OF CHICOT AND EVANGELINE AQUIFERS. GEOLOGIC SECTION B-B'. LYONDELL PETROCHEMICAL COMPANY CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	SEPTEMBER 1991	12

PRIVATE ROAD

SAN JACINTO RIVER

ARCO P/L
WARREN P/L
GULF P/L

5' BAROID 150' HO PIPE

HILGER ROW

AVE A

AVE B

AVE C

13TH ST

12TH ST

10TH ST

9TH ST

8TH ST

3RD ST

1ST ST

E 3RD ST

100' PIPELINE ROW

WARREN ROW

EXXON PIPELINE VALLEY

SLUDGE LAGOONS

125' PIPELINE ROW
ARCO PIPE ALLEY

EASEMENT

LEGEND

MONITOR WELL

APPROXIMATE SCALE : 1" = 800'

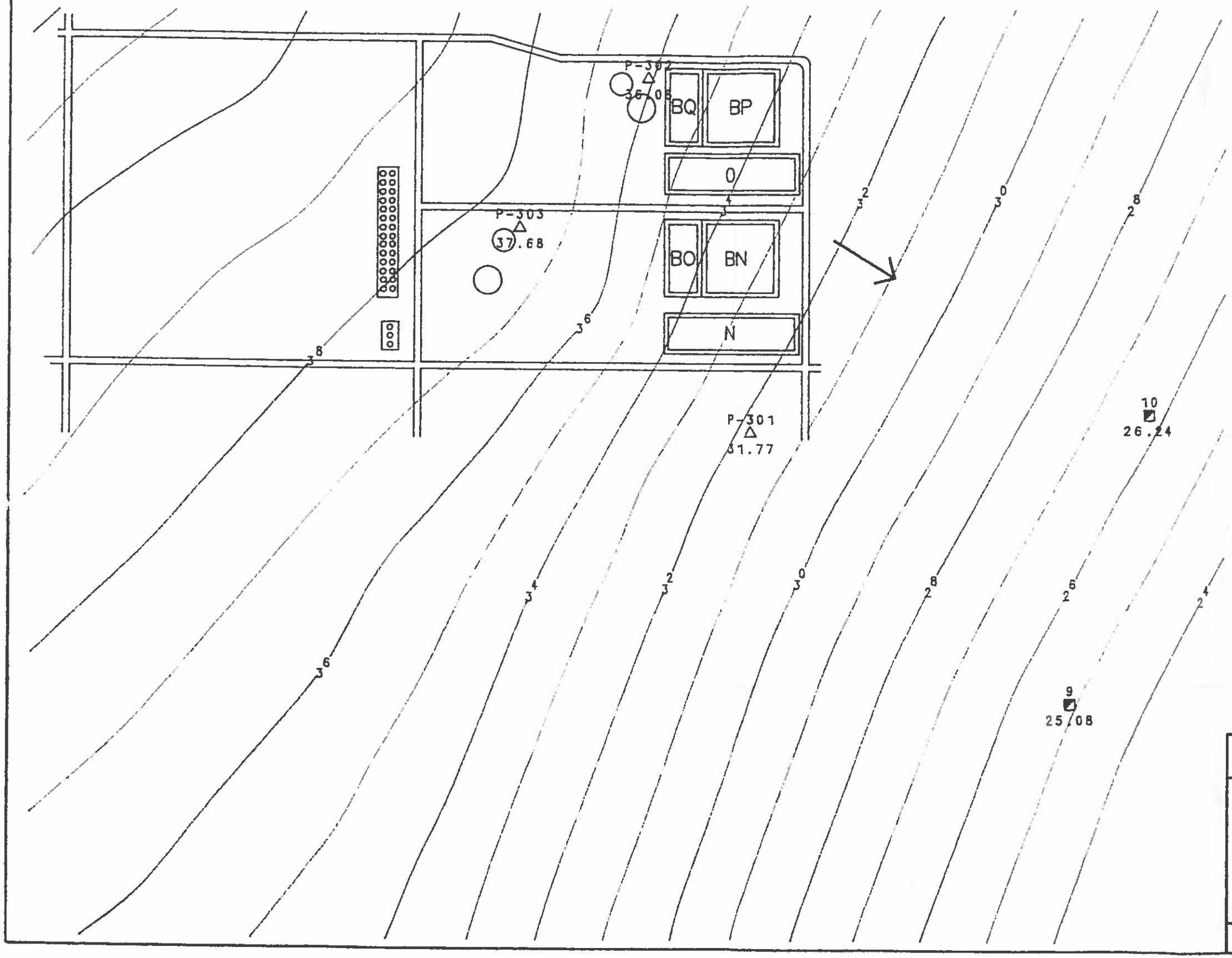
GEO ASSOCIATES

Geotechnical Engineering & Groundwater Hydrology

FACILITY MONITOR WELL
LOCATION MAP
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

NO.	DATE	EXHIBIT NUMBER
254	SEPT. 1991	21

FIRE STATION



N

LEGEND

- ■ MONITORING WELL
- △ PIEZOMETER
- 26.24 DATA VALUE
- ↙ FLOW DIRECTION

UPPER SHALLOW SAND
(FEET, MSL)
SCALE: 1 INCH = 300 FEET
DATE MEASURED: 8/7/91

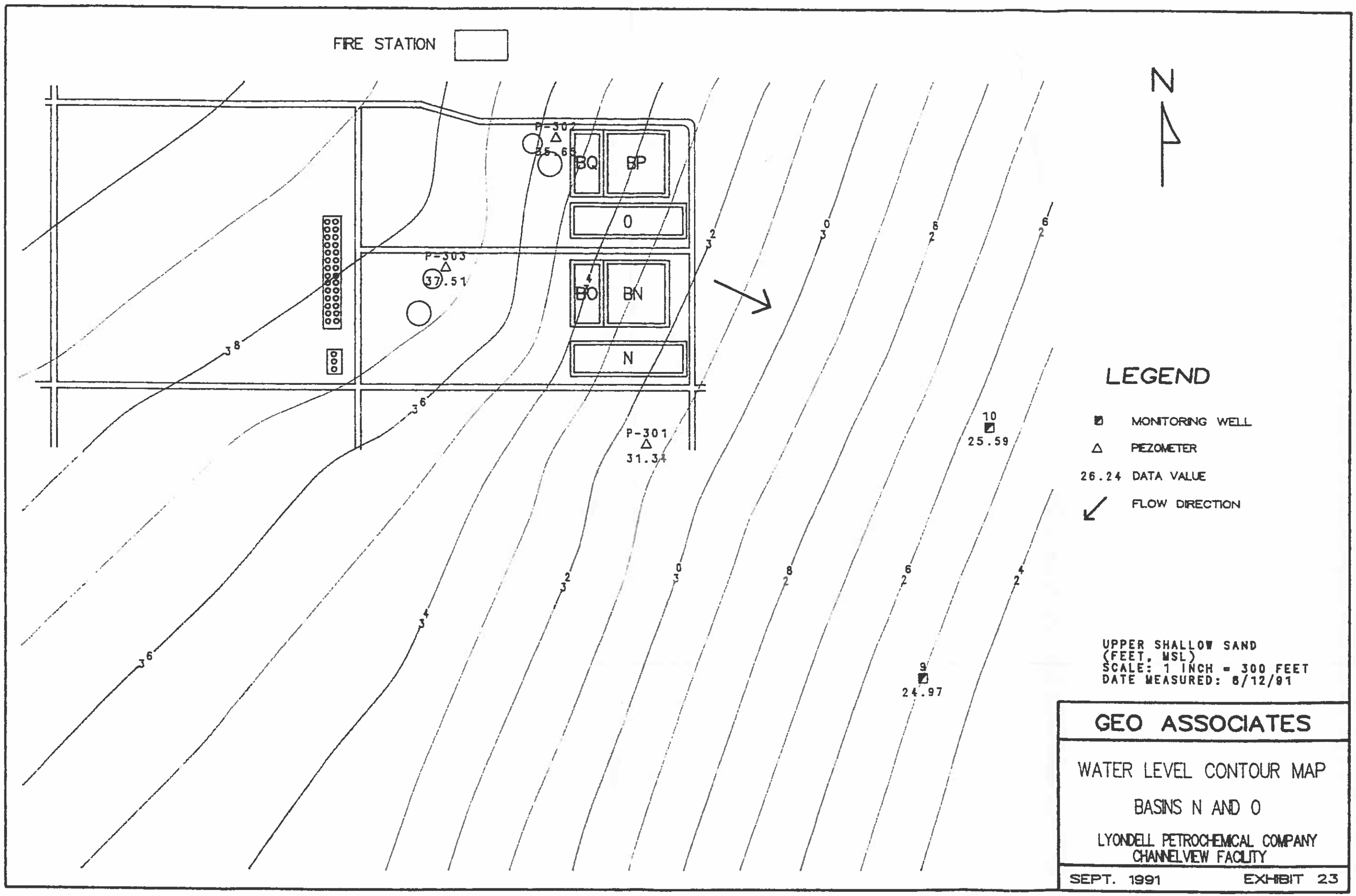
GEO ASSOCIATES

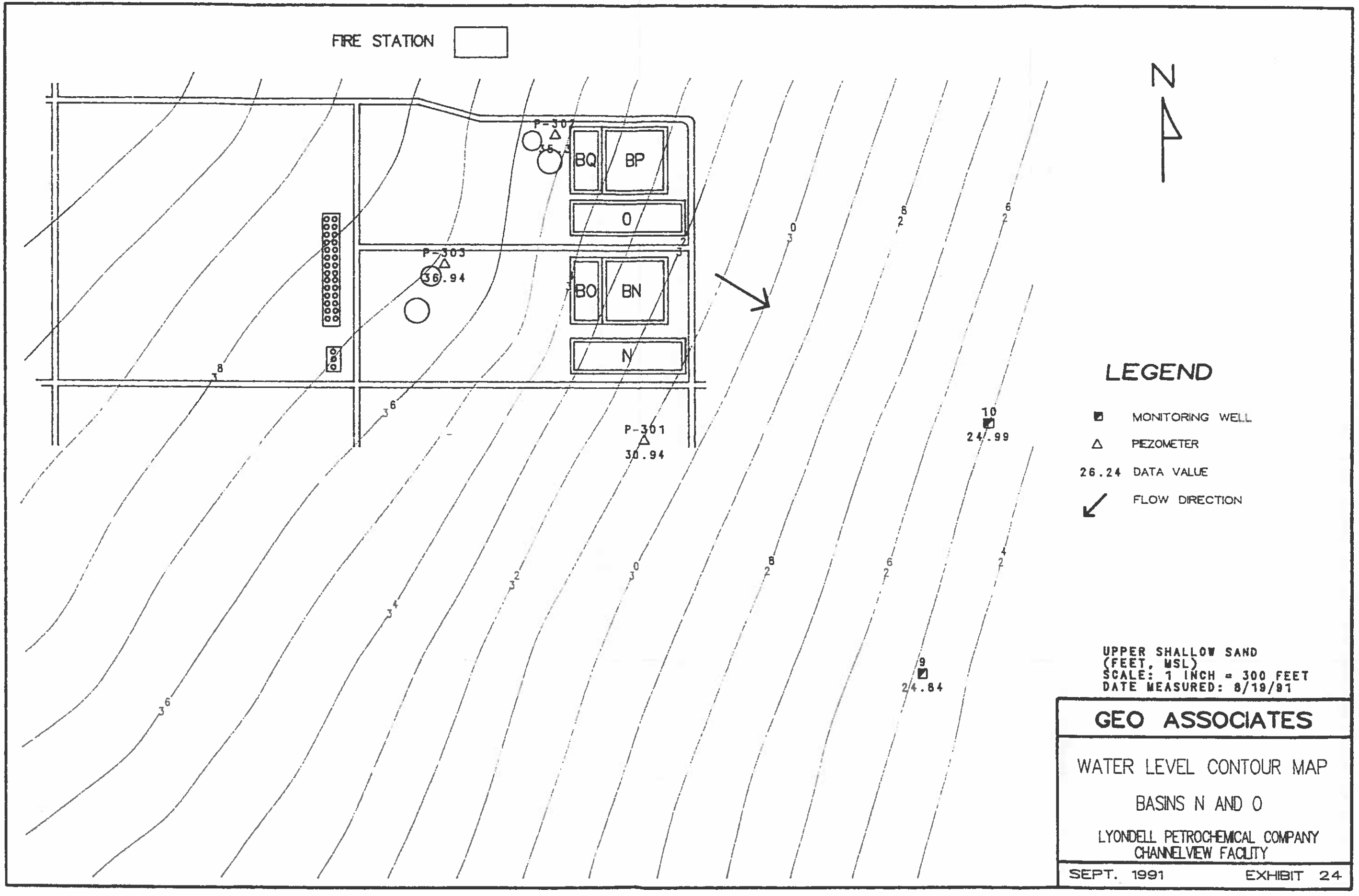
WATER LEVEL CONTOUR MAP

BASINS N AND O

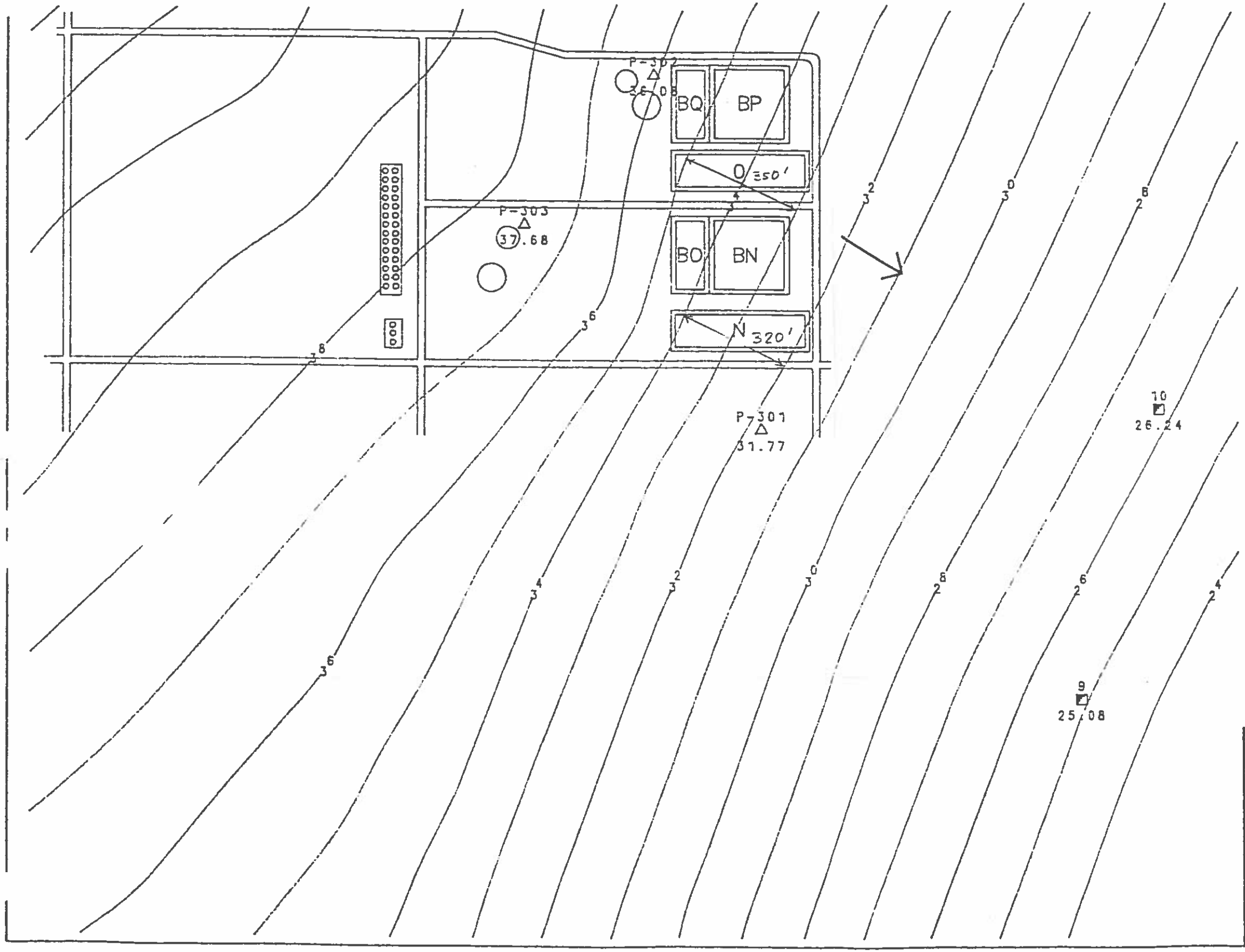
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

SEPT. 1991 EXHIBIT 22


FIRE STATION
N
P-302
35.65
BQ
BP
O
P-303
37.51
BO
BN
N
P-301
31.34
10
25.59
9
24.97
LEGEND
MONITORING WELL
PIEZOMETER
26.24 DATA VALUE
FLOW DIRECTION
UPPER SHALLOW SAND
(FEET, MSL)
SCALE: 1 INCH = 300 FEET
DATE MEASURED: 8/12/91
GEO ASSOCIATES
WATER LEVEL CONTOUR MAP
BASINS N AND O
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY
SEPT. 1991
EXHIBIT 23


FIRE STATION
N
P-302
35.31
BQ
BP
O
P-303
36.94
BO
BN
N
P-301
30.94
10
24.99
9
24.84
LEGEND
MONITORING WELL
PIEZOMETER
26.24 DATA VALUE
FLOW DIRECTION
UPPER SHALLOW SAND
(FEET, MSL)
SCALE: 1 INCH = 300 FEET
DATE MEASURED: 8/19/91
GEO ASSOCIATES
WATER LEVEL CONTOUR MAP
BASINS N AND O
LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY
SEPT. 1991
EXHIBIT 24

FIRE STATION



N

LEGEND

- ▩ MONITORING WELL
- △ PEZOMETER
- 26.24 DATA VALUE
- ↙ FLOW DIRECTION

UPPER SHALLOW SAND
(FEET, MSL)
SCALE: 1 INCH = 300 FEET
DATE MEASURED: 8/7/91

GEO ASSOCIATES

WATER LEVEL CONTOUR MAP

BASINS N AND O

LYONDELL PETROCHEMICAL COMPANY
CHANNELVIEW FACILITY

EXHIBIT

SECTION VII

CLOSURE PLAN

CLOSURE PLANS

1.0 INTRODUCTION

This section contains the closure plans for the permitted hazardous waste management units operated at the Equistar Channelview Plant. The closure plans have been developed as 'stand alone' documents for incorporation into the permit. In this manner they may be individually implemented or modified without affecting the other plans. The Closure Plans submitted and related sections are as follows:

- TK-1101A & B (NOR 010, permit unit & 011 permit unit)
- TK-3455 (NOR 032, permit unit 006) and TK-4455 (NOR 031, permit unit 007)
- TK-D-4383
- Hazardous and Non Hazardous Container Storage Area (NOR 022, permit unit 015)

The Closure Plans address the applicable requirements of 40 CFR §264 Subpart G, 30 TAC §335.8, and §350.2(h). Deed Restrictions associated with this site are presented in Appendix A. Letters issued since 2014 accepting unit closure or No Further Action are presented in Appendix B. Detailed closure cost estimates from the 2014 Permit Application are presented in Appendix C; costs have been updated for inflation to 2025 dollars. Unless otherwise mentioned, costs did not change.

1.1 Performance Standard

At closure, the Facility will comply with the performance standard codified at 40 CFR §264.111. Accordingly, closure will be completed in a manner that (a) minimizes need for further maintenance; (b) controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to ground or surface waters or to the atmosphere; and (c) complies with the unit-specific closure requirements of 40 CFR §264.178 and §264.197. Compliance with this performance standard will be satisfied by following the requirements of the Texas Risk Reduction Program rules codified at 30 TAC 350 and detailed in Section VII.1.3 of this plan. The closure plans were developed to comply with the general performance standard in 20 TAC 335.177. Accordingly, the implementation of the closure plans will prevent the discharge or imminent threat of discharge of hazardous waste, hazardous or nonhazardous constituents, or any other materials into or adjacent to the waters in the state. Additionally, the closure plan will prevent the creation or maintenance of a nuisance or the endangerment of the public health or welfare.

1.2 Texas Risk Reduction Program

At closure, the Facility will comply with the requirements of 30 TAC §350.2(h) addressing property regulated under 30 TAC Chapter 335. The closure procedures described in the following plans are intended to demonstrate that no release of chemicals of concern (COCs) to surrounding environmental media has occurred. To the degree it is necessary to complete closure, any remediation of media affected by operation of the permitted storage units that must be undertaken will meet the requirements of Remedy Standard A as per §350.32.

Remedy Standard A is a "walk-away" standard in which the affected media must be removed and/or decontaminated to protective concentrations such that physical controls or institutional controls are not necessary to protect human and ecological receptors from exposure to unprotective levels of the chemicals of concern.

Data collection activities associated with closures of hazardous waste units will comply with the requirements of the most recent version of the Quality Assurance Project Plan (QAPP) for Environmental monitoring and Measurement Activities Relating to the Resource Conservation and Recovery Act (RCRA) and Underground Injection Control (UIC) and Regulatory Guidance (RF)-366/TRRP-13.

2.0. TANK 1101A & B

The Facility intends to close the tank system in accordance with the closure by removal standard (sometimes referred to as "clean closure"). This plan describes the procedures necessary to attain Remedy Standard A as per 30 TAC §350.32, which when completed, will satisfy the standard for "clean closure."

2.1 Unit Description

Tanks 1101 A & B are identical above ground, horizontal, carbon steel tanks. The tanks are 72 inches in length, 28 inches in diameter with a maximum volumetric storage capacity of 195 gallons each. A curbed, concrete foundation provides secondary containment for both tanks.

2.2 Waste Description

Tanks 1101 A & B are used to manage waste chemicals generated in the analytical laboratory. This hazardous waste stream can typically carry one or more of the following waste codes: D001, D002, D009, D018, D019, D022, D035, D038, F002, F003, and F005.

2.3 Closure Activities

The following describes the field procedures that will be followed to close the tanks:

a. As much as possible, the waste will be removed from the tanks using the existing tank connections. The waste will be transferred to a vacuum truck for transport to an approved facility.
b. All tank flanges will be blinded. Then the vessels will be flushed out and/or steam cleaned. Residues from the cleaning operation will be sent to an approved facility.
c. The interior surfaces of the tank will then be pressure washed, steam cleaned, and/or water rinsed. Residues from this operation will be sent to an approved facility.
d. The concrete containment will be inspected to identify cracks or gaps which could provide a pathway for release of hazardous waste or constituents to soils. If no potential pathways are found, the concrete will be hydro cleaned. To confirm removal of the waste, the rinsate will be analyzed for COCs associated with the historic use of the unit. Appropriate analytical methods will be used in accordance with the requirements of the most recent version of the QAPP for Environmental Monitoring and Measurement Activities Relating to the RCRA and UIC. In addition, samples will be analyzed for reactivity, corrosivity, and ignitability. The RCI results will be compared to the hazardous characteristics listed in 40 CFR Part 261 Subpart C. The

COC concentrations will be compared to the respective Texas Risk Reduction Program (TRRP) Tier 1 Protective Concentration Levels (PCLs) for residential use. If necessary, the procedure will be repeated until the structure has been adequately decontaminated. Residues from the cleaning will be sent to an approved facility or managed in the site's wastewater treatment system.

e. An inspection of the unit will be conducted for evidence of waste release. In addition to visual inspection, the inspection activities will include a facility records search. In the event there is visual evidence, reporting evidence of a waste release, or pathway for waste release, closure activities will include removal of any material contaminated with hazardous waste and hazardous waste residues in compliance with 40 CFR 264.178 or 40 CFR 264.197, as applicable to each unit. Confirmation soil sampling will be conducted in conjunction with any soil removal activities. The confirmation soil samples will be analyzed for COCs associated with historic use of the tank. The COC concentrations will be compared to the respective Class-3 groundwater based PCLs for residential use. TCEQ approval of the Class 3 designations is provided in Appendix D.

f. The equipment and personnel protection used in the preceding steps will then be decontaminated. Decontamination will be conducted within a temporary decontamination containment located immediately adjacent to the tank. This step will include decontamination of all ancillary piping and other equipment connected to the tank. Any equipment which cannot be decontaminated will be drummed for subsequent disposal. The water collected from decontamination procedures will be sent to an approved facility.

g. An additional cleaning step using a selected detergent or chemical agent may be utilized if required to achieve appropriate decontamination of tank interior, ancillary equipment, and/or containment.

h. After completion of the closure activities, a closure certification report detailing compliance with the approved closure plan will be prepared. This closure certification report will be signed by the owner and by an independent Professional Engineer registered in the State of Texas and submitted to the TCEQ within sixty days after completion of the closure activities.

i. In accordance with 40 CFR 264.197(b), the owner or operator will close the tank system and perform post-closure care in accordance with the closure and post-closure care requirements that apply to landfills (40 CFR 264.310) if contaminated soils cannot be practicably removed or decontaminated as required in 40 CFR 264.197(a).

Note that, as per the TCEQ Part B Application Form, Table VII.A-2 has been completed for this unit. The table lists the facility components to be decontaminated, possible methods of decontamination, and possible methods of disposal of waste and waste residues generated during unit closure.

2.4. Closure Schedule

It is not anticipated that this facility unit will close before expiration of the permit. Final closure will occur either after the unit is no longer of service to the Plant or it is required by TCEQ to be taken out of service. In the event of such closure, it is anticipated that closure would proceed according the following schedule.

Time Element	Description of Task
45 days prior to final receipt of hazardous waste	Notify TCEQ of intent to close
Day 0	Commence closure activities
0 to 90 days	Remove wastes and dispose of in appropriate manner
90 to 180 days	Decontaminate system components and inspect for evidence of no prior releases
180 to 240 days	Prepare and submit closure report to TCEQ

2.5 Closure cost

A detailed cost estimate for closure of this unit is provided in Table VII.B. The cost estimate was developed utilizing TCEQ Technical Guideline No. 10. The estimate was calculated using conservative assumptions including: (a) closure at a time that would make closure most expensive (e.g., unit is filled to maximum capacity), (b) closure to be performed by third-party contractor, and (c) the cost estimate does not incorporate any salvage value that might be realized from the sale of property.

3.0 TANK 3455 AND TANK 4455

The Facility intends to close these identical tank systems in accordance with the closure by removal standard (sometimes referred to as “clean closure”). This plan describes the procedures necessary to attain Remedy Standard A as per 30 TAC §350.32, which when completed, will satisfy the standard for “clean closure.”

3.1. Unit Description

Tank 3455 (NOR 032, permit number 006) and Tank 4455 (NOR 031, permit unit 7) are above ground, vertical, carbon steel, double-walled tanks, with floating roofs. They are each 32 feet in height, 40 feet in diameter, and sits on a concrete foundation. The tanks have a maximum volumetric storage capacity of 284,000 gallons each.

3.2. Waste Description

Tank 3455 and Tank 4455 are used to manage caustic waste from the Olefins I Plant and Olefins Plant 2, respectively. The hazardous waste stream managed in TK-3455 and TK-4455 may carry one or more of the following waste codes: D001, D002, D003, and D018.

3.3. Closure Activities

The following describes the field procedures that will be followed to close each tank:

a. As much as possible, the waste will be removed from the tank using the existing tank connections. The waste will be transferred to a vacuum truck for transport to an approved facility.

b. All tank flanges will be blinded. Then the vessel will be flushed out and/or steam cleaned. Residues from the cleaning operation will be sent to an approved facility or managed in the site's wastewater treatment system.

c. The interior surfaces of the tank will then be pressure washed, steam cleaned, and/or water rinsed. Residues from this operation will be sent for deepwell disposal or managed in the site's wastewater treatment system.

d. A visual inspection of the interior surface of the storage tank will be performed. An inspection of the secondary containment will be conducted to identify cracks or gaps which could act as a pathway for waste materials to reach soils.

e. Rinsate samples will be collected from the tank and secondary containment. To confirm removal of the waste, the rinsate will be tested for COCs associated with the historic use of the unit. Appropriate analytical methods will be used in accordance with the requirements of the most recent version of the QAPP for Environmental Monitoring and Measurement Activities Relating to the RCRA and UIC. In addition, samples will be analyzed for reactivity, corrosivity, and ignitability. The RCI results will be compared to the hazardous characteristics listed in 40 CFR Part 261 Subpart C. The COC concentrations will be compared to the respective TRRP Tier 1 PCLs for residential use. If necessary, the procedure will be repeated until the structure has been adequately decontaminated. Residues from hydro blasting and rinsing will be sent to an approved facility or managed in the site's wastewater treatment system.

f. An inspection of the unit will be conducted for evidence of waste release. In addition to visual inspection, the inspection activities will include a facility records search. In the event there is visual evidence, reporting evidence of a waste release, or pathway for waste release, closure activities will include removal of any material contaminated with hazardous waste and hazardous waste residues in compliance with 40 CFR 264.178 or 40 CFR 264.197, as applicable to each unit. Confirmation soil sampling will be conducted in conjunction with any soil removal activities. The confirmation soil samples will be analyzed for COCs associated with historic use of the tank. The COC concentrations will be compared to the respective Class-3 groundwater based PCLs for residential use. TCEQ approval of the Class 3 designations provided in Appendix D.

g. The equipment and personnel protection used in the preceding steps will then be decontaminated. Decontamination will be conducted within a temporary decontamination pad located immediately adjacent to the tank. This step will include decontamination of all ancillary piping and other equipment connected to the tank. Any equipment which cannot be decontaminated will be drummed for subsequent disposal. The water collected from decontamination procedures will be sent to an approved facility or managed in the site's wastewater treatment system.

h. An additional cleaning step using a selected detergent or chemical agent may be utilized if required to achieve appropriate decontamination of tank interior, ancillary equipment, and/or containment.

i. After completion of the closure activities, a closure certification report detailing compliance with the approved closure plan will be prepared. This closure certification

report will be signed by the owner and by an independent Professional Engineer registered in the State of Texas and submitted to the TCEQ within sixty days after completion of the closure activities.

j. In accordance with 40 CFR 264.197(b), the owner or operator will close the tank system and perform post-closure care in accordance with the closure and post-closure care requirements that apply to landfills (40 CFR 264.310) if contaminated soils cannot be practicably removed or decontaminated as required in 40 CFR 264.197(a).

Note that, as per the TCEQ Part B Application Form, Table VII.A-3 has been completed for this unit. The table lists the facility components to be decontaminated, options for decontamination, and options for disposal of waste and waste residues generated during unit closure.

3.4. Closure Schedule

It is not anticipated that this facility unit will close before expiration of the permit. Final closure will occur either after the unit is no longer of service or it is required by TCEQ to be taken out of service. In the event of such closure, it is anticipated that closure would proceed according the following schedule.

Time Element	Description of Task
45 days prior to final receipt of hazardous waste	Notify TCEQ of intent to close
Day 0	Commence closure activities
0 to 90 days	Remove wastes and dispose of in appropriate manner
90 to 180 days	Decontaminate system components and inspect for evidence of no prior releases
180 to 240 days	Prepare and submit closure report to TCEQ

3.5. Closure Cost

A detailed cost estimate for closure of this unit is provided in Table VII. The cost estimate was developed utilizing TCEQ Technical Guideline No. 10. The estimate was calculated using conservative assumptions including: (a) closure at a time that would make closure most expensive (e.g., unit is filled to maximum capacity), (b) closure to be performed by third-party contractor, and (c) the cost estimate does not incorporate any salvage value that might be realized from the sale of property.

4.4. TANK D-4383

The Facility intends to close the tank system in accordance with the closure by removal

standard (sometimes referred to as “clean closure”). This plan describes the procedures necessary to attain Remedy Standard A as per 30 TAC §350.32, which when completed, will satisfy the standard for “clean closure.”

4.1. Unit Description

Tank D-4383 is a above ground, horizontal, carbon steel tank. It is 19 feet long, 10 feet in diameter, and sits on a concrete foundation. The tank has a maximum volumetric storage capacity of 12,000 gallons. The concrete foundation surrounding the tank is curbed and provides secondary containment.

4.2. Waste Description

Tank 4383 is used to manage low-concentration caustic waste from the Olefins II Flex Unit. The hazardous waste stream managed in TK D-4383 may carry one or more of the following waste codes: D001, D002, D003, and D018.

4.3. Closure Activities

The following describes the field procedures that will be followed to close the tank:

a. As much as possible, the waste will be removed from the tank using the existing tank connections. The waste will be transferred to a vacuum truck for transport to an approved facility.

b. All tank flanges will be blinded. Then the vessel will be flushed out and/or steam cleaned. Residues from the cleaning operation will be sent to an approved facility or managed in the site’s wastewater treatment system.

c. The interior surfaces of the tank will then be pressure washed, stem cleaned, and/or water rinsed. Residues from this operation will be sent for deepwell disposal or managed in the site’s wastewater treatment system.

d. A visual inspection of the interior surface of the storage tank will be performed. Next, personnel will inspect the concrete walls and floor of containment structure to identify cracks or gaps which could provide a pathway for release of hazardous waste or constituents to soils. If no potential pathways are found, the concrete will be pressure washed and/or steam cleaned. To confirm removal of the waste, the rinsate will be tested for COCs associated with the historic use of the unit. Appropriate analytical methods will be used in accordance with the requirements of the most recent version of the QAPP for Environmental Monitoring and Measurement Activities Relating to the RCRA and UIC. In addition, samples will be analyzed for reactivity, corrosivity, and ignitability. The RCI results will be compared to the hazardous characteristics listed in 40 CFR Part 261 Subpart C. The COC concentrations will be compared to the respective TRRP Tier 1 PCLs for residential use. If necessary, the procedure will be repeated until the structure has been adequately decontaminated. Residues from hydro blasting and rinsing will be sent to an approved facility or managed in the site’s wastewater treatment system.

e. Since this tank was operated prior to installation of secondary containment, an inspection of the unit and surrounding areas will be conducted for evidence of waste

release. In addition to visual inspection, the inspection activities will include a facility records search in order to determine if there have been any releases from the tank during its time in service. These records will include either soil samples taken at the time of the secondary containment installation (or more recent samples if available) or copies of inspection reports showing that no releases have occurred since the tank came into service with no time lapses. Soil samples were collected from this tank in 1993 and submitted to TCEQ when secondary containment was added to the tank. As such, closure costs for soil sampling have been removed. The COC concentrations will be compared to the respective Class-3 groundwater based PCLs for residential use. TCEQ approval of the Class 3 designations is provided in Appendix D.

f. The equipment and personnel protection used in the preceding steps will then be decontaminated. Decontamination will be conducted within a temporary decontamination pad located immediately adjacent to the tank. This step will include decontamination of all ancillary piping and other equipment connected to the tank. Any equipment which cannot be decontaminated will be drummed for subsequent disposal.

g. An additional cleaning step using a selected detergent or chemical agent may be utilized if required to achieve appropriate decontamination of tank interior, ancillary equipment, and/or containment.

h. After completion of the closure activities, a closure certification report detailing compliance with the approved closure plan will be prepared. This closure certification report will be signed by the owner and by an independent Professional Engineer registered in the State of Texas and submitted to the TCEQ within sixty days after completion of the closure activities.

i. In accordance with 40 CFR 264.197(b), the owner or operator will close the tank system and perform post-closure care in accordance with the closure and post-closure care requirements that apply to landfills (40 CFR 264.310) if contaminated soils cannot be practicably removed or decontaminated as required in 40 CFR 264.197(a).

Note that, as per the TCEQ Part B Application Form, Table VII.A-4 has been completed for this unit. The table lists the facility components to be decontaminated, options for decontamination, and options for disposal of waste and waste residues generated during unit closure.

4.4. Closure Schedule

It is not anticipated that this facility unit will close before expiration of the permit. Final closure will occur either after the unit is no longer of service or it is required by TCEQ to be taken out of service. In the event of such closure, it is anticipated that closure would proceed according the following schedule.

Time Element	Description of Task
45 days prior to final receipt of hazardous waste	Notify TCEQ of intent to close
Day 0	Commence closure activities
0 to 90 days	Remove wastes and dispose of in appropriate manner
90 to 180 days	Decontaminate system components and inspect for evidence of no prior releases
180 to 240 days	Prepare and submit closure report to TCEQ

4.5. Closure Cost

A detailed cost estimate for closure* of this unit is provided in Table VII. The cost estimate was developed utilizing TCEQ Technical Guideline No. 10. The estimate was calculated using conservative assumptions including: (a) closure at a time that would make closure most expensive (e.g., unit is filled to maximum capacity), (b) closure to be performed by third-party contractor, and (c) the cost estimate does not incorporate any salvage value that might be realized from the sale of property.

*Contingent closure costs are also provided because although this tank has secondary containment now, initially it did not.

5.0 HAZARDOUS AND NON HAZARDOUS CONTAINER STORAGE AREA

The facility intends to close the container storage area in accordance with the closure by removal standard (sometimes referred to as “clean closure”). This plan describes the procedures necessary to attain Remedy Standard A as per 30 TAC §350.32, which when completed, will satisfy the standard for “clean closure.”

5.1. Unit Description

The container storage area (NOR 022, permit number 015) is a covered concrete pad utilized for the storage of drums containing organic and inorganic wastes. This facility unit is permitted to store a maximum of 800 55-gallon drums or 2 30-cubic-yard roll-off bins a total of 56,150 gallons. The facility unit has a containment volume of 16,000 gallons.

5.2. Waste Description

The container storage area is used to manage miscellaneous Corrosive, ignitable, reactive, organic and inorganic wastes from onsite sources. Constituents of concern consist of D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D011, D018, D019, D021 D022, D027, D028, D035, D036, D038, D039, D040, F002, F003, F004, F005, P003, P022, U001, U002, U003, U004, U019, U022, U055, U056, U117, U123, U133, U147, U154, U159, U213, U220, U226, and U239.

5.3. Closure Activities

The following described the field procedures that will be followed to close the Container Storage Area:

a. All drums containing stored materials will be removed and transported to an approved facility. Next, personnel will inspect the concrete walls and floor of containment structure to identify cracks or gaps which could provide a pathway for release of hazardous waste or constituents to soils. If no potential pathways are found, the concrete will be hydro cleaned. Appropriate analytical methods will be used in accordance with the requirements of the most recent version of the QAPP for Environmental Monitoring and Measurement Activities Relating to the RCRA and UIC. In addition, samples will be analyzed for reactivity, corrosivity, and ignitability. The RCI results will be compared to the hazardous characteristics listed in 40 CFR Part 261 Subpart C. The COC concentrations will be compared to the respective TRRP Tier 1 PCLs for residential use. If necessary, the procedure will be repeated until the structure has been adequately decontaminated. Residues from hydro blasting and rinsing will be sent to an approved facility or managed in the site's wastewater treatment system.

b. Decontaminate equipment and personnel protection used in the preceding steps. Decontamination will be conducted within a temporary decontamination pad located immediately adjacent to the tank. This step will include decontamination of all ancillary piping and other equipment connected to the tank. Any equipment which cannot be decontaminated will be drummed for subsequent disposal. The water collected from decontamination procedures will be sent to an approved facility managed in the site's wastewater treatment system.

c. An additional cleaning step using a selected detergent or chemical agent may be utilized if required to achieve appropriate decontamination.

d. An inspection of the unit will be conducted for evidence of waste release. In addition to visual inspection, the inspection activities will include a facility records search. In the event there is visual evidence, or reporting evidence of a waste release, or pathway for waste release, closure activities will include removal of any material contaminated with hazardous waste and hazardous waste residues in compliance with 40 CF 264.178 or 40 CFR 264.197, as applicable to the unit. Confirmation soil sampling will be conducted in conjunction with any soil removal activities conducted. The confirmation soil samples will be analyzed for COCs associated with historic use of the tank. The COC concentrations will be compared to the respective Class-3 groundwater based PCLs for residential use. TCEQ approval of the Class 3 designations provided in Appendix D

e. Prepare closure certification report to detail compliance of all closure activities with the approved closure plan. This closure certification report will be signed by the owner and by an independent Professional Engineer registered in the State of Texas and submitted to the TCEQ within sixty days after completion of the closure activities.

f. In accordance with 40 CFR 264.197(b), the owner or operator will close the container storage area and perform post-closure care in accordance with the closure and post-

closure care requirements that apply to landfills (40 CFR 264.310) if contaminated soils cannot be practicably removed or decontaminated as required in 40 CFR 264.197(a).

Note that, as per the TCEQ Part B Application Form, Table VII.A-4 has been completed for this unit. The table lists the facility components to be decontaminated, options for decontamination, and options for disposal of waste and waste residues generated during unit closure.

5.4. Closure Schedule

It is not anticipated that this facility unit will close before expiration of the permit. Final closure will occur either after the unit is no longer of service to the Facility or it is required by TCEQ to be taken out of service. In the event of such closure, it is anticipated that closure would proceed according the following schedule.

Time Element	Description of Task
45 days prior to final receipt of hazardous waste	Notify TCEQ of intent to close
Day 0	Commence closure activities
0 to 90 days	Remove wastes and dispose of in appropriate manner
90 to 180 days	Decontaminate system components and inspect for evidence of no prior releases
180 to 240 days	Prepare and submit closure report to TCEQ

5.5. Closure Cost

A detailed cost estimate for closure of this unit is provided in Table VII.B. The cost estimate was developed utilizing TCEQ Technical Guideline No. 10. The estimate was calculated using conservative assumptions including: (a) closure at a time that would make closure most expensive (e.g., unit is filled to maximum capacity), (b) closure to be performed by third-party contractor, and (c) the cost estimate does not incorporate any salvage value that might be realized from the sale of property.

TABLE VII.A-2 TK-1101A & B

Equipment of HWM Unit	Options for Decontamination[1, 3]	Options for Disposal [1] [2]
Tank Shell	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Tank Shell - Recycle as a tank or dismantle and send to scrap metal recycler Rinse water and residues - to deepwell.
Tank Containment	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Rinse water and residues - to deepwell.
Pumps	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Working pumps - Reuse Non-working pumps - Scrap metal recycler Rinse water and residues - to deepwell.
Piping	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Piping - Reuse or send to scrap metal recycler Rinse water and residues - to deepwell.
Gaskets, bolts, nuts and small items	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Solid articles - Send to scrap metal recycler or handle/dispose as hazardous debris Rinse water and residues - to deepwell.

[1] Applicants may list more than one appropriate method.

[2] If contaminant concentrations are within acceptable parameters, on-site wastewater treatment may be considered for some rinse water/residues.

[3] A cleaning step using a detergent or chemical agent may be used if necessary

TABLE VII.A-3 TK-3455 and TK-4455

Equipment of HWM Unit	Options for Decontamination[1, 3]	Options for Disposal [1] [2]
Tank Shell	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Tank Shell - Recycle as a tank or dismantle and send to scrap metal recycler Rinse water and residues - to deepwell.
Tank Containment	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Rinse water and residues - to deepwell.
Pumps	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Working pumps - Reuse Non-working pumps - Scrap metal recycler Rinse water and residues - to deepwell.
Piping	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Piping - Reuse or send to scrap metal recycler Rinse water and residues - to deepwell.
Gaskets, bolts, nuts and small items	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Solid articles - Send to scrap metal recycler or handle/dispose as hazardous debris Rinse water and residues - to deepwell.

[1] Applicants may list more than one appropriate method.

[2] If contaminant concentrations are within acceptable parameters, on-site wastewater treatment may be considered for some rinse water/residues.

[3] A cleaning step using a detergent or chemical agent may be used if necessary

TABLE VII.A-4 TK D-4383

Equipment of HWM Unit	Options for Decontamination[1, 3]	Options for Disposal [1] [2]
Tank Shell	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Tank Shell - Recycle as a tank or dismantle and send to scrap metal recycler Rinse water and residues - to deepwell.
Tank Containment	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Rinse water and residues - to deepwell.
Pumps	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Working pumps - Reuse Non-working pumps - Scrap metal recycler Rinse water and residues - to deepwell.
Piping	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Piping - Reuse or send to scrap metal recycler Rinse water and residues - to deepwell.
Gaskets, bolts, nuts and small items	Pressure wash, or steam clean, or utilize other suitable mechanical removal methods	Solid articles - Send to scrap metal recycler or handle/dispose as hazardous debris Rinse water and residues - to deepwell.

[1] Applicants may list more than one appropriate method.

[2] If contaminant concentrations are within acceptable parameters, on-site wastewater treatment may be considered for some rinse water/residues.

[3] A cleaning step using a detergent or chemical agent may be used if necessary

TABLE VII.A-5 Container Storage Area Unit Closure

Equipment of HWM Unit	Options for Decontamination[1, 3]	Options for Disposal [1]
Concrete floor	Pressure wash, steam clean, or utilize other suitable mechanical removal methods	Structure - Reuse as storage area Rinse water - to fuels blending or incineration.

[1]Applicants may list more than one appropriate method.

[2] If contaminant concentrations are within acceptable parameters, on-site wastewater treatment may be considered for some rinse water/residues.

[3] A cleaning step using a detergent or chemical agent may be used if necessary

TABLE VII.B Unit Closure Cost Estimate

Task	Cost
Tank 1101A	
Mobilize 3-person crew and equipment [20 hrs. @ $69.73/hr + 7 hrs@94.14/hr]	$ 1,820
Material inventory – dispose, fuels blending or incineration [195 gallons (4 drums @ $1582/drum)]	$ 6,328
Wash water residues - fuels blending or incineration [669 gal @ $6.80/gal] (Triple rinse tank, est. 10% of 195 gal. per rinse, plus ext. 650 gal for containment pad = 669 gal)	$ 4,550
Transportation (6699 gal ⇒ 5,500 gal/truck @ $1,733/load = $1733)	
Laboratory Analysis [4 samples @ $735/sample]	$ 1,733
Certification report	$ 2,940
	$ 6,456
Subtotal	$23,827
Contingency (10% minimum)	$ 2,383
Total Unit Closure Cost (2025)	$26,210

Task	Cost
Tank 1101B	
Mobilize 3-person crew and equipment [20 hrs. @ $69.73/hr + 7 hrs@94.14/hr]	$ 1,820
Material inventory – dispose, fuels blending or incineration [195 gallons (4 drums @ $1582/drum)]	$ 6,328
Wash water residues - fuels blending or incineration [669 gal @ $6.80/gal] (Triple rinse tank, est. 10% of 195 gal. per rinse, plus ext. 650 gal for containment pad = 669 gal)	$ 4,550
Transportation (6699 gal ⇒ 5,500 gal/truck @ $1,733/load = $1733)	
Laboratory Analysis [4 samples @ $735/sample]	$ 1,733
Certification report	$ 2,940
	$ 6,456
Subtotal	$23,827
Contingency (10% minimum)	$ 2,382
Total Unit Closure Cost (2025)	$26,209

Task	Cost
Tank 3455	
Mobilize crew and equipment [2693 hrs. @$81.56/hr]	$219,641
Tank contents + decon (285,000 @$0.64/gal)]	$182,400
(Triple rinse tank, est.)	
Transportation 62 truckloads @1,733/load	$107,446
Laboratory Analysis [6 samples @ $734/sample]	$ 4,404
Certification Report	$16,515
Subtotal	$530,406
Contingency (10% minimum)	$ 53,041
Total Unit Closure Cost (2025)	$583,447

Task	Cost
Tank 4455	
Mobilize crew and equipment [2693 hrs. @$81.56/hr]	$219,641
Tank contents + decon (285,000 @$0.64/gal)]	$182,400
(Triple rinse tank, est.)	
Transportation 62 truckloads @1,733/load	$107,446
Laboratory Analysis [samples 6 @ $734/sample]	$ 4,404
Certification Report	$16,515
subtotal	$530,406
Contingency (10% minimum)	$ 53,041
Total Unit Closure Cost (2025)	$583,447

Task	Cost
Tank D-4383	
Mobilize 6-person crew and equipment [830 hrs. @ $81.56/hr.]	$49,800
Material inventory - dispose at off-site well [12,000 gallons @ $0.64/gal]	$ 3,000
Wash water residues - dispose - at off-site well [4,700 gal @ $0.64/gal.] (Triple rinse tank, est. 10% of 12,000 gal. per rinse, plus 10,324 for ancillary pad = 11524 gal)	$ 2,881
Transportation (22,324 gallons @ 5,500 gal/truck @ $1,440.83/load = $5,763.32)	$ 5,763
Laboratory Analysis [4 samples @ $883.53/sample]	$ 3,534
Certification report	$ 6,457
Subtotal	$ 71,435
Contingency (10% minimum)	$ 7,144
Total Unit Closure Cost (2025)	$ 78,579

Task	Cost
Container Storage Area	
Mobilize 3-person crew and equipment [190 hrs. @ $402.28/hr.]	$ 76,433
Material inventory - dispose at approved facility [1,130 drums @ $1164/drum]	$737,540
Wash water residues - dispose at approved facility [23,548 gal @ $0.64/gal]	$ 8,006
Transportation [23,548 gal] (14 tank truck @ $744.88)	$ 10,428
Laboratory Analysis [132 samples @ $849.54/sample]	$ 112,139
Certification report	$ 19,234
Engineering Support	$47,214
Subtotal	$1,010,994
Contingency (10% minimum)	$ 101,099
Total Unit Closure Cost (2025)	$1,112,093

TOTAL CLOSURE COSTS, ALL UNITS

UNIT NUMBER	TOTAL CLOSURE COSTS
TK-1101A	$ 26,209
TK-1101B	$ 26,209
TK-3455	$ 583,447
TK-4455	$ 583,447
TK-D-4383	$78,579
Container Storage Area	$1,112,093
Total Units Closure Costs (2025)	$1,409,984

APPENDIX A: Deed Recordation

Bryan W. Shaw, Ph.D., P.E., *Chairman*
Toby Baker, *Commissioner*
Zak Covar, *Commissioner*
Richard A. Hyde, P.E., *Executive Director*

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TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

July 7, 2014

Mr. Randall "Scott" Mayo
Environmental Manager
Equistar Chemicals, L.P. Channelview Facility
8280 Sheldon Road
Channelview, TX 77530

Re: Approval of Filing of Institutional Controls
Response Action Completion Report (RACR) for Remedy Standard B, dated January 21, 2014
Equistar Chemicals, L.P., Channelview, TX (Harris County)
TCEQ SWR No. 30030; TCEQ Industrial and Hazardous Waste Permit No. HW-50177; EPA ID No. TXD058275769; Customer No. CN600124705; Regulated Entity No. RN1005422818

Dear Mr. Mayo:

The Texas Commission on Environmental Quality (TCEQ) received your letter dated June 13, 2014 submitted by Equistar Chemicals, L.P. (Equistar) containing proof of filing of institutional controls for the following RCRA Facility Investigation (RFI) units/areas subject to RCRA Corrective Action (CA) Program requirements of Permit Provision IX of the above referenced hazardous waste permit (HW-50255):

- Area 1 North (RFI Units 1 and 3);
- OP-1 Area;
- Area 1 South (RFI Units 2 and 4);
- OP-2 Area;
- NESHAP Area; and the
- Sulfolane Sump Area.

TCEQ letter dated March 13, 2014 previously approved the Response Action Completion Report (RACR) dated January 21, 2014, documenting attainment of Remedy Standard B for the above referenced units/areas. According to the TCEQ's March 13, 2014 letter, Texas Risk Reduction Program (TRRP) Remedy Standard B-Commercial/Industrial PCLs have been attained such that no post-response action care is required for Area 1 South (RFI Units 2 and 4), OP-2 Area, NESHAP Area, and the Sulfolane Sump Area. However, the implementation of post-response action care activities consisting of annual inspection and maintenance of the established physicals controls are required to address surface soil Protective Concentration Level Exceedence (PCLE) zones associated with Area 1 North (RFI Units 1 and 3) and OP-1 Area. Financial assurance for the required post-response action care activities for Area 1 North (RFI Units 1 and 3) and OP-1 Area has been demonstrated in compliance with 30 TAC §350.33.

After reviewing the proof of filing of institutional controls the TCEQ concurs that the institutional control requirements of 30 Texas Administrative Code (TAC) §350.111 have been completed. The institutional control was filed in the Real Property Records of Harris County on June 6, 2014 in accordance with 30 TAC §350.34(2) to note that the response actions have been conditionally completed under Remedy Standard B for Area 1 North (RFI Units 1 and 3) and OP-1 Area and in accordance with 30 TAC §350.31(g) to note the use of an institutional or physical control to attain Remedy B without post-response action case being required for Area 1 South (RFI Units 2 and 4), OP-2 Area, NESHAP Area, and the Sulfolane Sump Area. Therefore, no further action is required Area 1 South (RFI Units 2 and 4), OP-2 Area, NESHAP Area, and the Sulfolane Sump Area. *Please initiate the approved post-response action care activities for Area 1 North (RFI Units 1 and 3) and OP-1 Area and submit the required Post-Response Action Care Reports (PRACRs) in accordance with the schedule provided in Worksheet 6.0 of the approved RAP, dated March 21, 2013.*

Please be aware that it is the continuing obligation of persons associated with a site to ensure that municipal hazardous waste and industrial solid waste are managed in a manner which does not cause the discharge or imminent threat of discharge of waste into or adjacent to waters in the state, a nuisance, or the endangerment of the public health and welfare as required by 30 TAC §335.4. If the actual response actions for the RFI units/areas fail to comply with these requirements, please take any necessary and authorized action to correct such conditions.

Questions concerning this letter should be directed to me at (512) 239-6542. When responding by mail, please submit an original and one copy of all correspondence and reports to the TCEQ Remediation Division at Mail Code MC-127 with an additional copy submitted to the local TCEQ Region Office. Please note that the Remediation Division sends letters via email when appropriate. Therefore, current email addresses and the site identification information in the reference block should be included in all future submittals.

Sincerely,

Eleanor T. Wehner

Eleanor T. Wehner, P.G.
Project Manager
VCP-CA Section
Remediation Division
Texas Commission on Environmental Quality

ETW/jdm

cc: Mr. Manish Pawar, P.E., Brown and Caldwell, One Westchase Center, 10777 Westheimer Road, Suite 925, Houston, TX 77042

Mr. Jason Ybarra, Waste Section Manager, TCEQ Region 12 Office, Houston

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Bryan W. Shaw, Ph.D., *Chairman*
Buddy Garcia, *Commissioner*
Carlos Rubinstein, *Commissioner*
Mark R. Vickery, P.G., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

November 3, 2009

Mr. Don Holloway, P. E.
Environmental Manager
Equistar Chemicals, LP
P. O. Box 777
Channelview, TX 77530-0777

Re: Proof of Filing Institutional Controls
For OP-I & OP-II Aeration Basin (TCEQ Permit Unit Nos. 16 & 17, respectively)
Equistar Chemicals, L. P., Channelview Complex, Channelview, TX
Hazardous Waste Permit No. 50117
Industrial Solid Waste Registration No. 30030
EPA Identification No. TXD858275769
ARTS ID# 112868623-2; RN100542281/CN600124705

Dear Mr. Holloway:

The Texas Commission on Environmental Quality (TCEQ) received your letter dated October 16, 2009, regarding the proof of filing institutional controls for the OP-I & OP-II Aeration Basins (TCEQ Permitted Unit Nos. 16 & 17, respectively). The Deed Notices filed restrict the future land use of the affected property to Commercial/Industrial uses.

Based on our review of the submittal, the TCEQ concurs that the institutional control requirements of 30 Texas Administrative Code (TAC) §350.111 have been completed. The institutional control was filed in accordance with Permit Provision VII.D.3 and 30 TAC §350.31(g) to note commercial land use is in effect for Remedy A. Therefore, no further action is required.

Please be aware that it is the continuing obligation of persons associated with a site to ensure that municipal hazardous waste and industrial solid waste are managed in a manner which does not cause the discharge or imminent threat of discharge of waste into or adjacent to waters in the state, a nuisance, or the endangerment of the public health and welfare as required by 30 TAC §335.4. If the actual response action fails to comply with these requirements, please take any necessary and authorized action to correct such conditions.

Questions concerning this letter should be directed to me at (512) 239-5454. When responding by mail, please include mail code MC 130 in the mailing address. The information in the reference block should be included in all submittals.

Sincerely,

Sarah A. Schreier, P.G., Project Manager
Industrial & Hazardous Waste Permits Section
Waste Permits Division

SS/sm

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06/06/2014 RP2 $420.00

18.
North
340.02

Texas Risk Reduction Program
Deed Notice

STATE OF TEXAS §
§
COUNTY OF HARRIS §

W

This notice is filed to provide information concerning certain environmental conditions and/or use limitation pursuant to the Texas Commission on Environmental Quality (TCEQ) Texas Risk Reduction Program (TRRP) rule found at 30 Texas Administrative Code (TAC), Chapter 350, and affects the real property (Property) described as follows:

> The legal description of the entire facility is documented in Exhibit A and is attached hereto and incorporated herein by reference as Exhibit A. The facility is utilized as commercial / Industrial land use.

Portions of the groundwater of the Property contain certain identified chemicals of concern (COCs) causing those portions of the property to be considered an Affected Property as that term is defined in TRRP. The portion considered to be Affected Property is described as follows:

> The Affected Property legal description is documented in Exhibit B and is attached hereto and incorporated herein by reference as Exhibit B.

Notice is required for the following reasons:

The Affected Property is subject to the TRRP requirements for properties with an area overlying a TCEQ-approved plume management zone. A plume management zone is defined as an area of groundwater containing concentrations of COCs exceeding the TCEQ-approved protective concentration levels, plus any additional area allowed by the TCEQ in accordance with 30 TAC §350.33(f)(4). Four plume management zones were established so that the COCs in the groundwater are managed such that human exposure is prevented and other groundwater resources are protected. Exhibit C depicts the location, COCs, Protective Concentration Exceedance (PCLE) Zones, Attenuation Monitoring Point (AMP) wells, Alternate Point of Exposure (APOE) wells and plume management zones. Exposure to groundwater within the PMZs for any purpose is not advised until such time when all of the COCs no longer exceed their respective protective concentration levels. As described in the Response Action Plan (RAP) dated March 21, 2013, no maintenance or monitoring of these plume management zones will be conducted. This deed notice must not be removed or modified without prior approval from TCEQ.

The Affected Property is subject to the TRRP requirements for properties containing concentrations of COCs in soil and is subject to the requirements in 30 TAC §350.33(e)(2) to prevent exposure to soils that contain COCs in excess of the protective concentration level. The attached Exhibit D describes and provides the location of the physical controls and extent of the soil that exceeds the TCEQ-approved protective concentration levels for certain COCs. The attached Exhibit D also describes the required maintenance and monitoring required for the physical controls. This program must be implemented unless and until TCEQ approves any modification. This deed notice must not be removed or modified without prior approval from TCEQ.

UNOFFICIAL COPY

RP-06-14-2488

As of the date of this Notice, the record owner of fee title to the Property is Equistar Chemicals, LP, 8280 Sheldon Road, Channelview, Texas 77530.

For additional information contact:

TCEQ		Mail:	TCEQ-MC199
Central Records			P.O. Box 13087
12100 Park 35 Circle, Building E			Austin, Texas 78711-3087

TCEQ Program: Corrective Action – Remediation Division
Identifier No.: EPA ID No. TXD058275769 / Industrial SWR No. 30030

This notice may be rendered of no further force or effect only by a superseding deed notice executed by the TCEQ or its successor agencies and filed in the same Real Property Records as those in which this Deed Notice is filed.

Executed this 4th day of April, 2014

By: Courtney Ruth

Name: Courtney Ruth

Title: EVO Site Manager

STATE OF TEXAS

HARRIS COUNTY

BEFORE ME, on this the 4th day of April personally appeared Mr. Courtney Ruth, Plant Manager, Equistar Chemicals, LP, known to me to be the person whose name is subscribed to the foregoing instrument, and they acknowledged to me that they executed the same for the purposes and consideration therein expressed. for

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the 4th day of April, 2014

Notary Public in and for the State of Texas,
County of Cathey Kelley

My Commission Expires:

CATHEY SUE KELLEY NOTARY PUBLIC STATE OF TEXAS EXPIRES 10-8-2017

N
Ret

Brown & Caldwell
Attn: Manish Pawar
10777 Westheimer, Ste. 925
Houston, TX 77042

RP-051-24486

UNOFFICIAL COPY

Exhibit A

Equistar Chemicals, LP's Legal Description

UNOFFICIAL COPY

RP 051-74-2490

Legal Description

A 1246.30 acre tract in the A. White Survey, Abstract No. 81, The M. Stroin Survey, Abstract No. 1559, the A. Peterson Survey, Abstract No. 1530, Harris County, Texas

Being a 1246.30 acre tract of land in the Amy White Survey, Abstract No. 81, the Michael Stroin Survey, Abstract No. 1559, and the August Peterson Survey, Abstract No. 1530 all in Harris County, Texas and being a tract of land sold to Atlantic Richfield Company as described in Deed recorded under Harris County Clerk's File No. E 237928 and also a portion of that land described in deed recorded in Volume 3012, Page 167 of the Harris County Deed Records and a portion of those lands described in deed recorded under the following Harris County Clerk's File Numbers: D 962902, D 962903, D 962905, D 962906, E 140826, E 237982.

RP-091-24-2491

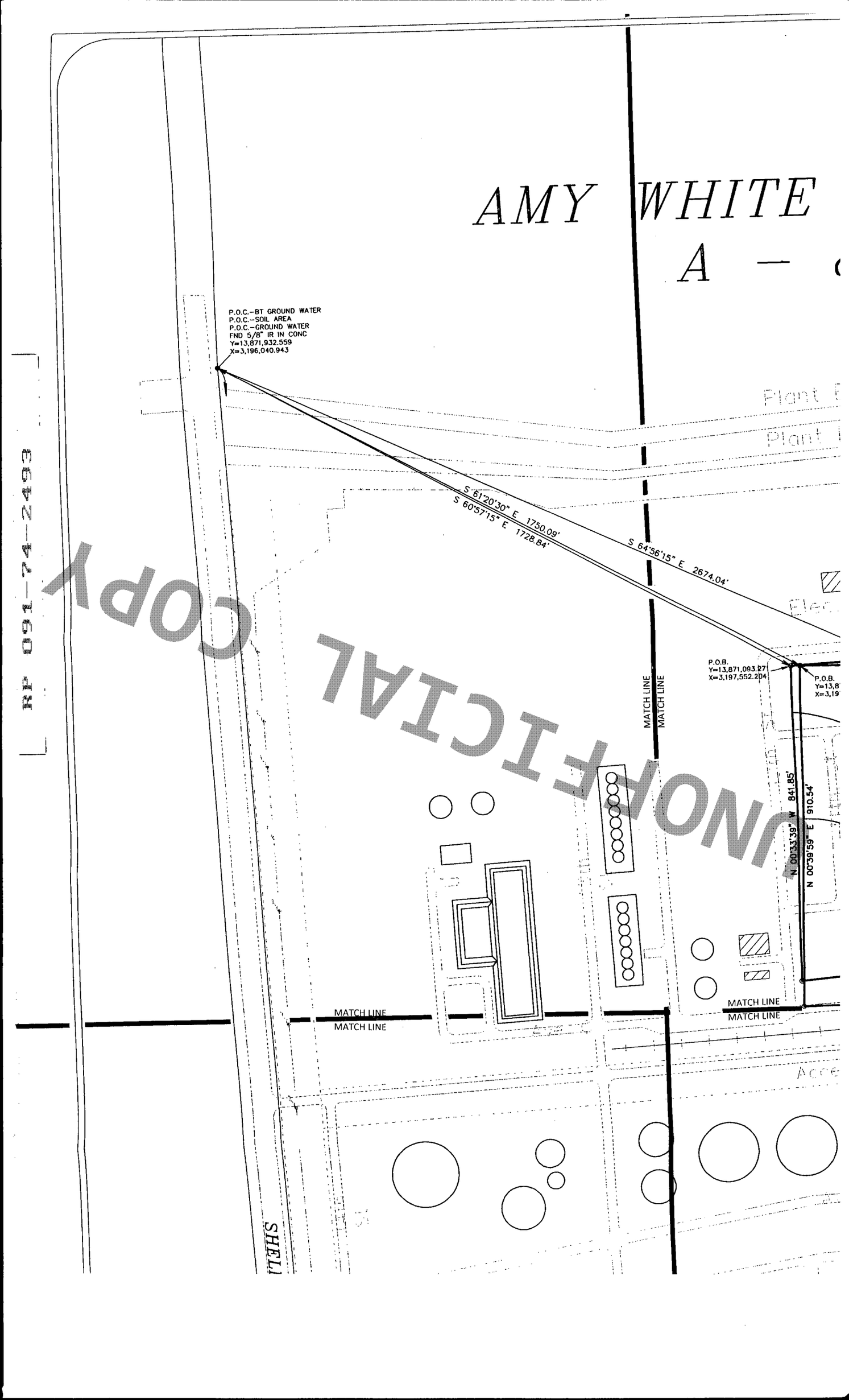
UNOFFICIAL COPY

Exhibit B

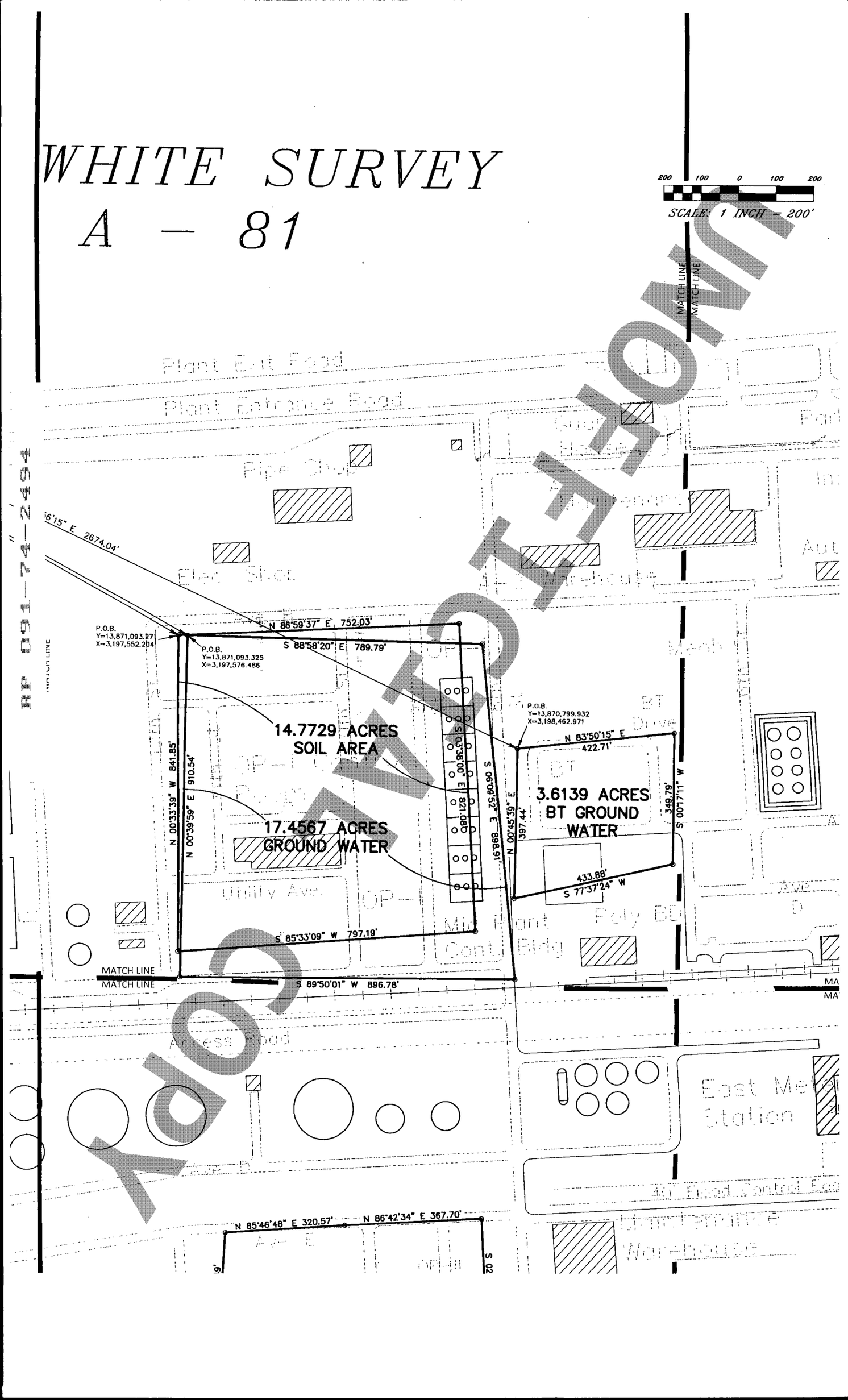
Affected Property Legal Description

UNOFFICIAL COPY

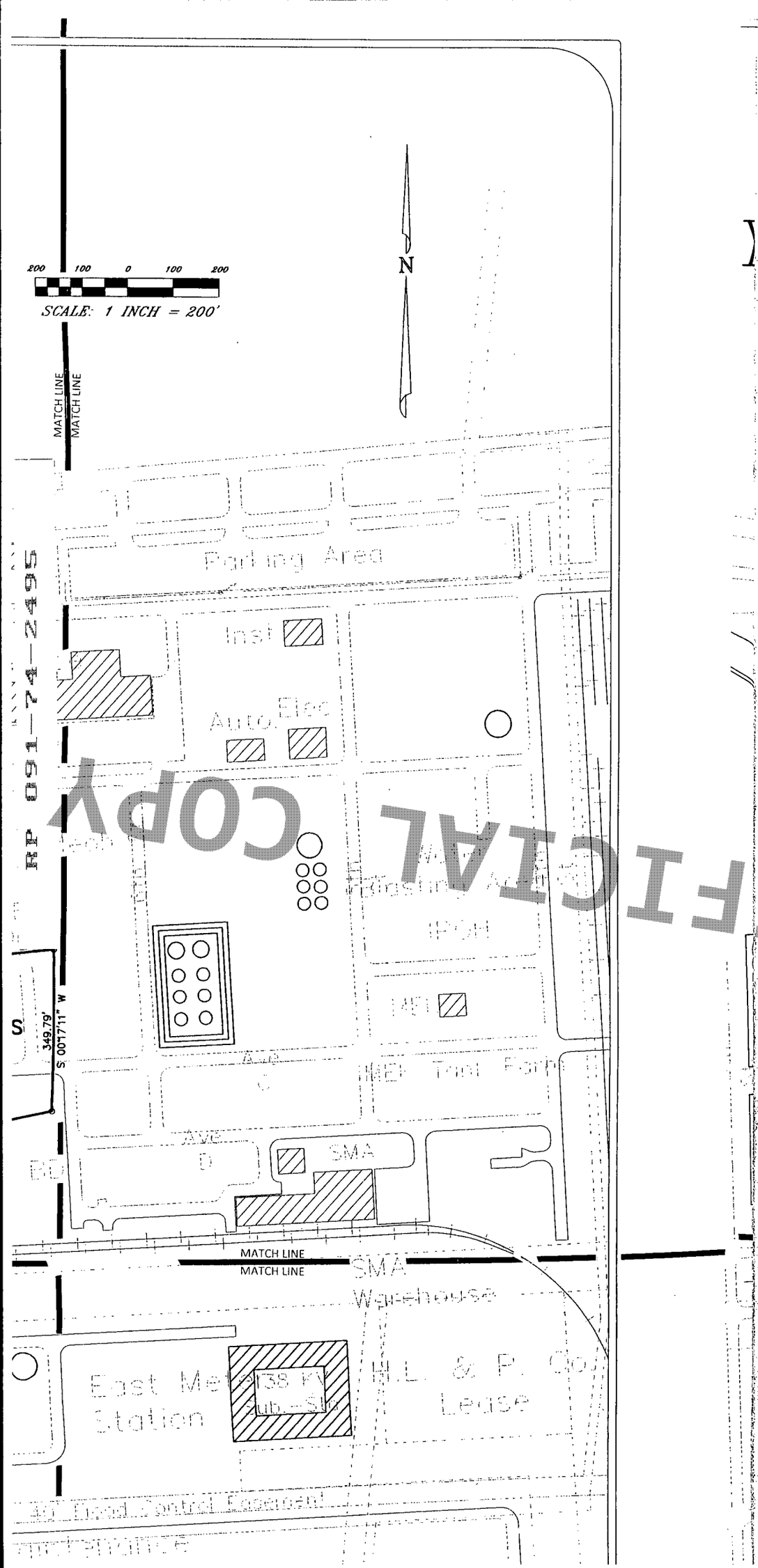
RP 09-74-2492


AMY WHITE
A —
P.O.C.–BT GROUND WATER
P.O.C.–SOIL AREA
P.O.C.–GROUND WATER
FND 5/8" IR IN CONC
Y=13,871,932.559
X=3,196,040.943
S 61°20'30" E 1750.09'
S 60°57'15" E 1728.84'
S 64°56'15" E 2674.04'
P.O.B.
Y=13,871,093.27
X=3,197,552.204
MATCH LINE
MATCH LINE
N 00°33'39" W 841.85'
N 00°39'59" E 910.54'
MATCH LINE
MATCH LINE
MATCH LINE
MATCH LINE
SHELL
UNOFFICIAL COPY
21-24-1691 SR

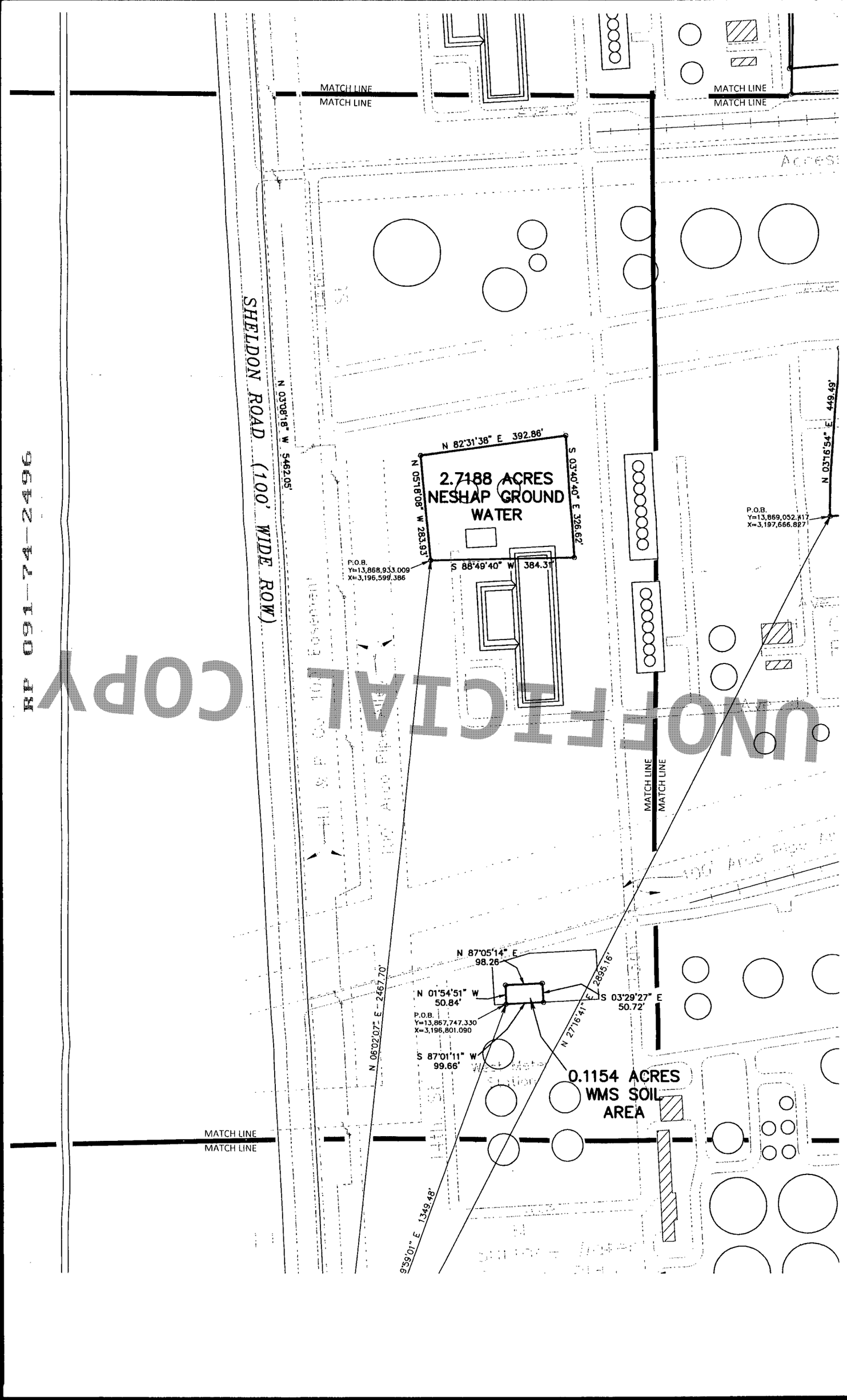
WHITE SURVEY
A – 81

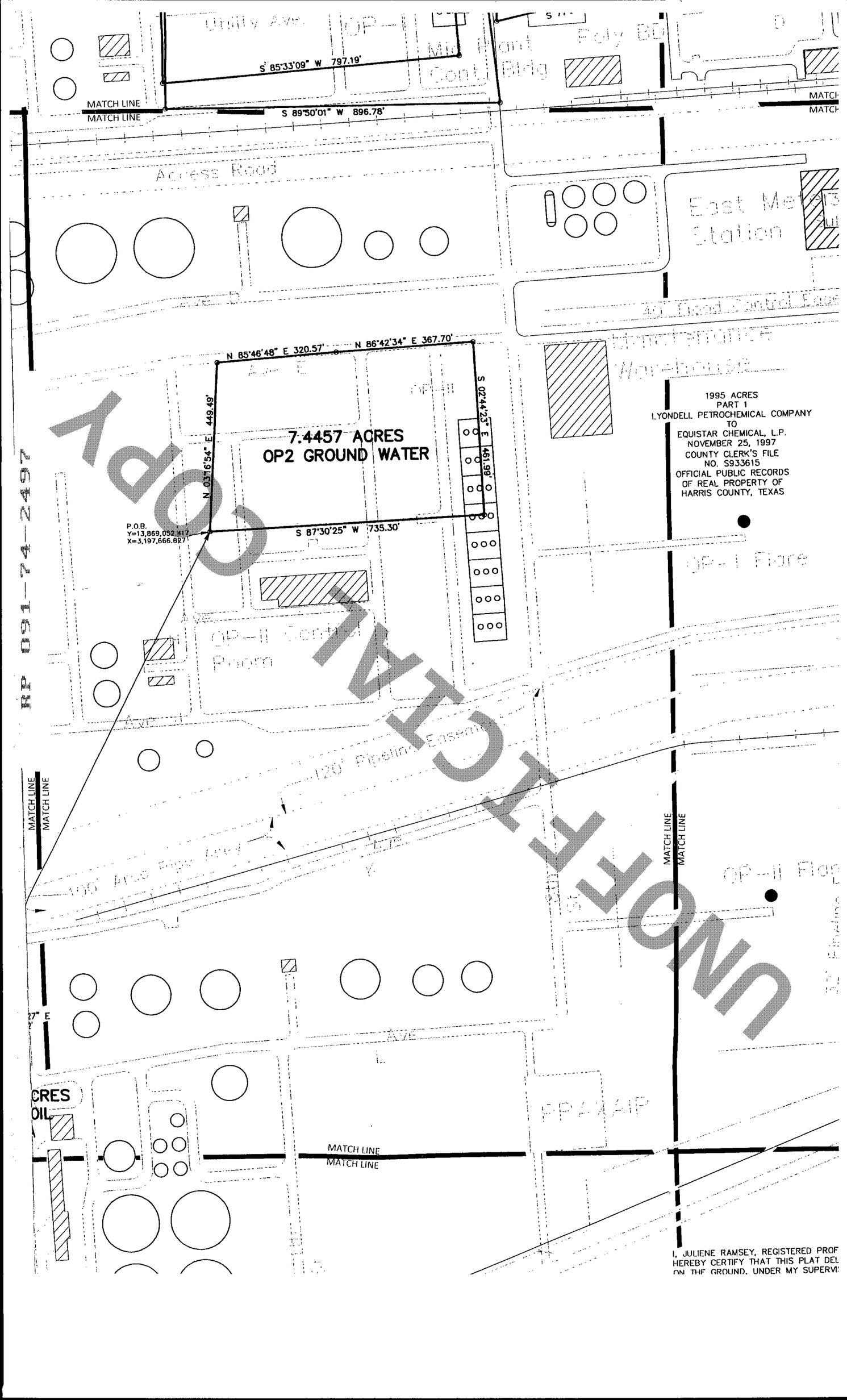


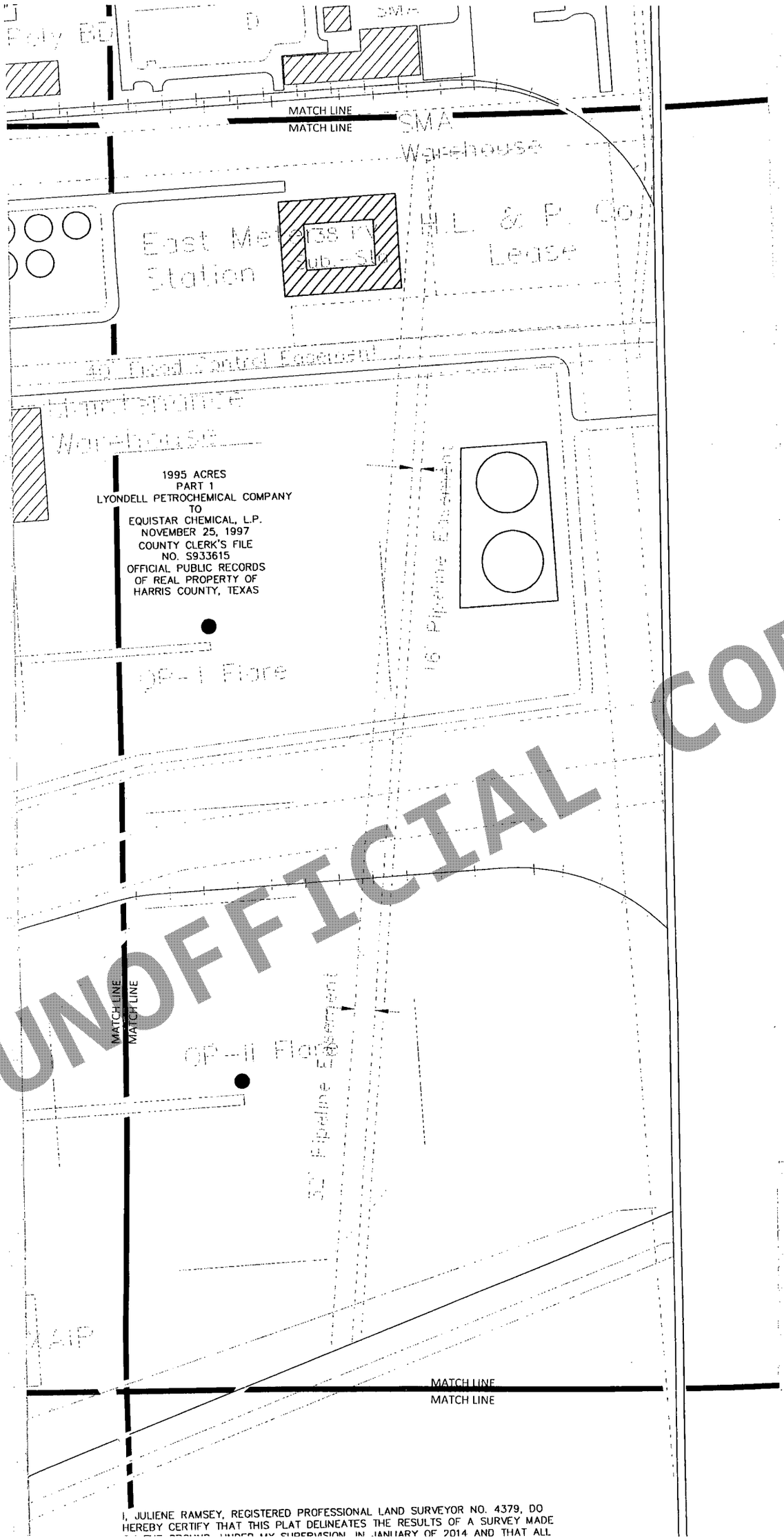
COPY NOT OFFICIAL



UNOFFICIAL COPY


MATCH LINE
MATCH LINE
MATCH LINE
MATCH LINE
SHELDON ROAD (100' WIDE ROW)
N 03°08'18" W 5462.05'
N 82°31'38" E 392.86'
S 03°40'40" E 326.62'
N 05°18'08" W 283.93'
2.7188 ACRES
NESHAP GROUND
WATER
P.O.B.
Y=13,868,933.009
X=3,196,599.386
S 88°49'40" W 384.31'
P.O.B.
Y=13,869,052.417
X=3,197,666.827
N 03°16'54" E 449.49'
MATCH LINE
MATCH LINE
N 87°05'14" E
98.26
N 01°54'51" W
50.84'
P.O.B.
Y=13,867,747.330
X=3,196,801.090
S 87°01'11" W
99.66'
S 03°29'27" E
50.72'
N 27°16'41" E 2895.16'
N 06°02'07" E 2467.70'
0.1154 ACRES
WMS SOIL
AREA
MATCH LINE
MATCH LINE
S 59°01" E 1349.48'
UNOFFICIAL COPY
181-247-1696

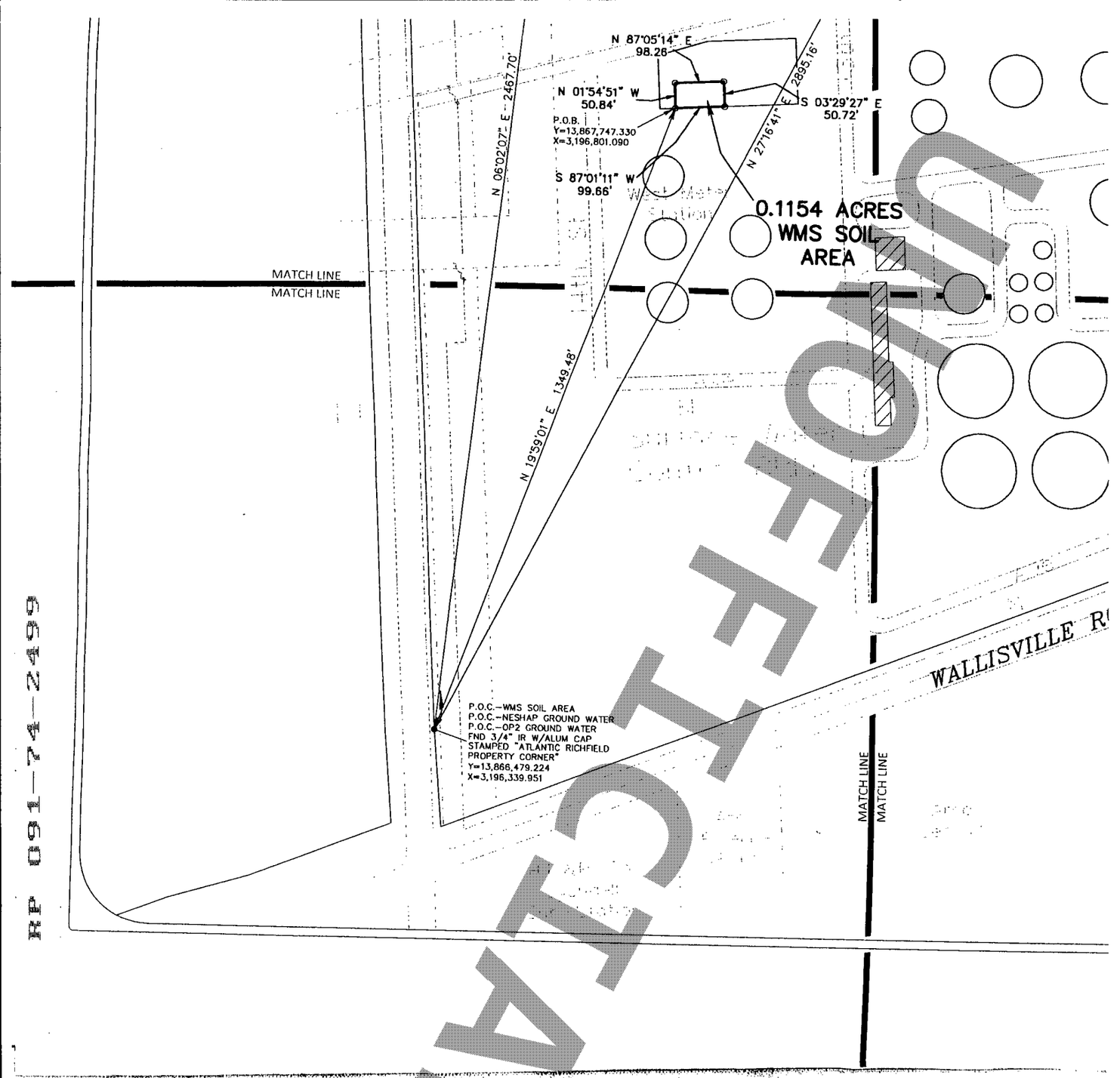

S 85°33'09" W 797.19'
S 89°50'01" W 896.78'
MATCH LINE
MATCH LINE
Access Road
Ave D
N 85°46'48" E 320.57'
N 86°42'34" E 367.70'
S 02°44'23" E 461.98'
N 03°16'54" E 449.49'
7.4457 ACRES
OP2 GROUND WATER
P.O.B.
Y=13,869,052.617
X=3,197,666.827
S 87°30'25" W 735.30'
1995 ACRES
PART 1
LYONDELL PETROCHEMICAL COMPANY
TO
EQUISTAR CHEMICAL, L.P.
NOVEMBER 25, 1997
COUNTY CLERK'S FILE
NO. S933615
OFFICIAL PUBLIC RECORDS
OF REAL PROPERTY OF
HARRIS COUNTY, TEXAS
Ave E
Ave L
120' Pipeline Easement
100' Ave Easement
RP 091-74-2497
UNOFFICIAL COPY



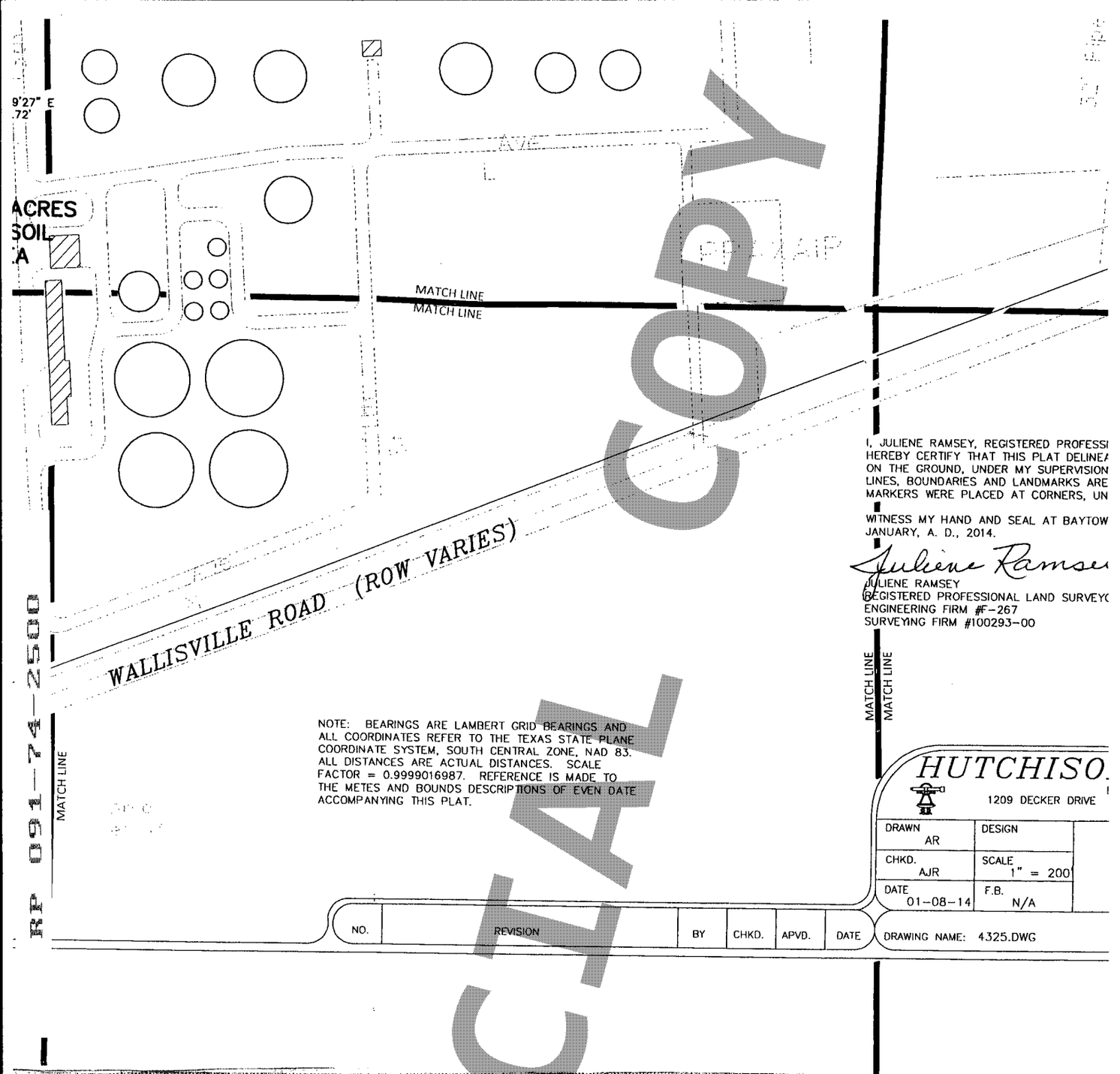
I, JULIENE RAMSEY, REGISTERED PROFESSIONAL LAND SURVEYOR NO. 4379, DO HEREBY CERTIFY THAT THIS PLAT DELINEATES THE RESULTS OF A SURVEY MADE

UNOFFICIAL COPY

Feb 05 14 02:49p



UNOFFICIAL COPY



I, JULIENE RAMSEY, REGISTERED PROFESSI
HEREBY CERTIFY THAT THIS PLAT DELINEA
ON THE GROUND, UNDER MY SUPERVISION
LINES, BOUNDARIES AND LANDMARKS ARE
MARKERS WERE PLACED AT CORNERS, UN

WITNESS MY HAND AND SEAL AT BAYTOW
JANUARY, A. D., 2014.

Juliene Ramsey

JULIENE RAMSEY
REGISTERED PROFESSIONAL LAND SURVEYO
ENGINEERING FIRM #F-267
SURVEYING FIRM #100293-00

NOTE: BEARINGS ARE LAMBERT GRID BEARINGS AND ALL COORDINATES REFER TO THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 83. ALL DISTANCES ARE ACTUAL DISTANCES. SCALE FACTOR = 0.9999016987. REFERENCE IS MADE TO THE METES AND BOUNDS DESCRIPTIONS OF EVEN DATE ACCOMPANYING THIS PLAT.

HUTCHISO

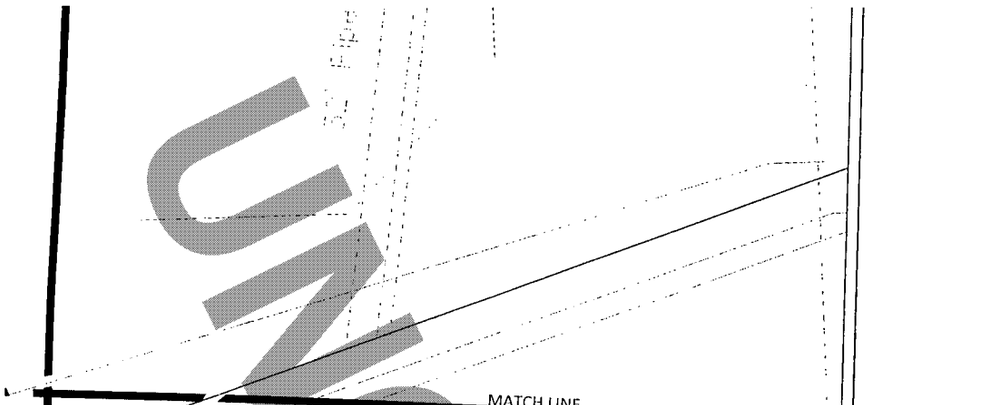
1209 DECKER DRIVE

DRAWN AR	DESIGN
CHKD. AJR	SCALE 1" = 200'
DATE 01-08-14	F.B. N/A

NO.	REVISION	BY	CHKD.	APVD.	DATE

DRAWING NAME: 4325.DWG

UNOFFICIAL COPY



I, JULIENE RAMSEY, REGISTERED PROFESSIONAL LAND SURVEYOR NO. 4379, DO HEREBY CERTIFY THAT THIS PLAT DELINEATES THE RESULTS OF A SURVEY MADE ON THE GROUND, UNDER MY SUPERVISION, IN JANUARY OF 2014 AND THAT ALL LINES, BOUNDARIES AND LANDMARKS ARE ACCURATELY SHOWN HEREON. NO MARKERS WERE PLACED AT CORNERS, UNLESS NOTED HEREON.

IESS MY HAND AND SEAL AT BAYTOWN, TEXAS, THIS THE 9TH DAY OF JARY, A. D., 2014.

ulieve Ramsey

ENE RAMSEY
STERED PROFESSIONAL LAND SURVEYOR NO. 4379
NEERING FIRM #F-267
/EYING FIRM #100293-00

STATE OF TEXAS
REGISTERED
JULIENE RAMSEY
4379
PROFESSIONAL
LAND SURVEYOR

HUTCHISON & ASSOCIATES

ENGINEERS – SURVEYORS

1209 DECKER DRIVE BAYTOWN, TEXAS 77520

281-422-8213

RAWN AR	DESIGN	SURVEY OF 6 TRACTS FOR BROWN AND CALDWELL SITUATED IN THE AMY WHITE SURVEY, A – 81 HARRIS COUNTY, TEXAS
HKD. AJR	SCALE 1" = 200'	
ATE 01-08-14	F.B. N/A	
AWING NAME: 4325.DWG	JOB NO. 144325	SHEET 1 OF 1

UNOFFICIAL COPY

STATE OF TEXAS)
COUNTY OF HARRIS)
BT GROUND WATER SITE)

FIELD NOTES of a 3.6139 acre tract of land situated in the Amy White Survey, Abstract 81, Harris County, Texas and being out of and a part of that certain 1995 acres (Part 1) as conveyed by Lyondell Petrochemical Company to Equistar Chemical, L.P. by Deed dated November 25, 1997 and recorded under County Clerk's File No. S933615 of the Official Public Records of Real Property of Harris County, Texas. This 3.6139 acre tract of land is more particularly described by the following metes and bounds, to-wit:

NOTE: BEARINGS ARE LAMBERT GRID BEARINGS AND ALL COORDINATES REFER TO THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 83. ALL DISTANCES ARE ACTUAL DISTANCES. SCALE FACTOR = 0.9999016987. REFERENCE IS MADE TO THE PLAT OF EVEN DATE ACCOMPANYING THIS METES AND BOUNDS DESCRIPTION.

COMMENCING at a 5/8 inch iron rod in concrete found in the East right-of-way line of Sheldon Road (100 feet wide right-of-way) and a West line of said 1995 acres. Said COMMENCING POINT has a State Plane Coordinate Value of Y=13,871,932.559 and X=3,196,040.943.

THENCE: South 64°56'15" East for a distance of 2674.04 feet to a point for the Northwest corner and POINT OF BEGINNING of this tract. Said BEGINNING POINT has a State Plane Coordinate Value of Y=13,870,799.932 and X=3,198,462.971.

THENCE: North 83°50'15" East along the North line of this tract for a distance of 422.71 feet to a point for the Northeast corner of this tract.

THENCE: South 00°17'11" West along the East line of this tract for a distance of 349.79 feet to a point for the Southeast corner of this tract.

THENCE: South 77°37'24" West along the South line of this tract for a distance of 433.88 feet to a point for the Southwest corner of this tract.

UNOFFICIAL COPY

RP-2014-25052

THENCE: North 00°45'39" East along the West line of this tract for a distance of 397.44 feet to the PLACE OF BEGINNING and containing within these boundaries 3.6139 acres of land.

SURVEYOR'S CERTIFICATE

I, Juliene Ramsey, Registered Professional Land Surveyor No. 4379, do hereby certify that the foregoing field notes were prepared from an actual survey made on the ground, under my supervision, in January of 2014 and that all lines, boundaries and landmarks are accurately described therein. No markers were placed at property corners, unless noted herein.

WITNESS my hand and seal at Baytown, Texas, this the 9th day of January, A. D., 2014.

Juliene Ramsey

Juliene Ramsey
Registered Professional Land Surveyor No. 4379
14-4325.BT.GROUND.WATER.SITE.fdn.doc
Hutchison & Associates, Inc.
Engineering Firm #F-267
Surveying Firm #100293-00



UNOFFICIAL COPY

RP 054-25-03

STATE OF TEXAS)
COUNTY OF HARRIS)
GROUND WATER SITE)

FIELD NOTES of a 17.4567 acre tract of land situated in the Amy White Survey, Abstract 81, Harris County, Texas and being out of and a part of that certain 1995 acres (Part 1) as conveyed by Lyondell Petrochemical Company to Equistar Chemical, L.P. by Deed dated November 25, 1997 and recorded under County Clerk's File No. S933615 of the Official Public Records of Real Property of Harris County, Texas. This 17.4567 acre tract of land is more particularly described by the following metes and bounds, to-wit:

NOTE: BEARINGS ARE LAMBERT GRID BEARINGS AND ALL COORDINATES REFER TO THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 83. ALL DISTANCES ARE ACTUAL DISTANCES. SCALE FACTOR = 0.9999016987. REFERENCE IS MADE TO THE PLAT OF EVEN DATE ACCOMPANYING THIS METES AND BOUNDS DESCRIPTION.

COMMENCING at a 5/8 inch iron rod in concrete found in the East right-of-way line of Sheldon Road (100 feet wide right-of-way) and a West line of said 1995 acres. Said COMMENCING POINT has a State Plane Coordinate Value of Y=13,871,932.559 and X=3,196,040.943.

THENCE: South 61°20'30" East for a distance of 1750.09 feet to a point for the Northwest corner and POINT OF BEGINNING of this tract. Said BEGINNING POINT has a State Plane Coordinate Value of Y=13,871,093.325 and X=3,197,576.486.

THENCE: South 88°58'20" East along the North line of this tract for a distance of 789.79 feet to a point for the Northeast corner of this tract.

THENCE: South 06°09'52" East along the East line of this tract for a distance of 898.91 feet to a point for the Southeast corner of this tract.

THENCE: South 89°50'01" West along the South line of this tract for a distance of 896.78 feet to a point for the Southwest corner of this tract.

UNOFFICIAL COPY

RP 091-74-2504

THENCE: North 00°39'59" East along the West line of this tract for a distance of 910.54 feet to the PLACE OF BEGINNING and containing within these boundaries 17.4567 acres of land.

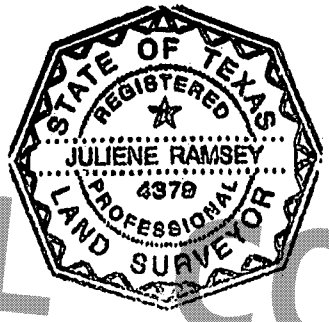
SURVEYOR'S CERTIFICATE

I, Juliene Ramsey, Registered Professional Land Surveyor No. 4379, do hereby certify that the foregoing field notes were prepared from an actual survey made on the ground, under my supervision, in January of 2014 and that all lines, boundaries and landmarks are accurately described therein. No markers were placed at property corners, unless noted herein.

WITNESS my hand and seal at Baytown, Texas, this the 9th day of January, A. D., 2014.

Juliene Ramsey

Juliene Ramsey
Registered Professional Land Surveyor No. 4379
14-4325.GROUND.WATER.SITE.fdn.doc
Hutchison & Associates, Inc.
Engineering Firm #F-267
Surveying Firm #100293-00



UNOFFICIAL COPY

FB 3941-25-25

STATE OF TEXAS)
COUNTY OF HARRIS)
SOIL AREA SITE)

FIELD NOTES of a 14.7729 acre tract of land situated in the Amy White Survey, Abstract 81, Harris County, Texas and being out of and a part of that certain 1995 acres (Part 1) as conveyed by Lyondell Petrochemical Company to Equistar Chemical, L.P. by Deed dated November 25, 1997 and recorded under County Clerk's File No. S933615 of the Official Public Records of Real Property of Harris County, Texas. This 14.7729 acre tract of land is more particularly described by the following metes and bounds, to-wit:

NOTE: BEARINGS ARE LAMBERT GRID BEARINGS AND ALL COORDINATES REFER TO THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 83. ALL DISTANCES ARE ACTUAL DISTANCES. SCALE FACTOR = 0.9999016987. REFERENCE IS MADE TO THE PLAT OF EVEN DATE ACCOMPANYING THIS METES AND BOUNDS DESCRIPTION.

COMMENCING at a 5/8 inch iron rod in concrete found in the East right-of-way line of Sheldon Road (100 feet wide right-of-way) and a West line of said 1995 acres. Said COMMENCING POINT has a State Plane Coordinate Value of Y=13,871,932.559 and X=3,196,040.943.

THENCE: South 60°57'15" East for a distance of 1728.84 feet to a point for the Northwest corner and POINT OF BEGINNING of this tract. Said BEGINNING POINT has a State Plane Coordinate Value of Y=13,871,093.271 and X=3,197,552.204.

THENCE: North 86°59'37" East along the North line of this tract for a distance of 752.03 feet to a point for the Northeast corner of this tract.

THENCE: South 03°38'00" East along the East line of this tract for a distance of 821.08 feet to a point for the Southeast corner of this tract.

THENCE: South 85°33'09" West along the South line of this tract for a distance of 797.19 feet to a point for the Southwest corner of this tract.

RP-091-24-2506
UNOFFICIAL COPY

PAGE 2 - 14.7729 ACRES, SOIL AREA SITE.

THENCE: North 00°33'39" West along the West line of this tract for a distance of 841.85 feet to the PLACE OF BEGINNING and containing within these boundaries 14.7729 acres of land.

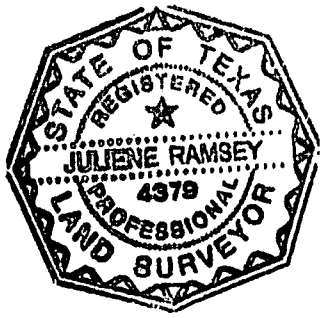
SURVEYOR'S CERTIFICATE

I, Juliene Ramsey, Registered Professional Land Surveyor No. 4379, do hereby certify that the foregoing field notes were prepared from an actual survey made on the ground, under my supervision, in January of 2014 and that all lines, boundaries and landmarks are accurately described therein. No markers were placed at property corners, unless noted herein.

WITNESS my hand and seal at Baytown, Texas, this the 9th day of January, A. D., 2014.

Juliene Ramsey

Juliene Ramsey
Registered Professional Land Surveyor No. 4379
14-4325.SOIL.AREA.SITE.fdn.doc
Hutchison & Associates, Inc.
Engineering Firm #F-267
Surveying Firm #100293-00



UNOFFICIAL COPY

RP 091-74-2507

STATE OF TEXAS)
COUNTY OF HARRIS)
OP2 GROUND WATER SITE)

FIELD NOTES of a 7.4457 acre tract of land situated in the Amy White Survey, Abstract 81, Harris County, Texas and being out of and a part of that certain 1995 acres (Part 1) as conveyed by Lyondell Petrochemical Company to Equistar Chemical, L.P. by Deed dated November 25, 1997 and recorded under County Clerk's File No. S933615 of the Official Public Records of Real Property of Harris County, Texas. This 7.4457 acre tract of land is more particularly described by the following metes and bounds, to-wit:

NOTE: BEARINGS ARE LAMBERT GRID BEARINGS AND ALL COORDINATES REFER TO THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 83. ALL DISTANCES ARE ACTUAL DISTANCES. SCALE FACTOR = 0.9999016987. REFERENCE IS MADE TO THE PLAT OF EVEN DATE ACCOMPANYING THIS METES AND BOUNDS DESCRIPTION.

COMMENCING at a 3/4 inch rod, with aluminum cap stamped "Atlantic Richfield Property Corner" found in the East right-of-way line of Sheldon Road (100 feet wide right-of-way) and a West line of said 1995 acres. Said COMMENCING POINT has a State Plane Coordinate Value of Y=13,866,479.224 and X=3,196,339.951.

THENCE: North 27°16'41" East for a distance of 2895.16 feet to a point for the Southwest corner and POINT OF BEGINNING of this tract. Said BEGINNING POINT has a State Plane Coordinate Value of Y=13,869,052.417 and X=3,197,666.827.

THENCE: North 03°16'54" East along the West line of this tract for a distance of 449.49 feet to a point for the Northwest corner of this tract.

THENCE: North 85°46'48" East along the North line of this tract for a distance of 320.57 feet to a point for an angle point in the North line of this tract.

THENCE: North 86°42'34" East along the North line of this tract for a distance of 367.70 feet to a point for the Northeast corner of this tract.

THENCE: South 02°44'23" East along the East line of this tract for a distance of 461.99 feet to a point for the Southeast corner of this tract.

RP 591-74-2508
UNOFFICIAL COPY

THENCE: South 87°30'25" West along the South line of this tract for a distance of 735.30 feet to the PLACE OF BEGINNING and containing within these boundaries 7.4457 acres of land.

SURVEYOR'S CERTIFICATE

I, Juliene Ramsey, Registered Professional Land Surveyor No. 4379, do hereby certify that the foregoing field notes were prepared from an actual survey made on the ground, under my supervision, in January of 2014 and that all lines, boundaries and landmarks are accurately described therein. No markers were placed at property corners, unless noted herein.

WITNESS my hand and seal at Baytown, Texas, this the 9th day of January, A. D., 2014.

Juliene Ramsey

Juliene Ramsey
Registered Professional Land Surveyor No. 4379
14-4325.OP2.GROUND.WATER.SITE.fdn.doc
Hutchison & Associates, Inc.
Engineering Firm #F-267
Surveying Firm #100293-00



UNOFFICIAL COPY

RP 054-24-2559

STATE OF TEXAS)
COUNTY OF HARRIS)
NESHAP GROUND WATER SITE)

FIELD NOTES of a 2.7188 acre tract of land situated in the Amy White Survey, Abstract 81, Harris County, Texas and being out of and a part of that certain 1995 acres (Part 1) as conveyed by Lyondell Petrochemical Company to Equistar Chemical, L.P. by Deed dated November 25, 1997 and recorded under County Clerk's File No. S933615 of the Official Public Records of Real Property of Harris County, Texas. This 2.7188 acre tract of land is more particularly described by the following metes and bounds, to-wit:

NOTE: BEARINGS ARE LAMBERT GRID BEARINGS AND ALL COORDINATES REFER TO THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 83. ALL DISTANCES ARE ACTUAL DISTANCES. SCALE FACTOR = 0.9999016987. REFERENCE IS MADE TO THE PLAT OF EVEN DATE ACCOMPANYING THIS METES AND BOUNDS DESCRIPTION.

COMMENCING at a 3/4 inch rod, with aluminum cap stamped "Atlantic Richfield Property Corner" found in the East right-of-way line of Sheldon Road (100 feet wide right-of-way) and a West line of said 1995 acres. Said COMMENCING POINT has a State Plane Coordinate Value of Y=13,866,479.224 and X=3,196,339.951.

THENCE: North 06°02'07" East for a distance of 2467.70 feet to a point for the Southwest corner and POINT OF BEGINNING of this tract. Said BEGINNING POINT has a State Plane Coordinate Value of Y=13,868,933.009 and X=3,196,599.386.

THENCE: North 05°18'08" West along the West line of this tract for a distance of 283.93 feet to a point for the Northwest corner of this tract.

THENCE: North 82°31'38" East along the North line of this tract for a distance of 392.86 feet to a point for the Northeast corner of this tract.

THENCE: South 03°40'40" East along the East line of this tract for a distance of 326.62 feet to a point for the Southeast corner of this tract.

UNOFFICIAL COPY

RP-2015-45210

THENCE: South 88°49'40" West along the South line of this tract for a distance of 384.31 feet to the PLACE OF BEGINNING and containing within these boundaries 2.7188 acres of land.

SURVEYOR'S CERTIFICATE

I, Juliene Ramsey, Registered Professional Land Surveyor No. 4379, do hereby certify that the foregoing field notes were prepared from an actual survey made on the ground, under my supervision, in January of 2014 and that all lines, boundaries and landmarks are accurately described therein. No markers were placed at property corners, unless noted herein.

WITNESS my hand and seal at Baytown, Texas, this the 9th day of January, A. D., 2014.

Juliene Ramsey

Juliene Ramsey
Registered Professional Land Surveyor No. 4379
14-4325.NESHAP.GROUND.WATER.SITE.fdn.doc
Hutchison & Associates, Inc.
Engineering Firm #F-267
Surveying Firm #100293-00



UNOFFICIAL COPY

RP 051-74-2511

Exhibit C

As described in the RAP and RACR groundwater monitoring at Equistar Chemicals, LP since 2007 has demonstrated that the groundwater PCLE Zones at the Site have limited ability to migrate and have generally remained stable or have decreased. Therefore, no monitoring and maintenance of Plume Management Zones will be conducted in accordance with the RAP and RACR.

List of Groundwater Figures

Figure Exhibit C-1 – Groundwater PCLE Zone/PMZ Map

Figure Exhibit C-2 – Groundwater PCLE Zone /PMZ Map Area I North/OP-1 Area

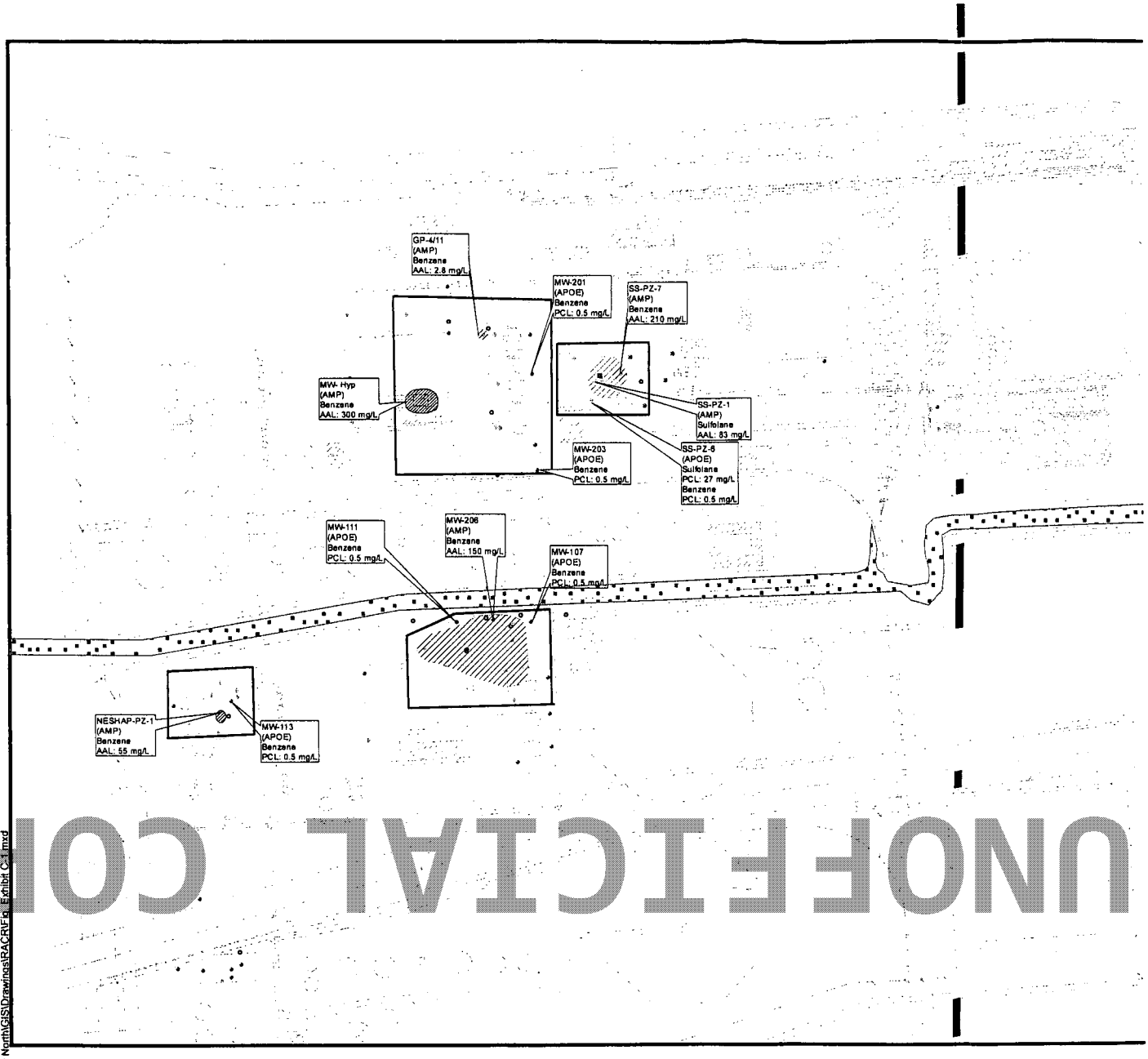
Figure Exhibit C-3 – Groundwater PCLE Zone/PMZ Map Area I South/OP-2 Area

Figure Exhibit C-4 – Groundwater PCLE Zone /PMZ Map Sulfolane Sump Area

Figure Exhibit C-5 – Groundwater PCLE Zone /PMZ Map NESHAP Area

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RE: 091-74-2512



UNOFFICIAL COPY

Legend

- Monitoring Well Transmissive Zone 1
- Monitoring Well Transmissive Zone 2
- Piezometer Transmissive Zone 1
- 2012 Estimated PCLE Zone for Benzene
- 2011 Estimated PCLE Zone for Sulfolane
- Assumed PCLE Zone for Benzene
- OP-1 Area
- Plume Management Zone
- Stormwater Ditch

MATCH LINE MATCH LINE

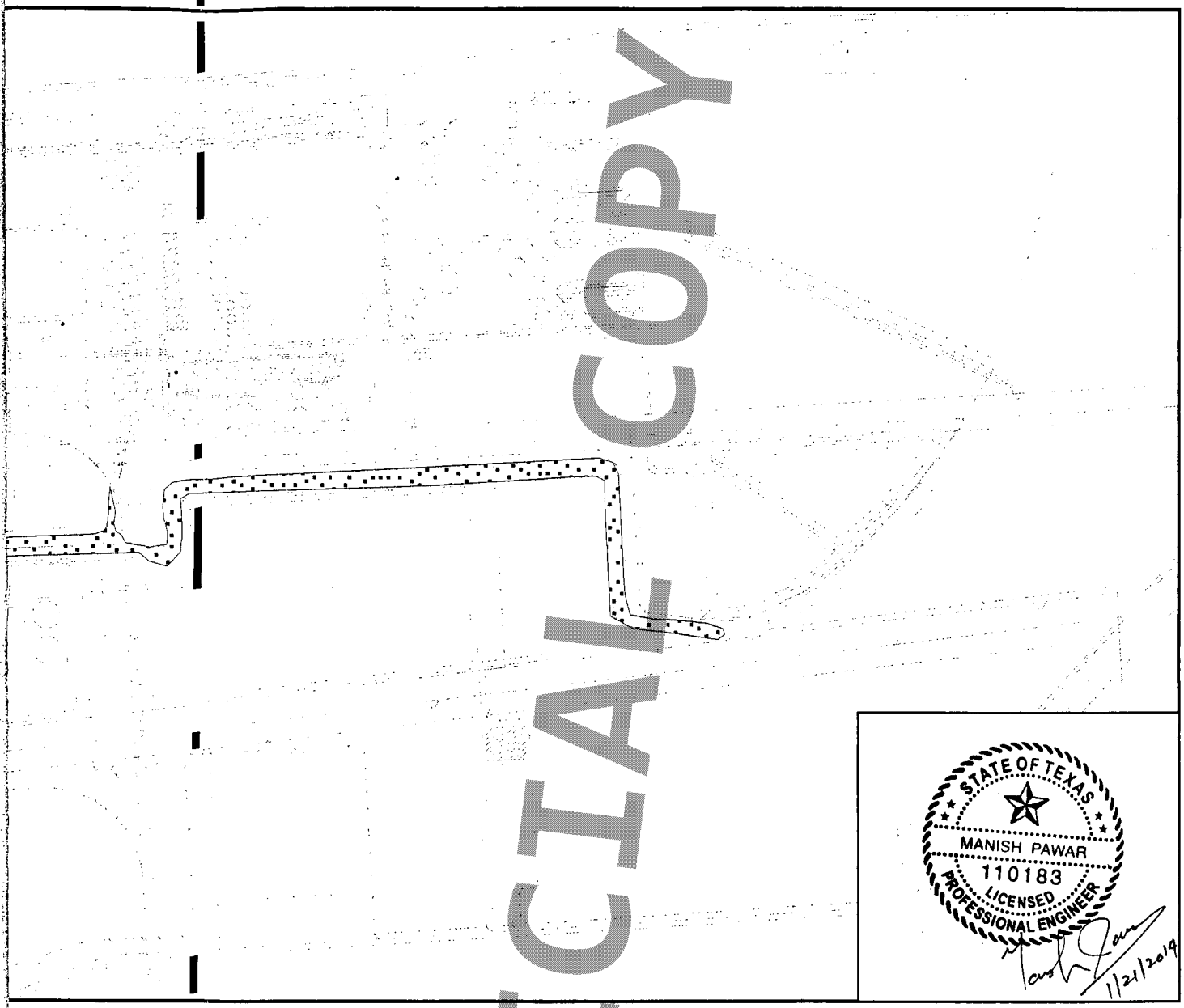
0 400 800 1,200

Path: P:\Lyondell\137194 - LyondellBasell Channelview North\GIS\Drawings\RACR\Exhibit C-1.mxd

Date: 1/14/2014

EPA-CD-14-2-2-15

UNOFFICIAL COPY



MATCH LINE

MATCH LINE

0 400 800 1,200 1,600 Feet

N

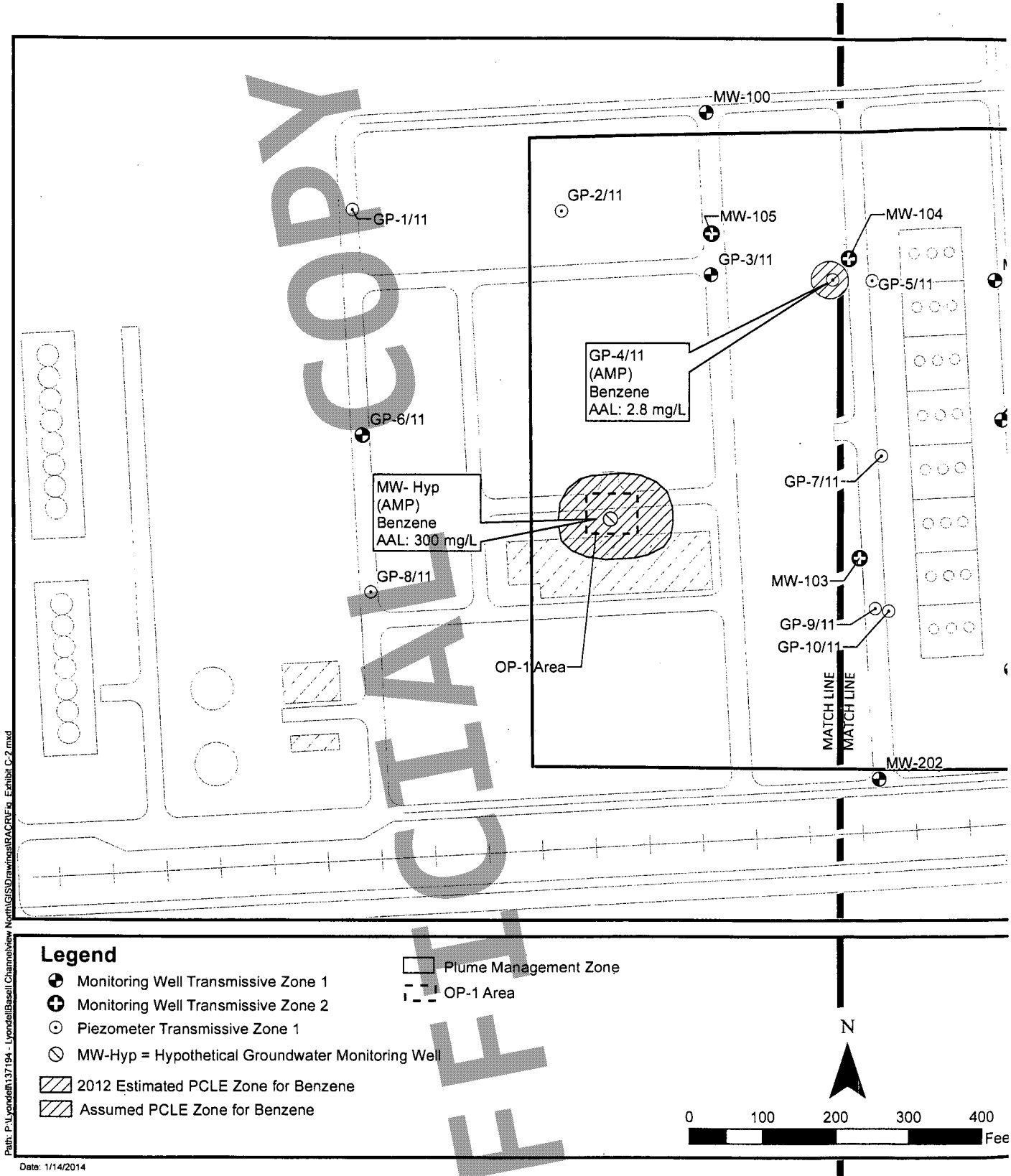
NOTES:
All values in mg/L.
Bold, underlined, and italicized values indicate Critical PCL exceedence.
J indicates estimated value.
NA indicates not analyzed.

FIGURE EXHIBIT C-1
Groundwater PCLE Zone / PMZ Map

Equistar Chemicals, LP.
Channelview Complex
Channelview, Texas

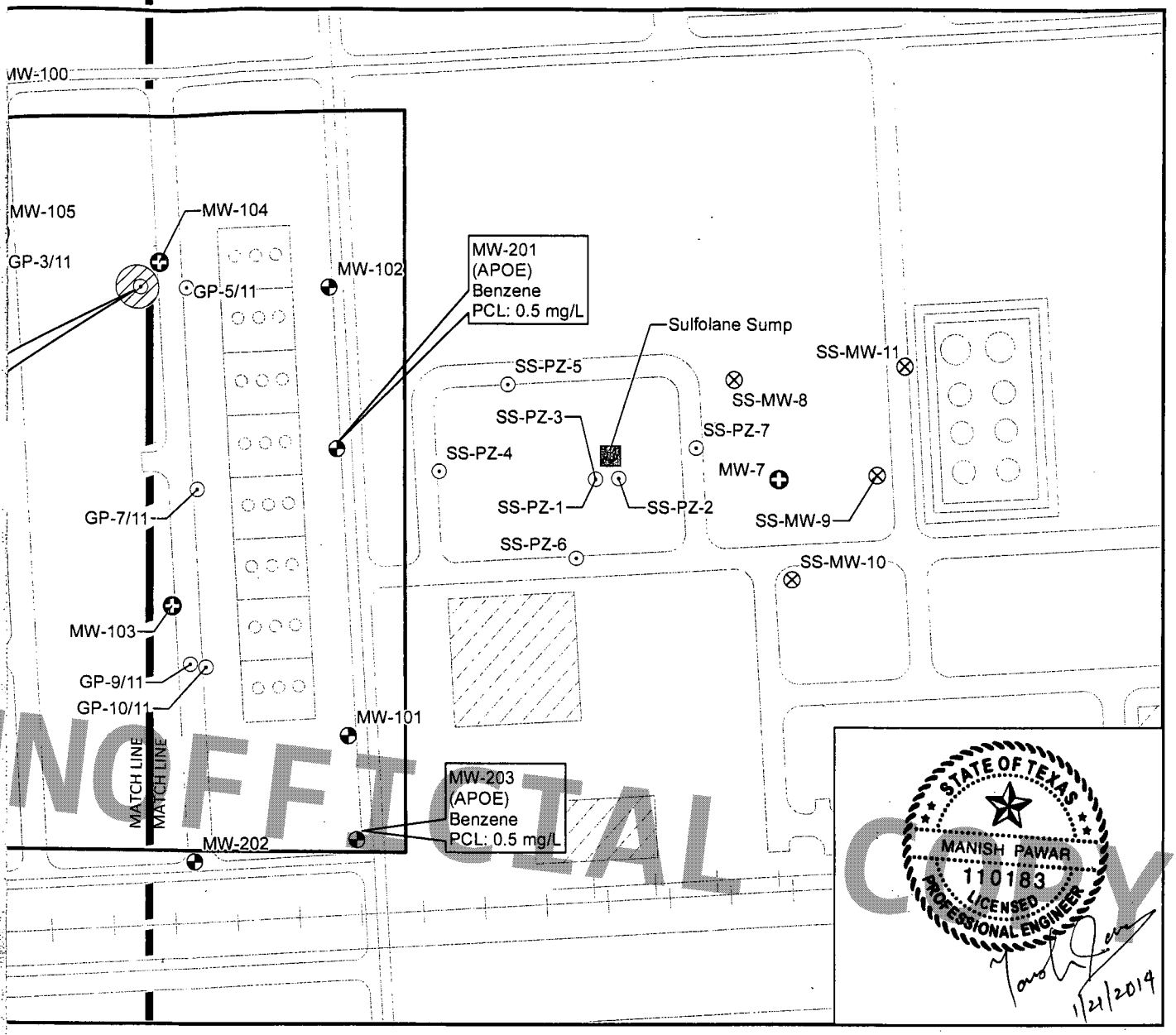
Brown AND Caldwell

FEB 05 15-7-2514



EPA 091-24-2515

OFFICIAL COPY
UNOFFICIAL



UNOFFICIAL COPY

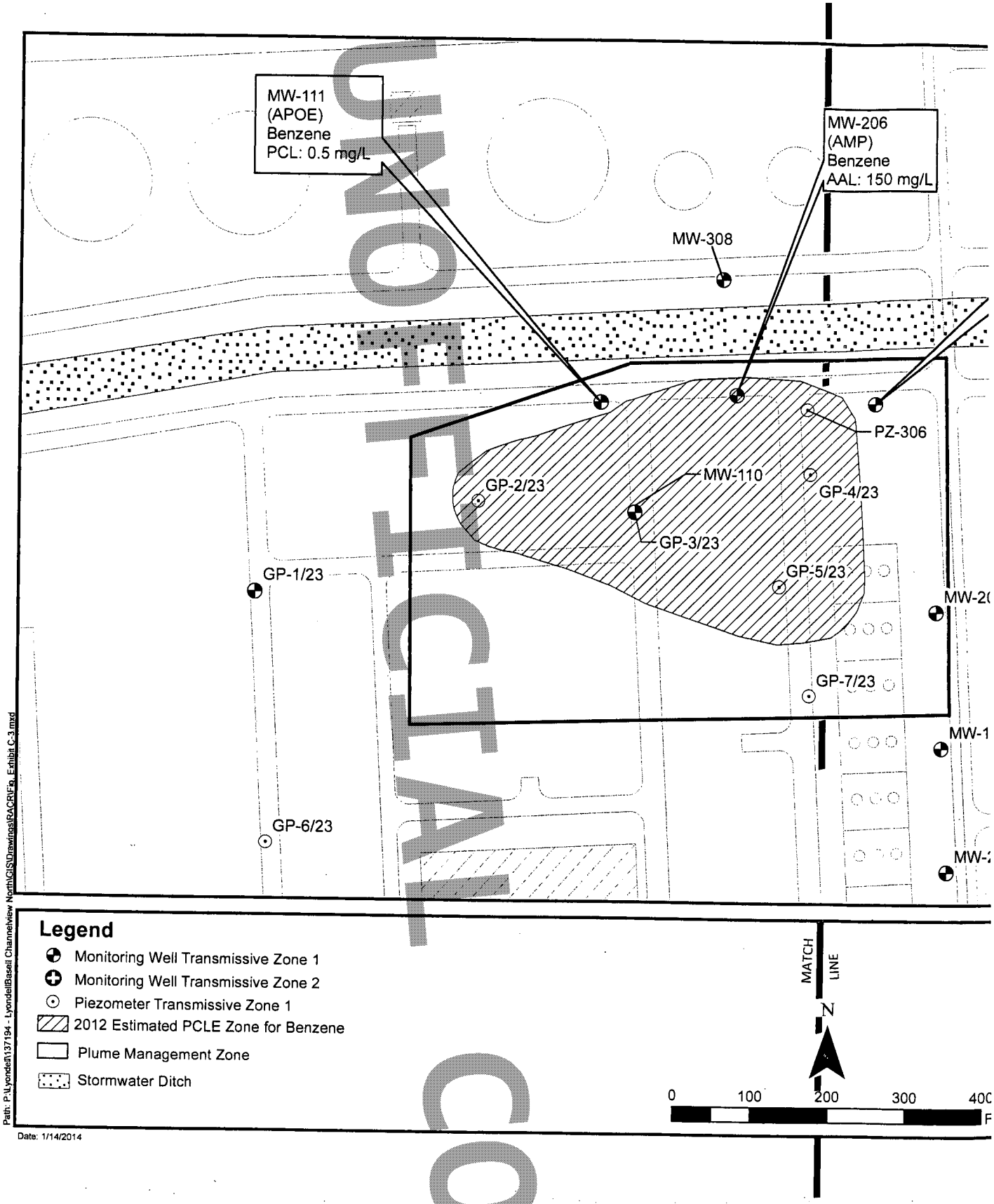
RP-09-1-2516

NOTES:
All values in mg/L.
Bold, underlined, and italicized values indicate Critical PCL exceedence.
J indicates estimated value.
NA indicates not analyzed.

FIGURE EXHIBIT C-2-
Groundwater PCLE
Zone / PMZ Map
Area I North / OP-1 Area

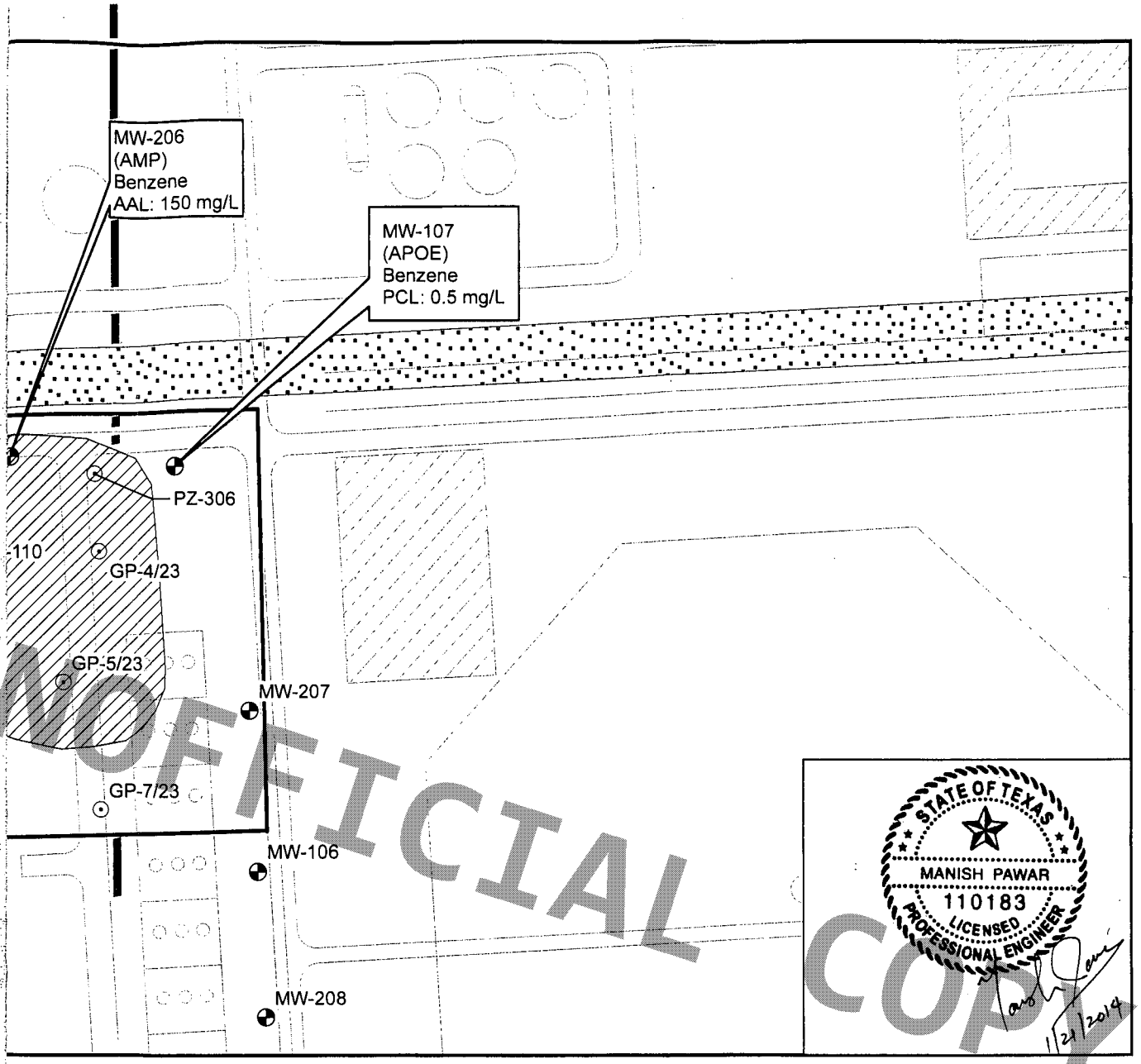
Equistar Chemicals, LP.
Channelview Complex
Channelview, Texas

Brown AND Caldwell



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RP-06-1-2547



UNOFFICIAL COPY

MATCH LINE

N

100 200 300 400 Feet

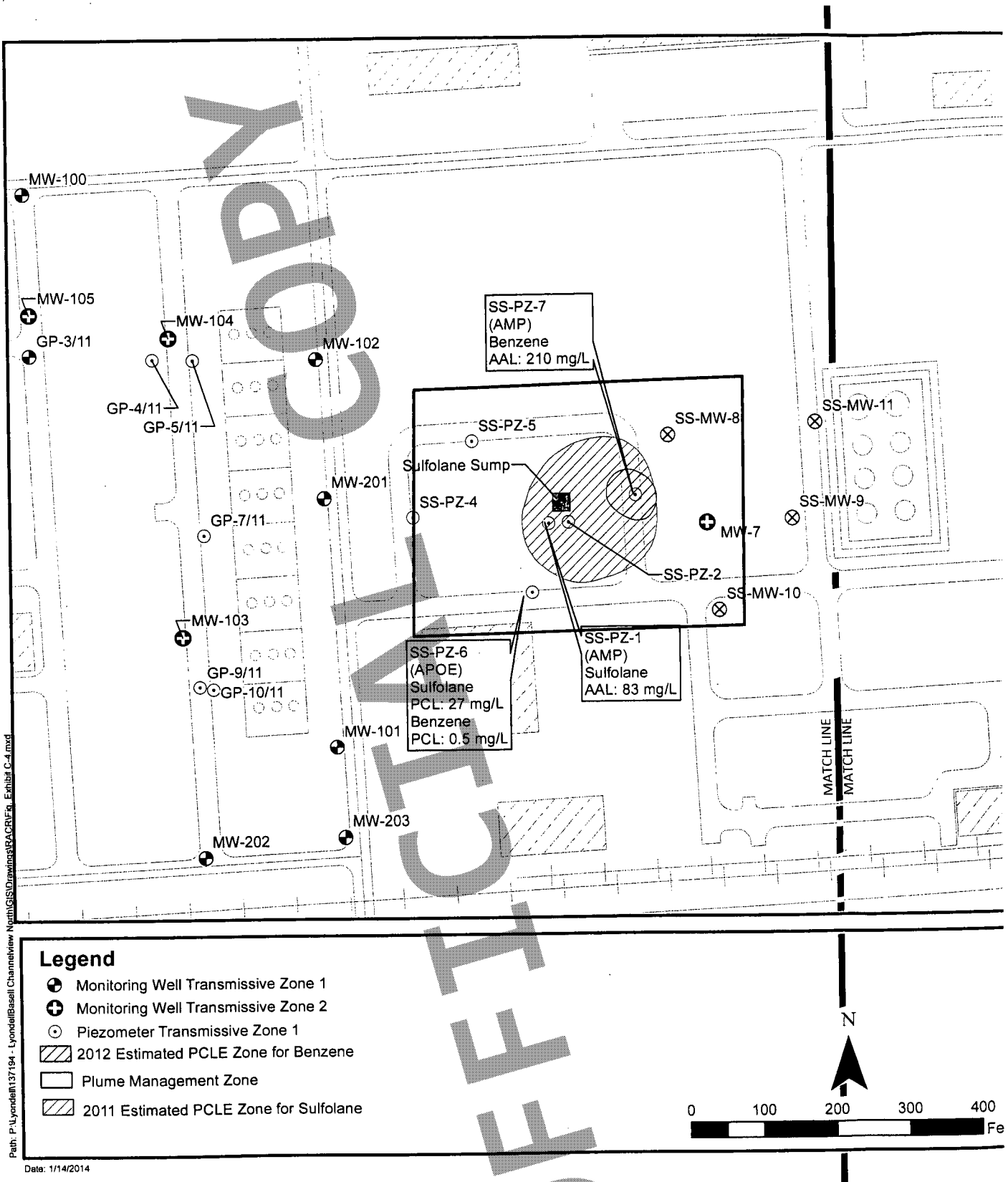
NOTES:
All values in mg/L.
Bold, underlined, and italicized values indicate Critical PCL exceedence.
J indicates estimated value.
NA indicates not analyzed.

FIGURE EXHIBIT C-3
Groundwater PCLE
Zone / PMZ Map
Area I South / OP-2 Area

Equistar Chemicals, LP.
Channelview Complex
Channelview, Texas

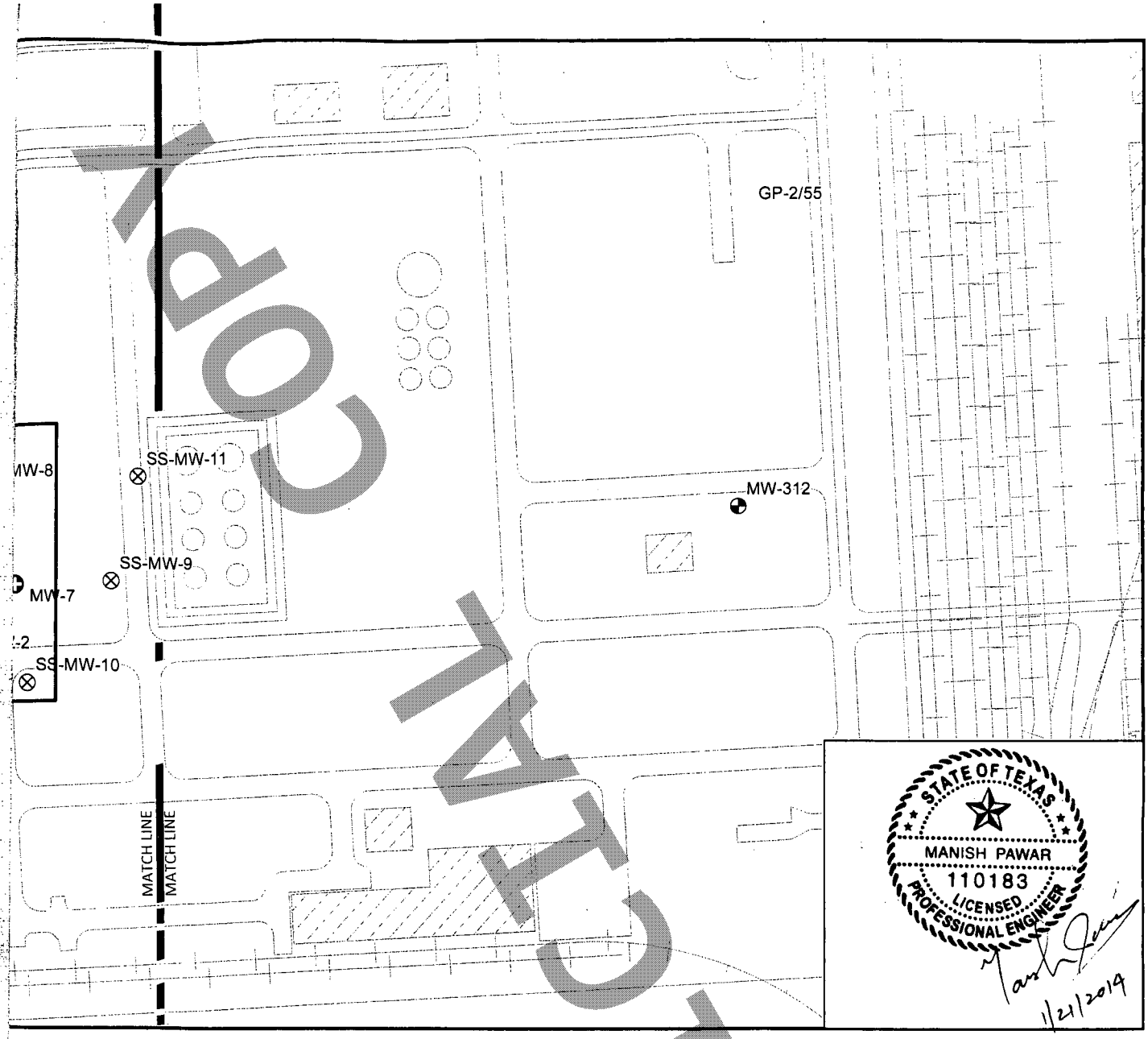
Brown AND Caldwell

RP 051-74-2518



COPY
UNOFFICIAL

RP 0914-2519



NOTES:
All values in mg/L.
Bold, underlined, and italicized values indicate Critical PCL exceedence.
J indicates estimated value.
NA indicates not analyzed.

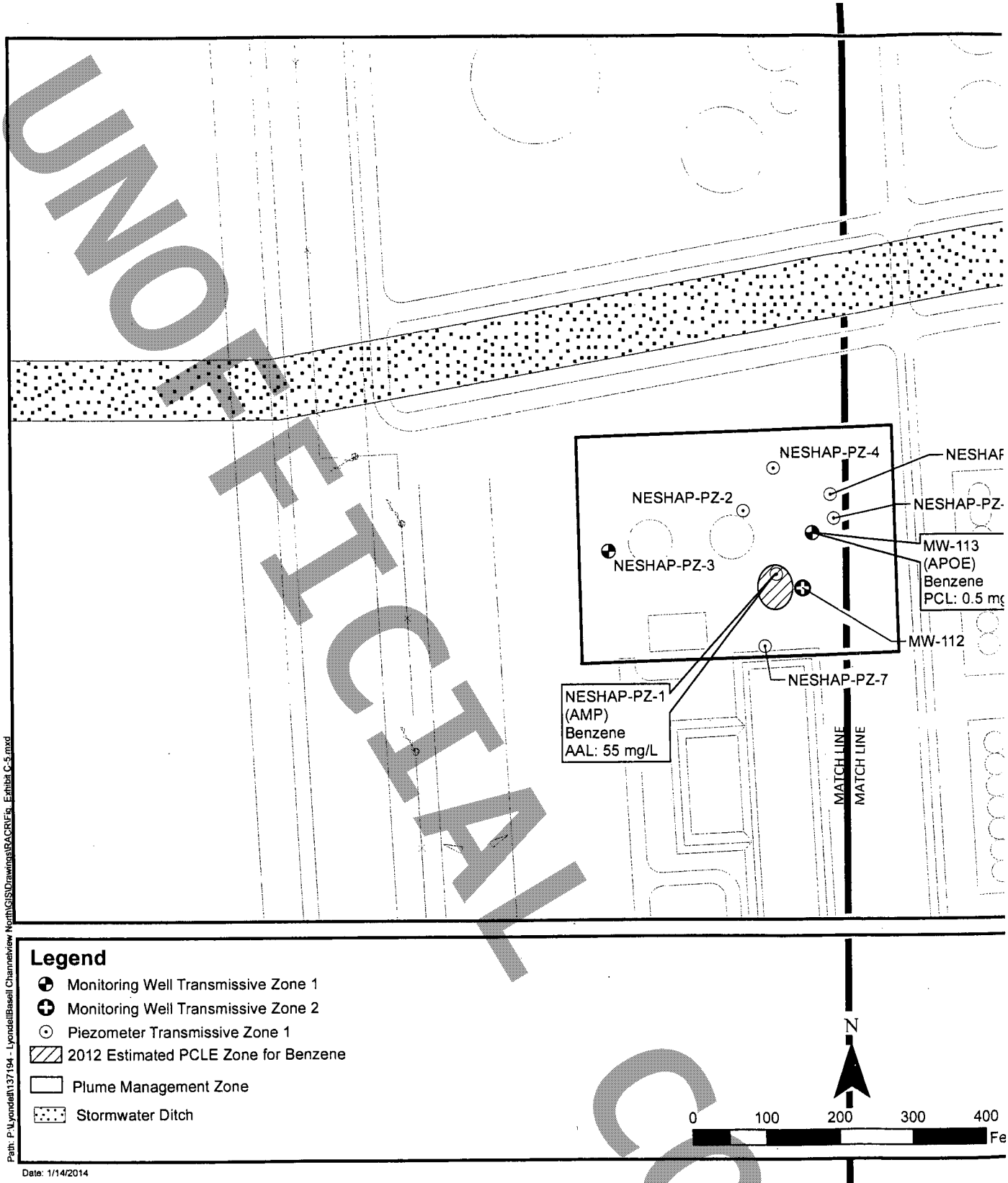
FIGURE EXHIBIT C-4
Groundwater PCLE
Zone/ PMZ Map
Sulfolane Sump Area

Equistar Chemicals, LP.
Channelview Complex
Channelview, Texas

Brown AND Caldwell

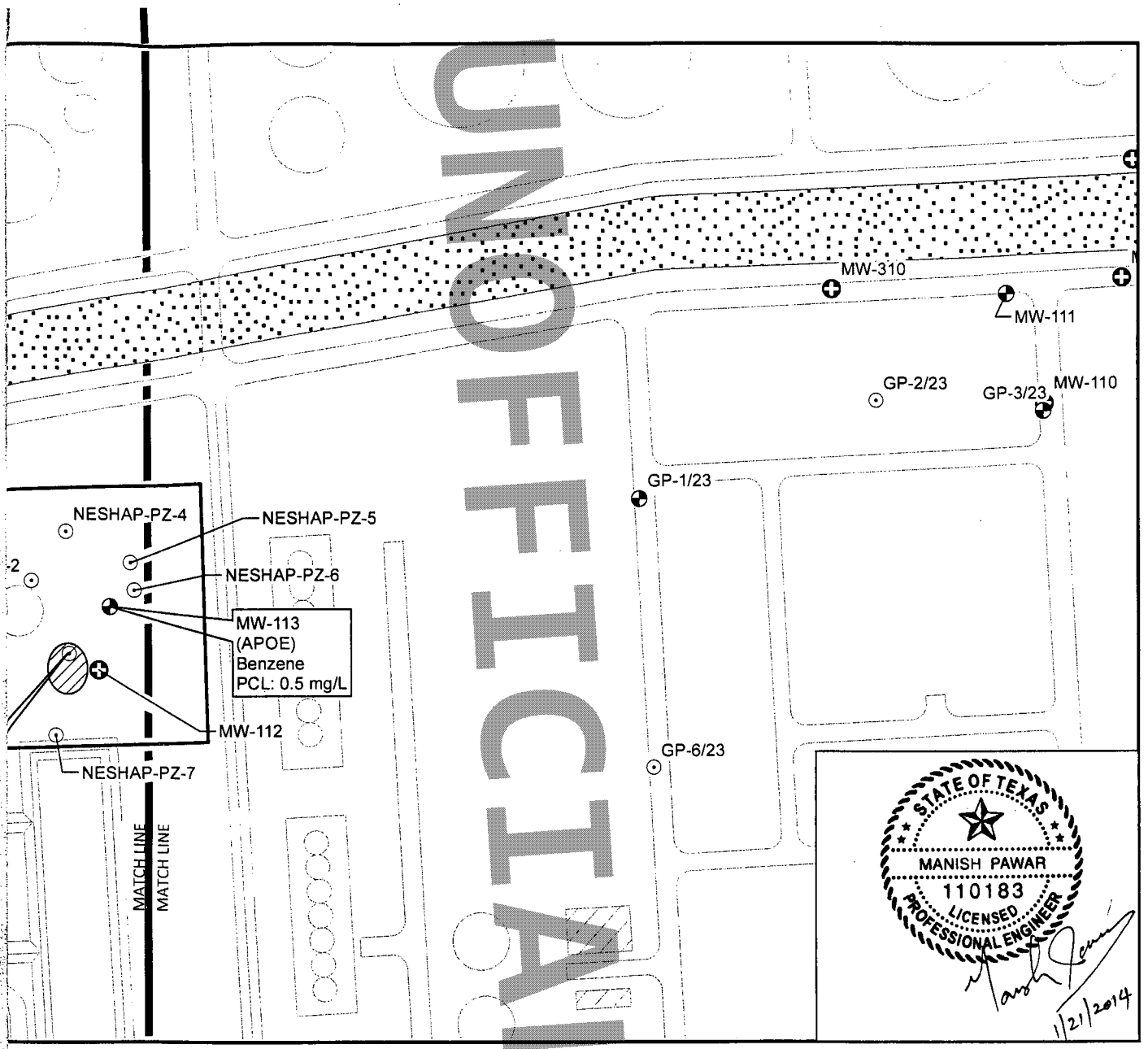
RP-091-74-2526

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UNOFFICIAL



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2014-152-16 PM 2:23



NOTES:
All values in mg/L.
Bold, underlined, and italicized values indicate Critical PCL exceedence.
J indicates estimated value.
NA indicates not analyzed.

FIGURE EXHIBIT C-5
Groundwater PCLE
Zone/ PMZ Map
NESHAP Area

Equistar Chemicals, LP.
Channelview Complex
Channelview, Texas

Brown AND Caldwell

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RE: 09-24-2522

Exhibit D

Post-response action care will consist of continued inspection and maintenance of the physical controls overlying the surface soil PCLE zones. In accordance with the RAP and RACR, annual inspection of physical controls will be conducted. Some degradation of the controls (i.e. potholes, cracks, etc. in the pavement or foundations) is to be expected and will be repaired. In addition, Post-Response Action Care Reports (PRACRs) will be submitted every five years. Internal controls will be implemented as part of the soil excavation permit process at the Site such that any excavations in the PCLE zones are conducted by Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) trained personnel that have been notified that exposure to hazardous chemicals may occur through accidental inhalation of dusts or accidental ingestion of soils within the area.

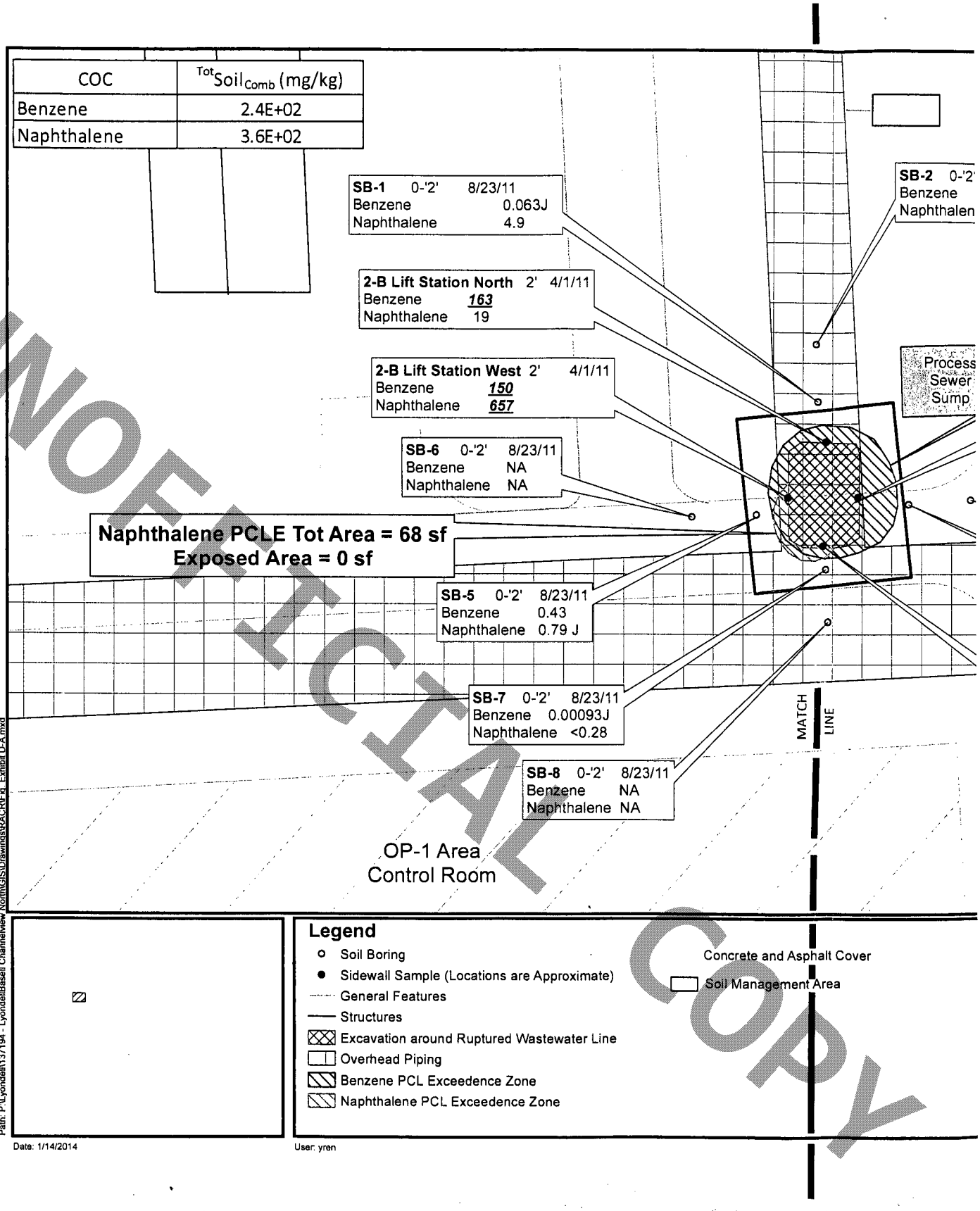
List of Soil Figures

Figure Exhibit D-A – Concrete and Asphalt Cover- OP-1 Area

Figure Exhibit D-B – Concrete and Asphalt Cover- Area I North

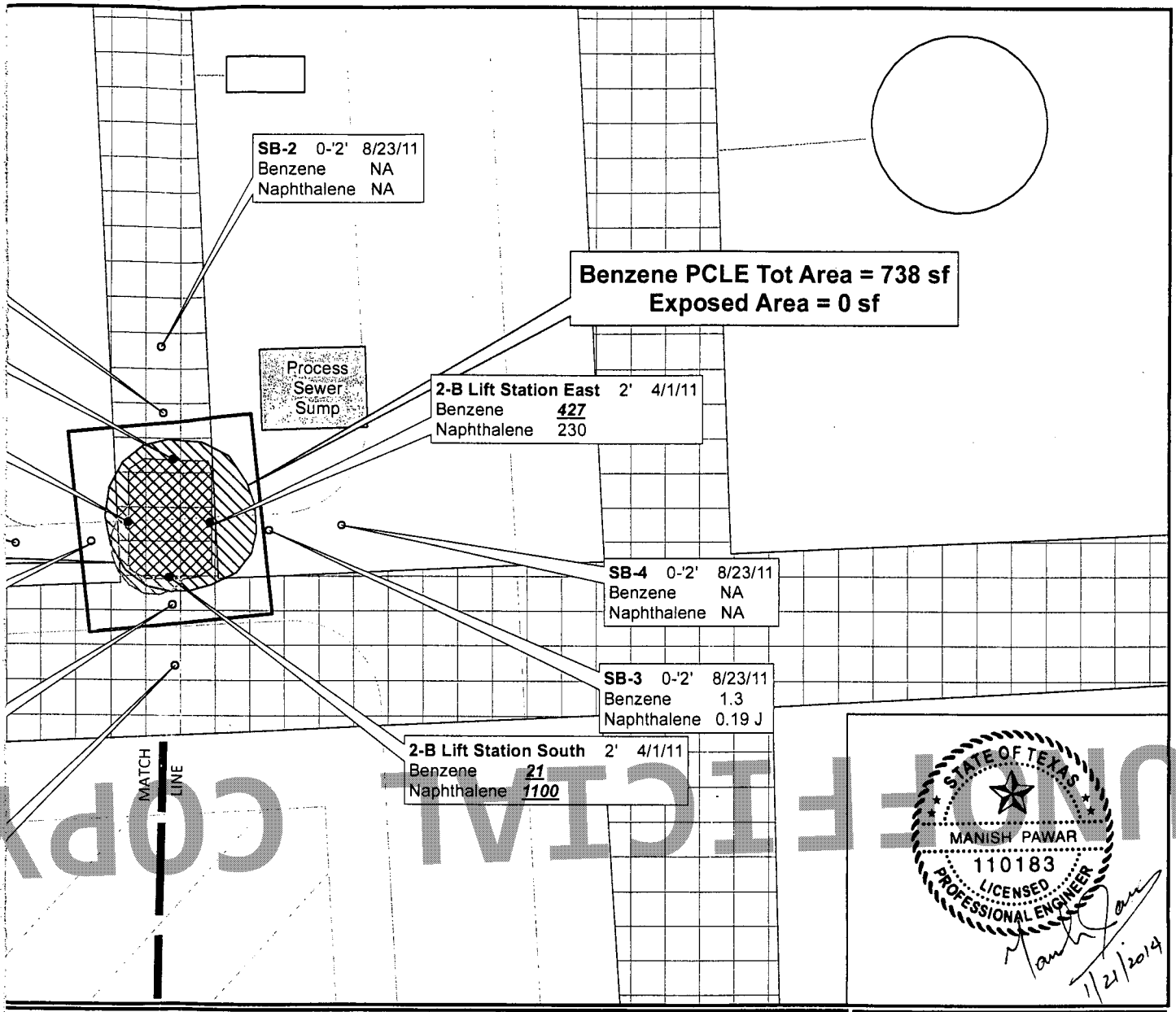
UNOFFICIAL COPY

RR 09-74-2523



UNOFFICIAL COPY

RP-0511-74-2521



Concrete and Asphalt Cover

Soil Management Area

N

0 25 50 Feet

Notes:
All values are in mg/kg.
Bold, underlined, and italic values exceed the Critical PCL.
NA = Not Analyzed

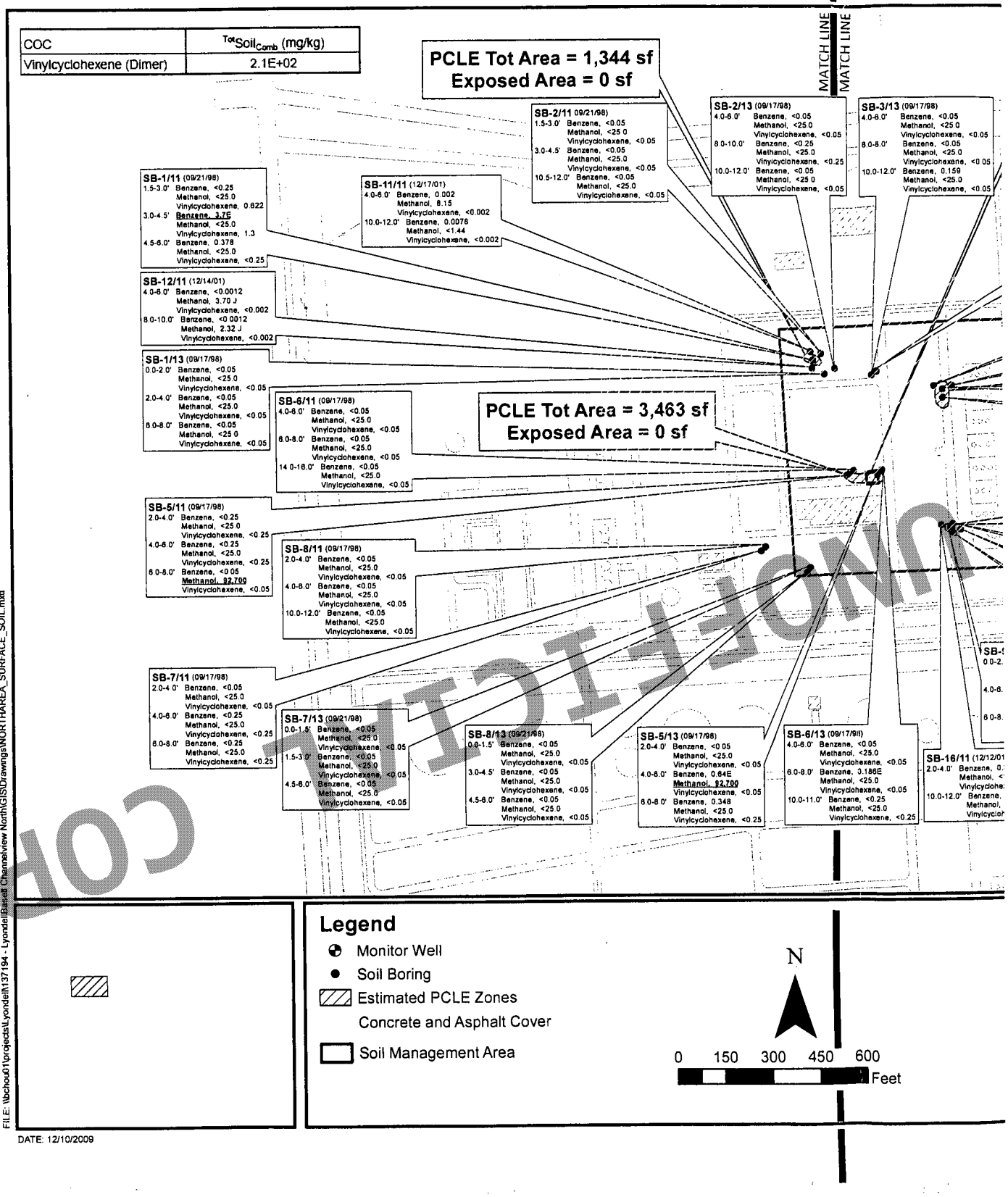
FIGURE EXHIBIT D-A
CONCRETE AND ASPHALT COVER
OP-1 AREA

Equistar Chemicals, LP.
Channelview Facility

Brown AND Caldwell

UNOFFICIAL COPY

RP 64-2525



FILE: \\bchou01\projects\Lyondell\137194 - Lyondell\Basell Channelview North\GIS\Drawings\NORTHAREA_SURFACE_SOIL.mxd

DATE: 12/10/2009

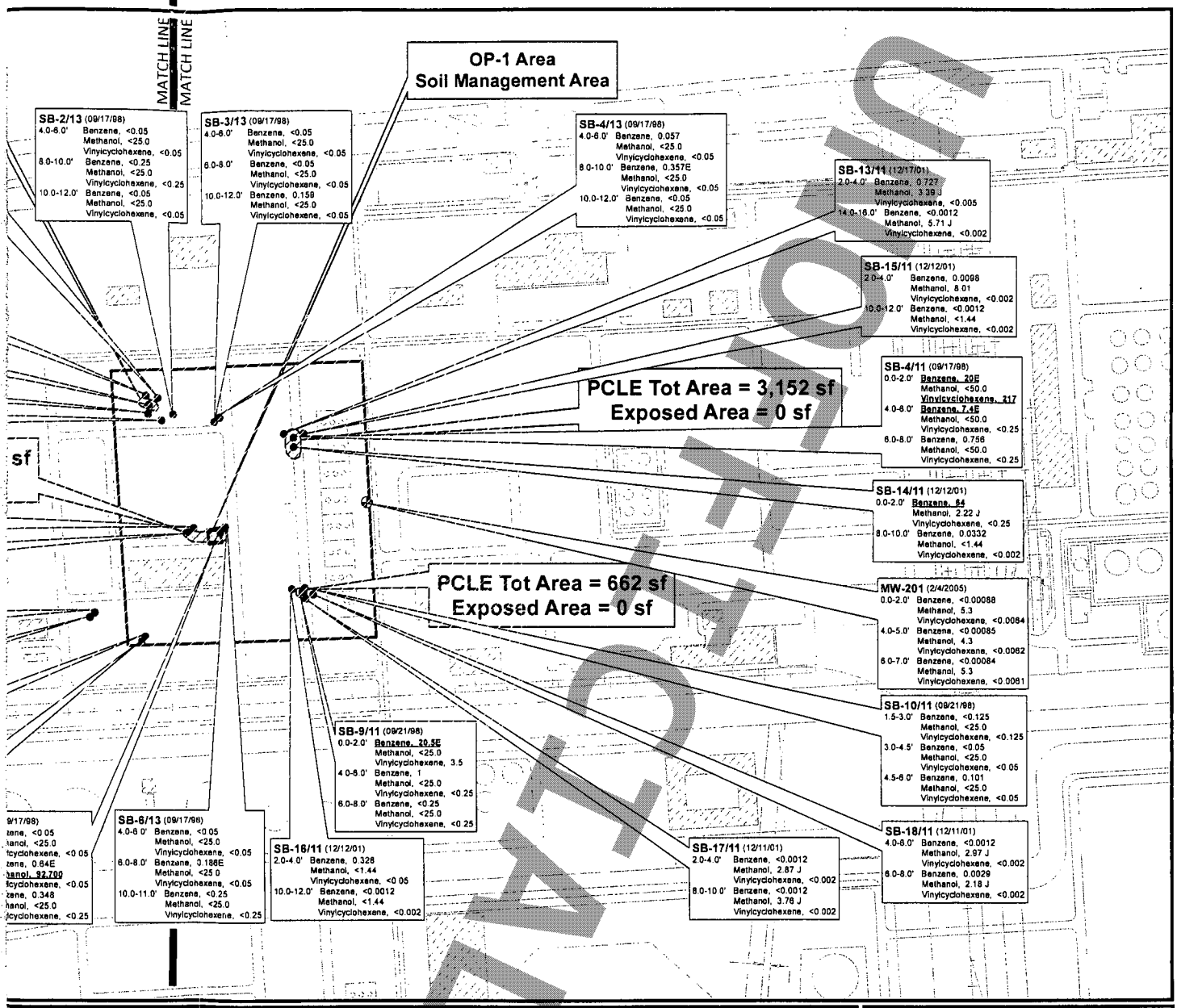


FIGURE EXHIBIT D-B
CONCRETE AND ASPHALT COVER AREA I NORTH

Equistar Chemicals, LP.
Channelview Complex

Brown AND Caldwell

CONFIDENTIAL COPY

2252-42-1-15-84

FILED

2014 JUN -6 PM 1:20

Stan Stanart

COUNTY CLERK
HARRIS COUNTY, TEXAS

UNOFFICIAL COPY

20140252168 3 pgs

ANY PROVISION HEREIN WHICH RESTRICTS THE SALE RENTAL, OR USE OF THE DESCRIBED REAL PROPERTY BECAUSE OF COLOR OR RACE IS INVALID AND UNENFORCEABLE UNDER FEDERAL LAW.

THE STATE OF TEXAS
COUNTY OF HARRIS

I hereby certify that this instrument was FILED in File Number Sequence on the date and at the time stamped hereon by me; and was duly RECORDED, in the Official Public Records of Real Property of Harris County, Texas

JUN - 6 2014

Stan Stanart

COUNTY CLERK
HARRIS COUNTY, TEXAS

U291724

Upon recordation, return to:

Greg N. Martin, Esq.
Baker Botts L.L.P.
910 Louisiana, Suite 3112
Houston, Texas 77002-4995

531-33-2447

03/23/00 201207078 U291724 $21.00

STATE OF TEXAS
HARRIS COUNTY

INDUSTRIAL SOLID WASTE
CERTIFICATION OF REMEDIATION

KNOW ALL MEN BY THESE PRESENTS THAT:

Pursuant to the Rules of the Texas Natural Resource Conservation Commission (TNRCC) pertaining to Industrial Solid Waste Management, this document is hereby filed in the Deed Records of Harris County, Texas in compliance with the recordation requirements of said rules:

Equistar Chemicals, L.P., has performed a remediation of the land described herein. A list of the known waste constituents, including known concentrations, which have been left in place, is attached hereto as Exhibit A and is made part of this filing. Further information concerning this matter may be found by an examination of company records or in the Notice of Registration (No. 30030) files, which are available for inspection upon request at the central office of the TNRCC in Austin, Texas.

TNRCC derives its authority to review the remediation of this tract of land from the Texas Solid Waste Disposal Act, §361.002, Texas Health and Safety Code, Chapter 361, which enables the Texas Water Commission to promulgate closure and remediation standards to safeguard the health, welfare and physical property of the people of the State and to protect the environment by controlling the management of solid waste In addition, pursuant to the Texas Water Code, §5.012 and §5.013, Texas Water Code, Annotated, Chapter 5, the TNRCC is given primary responsibility for implementing the laws of the State of Texas relating to water and shall adopt any rules necessary to carry out its powers and duties under the Texas Water Code. In accordance with this authority, the TNRCC requires certain persons to provide certification and/or recordation in the real property records to notify the public of the conditions of the land and/or the occurrence of remediation. This deed certification is not a representation or warranty by the TNRCC of the suitability of this land for any purpose, nor does it constitute any guarantee by the TNRCC that the remediation standards specified in this certification have been met by Equistar Chemicals.

UNOFFICIAL COPY

The land described herein is more particularly described in Exhibit B attached hereto and made a part of this filing.

Sludge from the Sludge Drying Beds, deposited hereon have been remediated to meet non-residential (i.e., industrial/commercial) soil criteria)), in accordance with a plan designed to meet the TNRCC's requirements in 31 Texas Administrative Code, §335.555), which mandates that the remedy be designed to eliminate substantial present and future risk such that no post-closure care or engineering or institutional control measures are required to protect human health and the environment. Future land use is considered suitable for non-residential (i.e., industrial/commercial)) purposes in accordance with risk reduction standards applicable at the time of this filing. Future land use is intended to be non-residential.

531-33-2448

The owner of the site is Equistar Chemicals L.P., a Delaware Limited Partnership, and its address is 8280 Sheldon Road, Channelview, Texas 77382, where more specific information may be obtained from the (site manager).

EXECUTED this the 21st day of March, 2000.

Equistar Chemicals, L.P.
a Delaware Limited Partnership

for

By: Russell T. Crockett
Site Manager

STATE OF TEXAS
HARRIS COUNTY

BEFORE ME, on this the 21st day of March, 2000, personally appeared Russell T. Crockett, Site Manager, Equistar Chemicals L.P, a Delaware Limited Partnership, known to me to be the person and agent of said corporation whose name is subscribed to the foregoing instrument, and he acknowledged to me that he executed the same for the purposes and in the capacity therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the 21st day of March 2000.

Notary Public in and
for the State of Texas,
County of Harris

ANN SHIPLEY RAGSDALE
Notary Public, State of Texas
My Commission Expires 3-21-2000

My Commission Expires
3-21-2000

Ann Shipley Ragsdale

UNOFFICIAL COPY

531-33-2449

EXHIBIT A
SLUDGE DRYING BEDS
REMAINING CONSTITUENTS

Constituent	TCLP Background Results (mg/L)	TCLP Range of Liner Results (mg/L)	TCLP Average Liner Results (mg/L)	Allowable Risk Reduction Standard #2 GW-Ind (mg/L)	Drinking Water Maximum Contaminant Limit (mg/L)	Site Specific Background Results (mg/KG)	Allowable Risk Reduction Standard #2 GWP-Ind (mg/KG)
Barium	1.4	0.2-1.3	0.79	2.0	2.0	160	200
Chromium	0.01	0.01-0.03	0.014	0.1	0.1	12.6	10

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EXHIBIT B

531-33-2450

FEBUARY 11, 2000

0.482 ACRE TRACT OF LAND
OUT OF THE AMY WHITE SURVEY,
A-81, IN HARRIS COUNTY, TEXAS

Being a 0.482 acre (21,003 square feet) tract of land in the Amy White Survey, A-81, in Harris County, Texas, and being a portion of Arco Chemical Company Section 1, as described in deed recorded in Volume 3012, Page 167, of the Harris County Deed Records (H.C.D.R.), and being more particularly described by metes and bounds as follows, with all bearings and coordinates based on Texas State Plane Coordinate System, South Central Zone (NAD 83):

COMMENCING at the northwest corner of said Arco Chemical Company Section 1, and the southwest corner of Hughes Club, as described in deed recorded in Volume 1898, Page 712, of the Harris County Deed Records, and the east right-of-way line of Sheldon Road (100 foot wide), at a 5/8 inch iron rod in concrete found for corner;

THENCE South 3 degrees 08 minutes 23 seconds East, a distance of 1362.32 feet along the east right-of-way line of said Sheldon Road and the west line of said Arco Chemical Company Section 1, to a point for corner;

THENCE North 88 degrees 29 minutes 30 seconds East, a distance of 5970.18 feet departing the east right-of-way line of said Sheldon Road to the POINT OF BEGINNING and being the northwest corner of the herein described tract;

THENCE North 88 degrees 29 minutes 30 seconds East, a distance of 150.20 feet to a point for corner and being the northeast corner of the herein described tract;

THENCE South 02 degrees 18 minutes 24 seconds East, a distance of 202.83 feet to a point for corner and being the southeast corner of the herein described tract;

THENCE South 87 degrees 00 minutes 14 seconds West, a distance of 49.71 feet to a point for corner;

THENCE North 02 degrees 27 minutes 01 seconds West, a distance of 179.00 feet to a point for corner;

THENCE South 86 degrees 50 minutes 12 seconds West, a distance of 56.02 feet to a point for corner;

THENCE South 04 degrees 25 minutes 24 seconds East, a distance of 176.01 feet to a point for corner;

SLUDGE DRYING BEDS

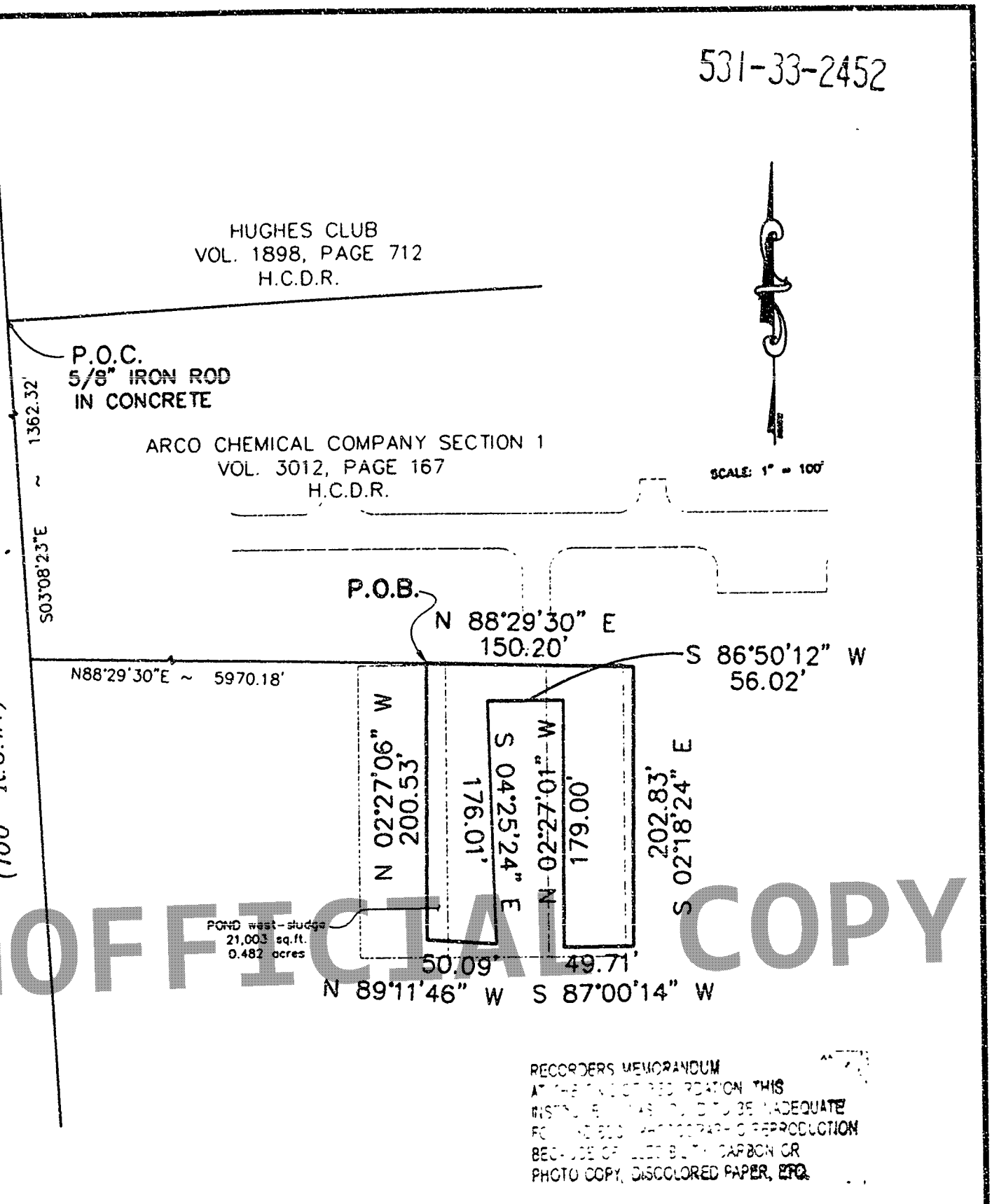
UNOFFICIAL COPY

THENCE North 89 degrees 11 minutes 46 seconds West, a distance of 50.09 feet to a point for corner and being the southwest corner of the herein described tract;

THENCE North 02 degrees 27 minutes 06 seconds West, a distance of 200.53 feet to the Point of Beginning and containing 0.482 acre (21,003 square feet) of land.

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531-33-2452



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RECORDERS MEMORANDUM
AT THE TIME OF RECORDATION THIS
INSTRUMENT WAS FOUND TO BE INADEQUATE
FOR THE BEST PHOTOGRAPHIC REPRODUCTION
BECAUSE OF ILLEGIBILITY, CARBON OR
PHOTO COPY, DISCOLORED PAPER, ETC.

CLR
Coburn Linseisen & Ratcliff, Inc.
Civil Engineers • Architects • Surveyors • Planners
13100 Northwest Freeway, Suite 500 TEL 713 462-0993
Houston, Texas 77040 Fax: 713 462-2732

SLUDGE DRYING BEDS

SCALE	DATE	DRAWN BY	FB NO.	APPROVED:	DWG. NO.
1"=100'	02/10/00	BOB	573		POND3

PERFORMED FOR
EQUISTAR

FILE INFO: G:\survey\Land Projects\EQUISTAR-PLANT\dwg\pond3.dwg 1=1 02/10/00 09:27 BOB

531-33-2453

FILED

2000 MAR 23 PM 2:47

COUNTY CLERK
HARRIS COUNTY, TEXAS

ANY PROVISION HEREIN WHICH RESTRICTS THE SALE, RENTAL, OR USE OF THE DESCRIBED REAL PROPERTY BECAUSE OF COLOR OR RACE IS INVALID AND UNENFORCEABLE UNDER FEDERAL LAW

THE STATE OF TEXAS }
COUNTY OF HARRIS }

I hereby certify that this instrument was FILED in File Number Sequence on the date and at the time stamped hereon by me; and was duly RECORDED, in the Official Public Records of Real Property of Harris County, Texas on

MAR 23 2000

COUNTY CLERK
HARRIS COUNTY TEXAS

UNOFFICIAL COPY

U551418

Water

533-93-1043

STATE OF TEXAS §

HARRIS COUNTY §

08/07/00 101386230 U551418 $59.00

INDUSTRIAL SOLID WASTE
CERTIFICATION OF REMEDIATION

KNOW ALL MEN BY THESE PRESENTS THAT:

Pursuant to the Rules of the Texas Natural Resource Conservation Commission (TNRCC) pertaining to Industrial Solid Waste Management, this document is hereby filed in the Deed Records of Harris County, Texas in compliance with the recordation requirements of said rules:

Equistar Chemicals, LP has performed a remediation of the land described herein. A list of the known waste constituents, including known concentrations, which have been left in place, is attached hereto as Exhibit A and is made part of this filing. Exhibit A presents the individual verification sampling results for each of the six solid waste management units included in this closure. Further information concerning this matter may be found by an examination of company records or in the Notice of Registration (No. 30030) files, which are available for inspection upon request at the central office of the TNRCC in Austin, Texas.

59
5

TNRCC derives its authority to review the remediation of this tract of land known the Texas Solid Waste Disposal Act, §361.002, Texas Health and Safety Code, Chapter 361, which enables the Texas Water Commission to promulgate closure and remediation standards to safeguard the health, welfare and physical property of the people of the State and to protect the environment by controlling the management of solid waste. In addition, pursuant to the Texas Water Code, §5.012 and §5.013, Texas Water Code, Annotated, Chapter 5, the TNRCC is given primary responsibility for implementing the laws of the State of Texas relating to water and shall adopt any rules necessary to carry out its powers and duties under the Texas Water Code. In accordance with this authority, the TNRCC requires certain persons to provide certification and/or recordation in the real property records to notify the public of the conditions of the land and/or the occurrence of remediation. This deed certification is not a representation or warranty by the TNRCC of the suitability of this land for any purpose, nor does it constitute any guarantee by the TNRCC that the remediation standards specified in this certification have been met by Equistar Chemicals.

Add Text Here

The land described herein is more particularly described in Exhibits B and C attached hereto and made a part of this filing. Exhibit B includes the information relating to the OP-1 Area while Exhibit C includes the information related to the OP-2 Area. Please note that both areas only contain residual amounts of constituents left inplace.

Sludge from the OP-1 "C" Pond, OP-1 "D" Pond, OP-1 API Separator, OP-2 "C" Pond, OP-2 "D" Pond, and OP-2 API Separator, deposited hereon have been remediated (to meet nonresidential (i.e., industrial/commercial) solid criteria)), in accordance with a plan designed to

Upon recordation, return to:

Greg N. Martin, Esq.
Baker Botts L.L.P.
910 Louisiana, Suite 3112
Houston, Texas 77002-4995

meet the TNRCC's requirements in 31 Texas Administrative Code, §335.555, which mandates that the remedy be designated to eliminate substantial present and future risk such that no post-closure care or engineering or institutional control measures are required to protect human health and the environment. Future land use is considered suitable for nonresidential (i.e., industrial/commercial) purposes in accordance with risk reduction standards applicable at the time of this filing. Future land use is intended to be nonresidential.

The owner of the site is Equistar Chemicals L.P., a Delaware Limited Partnership, and its address is 8280 Sheldon Road, Channelview, Texas 77382, where more specific information may be obtained from the Site Manager.

EXECUTED this the 31st day of July 2000.

EQUISTAR CHEMICALS, LP,
A Delaware limited partnership

By: _____
Russell T. Crockett
Site Manager

STATE OF TEXAS §

HARRIS COUNTY §

BEFORE ME, on this the 31st day of July, 2000, personally appeared Russell T. Crockett, Site Manager, Equistar Chemicals, LP, a Delaware limited partnership, known to me to be the person and agent of said corporation whose name is subscribed to the foregoing instrument, and he acknowledged to me that he executed the same for the purposes and in the capacity therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the 31st day of July 2000.

ANN SHIPLEY RAGSDALE
Notary Public, State of Texas
My Commission Expires
March 21, 2004

_____
Ann Shipley Ragsdale
Notary Public in and for
The State of Texas, County of Harris

My Commission Expires:
3-21-2004

UNOFFICIAL COPY

EXHIBIT A

UNOFFICIAL COPY

OP-1 API Verification Data

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Analytical Data for OP-1 API Separator from Phase 2 Closure Investigation

PARAMETER (mg/kg)	PN 0-2' 9/9/98	PN 11-12' 9/9/98	PNE 0-2' 9/9/98	PNE 10-11' 9/9/98	PSE 0-2' 9/9/98	PSE 9-10' 9/9/98	PS 0-2' 9/9/98	PS 7-8' 9/9/98	PSW 0-2' 9/9/98	PSW 9-10' 9/9/98	NW 0-2' 9/9/98	NW 8-9' 9/9/98	OP1APISW 9/10/98	OP2APISW 9/10/98
Barium	57.3	60.8	68.6	41.9	72.9	34.3	89.8	223[1]	89.5	23.7	47.6	53.9	0.010	0.030
Chromium	3	5	2	3	5	4	7	2	1	2	2	1	<0.01	<0.01
Nickel	<2	18[2]	<2	3	8	14[2]	5	9	4	5	<2	7	<0.02	<0.02
Mercury	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.00050	<0.00050
Acetone	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.02	<0.02
Benzene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.018	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Xylene (total)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Acenaphthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Acetophenone	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
bis(2-Ethylhexyl) phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Chrysene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
p-Cresol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Dibenzofuran	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Fluorene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Hexachloroethane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
2-Methylnaphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
N-Nitrosodiphenylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Phenanthrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Pyrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
TPH	<10	20	<10	12	18	<10	57	21	16	12	<10	<10	<1	<1

Concentration of this constituent for this sample exceeds the RRS2 cleanup level.

(1) SPLP concentration of barium from sample was 0.069 mg/L, which is below the Risk Reduction Standard No. 2 level of 2 mg/L (see *"Revised Closure Plan Surface Impoundments and API Separators at Olefins Products in Units"*, 12-22-98)

(2) SPLP concentration of nickel from PN 11-12 sample was less than the detection limit of 0.02 mg/L (see *"Revised Closure Plan Surface Impoundments and API Separators at Olefins Products in Units,"* 12-22-98)

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OP-2 API Verification Data

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Analytical Data for OP-2 API Separator from Phase 2 Closure Investigation

PARAMETER (mg/kg)	SW 0-2' 9/10/98	SW 8-9' 9/10/98	NW 0-2' 9/10/98	NW 8-9' 9/10/98	PN 0-2' 9/10/98	PN 8.5-9.5' 9/10/98	PNE 0-2' 9/10/98	PNE 8.5-9.5' 9/10/98	PSE 0-2' 9/10/98	PSE 8-9' 9/10/98	PS 0-2' 9/10/98	PS 7-8' 9/10/98	OP1APISW 9/10/98	OP2APISW 9/10/98
Barium	66.1	28.1	66.8	34.5	43.6	46.3	68.1	58.9	63.9	35.1	54.5	51.3	0.010	0.030
Chromium	5	1	4	<1	5	1	11	1	5	2	11	2	<0.01	<0.01
Nickel	3	<2	3	<2	4	<2	5	<2	4	2	4	3	<0.02	<0.02
Mercury	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.00050	<0.00050
Acetone	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	0.03	0.01	0.02	0.01
Benzene	<0.005	<0.005	0.014	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.005	<0.005	0.023	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.005	<0.005	0.028	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Xylene (total)	<0.02	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Acenaphthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Acetophenone	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
bis(2-Ethylhexyl) phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Chrysene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
p-Cresol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Dibenzofuran	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Fluorene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Hexachloroethane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
2-Methylnaphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Naphthalene	<0.33	<0.33	0.59	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
N-Nitrosodiphenylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Phenanthrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
Pyrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.01	<0.01
TPH	25	13	37	<10	114	<10	37	21	<10	20	83	17	<1	<1

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OP-1C Pond Verification Data

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Analytical Data for OP-1 C Pond from Phase 1 Closure

PARAMETER	OP-1C-NW	OP-1C-NE	OP-1C-SW	OP-1C-SE	OP-1C-SW	OP-1C-SE	OP-1C-SE-G	OP-1C-SE 1000
Total Metals (mg/kg)								
Arsenic	N/A	N/A	N/A	N/A	6.2	2.7	1.4	N/A
Barium	N/A	N/A	N/A	N/A	98.1	77.2	416	N/A
Cadmium	N/A	N/A	N/A	N/A	<0.5	<0.5	<0.5	N/A
Chromium	N/A	N/A	N/A	N/A	3.9	2.6	4.5	N/A
Lead	N/A	N/A	N/A	N/A	8.0	6.2	16.0	N/A
Nickel	N/A	N/A	N/A	N/A	11.9	7.3	27.1	N/A
Mercury	N/A	N/A	N/A	N/A	<0.25	<0.25	<0.25	N/A
Selenium	N/A	N/A	N/A	N/A	<1.5	<1.5	2.8	N/A
Silver	N/A	N/A	N/A	N/A	<0.5	<0.5	<0.5	N/A
TCLP Metals (mg/L)								
Arsenic	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Barium	1.39	1.37	2.02*	2.7*	2.25*	2.21*	1.30	3.27*
Cadmium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chromium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Lead	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nickel	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Mercury	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Selenium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Silver	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
TCLP Volatiles (mg/L)								
Acetone	<0.200	<0.200	<0.200	0.531	<0.2	<0.2	<0.2	<0.2
Benzene	<0.005	<0.005	<0.005	<0.005	<0.1	<0.1	<0.1	<0.1
2-Butanone (MEK)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Carbon tetrachloride	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorobenzene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloroform	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,4-Dichlorobenzene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,1-Dichloroethene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,2-Dichloroethane	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	<0.100	<0.100	<0.100	<0.100	<0.1	<0.1	<0.1	<0.1
Styrene	<0.100	<0.100	<0.100	<0.100	<0.1	<0.1	<0.1	<0.1
Tetrachloroethene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	<0.100	<0.100	<0.100	<0.100	<0.1	<0.1	<0.1	<0.1
Trichloroethene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vinyl chloride	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Xylene (total)	<0.300	<0.300	<0.300	<0.300	<0.3	<0.3	<0.3	<0.3
Volatile Organics (mg/kg)								
Acetone	N/A	N/A	N/A	N/A	<0.005	<0.005	<0.005	N/A
Benzene	N/A	N/A	N/A	N/A	<0.005	<0.005	<0.005	N/A
Ethylbenzene	N/A	N/A	N/A	N/A	<0.005	<0.005	<0.005	N/A
Styrene	N/A	N/A	N/A	N/A	<0.005	<0.005	<0.005	N/A
Toluene	N/A	N/A	N/A	N/A	<0.005	<0.005	<0.005	N/A
Xylene (total)	N/A	N/A	N/A	N/A	<0.020	<0.020	<0.020	N/A
TCLP Semivolatiles (mg/L)								
Acenaphthene	<0.010	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01
Acetophenone	<0.010	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01
bis(2-Ethylhexyl) phthalate	<0.010	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01
Chrysene	<0.010	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01
Dibenzofuran	<0.010	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01
2,4-Dinitrotoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.010	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachloro-1, 3-butadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	<0.010	<0.010	<0.010	0.057	<0.01	<0.01	<0.01	<0.01
Naphthalene	<0.010	<0.010	<0.010	0.199	<0.01	<0.01	<0.01	0.10
Nitrobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.09
N-Nitrosodiphenylamine	<0.010	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.010	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phenol	<0.010	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.010	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01
Pyridine	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
o-Cresol (2-Methylphenol)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
m+p Cresol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4,5-Trichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4,6-Trichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Semivolatiles (mg/kg)								
Acenaphthene	<0.330	<0.330	<0.330	<0.330	<0.33	<0.33	<0.33	0.61
Acetophenone	<0.330	<0.330	<0.330	<0.330	<0.33	<0.33	<0.33	<0.33
bis(2-Ethylhexyl) phthalate	<0.330	<0.330	<0.330	<0.330	<0.33	<0.33	<0.33	<0.33
Chrysene	<0.020	<0.020	<0.020	0.091	<0.02	<0.02	<0.02	0.58
p-Cresol (4-Methylphenol)	<0.330	<0.330	<0.330	<0.330	<0.33	<0.33	<0.33	<0.33
Dibenzofuran	<0.330	<0.330	<0.330	<0.330	<0.33	<0.33	<0.33	<0.33
2,4-Dinitrotoluene	<0.330	<0.330	<0.330	<0.330	<0.33	<0.33	<0.33	<0.33
Fluorene	<0.330	<0.330	<0.330	<0.330	<0.33	<0.33	<0.33	0.76
Hexachloroethane	<0.330	<0.330	<0.330	<0.330	<0.33	<0.33	<0.33	<0.33
2-Methylnaphthalene	<0.330	<0.330	<0.330	1.250	<0.33	<0.33	<0.33	4.09
Naphthalene	<0.330	<0.330	<0.330	<0.330	<0.33	<0.33	<0.33	1.75
N-Nitrosodiphenylamine	<0.330	<0.330	<0.330	<0.330	<0.33	<0.33	<0.33	<0.33
Phenanthrene	<0.330	<0.330	<0.330	0.574	<0.33	<0.33	<0.33	1.84
Phenol	<0.330	<0.330	<0.330	<0.330	<0.33	<0.33	<0.33	<0.33
Pyrene	<0.330	<0.330	<0.330	<0.330	<0.33	<0.33	<0.33	1.51
TPH	<10	99	<10	310	<10	<10	<10	820

* Phase 2 soil samples analyzed for total barium verified attainment of Risk Reduction Standard 2: SW Sample - 71.2 mg/kg; SE Sample - 73.4 mg/kg
(See *"Closure Plan Surface Impoundments and API Separators at the Olefins Production Units"* dated 12-22-98)

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533-93-1052

OP-2C Pond Verification Data

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Analytical Data for OP-2 C Pond from Phase 1 Closure

PARAMETER	OP-2C-SW 0-12"	OP-2C-SE 0-12"	OP-2C-NW 18-24"	OP-2C-NE 18-24"	OP-2C 81003	SW 0-6" 8/19/88 8/20/88	SE 0-6" 8/19/88 8/20/88	NE 0-6" 9/10/88
Total Metals (mg/Kg)								
Arsenic	N/A	N/A	3.7	2.0	1.1			
Barium	N/A	N/A	79.3	84.5	40.1	13.7	23.5	65.8
Cadmium	N/A	N/A	<0.5	0.5	0.6			
Chromium	N/A	N/A	2.6	15.4	5.9	6	3	NA
Lead	N/A	N/A	4.1	9.0	4.0			
Nickel	N/A	N/A	3.6	13.5	3.8	3	2	NA
Mercury	N/A	N/A	<0.250	<0.250	<0.25	<0.25	<0.25	NA
Selenium	N/A	N/A	<1.5	<1.5	<1.5			
Silver	N/A	N/A	<0.5	0.6	<0.5			
TCLP Metals (mg/L)								
Arsenic	<0.10	<0.10	<0.10	<0.10	0.16			
Barium	0.83	1.22	1.39	2.07	1.40			
Cadmium	<0.10	<0.10	<0.10	<0.10	<0.10			
Chromium	<0.10	<0.10	<0.10	<0.10	<0.10			
Lead	<0.10	<0.10	<0.10	<0.10	<0.10			
Nickel	<0.10	<0.10	<0.10	<0.10	0.10			
Mercury	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020			
Selenium	<0.10	<0.10	<0.10	<0.10	0.31			
Silver	<0.10	<0.10	<0.10	<0.10	<0.10			
TCLP Volatiles (mg/L)								
Acetone	<0.200	<0.200	<0.050	<0.050	<0.050			
Benzene	<0.005	<0.005	<0.1	<0.1	<0.1			
2-Butanone (MEK)	<0.2	<0.2	<0.2	<0.2	<0.2			
Carbon tetrachloride	<0.1	<0.1	<0.1	<0.1	<0.1			
Chlorobenzene	<0.1	<0.1	<0.1	<0.1	<0.1			
Chloroform	<0.1	<0.1	<0.1	<0.1	<0.1			
1,4-Dichlorobenzene	<0.1	<0.1	<0.1	<0.1	<0.1			
1,1-Dichloroethene	<0.1	<0.1	<0.1	<0.1	<0.1			
1,2-Dichloroethane	<0.1	<0.1	<0.1	<0.1	<0.1			
Ethylbenzene	<0.100	<0.100	<0.020	<0.020	<0.020			
Styrene	<0.100	<0.100	<0.020	<0.020	<0.020			
Tetrachloroethene	<0.1	<0.1	<0.1	<0.1	<0.1			
Toluene	<0.100	<0.100	<0.020	<0.020	<0.020			
Trichloroethene	<0.1	<0.1	<0.1	<0.1	<0.1			
Vinyl chloride	<0.1	<0.1	<0.1	<0.1	<0.1			
Xylene (total)	<0.300	<0.300	<0.300	<0.300	<0.300			
Volatile Organics (mg/Kg)								
Acetone	N/A	N/A	<0.020	<0.020	<0.020	<0.01	<0.01	NA
Benzene	N/A	N/A	<0.020	<0.020	<0.020	<0.005	<0.005	NA
Ethylbenzene	N/A	N/A	<0.020	<0.020	<0.020	<0.005	<0.005	NA
Styrene	N/A	N/A	<0.020	<0.020	<0.020	<0.005	<0.005	NA
Toluene	N/A	N/A	<0.020	<0.020	<0.020	<0.005	<0.005	NA
Xylene (total)	N/A	N/A	<0.080	<0.080	<0.080	<0.02	<0.02	NA
TCLP Semivolatiles (mg/L)								
Acenaphthene	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010
Acetophenone	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010
bis(2-Ethylhexyl) phthalate	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010
Chrysene	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010
Dibenzofuran	<0.010	<0.010	<0.010	<0.010	<0.010			NA
2,4-Dinitrotoluene	<0.01	<0.01	<0.01	<0.01	<0.01			NA
Fluorene	<0.010	<0.010	<0.010	<0.010	<0.010			NA
Hexachlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01
Hexachloro-1, 3-butadiene	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01
Hexachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01
2-Methylnaphthalene	<0.010	<0.010	<0.010	0.042	<0.010			<0.010
Naphthalene	<0.010	0.020	<0.010	0.051	<0.010			<0.010
Nitrobenzene	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01
N-Nitrosodiphenylamine	<0.010	0.157	<0.010	<0.010	<0.010			<0.010
Phenanthrene	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010
Phenol	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010
Pyrene	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010
Pyridine	<0.02	<0.02	<0.02	<0.02	<0.02			<0.02
o-Cresol (2-Methylphenol)	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01
m+p Cresol	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01
Pentachlorophenol	<0.05	<0.05	<0.05	<0.05	<0.05			<0.05
2,4,5-Trichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01
2,4,6-Trichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01
Semivolatiles (mg/kg)								
Acenaphthene	<0.330	<0.330	<0.33	1.12	<0.33	<0.33	<0.33	NA
Acetophenone	<0.330	<0.330	<0.33	<0.33	<0.33	<0.33	<0.33	NA
bis(2-Ethylhexyl) phthalate	<0.330	<0.330	<0.33	<0.33	0.40	<0.33	<0.33	NA
Chrysene	<0.020	<0.020	<0.02	0.41	0.06	<0.33	<0.33	NA
p-Cresol (4-Methylphenol)	<0.330	<0.330	<0.33	<0.33	<0.33	<0.33	<0.33	NA
Dibenzofuran	<0.330	<0.330	<0.33	<0.33	<0.33	<0.33	<0.33	NA
2,4-Dinitrotoluene	<0.330	<0.330	<0.33	<0.33	<0.33			
Fluorene	<0.330	<0.330	<0.33	1.59	<0.33	<0.33	<0.33	NA
Hexachloroethane	<0.330	<0.330	<0.33	<0.33	<0.33	<0.33	<0.33	NA
2-Methylnaphthalene	<0.330	<0.330	<0.33	7.06	<0.33	<0.33	<0.33	NA
Naphthalene	<0.330	<0.330	<0.33	3.79	<0.33	<0.33	<0.33	NA
N-Nitrosodiphenylamine	<0.330	<0.330	<0.33	<0.33	<0.33	<0.33	<0.33	NA
Phenanthrene	<0.330	<0.330	<0.33	2.82	<0.33	<0.33	<0.33	NA
Phenol	<0.330	<0.330	<0.33	<0.33	<0.33			
Pyrene	<0.330	<0.330	<0.33	1.12	<0.33	<0.33	<0.33	NA
TPH	152	17	<10	29	4430	17	<10	NA

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533-93-1054

OP-1D Pond Verification Data

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OP-1D Pond
Verification Sample Analytical Results

	October 20, 1999		November 5, 1999					Cleanup Levels mg/kg
	OP-1-IP-1-VS mg/kg	OP-1-IP-2-VS mg/kg	OP-1-NE-VS mg/kg	OP-1-NE-VS-2 mg/kg	OP-1-SW-VS mg/kg	OP-1-SE-VS mg/kg	OP-1-NW-VS mg/kg	
Volatile Organics Method SW 846/8260								
Acetone	<2.0	<2.0	<2.0	na	<2.0	<2.0	<2.0	1,020
Benzene	<0.5	<0.5	<0.5	na	<0.5	<0.5	<0.5	0.5
Ethylbenzene	<0.5	<0.5	<0.5	na	<0.5	<0.5	<0.5	70
Styrene	<0.5	<0.5	<0.5	na	<0.5	<0.5	<0.5	10
Toluene	<0.5	<0.5	<0.5	na	<0.5	<0.5	<0.5	100
m+p Xylenes	<0.5	<0.5	<0.5	na	<0.5	<0.5	<0.5	1,000
o-Xylene	<0.5	<0.5	<0.5	na	<0.5	<0.5	<0.5	1,000
Semivolatile Organics Method SW 846/8270								
Acanaphthene	<2.5	<2.5	<2.5	na	<2.5	<2.5	<2.5	613
Acetophenone	<2.5	<2.5	<2.5	na	<2.5	<2.5	<2.5	1,020
Bis(2-ethyhexyl)phthalate	<2.5	<2.5	<2.0	na	<2.0	<2.0	<2.0	2.04
Chrysene	<2.5	<2.5	<2.5	na	<2.5	<2.5	<2.5	3.92
m + p Cresol	<2.5	<2.5	<2.5	na	<2.5	<2.5	<2.5	511
Dibenzofuran	<2.5	<2.5	<2.5	na	<2.5	<2.5	<2.5	409
Fluroene	<2.5	<2.5	<2.5	na	<2.5	<2.5	<2.5	409
Hexachloroethane	<2.5	<2.5	<2.5	na	<2.5	<2.5	<2.5	20.4
Naphthalene	<2.5	17	<2.5	na	<2.5	<2.5	<2.5	409
n-Nitrosodiphenylamine	<2.5	<2.5	<2.5	na	<2.5	<2.5	<2.5	409
Phenanthrene	<2.5	<2.5	<2.5	na	<2.5	<2.5	<2.5	307
Pyrene	<2.5	<2.5	<2.5	na	<2.5	<2.5	<2.5	310
2-Methylnaphthalene	<2.5	15.3	<2.5	na	<2.5	<2.5	<2.5	409
Total Metals								
Barium - Method 6010	43.5	43.6	49.2	na	31.5	31.5	40.9	200 (160)
Chromium - Method 6010	7.1	7.09	8	na	5.6	5.6	5.72	10 (12.6)
Mercury - Method 7470	0.476	0.0972	4.48	<0.025	3.04	0.409	0.548	0.2 (0.2)
Nickel - Method 6010	9.6	9.23	7.23	na	8	8	3.76	10 (4.4)
SPLP Analysis	mg/L		mg/L		mg/L	mg/L	mg/L	mg/L
Mercury - Method 1312	<0.002		<0.001		<0.002	<0.002	<0.002	0.002

na - not applicable

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OP-2D Pond Verification Data

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533-93-1057

OP2-D Pond
Verification Sample Analytical Results

	October 22, 1999					
	OP-2-NW-VS mg/kg	OP-2-NE-VS mg/kg	OP-2-SW-VS mg/kg	OP-2-SE-VS mg/kg	OP-2-IP-1-VS mg/kg	Cleanup Levels mg/kg
Volatile Organics Method SW 846/8260						
Acetone	<2.0	<2.0	<2.0	<2.0	<2.0	1,020
Benzene	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
Ethylbenzene	<0.5	<0.5	<0.5	<0.5	<0.5	70
Styrene	<0.5	<0.5	<0.5	<0.5	<0.5	10
Toluene	<0.5	<0.5	<0.5	<0.5	<0.5	100
m+p Xylenes	<0.5	<0.5	<0.5	<0.5	<0.5	1,000
o-Xylene	<0.5	<0.5	<0.5	<0.5	<0.5	1,000
Semivolatile Organics Method SW 846/8270						
Acanaphthene	<2.5	<2.5	<2.5	<2.5	<2.5	613
Acetophenone	<2.5	<2.5	<2.5	<2.5	<2.5	1,020
Bis(2-ethyhexyl)phthalate	<2.5	<2.5	<2.5	<2.5	<2.5	2.04
Chrysene	<2.5	<2.5	<2.5	<2.5	<2.5	3.92
m + p Cresol	<2.5	<2.5	<2.5	<2.5	<2.5	511
Dibenzofuran	<2.5	<2.5	<2.5	<2.5	<2.5	409
Fluroene	<2.5	<2.5	<2.5	<2.5	<2.5	409
Hexachloroethane	<2.5	<2.5	<2.5	<2.5	<2.5	20.4
Naphthalene	<2.5	<2.5	<2.5	<2.5	<2.5	409
n-Nitrosodiphenylamine	<2.5	<2.5	<2.5	<2.5	<2.5	409
Phenanthrene	<2.5	<2.5	<2.5	<2.5	<2.5	307
Pyrene	<2.5	<2.5	<2.5	<2.5	<2.5	310
2-Methylnaphthalene	<2.5	<2.5	<2.5	<2.5	<2.5	409
Total Metals						
Barium - Method 6010	13.5	19.5	20.1	42.1	24.6	200 (160)
Chromium - Method 6010	2.09	2.15	1.74	2.56	5.28	10 (12.6)
Mercury - Method 7470	0.010	0.027	0.009	0.009	0.128	0.2 (0.2)
Nickel - Method 6010	1.37	1.56	0.97	1.85	5.09	10 (4.4)
Mercury - Method 6010						
SPLP Analysis						mg/L
Mercury - Method 1312						0.002

na - not applicable

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EXHIBIT B

533-93-1059

FEBUARY 11, 2000

3.823 ACRE TRACT OF LAND
OUT OF THE AMY WHITE SURVEY,
A-81, IN HARRIS COUNTY, TEXAS

D+(=)

Being a 3.823 acre (166,545 square feet) tract of land in the Amy White Survey, A-81, in Harris County, Texas, and being a portion of Arco Chemical Company Section 1, as described in deed recorded in Volume 3012, Page 167, of the Harris County Deed Records (H.C.D.R.), and being more particularly described by metes and bounds as follows, with all bearings and coordinates based on Texas State Plane Coordinate System, South Central Zone (NAD 83):

COMMENCING at the northwest corner of said Arco Chemical Company Section 1, and the southwest corner of Hughes Club, as described in deed recorded in Volume 1898, Page 712, of the Harris County Deed Records, and the east right-of-way line of Sheldon Road (100 foot wide), at a 5/8 inch iron rod in concrete found for corner;

THENCE South 3 degrees 08 minutes 23 seconds East, a distance of 1267.38 feet along the east right-of-way line of said Sheldon Road and the west line of said Arco Chemical Company Section 1, to a point for corner;

THENCE North 87 degrees 17 minutes 26 seconds East, a distance of 568.26 feet departing said east right-of-way of Sheldon Road, to the POINT OF BEGINNING, said point being on the most northwestern corner of the herein described tract;

THENCE North 87 degrees 17 minutes 26 seconds East, a distance of 250.03 feet to a point for corner, said point being the northeast corner of the herein described tract;

THENCE South 03 degrees 00 minutes 46 seconds East, a distance of 499.56 feet to a point for corner, said point being the southeast corner of the herein described tract;

THENCE South 85 degrees 40 minutes 12 seconds West, a distance of 329.28 feet to a point for corner, said point being the southerly most southeast corner of the herein described tract;

THENCE North 04 degrees 16 minutes 53 seconds West, a distance of 54.91 feet to a point for corner;

THENCE South 86 degrees 12 minutes 36 seconds West, a distance of 8.49 feet to a point for corner;

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THENCE North 04 degrees 46 minutes 09 seconds West, a distance of 18.77 feet to a point for corner;

THENCE North 82 degrees 59 minutes 17 seconds East, a distance of 10.96 feet to a point for corner;

THENCE North 03 degrees 12 minutes 44 seconds West, a distance of 37.77 feet to a point for corner;

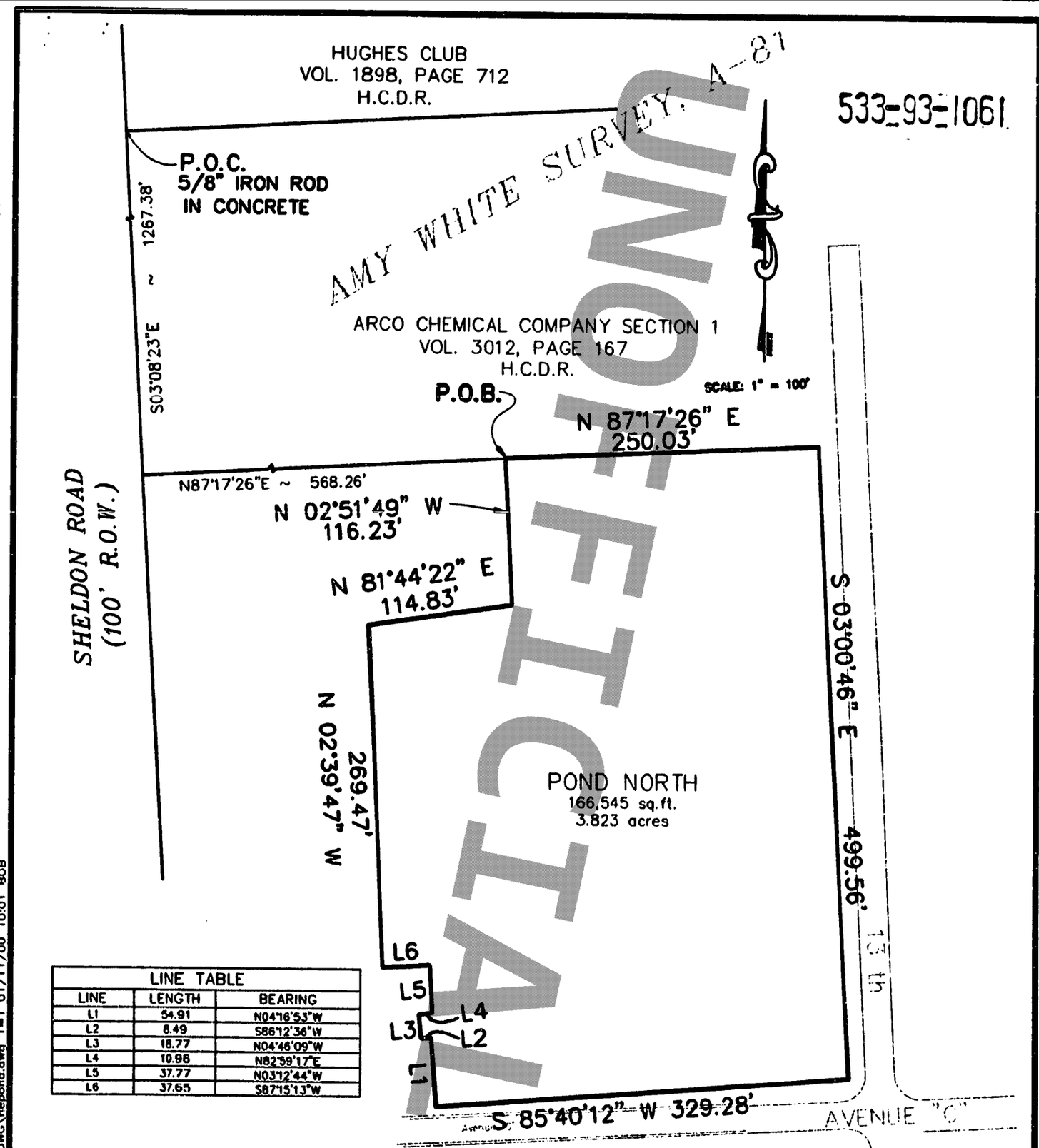
THENCE South 87 degrees 15 minutes 13 seconds West, a distance of 37.65 feet to a point for corner;

THENCE North 02 degrees 39 minutes 47 seconds West, a distance of 269.47 feet to a point for corner;

THENCE North 81 degrees 44 minutes 22 seconds East, a distance of 114.83 feet to a point for corner;

THENCE North 02 degrees 51 minutes 49 seconds West, a distance of 116.23 feet to the Point of Beginning and containing 3.823 acres (166,545 square feet) of land.

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LINE TABLE		
LINE	LENGTH	BEARING
L1	54.91	N04°16'53"W
L2	8.49	S86°12'36"W
L3	18.77	N04°46'09"W
L4	10.98	N82°59'17"E
L5	37.77	N03°12'44"W
L6	37.65	S87°15'13"W

CLR

Coburn Linseisen & Ratcliff, Inc.

Civil Engineers • Architects • Surveyors • Planners

13100 Northwest Freeway, Suite 500 TEL: 713 462-0993
Houston, Texas 77040 Fax: 713 462-2732

OP-1 POND + API SEPARATOR AREA

SCALE :	DATE :	DRAWN BY:	FB NO:	APPROVED:	DWG. NO. :
1"=100'	02/10/00	BOB	573		NEPOND

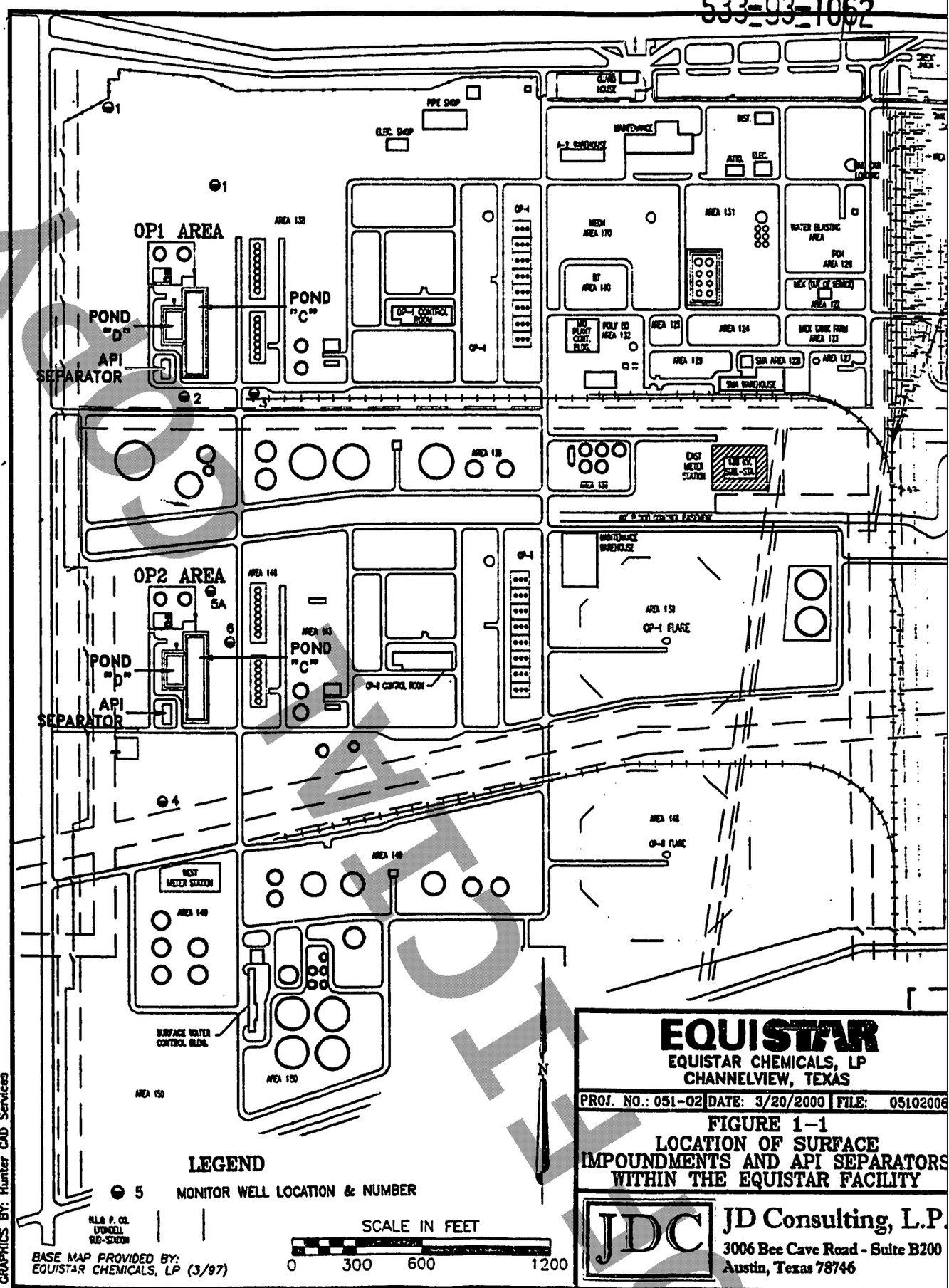
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533-93-1062



GRAPHICS BY: Hunter CAD Services

EQUISTAR

EQUISTAR CHEMICALS, LP
CHANNELVIEW, TEXAS

PROJ. NO.: 051-02 | DATE: 3/20/2000 | FILE: 05102006

FIGURE 1-1
LOCATION OF SURFACE IMPOUNDMENTS AND API SEPARATORS WITHIN THE EQUISTAR FACILITY

JDC
JD Consulting, L.P.
3006 Bee Cave Road - Suite B200
Austin, Texas 78746

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EXHIBIT C

FEBUARY 11, 2000

3.570 ACRE TRACT OF LAND
OUT OF THE AMY WHITE SURVEY,
A-81, IN HARRIS COUNTY, TEXAS

Being a 3.570 acre (155,497 square feet) tract of land in the Amy White Survey, A-81, in Harris County, Texas, and being a portion of Arco Chemical Company Section 1, as described in deed recorded in Volume 3012, Page 167, of the Harris County Deed Records (H.C.D.R.), and being more particularly described by metes and bounds as follows, with all bearings and coordinates based on Texas State Plane Coordinate System, South Central Zone (NAD 83): See

COMMENCING at the northwest corner of said Arco Chemical Company Section 1, and the southwest corner of Hughes Club, as described in deed recorded in Volume 1898, Page 712, of the Harris County Deed Records, and the east right-of-way line of Sheldon Road (100 foot wide), at a 5/8 inch iron rod in concrete found for corner;

THENCE South 3 degrees 08 minutes 23 seconds East, a distance of 2830.91 feet along the east right-of-way line of said Sheldon Road and the west line of said Arco Chemical Company Section 1, to a point for corner;

THENCE North 85 degrees 52 minutes 00 seconds East, a distance of 573.55 feet departing the east right-of-way line of said Sheldon Road, to the POINT OF BEGINNING and the northern most northwest corner of the herein described tract;

THENCE North 85 degrees 52 minutes 00 seconds East, a distance of 223.55 feet to a point for the northeast corner of the herein described tract;

THENCE South 01 degrees 35 minutes 52 seconds East, a distance of 502.75 feet to a point for the southeast corner of the herein described tract;

THENCE South 87 degrees 01 minutes 56 seconds West, a distance of 304.21 feet to a point for the southerly most southwest corner of the herein described tract;

THENCE North 03 degrees 22 minutes 08 seconds West, a distance of 51.01 feet to a point for corner;

THENCE North 86 degrees 37 minutes 10 seconds West, a distance of 11.12 feet to a point for corner;

THENCE North 02 degrees 05 minutes 54 seconds West, a distance of 19.70 feet to a point for corner;

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THENCE North 86 degrees 40 minutes 50 seconds East, a distance of 10.65 feet to a point for corner;

THENCE North 02 degrees 18 minutes 30 seconds West, a distance of 37.99 feet to a point for corner;

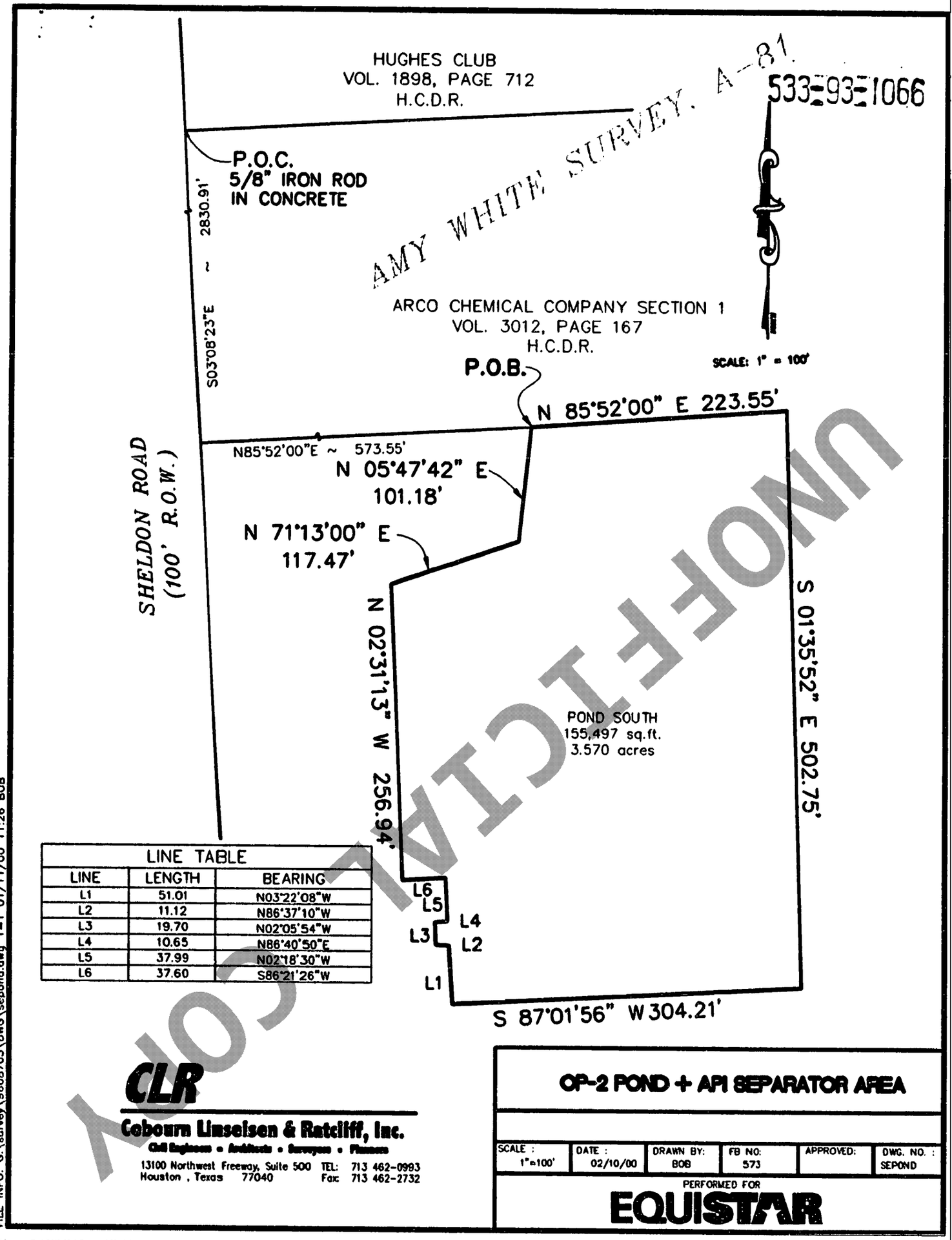
THENCE South 86 degrees 21 minutes 26 seconds West, a distance of 37.60 feet to a point for corner;

THENCE North 02 degrees 31 minutes 13 seconds West, a distance of 256.94 feet to a point for corner;

THENCE North 71 degrees 13 minutes 00 seconds East, a distance of 117.47 feet to a point for corner;

THENCE North 05 degrees 47 minutes 42 seconds East, a distance of 101.18 feet to the Point of Beginning and containing 3.570 acres (155,497 square feet) of land.

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LINE TABLE		
LINE	LENGTH	BEARING
L1	51.01	N03°22'08"W
L2	11.12	N86°37'10"W
L3	19.70	N02°05'54"W
L4	10.65	N86°40'50"E
L5	37.99	N02°18'30"W
L6	37.60	S86°21'26"W

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CLR
Ceburn Linseisen & Ratcliff, Inc.
Civil Engineers • Architects • Surveyors • Planners
13100 Northwest Freeway, Suite 500 TEL: 713 462-0993
Houston, Texas 77040 Fax: 713 462-2732

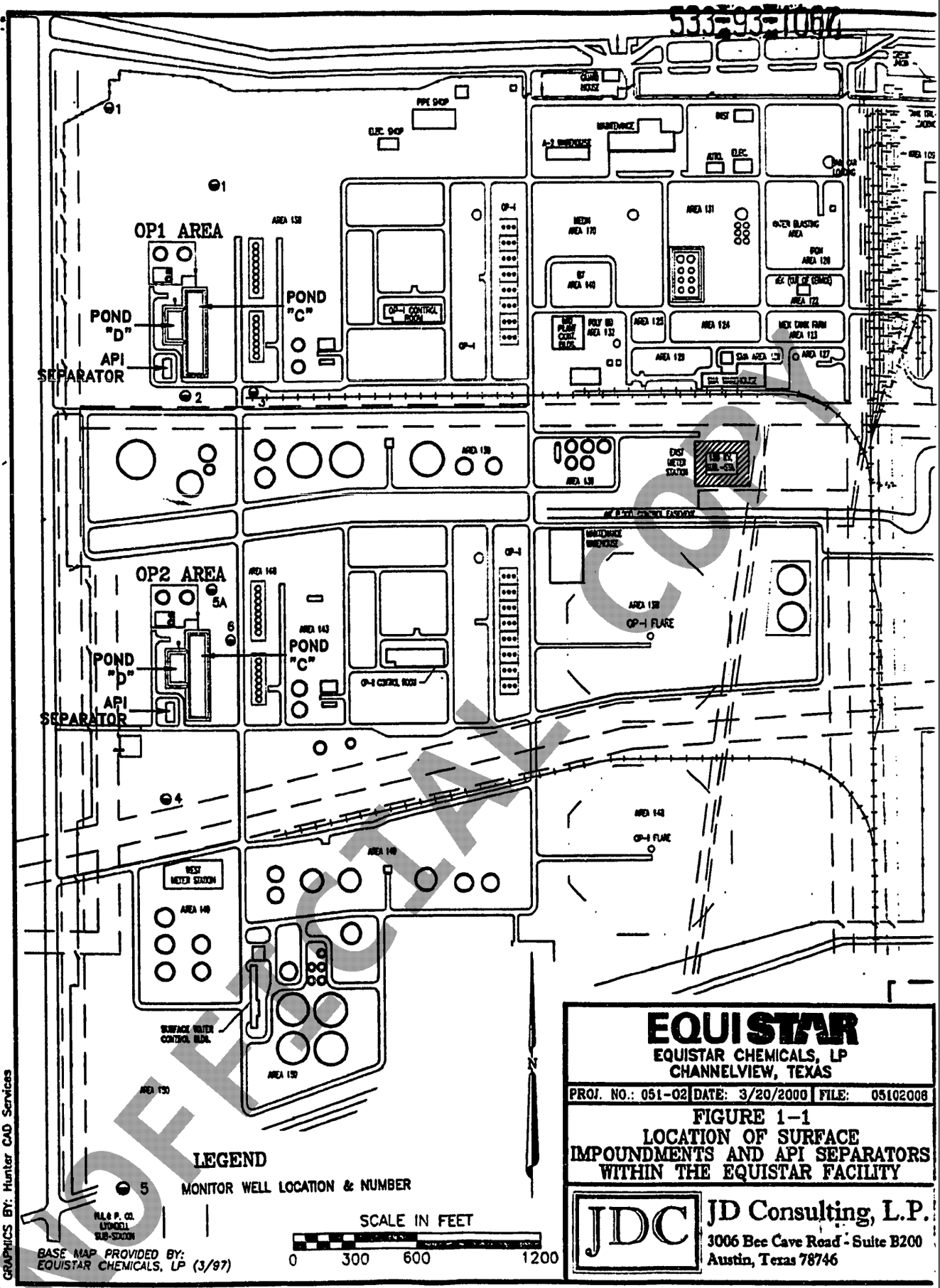
OP-2 POND + API SEPARATOR AREA

SCALE :	DATE :	DRAWN BY:	FB NO:	APPROVED:	DWG. NO. :
1"=100'	02/10/00	BOB	573		SEPOND

PERFORMED FOR
EQUISTAR

FILE INFO: G:\survey\9608705\DWG\sepond.dwg 1=1 01/11/00 11:26 BOB

533-93-1067



EQUISTAR
EQUISTAR CHEMICALS, LP
CHANNELVIEW, TEXAS

PROJ. NO.: 051-02	DATE: 3/20/2000	FILE: 05102008

FIGURE 1-1
LOCATION OF SURFACE IMPOUNDMENTS AND API SEPARATORS WITHIN THE EQUISTAR FACILITY

JDC JD Consulting, L.P.
3006 Bee Cave Road - Suite B200
Austin, Texas 78746

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533-93-1068

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2000 AUG -7 PM 2:23
COUNTY CLERK
HARRIS COUNTY, TEXAS

ANY PROVISION HEREIN WHICH RESTRICTS THE SALE, RENTAL, OR USE OF THE DESCRIBED REAL PROPERTY BECAUSE OF COLOR OR RACE IS INVALID AND UNENFORCEABLE UNDER FEDERAL LAW

THE STATE OF TEXAS }
COUNTY OF HARRIS }

I hereby certify that this instrument was FILED in File Number Sequence on the date and at the time stamped hereon by me; and was duly RECORDED, in the Official Public Records of Real Property of Harris County, Texas on

AUG 7 2000

COUNTY CLERK
HARRIS COUNTY TEXAS

15
Notice
$4-
l

RP-2023-148975
04/26/2023 RP1 $78.00

Texas Risk Reduction Program

Deed Notice

STATE OF TEXAS §

§

COUNTY OF HARRIS §

This Notice is filed to provide information concerning certain environmental conditions and/or use limitation pursuant to the Texas Commission on Environmental Quality (TCEQ) Texas Risk Reduction Program Rule (TRRP) found at 30 Texas Administrative Code (TAC), Chapter 350, and affects the real property (Property) described in Exhibit A, which is attached hereto and incorporated herein by reference.

The legal description of the entire facility is documented in Exhibit A and is attached hereto and incorporated herein by reference as Exhibit A. The facility is utilized as commercial / industrial land use.

Portions of the soils of the Property contain certain identified chemicals of concern causing those portions of the Property to be considered an Affected Property as that term is defined in TRRP. The portion considered to be Affected Property is described as follows:

The Affected Property legal description is documented in Exhibit B and is attached hereto and incorporated by reference as Exhibit B. Benz(a)anthracene, naphthalene and Total Petroleum Hydrocarbons are the COCs for the Affected property.

This Notice is required for the following reasons:

The Affected Property is subject to the TRRP requirements for properties containing concentrations of chemicals of concern in the soil and is subject to the requirements in 30 TAC §350.33(e)(2) to prevent exposure to soils that contain a chemical of concern in excess of the protective concentration level. The attached Exhibit C describes and provides the location of the

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physical control and extent of the soil that exceeds the TCEQ-approved protective concentration levels for certain chemicals of concern. The attached Exhibit C also describes the required maintenance and monitoring required for the physical control. This program must be implemented unless and until TCEQ approves any modification. This deed notice must not be removed or modified without prior approval from TCEQ.

As of the date of this Notice, the record owner of fee title to the property is Equistar Chemicals, LP (Owner) with an address of 8280 Sheldon Road, Channelview, Texas 77530.

For additional information, contact:

TCEQ
Central Records
12100 Park 35 Circle,
Building E
Austin, Texas 78753

Mail: TCEQ - MC 199
P O Box 13087
Austin, Texas 78711-3087

TCEQ Program: Corrective Action Section – Remediation Division
Identifier No.: SWR ID No. 30030; HW Permit/CP No. 50117

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This Notice may be rendered of no further force or effect only by a superseding deed notice executed by the TCEQ or its successor agencies and filed in the same Real Property Records as those in which this Deed Notice is filed.

Executed this _day of 04/20/2023

By: _____

Name: Anthony Wood

Title: Site Manager

STATE OF TEXAS

HARRIS COUNTY

BEFORE ME, on this the 20th day of April personally appeared Anthony [name] Wood, Site Manager of Equistar Chemicals Channelview Facility, known to me to be the person whose name is subscribed to the foregoing instrument, and they acknowledged to me that they executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the 20th day of April, 2023

CATHEY KELLEY
Notary Public, State of Texas
Comm. Expires 10-08-2025
Notary ID 3531440

Cathey Kelley

Notary Public in and for the State of Texas, County of Harris

My Commission Expires: 10-08-2025

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RP-2023-148975

10R

Exhibit A
Property Survey

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RP-2023-148975

√√ Ret

Brown & Caldwell
Attn: ~~Michelle~~ Michelle Payne
10777 Westheimer Rd. Suite 975
Houston, TX 77042

Cobourn Linseisen & Ratcliff Inc.
civil engineers • surveyors • planners • architects

June 11, 1980

METES AND BOUNDS DESCRIPTION OF A 1246.30 ACRE TRACT IN THE A. WHITE SURVEY, ABSTRACT NO. 81, THE M. STROIN SURVEY, ABSTRACT NO. 1559, THE A. PETERSON SURVEY, ABSTRACT NO. 1530, HARRIS COUNTY, TEXAS

Being a 1246.30 acre tract of land in the Amy White Survey, Abstract No. 81, the Michael Stroin Survey, Abstract No. 1559, and the August Peterson Survey, Abstract No. 1530 all in Harris County, Texas, and being a tract of land sold to Atlantic Richfield Company as described in Deed recorded under Harris County Clerk's File No. E 237928 and also a portion of that land described in deed recorded in Volume 3012, Page 167 of the Harris County Deed Records and a portion of those lands described in deed recorded under the following Harris County Clerk's File Numbers: D 962902, D 962903, D 962905, D 962906, E 140826, E 237982; and being more particularly described by metes and bounds as follows utilizing the ARCO Plant Coordinate System as a basis for bearings, said bearing system being rotated 2° 48' clockwise form the Texas State Plane Coordinate System, South Central Zone:

BEGINNING at a 5/8 inch iron rod found marking the intersection of the east right-of-way line of Sheldon Road (100 foot wide) as described in deed recorded under Harris County Clerk's File No. E 655120 and the north right-of-way line of Wallisville Road (60 foot wide); said **POINT OF BEGINNING** being in a curve concave to the east;

THENCE along the east right-of-way line of said Sheldon Road as follows:

Northerly 196.56 feet along said curve concave to the east having a central angle of 04 degrees 00 minutes 03 seconds, a radius of 2814.94 feet and whose chord bears North 02 degrees 20 minutes 09 seconds West, 196.52 feet to a 5/8 inch iron rod found marking the point of tangency of said curve concave to the east;

North 00 degrees 20 minutes 09 seconds West, at 5462.06 feet to a 5/8 inch iron rod in concrete found marking the point of curvature of a curve concave to the east;

Northerly 191.19 feet along said curve concave to the east having a central angle of 03 degrees 53 minutes 30 seconds a radius of 2814.79 feet, and whose chord bears North 01 degrees 44 minutes 43 seconds East, 191.17 feet to a 5/8 inch iron rod found marking the point of tangency of said curve;

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5801 Dierker • Houston, Texas 77041-6214 • (713) 462-0993 • Fax (713) 462-2732

North 03 degrees 24 minutes 43 seconds East, 100.17 feet to a 5/8 inch iron rod in concrete found marking the point of curvature of a curve concave to the west;

Northerly 197.98 feet along said curve concave to the west having a central angle of 03 degrees 53 minutes 30 seconds, a radius of 2914.79 and whose chord bears North 01 degrees 35 minutes 43 seconds, 197.94 feet to a 5/8 inch iron rod in concrete found marking the point of tangency of said curve;

North 00 degrees 20 minutes 09 seconds West, 423.06 feet to a 5/8 inch iron rod found marking the northwest corner of the herein described tract, the northwest corner of the Hugh Club tract as described in Deed recorded under Harris County Clerk's File No. F 211524 and the southwest corner of a South Pacific Railroad Company tract described in deed recorded under Harris County Clerk's File No. F 431956;

THENCE along the south line of the said Southern Pacific Railroad Company tract and along the north line of the said Hugh Club tract and along a fence as follows:

South 88 degrees 54 minutes 39 seconds East, 1588.92 feet to a 5/8 inch iron rod in concrete,

South 87 degrees 50 minutes 34 seconds East, 367.84 feet to a 5/8 inch iron rod in concrete,

South 89 degrees 33 minutes 31 seconds East, 516.55 feet to a 5/8 inch iron rod in concrete,

South 89 degrees 50 minutes 37 seconds East, 795.25 feet to a 5/8 inch iron rod in concrete,

North 89 degrees 26 minutes 16 seconds East, 487.40 feet to a 5/8 inch iron rod in concrete,

North 89 degrees 58 minutes 27 seconds East, 541.24 feet to a 5/8 inch iron rod in concrete,

North 89 degrees 44 minutes 54 seconds East, 1708.01 feet to a 5/8 inch iron rod in concrete marking an "ell" corner,

North 00 degrees 14 minutes 42 seconds East, 297.82 feet to a 1 ¼ inch iron pipe marking an "ell" corner,

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COPY

North 89 degrees 58 minutes 38 seconds East, at 990.10 feet pass a reference concrete monument and continue in all a total distance of 1319.68 feet to a 5/8 inch iron rod in concrete set for reference on the west bank of the San Jacinto River, approximately 150.00 feet from the centerline of the said river;

THENCE along the meanders of the San Jacinto River as follows:

South 37 degrees 52 minutes 20 seconds East 113.02 feet to an angle point,

South 26 degrees 37 minutes 52 seconds East, 232.13 feet to an angle point,

South 42 degrees 08 minutes 37 seconds East, 93.65 feet to an angle point,

South 30 degrees 17 minutes 09 seconds East, 209.63 feet to a 5/8 inch iron rod set for reference,

South 49 degrees 12 minutes 07 seconds East, 2855.01 feet to a 5/8 inch iron rod set for reference on the west bank of said river,

South 48 degrees 52 minutes 12 seconds East, 87.70 feet to a 5/8 inch iron rod on the west bank of said San Jacinto River,

South 59 degrees 35 minutes 08 seconds East, 261.04 feet to an angle point;

South 54 degrees 44 minutes 15 seconds East, 408.41 feet to an angle point;

South 56 degrees 53 minutes 48 seconds East, 249.89 feet to an angle point,

South 62 degrees 42 minutes 38 seconds East, 142.31 feet to a 5/8 inch iron rod in concrete found marking a reference point in the east line of the herein described tract, the centerline of said San Jacinto River bears North 27 degrees 17 minutes 22 seconds East, approximately 150.00 feet;

THENCE leaving said river, South 00 degrees 05 minutes 58 seconds West, at 165.35 feet pass a ½ inch iron pipe in concrete and continue in all, along the north line of an American Plant Food Corporation Tract, and along the east line of ARCO Section XI, 2533.36 feet to a one inch iron pipe in concrete found marking the southeast corner of the herein described tract, the southeast corner of ARCO Section XI the southwest corner of said American Plant Food Corporation tract, and a point in the north right-of-way line of said Wallisville Road;

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THENCE along the north right-of-way line of said Wallisville Road as follows:

South 89 degrees 23 minutes 25 seconds West, 610.15 feet to a fence corner;

South 89 degrees 51 minutes 43 seconds West, 2649.68 feet to 5/8 inch iron rod in concrete,

South 89 degrees 41 minutes 24 seconds West, 3620.72 feet to a ¾ inch iron pipe in concrete at the southeast corner of a Missouri Pacific Railroad Company FEE STRIP as described in deed recorded in Volume 4187, Page 220 of the Harris County Deed Records;

THENCE along the east line of said Missouri Pacific Railroad Company FEE STRIP and the west line of ARCO Section XI, North 00 degrees 41 minutes 04 seconds, 2371.18 feet to the northeast corner of said Missouri Pacific Railroad Company FEE STRIP;

THENCE along the north line of said Missouri Pacific Railroad Company FEE STRIP South 89 degrees 59 minutes 58 seconds West, 150.01 feet to the northwest corner of the Missouri Pacific Railroad Company FEE STRIP as described in deed recorded in Volume 3135, Page 633 of the Harris County Deed Records;

THENCE along the west line of said Missouri Pacific Railroad Company FEE STRIP South 00 degrees 41 minutes 04 seconds East, 300.00 feet to the northeast corner of a Houston Lighting & Power FEE STRIP as described in deed recorded in Volume 3049, Page 533 of the Harris County Deed Records;

THENCE around the perimeter of a Houston Lighting & Power Company property as per deeds recorded in Volume 3049, Page 533, Volume 6008, Page 13, Volume 5880, Page 363, as follows:

South 89 degrees 59 minutes 58 seconds West, 400.00 feet to an "ell" corner;

South 00 degrees 41 minutes 04 seconds East, 11.71 feet to an "ell" corner;

North 89 degrees 42 minutes 14 seconds West, 298.96 feet to an "ell" corner;

South 00 degrees 17 minutes 46 seconds West, 100.00 feet to an "ell" corner;

South 89 degrees 42 minutes 14 seconds East, 551.55 feet to an "ell" corner;

South 00 degrees 41 minutes 04 seconds East, 20.00 feet to an "ell" corner marking the northwest corner of a 50.00 foot strip sold to Atlantic Richfield

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Add to Home

Company by Houston Lighting & Power Company as described in deed recorded under Harris County Clerk's File No. E 515898;

THENCE along the common line of said ARCO FEE STRIP and Houston Lighting & Power Company line as follows:

North 89 degrees 18 minutes 10 seconds East, 50.01 feet to an "ell" corner,

South 00 degrees 41 minutes 50 seconds East, 714.24 feet to an angle point,

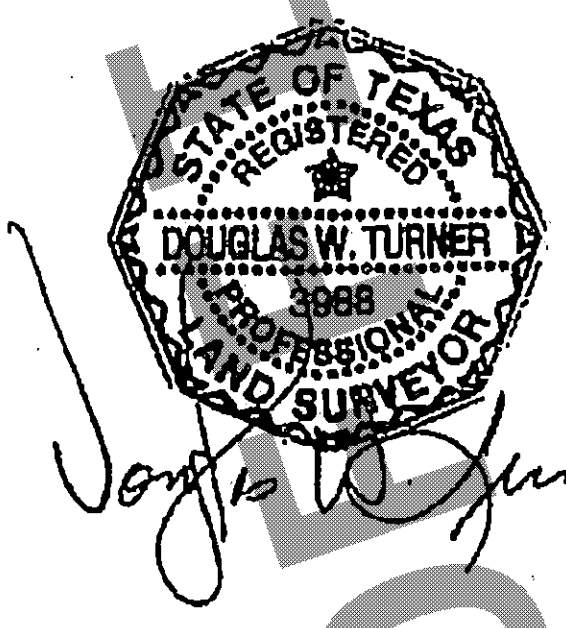
South 00 degrees 39 minutes 48 seconds East, 1229.80 feet to a point in the north right-of-way line of said Wallisville Road;

THENCE along the north right-of-way line of said Wallisville Road as follows:

South 71 degrees 24 minutes 45 seconds West, 1572.59 feet to a 5/8 inch iron rod in concrete marking an angle point,

South 71 degrees 32 minutes 01 seconds West, 689.08 feet to a 5/8 inch iron rod in concrete marking an angle point;

South 71 degrees 23 minutes 12 seconds West, 1567.70 feet to the **POINT OF BEGINNING** and containing 1246.30 acres of land.



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Exhibit B

Affected Area Property Survey

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Exhibit C

Extent of Contamination and Preventative Maintenance and Monitoring

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Exhibit C: Location and Extent of Contamination and Preventative Maintenance and Monitoring

The Protective Concentration Level (PCL) Exceedance (PCLE) Zone is concentrated beneath the footprint of Tank 48304 described in Exhibit B and presented below. The PCLE zone does not extend beyond the footprint of Tank 48304.

The contaminants of concern (COCs) are benzo(a)anthracene, naphthalene, and Total Petroleum Hydrocarbons (TPH). Benzo(a)anthracene concentrations range from 29 to 56 mg/kg and exceed Residential PCLs. Naphthalene concentrations range from 380 to 1,600 mg/kg. TPH concentrations for a >nC12 to nC28 compound range from 15,000 to 34,000 mg/kg. Naphthalene and TPH exceed the Critical PCL for Commercial/Industrial use. The restricted use of this property will serve to prevent potential receptor exposure to COCs identified in the PCLE zones in surface soil at Tank 48304.

The tank will be visually inspected annually to the extent practicable and visual inspection of the soil surrounding the tank will be conducted too and documented in the *Equistar Channelview Post-Response Action Completion Report (PRACR)* for the Area 1 North and OP-1 Soil Management Areas or in a separate *PRACR*. The tank undergoes scheduled maintenance every 20 years per *API Standard 653* which provides the minimum requirements for inspection and repairs to maintain the integrity of tanks in service. The next date for scheduled service is in 2039.

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STATE OF TEXAS)
COUNTY OF HARRIS)

DESCRIPTION of a 2914 square feet circular tank situated in the Amy White Survey, Abstract 81, Harris County, Texas. Said tank having a radius of 30.5 feet and a circumference of 191.39 feet. All points along said circumference are located equidistant from the hereinafter described center point/radius point of said tank.

NOTE: BEARINGS ARE LAMBERT GRID BEARINGS AND ALL COORDINATES REFER TO THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 83. ALL DISTANCES ARE ACTUAL DISTANCES. SCALE FACTOR = 1.0000000. REFERENCE IS MADE TO THE MAP OF SAME DATE ACCOMPANYING THIS METES AND BOUNDS DESCRIPTION.

COMMENCING at a ¾ inch iron rod, with aluminum cap stamped "Atlantic Richfield Property Corner", found in the East right-of-way line of Sheldon Road (100 feet wide right-of-way). Said COMMENCING POINT has a State Plane Coordinate Value of Y=13,866,479.224 and X=3,196,339.951.

THENCE: North 29°15'24" East for a distance of 2230.18 feet to a point for the center point/radius point herein described. Said center point/radius point has a State Plane Coordinate Value of Y=13,868,424.92 and X=3,197,429.89.

SURVEYOR'S CERTIFICATE

I, Juliene Harrod, Registered Professional Land Surveyor No. 4379, do hereby certify that the above description was prepared from an actual survey made on the ground to locate the above-mentioned tank, under my supervision, on April 9, 2020 and that all lines, boundaries and landmarks are accurately described therein.

WITNESS my hand and seal at Baytown, Texas, this the 14th day of April, A. D., 2020.

Juliene Harrod

Juliene Harrod
R. P. L. S. No. 4379
20-6346.fdn.docx
Hutchison & Associates, Inc.
1209 Decker Drive, Ste. 100
Baytown, TX 77520
Engineering Firm #F-267
Surveying Firm #10029-00

STATE OF TEXAS
REGISTERED
JULIENE HARROD
4379
PROFESSIONAL
LAND SURVEYOR

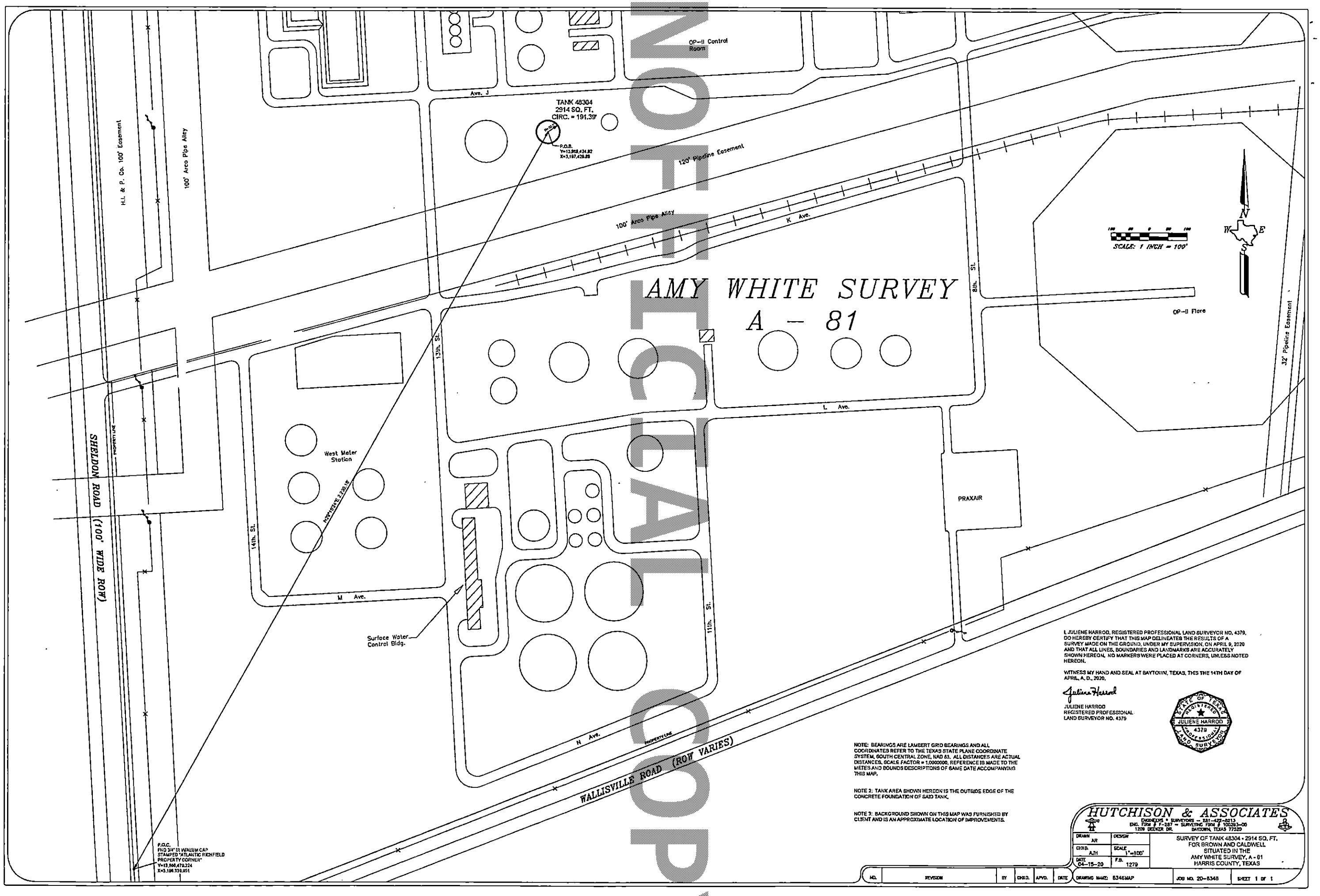
RECORDER'S MEMORANDUM:
At the time of recordation, this instrument was found to be inadequate for the best photographic reproduction because of illegibility, carbon or photo copy, discolored paper, etc. All blockouts, additions and changes were present at the time the instrument was filed and recorded.

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I, JULIENE HARROD, REGISTERED PROFESSIONAL LAND SURVEYOR NO. 4379, DO HEREBY CERTIFY THAT THIS MAP DELINEATES THE RESULTS OF A SURVEY MADE ON THE GROUND, UNDER MY SUPERVISION, ON APRIL 9, 2020 AND THAT ALL LINES, BOUNDARIES AND LANDMARKS ARE ACCURATELY SHOWN HEREON. NO MARKERS WERE PLACED AT CORNERS, UNLESS NOTED HEREON.

WITNESS MY HAND AND SEAL AT BAYTOWN, TEXAS, THIS THE 14TH DAY OF APRIL, A. D., 2020.

Juliene Harrod

JULIENE HARROD
REGISTERED PROFESSIONAL
LAND SURVEYOR NO. 4379

STATE OF TEXAS
REGISTERED
JULIENE HARROD
4379
PROFESSIONAL
LAND SURVEYOR

NOTE: BEARINGS ARE LAMBERT GRID BEARINGS AND ALL COORDINATES REFER TO THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 83. ALL DISTANCES ARE ACTUAL DISTANCES. SCALE FACTOR = 1.0000000. REFERENCE IS MADE TO THE METES AND BOUNDS DESCRIPTIONS OF SAME DATE ACCOMPANYING THIS MAP.

NOTE 2: TANK AREA SHOWN HEREON IS THE OUTSIDE EDGE OF THE CONCRETE FOUNDATION OF SAID TANK.

NOTE 3: BACKGROUND SHOWN ON THIS MAP WAS FURNISHED BY CLIENT AND IS AN APPROXIMATE LOCATION OF IMPROVEMENTS.

HUTCHISON & ASSOCIATES
ENGINEERS • SURVEYORS — 281-422-8211
ENG. FIRM # F-287 — SURVEYING FIRM # 100253-06
1209 DECKER DR.
BAYTOWN, TEXAS 77520

DRAWN	DESIGN	SURVEY OF TANK 48304 • 2914 SQ. FT. FOR BROWN AND CALDWELL SITUATED IN THE AMY WHITE SURVEY, A - 81 HARRIS COUNTY, TEXAS
AR		
CHKD. AJH	SCALE 1"=100'	
DATE 04-15-20	F.B. 1279	

NO.	REVISION	BY	CHKD.	APVD.	DATE	DRAWING NAME: 8346MAP	JOB NO. 20-8346	SHEET 1 OF 1

RP-2023-148975

DWG. NO.	REFERENCE DRAWINGS	NO.	DATE	REVISIONS	REV.

DRAWING NUMBER				REV.
E	99	L	099	0

DSGN. CHK. DATE ××/××/××
DRWN. XXX DATE ××/××/××
CHK. XXX DATE ××/××/××
APP. XXX DATE ××/××/××
SCALE 1"=300'
AFP-ROX

LYONDELL PETROCHEMICAL COMPANY
SITE PLOT PLAN
AREAS

LOCATION: CHANNELVIEW ENGINEERING DEPARTMENT

Lyondell Petrochemical Company

LEGEND
PROPERTY BOUNDARY LINES
EASEMENT & PIPE ALLEY BOUNDARY LINES
BUILDINGS
METERS 10 50 100

WALLISVILLE ROAD
SHELDON ROAD
ARCO CHEM.
TO ARCO CHEM
BARGE LOADING DOCK FACILITIES
FENCE LINE
100' ARCO PIPE ALLEY
120' PIPELINE EASEMENT
PROJECT ENGINEERING FACILITY
SARTOMER PLANT
EAST PLANT
WALLISVILLE ALLEY
SLUDGE LAGOONS
DITCH
DEMOLITION'S CLUB HOUSE AND GYM
DEMOLITION'S RECREATION AREA
DEMOLITION'S STORAGE AREA
SAFETY
MAGNOLIA AREA
PLANT ENTRANCE ROAD
N

NOT OFFICIAL COPY

FILED FOR RECORD

2:25:46 PM

Wednesday, April 26, 2023

Teneshia Hudspeth

COUNTY CLERK, HARRIS COUNTY, TEXAS

UNOFFICIAL COPY

RP-2023-148975

ANY PROVISION HEREIN WHICH RESTRICTS THE SALE RENTAL, OR USE OF THE DESCRIBED REAL PROPERTY BECAUSE OF COLOR OR RACE IS INVALID AND UNENFORCEABLE UNDER FEDERAL LAW.

THE STATE OF TEXAS
COUNTY OF HARRIS

I hereby certify that this instrument was FILED in File Number Sequence on the date and at the time stamped hereon by me; and was duly RECORDED; in the Official Public Records of Real Property of Harris County Texas

Wednesday, April 26, 2023

COUNTY COURT OF HARRIS COUNTY, TEXAS

Teneshia Hudspeth

COUNTY CLERK
HARRIS COUNTY, TEXAS

4.
NOTICE
W

20150514284
11/11/2015 RP2 $28.00

DEED NOTICE

STATE OF TEXAS §

§

COUNTY OF HARRIS §

This Notice is filed to provide information concerning certain environmental conditions and/or use limitations pursuant to the Texas Commission on Environmental Quality (TCEQ) Underground Injection Control (UIC) 30 Texas Administrative Code (TAC), Chapter 331, and affects the real property (Property) described as follows: Exhibit A is the meets and bounds description for the Property along with a plat displaying the location of deep injection well, WDW036 (noted as *Water Disposal Well No.1* in the plat). Exhibit A is attached hereto and incorporated herein by reference.

The Property described above has been used to manage hazardous waste in which a deep injection well was utilized to dispose of the waste, WDW036.

The plat displaying the location of the deep injection well, WDW036, has been filed with Harris County Real Property Records as well as Texas Commission on Environmental Quality (TCEQ) Underground Injection Control (UIC) staff of the commission submitted to Mail Code 233, P.O. Box 13087, Austin, TX 78711-3087.

The type of waste injected into WDW036 consisted of authorized industrial hazardous and nonhazardous waste streams. The waste streams included propylene oxide / styrene monomer waste caustic, olefins waste caustic, butane waste caustic, and emergency flare knockout drum waste. Waste streams from production units included polybutadiene, methanol, benzene / toluene, styrene maleic anhydride, isopropanol, methyl ethyl ketone, and acetonitrile wastewater from a recovery unit. Miscellaneous waste streams included groundwater and stormwater contaminated by the above listed wastes, spills of the above listed wastes, and wash water and solutions used to clean and service the disposal well and its equipment. Wastes generated during the well construction and closure of the well was also injected into the well. These wastes were compatible with permitted wastes, injection zone and the well. The total volume of waste injected into the Frio A, B, and C Sands was 1,020,280,600 gallons from March 1969 to May 1977. The total volume of waste injected into the Frio D, E, and F Sands was 368,787,909 gallons from June 1977 to August 1991. Injection ceased in September 1991.

This Notice is required as a condition of closure for deep injection well WDW036 by TCEQ.

As of the date of this Notice, the record owner of fee title to the Property is Equistar Chemicals, LP with an address of 8280 Sheldon Road, Channelview, Texas 77530.

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For additional information, contact:

TCEQ
UIC Permits Section
Radioactive Materials Division
12100 Park 35 Circle
Building F
Austin Texas 78753

Mail: TCEQ – MC 233
Attn: UIC Permit Section
Radioactive Materials Division
P.O. Box 13087
Austin, Texas 78711-3087

TCEQ Program and Identifier No.: Underground Injection Control Permit No. WDW036

This Notice may be rendered of no further force or effect only by a superseding deed notice executed by the TCEQ or its successor agencies and filed in the same Real Property Records as those in which this Deed Notice is filed.

Executed this 10TH day of NOVEMBER, 2015.

By: M.R. Bookmyer FOR TODD MONETTE

Name: Mr. Todd Monette

Title: Site Manager

Golder Associates Inc.
Attn. Thomas Marou
500 Century Plaza Dr. Suite 190
Houston, Texas 77073

STATE OF TEXAS §
§
HARRIS COUNTY §

BEFORE ME, on this the 10th day of November, 2015, personally appeared Mr. Todd Monette, Site Manager, of Equistar Chemicals, LP, known to me to be the person whose name is subscribed to the foregoing instrument, and they acknowledged to me that they executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this 10th day of November, 2015

Cathey Sue Kelley
Notary Public in and for the State of Texas County of Harris
My Commission Expires: October 8, 2017

CATHEY SUE KELLEY NOTARY PUBLIC STATE OF TEXAS EXPIRES 10-8-2017

UNOFFICIAL DOCUMENT

0820-801-960 888

Cobourn-Linseisen & Associates, Inc.

Exhibit A

ENGINEERS - SURVEYORS

January 25, 1983

METES AND BOUNDS DESCRIPTION
OF A 1.1318 ACRE TRACT OF LAND
IN THE JOHN JONES SURVEY, ABSTRACT NO. 483
IN HARRIS COUNTY, TEXAS

Being a 1.1318 acre tract of land in the John Jones Survey, Abstract No. 483, in Harris County, Texas, and being a portion of that 8.76 acre tract of land sold to Sinclair Petrochemicals, Inc. by George Burnett Magee as described in deed recorded in Volume 7144 Page 405 of the Harris County Deed Records, and being more particularly described by Metes and Bounds as follows utilizing the Arco Plant Coordinate System as a basis for bearings, said bearing system being rotated 2°48' clockwise from the Texas State Plane Coordinate System, South Central Zone:

COMMENCING at the intersection of the south right-of-way line of Van Road (60.00 feet wide) with the east right-of-way line of Sheldon Road (100.00 feet wide) as described in deed recorded under Harris County Clerk's File No. E 760562;

THENCE along the south right-of-way line of said Van Road N 89°08'13" E, 460.01 feet to a 5/8 inch iron rod set marking the POINT OF BEGINNING and northwest corner of the herein described tract and the northwest corner of said 8.76 acre tract, from which a 2 inch iron pipe bears north 0.4 feet and west 0.2 feet;

THENCE continuing along the south right-of-way line of said Van Road N 89°08'13" E, 197.26 feet to a chain link fence corner marking the northeast corner of the herein described tract and the northwest corner of a 2.9394 acre tract of land;

THENCE along the west line of said 2.9394 acre tract S 00°28'48" W, at 141.00 feet pass a corner of said chain link fence, and continuing in all 251.27 feet to a 5/8 inch iron rod set in the south line of said 8.76 acre tract marking the southeast corner of the herein described tract;

THENCE along the south line of said 8.76 acre tract S 89°14'13" W, 195.53 feet to a 5/8 inch iron rod set marking the common southwest corner of said 8.76 acre tract and of the herein described tract, from which a 2 inch iron pipe bears north 0.2 feet and west 0.7 feet;

THENCE along the west line of said 8.76 acre tract N 00°05'13" E, 250.89 feet to the POINT OF BEGINNING and enclosing 1.1318 acres of land.

STATE OF TEXAS
RODOLFO R. JASSO, JR.
4017
REGISTERED PUBLIC SURVEYOR

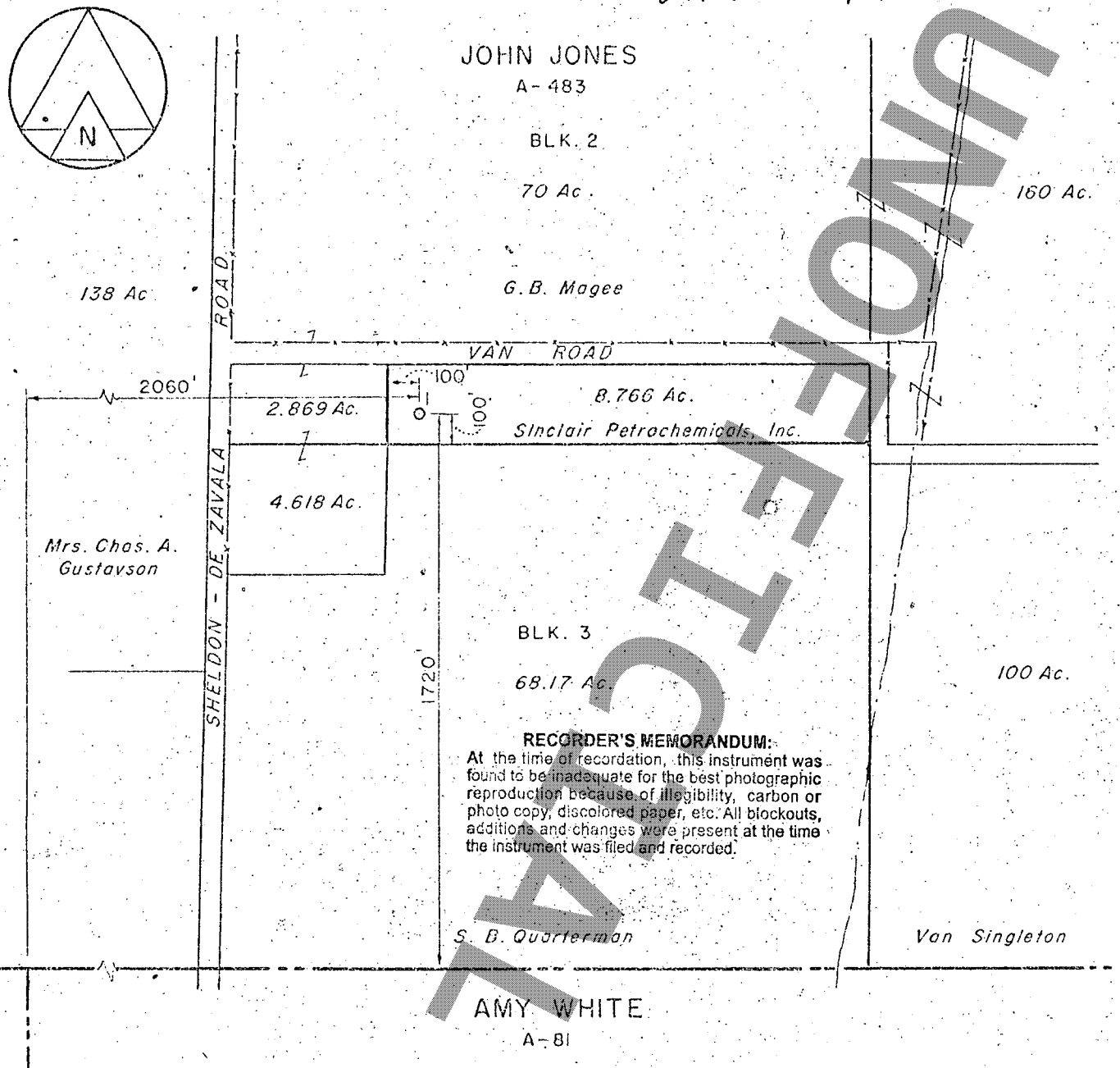
Rodolfo R. Jasso, Jr.
R.P.S. 4017

Tract 1
82-01

RP 096-19-0790

ADD EXHIBIT

Exhibit A



RECORDER'S MEMORANDUM:
At the time of recordation, this instrument was found to be inadequate for the best photographic reproduction because of illegibility, carbon or photo copy, discolored paper, etc. All blockouts, additions and changes were present at the time the instrument was filed and recorded.

This is to certify that this plat correctly represents the location of Sinclair Petrochemicals, Inc. Water Disposal Well No. 1, John Jones Survey, A-483, Harris County, Texas, as staked on the ground by us.

STILL, WILDMAN & CROCKETT

By: C. M. Wildman

C. M. Wildman

STATE OF TEXAS
C. M. WILDMAN
114
REGISTERED PUBLIC SURVEYOR

SINCLAIR PETROCHEMICALS, INC.
HOUSTON, TEXAS

LOCATION WATER DISPOSAL WELL NO.1 JOHN JONES SURVEY, A-483, HARRIS COUNTY, TEXAS

STILL, WILDMAN & CROCKETT
ENGINEERS HOUSTON, TEXAS

SCALE: 1" = 500'
DATE: March 1968

Vol. 508

EP 95-15-91

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Stan Stanart
COUNTY CLERK
HARRIS COUNTY, TEXAS

20150-84-9600 dh

ANY PROVISION HEREIN WHICH RESTRICTS THE SALE RENTAL, OR USE OF THE DESCRIBED REAL PROPERTY BECAUSE OF COLOR OR RACE IS INVALID AND UNENFORCEABLE UNDER FEDERAL LAW.

THE STATE OF TEXAS
COUNTY OF HARRIS

I hereby certify that this instrument was FILED in File Number Sequence on the date and at the time stamped hereon by me; and was duly RECORDED, in the Official Public Records of Real Property of Harris County, Texas

NOV 11 2015

Stan Stanart
COUNTY CLERK
HARRIS COUNTY, TEXAS

APPENDIX B: Closure Letters

Jon Niermann, *Chairman*
Emily Lindley, *Commissioner*
Bobby Janecka, *Commissioner*
Kelly Keel, *Interim Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 15, 2023

Transmitted Electronically

Mr. Thomas Warnement
Environmental Manager
Equistar Chemicals, L.P.
8280 Sheldon Road
Channelview, Texas 77530

Re: Approval of Remedy Standard B - Commercial/Industrial
Revised Affected Property Assessment Report (APAR) - Waste Management Unit (WMU) 001, June 16, 2023
Filing of Institutional Controls, April 20, 2023
Equistar Chemicals, L.P - Channelview Complex (Harris County)
TCEQ SWR No. 30030; TCEQ Industrial and Hazardous Waste (IHW) Permit No. HW-50177; EPA ID No. TXD058275769; Customer No. CN600124705; Regulated Entity No. RN100542281

Dear Mr. Warnement:

The Texas Commission on Environmental Quality (TCEQ) has reviewed the above-referenced submittals. The report provided a description of the unit, the observed condition of the unit, wastes managed in the unit, and color photographs. The unit is a trash incinerator which has been inactive since 1995. An initial soil investigation was performed on July 19, 2017. TCEQ requested[1] that Equistar conduct an inspection of the onsite incinerator structure and evaluate the presence of residual ash/debris in the upper six inches of soil. The incinerator structure was demolished and removed between November 28 and December 2, 2022. On April 5, 2023, the upper six inches of soil was removed from the former incinerator location, comprising approximately a 15 by 25 square foot area.

Based on process knowledge and waste characterization analyses, metals[2] and total petroleum hydrocarbons (TPH) were the target chemicals of concern (COCs). On April 12, 2023, five confirmation samples were collected in the former WMU-001 location. Soil sample results indicated no concentrations of COCs were above protective concentration levels (PCLs). Demolition waste was disposed as Class 2 soil and construction debris at Space City Services, Houston, Texas.

[1] TCEQ letter dated December 16, 2021

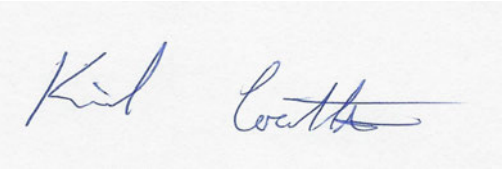
[2] 8 RCRA - Arsenic (As), Barium (Ba), Cadmium (Cd), Chromium (Cr), Lead (Pb), Mercury (Hg), Selenium (Se), and Silver (Ag).

Based on the TCEQ's review of the report, Texas Risk Reduction Program (TRRP) Remedy Standard B Commercial/Industrial PCLs have been achieved such that no post-response action care is required. ***No further action is required under 30 Texas Administrative Code (TAC) §335.8.*** A copy of this letter has been forwarded to the TCEQ Registration and Reporting Section to update your Notice of Registration (NOR). For questions regarding the NOR, please contact the Registration and Reporting Section at (512) 239-6833.

Equistar provided institutional controls in a separate document[3] from the APAR. After reviewing the proof of filing of institutional controls the TCEQ concurs that the institutional control requirements of 30 Texas Administrative Code (TAC) §350.111 have been completed. The institutional control was filed in accordance 30 TAC §350.34(1) to note commercial land use is in effect for Remedy B.

Questions concerning this letter should be directed to me at (512) 239-1107. When responding by mail, please submit one paper copy and one electronic copy (on USB or disc) of all correspondence and reports to the TCEQ Remediation Division at Mail Code MC-127. An additional copy should be submitted in electronic format to the local TCEQ Region Office. The information in the reference block should be included in all submittals. Note that the electronic and hard copies should be identical, complete copies. A Correspondence ID Form (TCEQ Form 20428) must accompany each document submitted to the Remediation Division and should be affixed to the front of your submittal. The Correspondence ID Form helps ensure that your documents are identified correctly and are routed to the applicable program for a timely response.

Sincerely,



Kirk Coulter, P.G., Project Manager
Team 1, VCP-CA Section
Remediation Division
Texas Commission on Environmental Quality

KEC/kec

cc: Ms. Karina Rocha, TCEQ, Waste Section Manager, Houston Regional Office, MC-R12 (via e-mail)

Ms. Jean Youngerman, Brown and Caldwell (via email)

TCEQ Registration and Reporting Section (MC- 129)

[3] Dated April 26, 2023

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ENVIRONMENTAL

Bryan W. Shaw, Ph.D., P.E., *Chairman*
Toby Baker, *Commissioner*
Jon Niermann, *Commissioner*
Richard A. Hyde, P.E., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

June 28, 2016

Mr. Randall "Scott" Mayo
Environmental Manager
Equistar Chemicals, L.P. Channelview Facility
8280 Sheldon Road
Channelview, Texas 77530

Re: TCEQ Approval of Equistar Chemicals, L.P.'s *Response to TCEQ letter dated January 26, 2016*, dated April 7, 2016
Closure Request for WMU Nos. 008 and 099, dated December 30, 2015
TCEQ Notice of Registration (NOR) Unit Closure Request
Equistar Chemicals, L.P., Channelview, TX (Harris County)
TCEQ SWR No. 30030; TCEQ Industrial and Hazardous Waste Permit No. HW-50177; EPA ID No. TXD058275769; Customer No. CN600124705; Regulated Entity No. RN100542281

Dear Mr. Mayo:

The Texas Commission on Environmental Quality (TCEQ) has reviewed the above referenced submittal providing a response to TCEQ letter dated January 26, 2016. The TCEQ's letter was issued in response to technical review of a December 30, 2015 closure certification request submitted in accordance with the requirements of 30 TAC 335.8 for the following waste management units (WMU) associated with Equistar Chemicals, L.P. (Equistar) Solid Waste Registration (SWR) No. 30030:

- WMU No. 008: Tk 1201 (Inactive status above ground storage tank), and
- WMU No. 099: Tk 2613 (Inactive status above ground storage tank).

According to the December 30, 2015 report, tank 'Tk 1201' (i.e., WMU No. 008) was installed in 1979 and stored waste (i.e., dilute acetonitrile) associated with operations at a butadiene recovery unit. The butadiene recovery unit was reportedly taken out of service in 1989. Tank 'Tk 2613' (i.e., WMU No. 099) was installed in 1975 and reportedly stored wastewater from the maintenance and cleaning area in Equistar's IPOH unit. The butadiene recovery unit was reportedly taken out of service in 1989. The December 30, 2015 report indicated that both tanks are currently empty. A visual site inspection (VSI) of the area surrounding both tanks was also conducted by representatives of Brown and Caldwell on August 1, 2014 and September 4, 2015. The April 7, 2016 response also documented the collection and analysis of rinsate samples from the interior of the tank units to confirm residual waste removal/decontamination efforts. In addition, the April 7, 2016 response provided a signed and notarized statement verifying proper disposition of residual waste associated with the WMUs. *Based on information contained in the response and other information available to staff, the TCEQ accepts the closure of WMU Nos.*

008 and 099. No further action is required under 30 Texas Administrative Code (TAC) §335.8 for the units.

A copy of this letter has been forwarded to the TCEQ Registration and Reporting Section to update your Notice of Registration (NOR) to note the TCEQ's acceptance of the closure of WMU No. 008 and 099. For questions regarding the NOR, please contact the Registration and Reporting Section at (512) 239-6413.

Please be aware that it is the continuing obligation of persons associated with a site to ensure that municipal hazardous waste and industrial solid waste are managed in a manner which does not cause the discharge or imminent threat of discharge of waste into or adjacent to waters in the state, a nuisance, or the endangerment of the public health and welfare as required by 30 TAC §335.4. If the supporting information described in the August 21, 2014 response fails to comply with these requirements, please take any necessary and authorized action to correct such conditions. A TCEQ field inspector may conduct an inspection of WMU Nos. 002, 011, 015, 049, 050, 060 and 090 to determine compliance with 30 TAC 335.8.

Questions concerning this letter should be directed to me at (512) 239-6542. When responding by mail, please submit an original and one copy of all correspondence and reports to the TCEQ Remediation Division at Mail Code MC-127 with an additional copy submitted to the local TCEQ Region Office.

Sincerely,

Eleanor T. Wehner

Eleanor T. Wehner, P.G.
Sr. Project Manager
VCP-CA Section
Remediation Division
Texas Commission on Environmental Quality

ETW/mdh

cc: Mr. Manish Pawar, P.E., Brown and Caldwell, One Westchase Center, 10777 Westheimer Road, Suite 925, Houston, TX 77042

Mr. Jason Ybarra, Waste Section Manager, TCEQ Region 12 Office, Houston

Mr. Ed Minter, Team Leader, TCEQ Registration and Reporting Section (MC-129)

APPENDIX C: DETAILED CLOSURE COSTS (2014)

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 114
Unit Name: Tank 1101A
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
1.0	**Removal of Waste**				
1.1	Load Waste onto Trucks				
	Permitted Capacity of Tank	195	GAL		
	Volume of Drums	55	GAL		
	Number of drums (roundup to whole number)	4	EA		
	Assume time to load a drum	1	HR		
	Total time to load trucks (roundup to whole number)	4	HR		
	Laborer (2)	8	HR	$51.30	$410
	Foreman	4	HR	$69.26	$277
1.2	Collect/contain/remove accumulated stormwater from secondary containment area	650	GAL		
	Laborer (2)	4	HR	$51.30	$205.20
	Foreman (assume half-time for this task)	2	HR	$69.26	$138.52
	Vacuum Truck (LS allowance for half day)	4	HR	$193.98	$775.92
2.0	**Purging of Tank System**	1	LS	$500.00	$500.00
3.0	**Decontamination of the Tank System and Equipment**				
3.1	Pressure wash/steam clean interior surfaces	116	SF		
	Secondary Containment	65	SF		
	Assume productivity of 400 SF/hour (20' x 20')	400	SF/hour		
	Work hours required	1	HR		
	Crew SC1: steam cleaner and laborers for pressure washing/steam cleaning units and secondary containment (ground level work)	1	HR	$172.66	$172.66

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 114
Unit Name: Tank 1101A
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
3.2	Collect rinsate	included in work item 3.1 above			
3.3	Sample rinsate for disposal characterization	see work item 4.3.1 below			
2.4	Analyze rinsate samples	see work item 4.3.2 below			
4.0	**Sampling & Analysis**				
4.1	Characterize Tank Contents				
4.1.1	Collect Samples				
	Number of samples - assume 2 samples per tank (liquid + sludge)	2	EA		
	Hours per sample	1	HR		
	Assume crew consists of 1 laborer and a helper (for sample packaging & decon)				
	Laborer	2	HR	$51.30	$103
	Helper	2	HR	$48.71	$97
	Courier Shipments to laboratory (1 shipment per 10-hour work day; roundup to next whole number)	1	EA	$150.00	$150
4.1.2	Analyze Samples				
	Number of Samples	2	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	3	EA		
	Total Number of Samples to be Analyzed	3	EA		
	Ignitability by SW-846 Method 1010	3	EA	$30.00	$90
	Corrosivity by EPA Method 9045	3	EA	$10.00	$30

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 114
Unit Name: Tank 1101A
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Cyanide Reactivity	3	EA	$30.00	$90
	Sulfice Reactivity	3	EA	$30.00	$90
	Metals by ICP/MS by SW-846 Method 6020A	3	EA	$150.00	$450
	Volatiles by SW-846 Method 8260	3	EA	$95.00	$285
	Semivolatiles by SW-846 Method 8270	3	EA	$195.00	$585
4.1.3	Summarize and Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
4.2	Accumulated Stormwater	650	GAL		
4.2.1	Collect Samples				
	Assume samples collected by same crew (already mobilized to site) as drum samples				
	Assume 1 sample of stormwater from containment area for disposal characterization	1	EA		
	Laborer	1	HR	$51.30	$51
	Courier Shipments to laboratory (1 shipment)	1	EA	$150.00	$150
4.2.2	Analyze Samples	1	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	2	EA		
	Assume analytes for deep well injection				
	Ignitability by SW-846 Method 1010	2	EA	$30.00	$60
	Corrosivity by EPA Method 9045	2	EA	$10.00	$20
	Cyanide Reactivity	2	EA	$30.00	$60
	Sulfice Reactivity	2	EA	$30.00	$60

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 114
Unit Name: Tank 1101A
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Metals by ICP/MS by SW-846 Method 6020A	2	EA	$150.00	$300
	Volatiles by SW-846 Method 8260	2	EA	$95.00	$190
	Semivolatiles by SW-846 Method 8270	2	EA	$195.00	$390
				$26.32	
4.2.3	Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
4.3	Decon Wastewater				
4.3.1	Collect Samples				
	Assume samples collected by same crew (already mobilized to site) as drum samples				
	Asume 1 sample of decon wastewater at end of decon operations				
	Laborer	1	HR	$51.30	$51
	Courier Shipments to laboratory (1 shipment)	1	EA	$150.00	$150
4.3.2	Analyze Samples	1	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	2	EA		
	Assume analytes for deep well injection				
	Ignitability by SW-846 Method 1010	2	EA	$30.00	$60
	Corrosivity by EPA Method 9045	2	EA	$10.00	$20
	Cyanide Reactivity	2	EA	$30.00	$60
	Sulfice Reactivity	2	EA	$30.00	$60
	Metals by ICP/MS by SW-846 Method 6020A	2	EA	$150.00	$300

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 114
Unit Name: Tank 1101A
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Volatiles by SW-846 Method 8260	2	EA	$95.00	$190
	Semivolatiles by SW-846 Method 8270	2	EA	$195.00	$390
4.3.3	Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
5.0	**Transportation of Wastes**				
5.1	Tank Content Wastes (# drums)	4	EA		
	Assume average number of drums per truckload	80	/load		
	Number of truckloads	1	Loads		
	Project manager to prepare manifests & documentation (assume 1 hour per load)	1	HR	$150.00	$150.00
	Truck transport (assume treatment/disposal facility within 50 miles; minimum charge per load)	1	loads	$1,275.00	$1,275.00
5.2	Accumulated Stormwater				
	Volume of accumulated stormwater (assume containment is full)	650	GAL		
	Water density	8.6	LB/GAL		
	Mass of stormwater	5590	LB		
	Net cargo capacity of tank truck	40000	LB		
	Number of truckloads (roundup)	1	Loads		
	Project manager to prepare manifests & documentation (assume 1.0 hour per load)	1	HR	$150.00	$150.00
	Disposal of waste, transportation mileage charges, tanker trailer, hazardous waste, min charge	1	loads	$1,060.00	$1,060.00

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 114
Unit Name: Tank 1101A
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
5.3	Decon Wastewater				
	Number of truckloads	1	Loads		
	Project manager to prepare manifests & documentation (assume 1.0 hour per load)	1	HR	$150.00	$150.00
	Disposal of waste, transportation mileage charges, tanker trailer, hazardous waste, min charge	1	loads	$1,060.00	$1,060.00
6.0	**Treatment and Disposal of Wastes**				
6.1	Tank Content Wastes				
	Dispose at approved facility (# drums)	4	EA	$480.18	$1,921
6.2	Accumulated Stormwater				
	Dispose at approved facility (assume UIC)	650	GAL	$0.25	$163
6.3	Decon Wastewater				
	Dispose at approved facility (assume UIC)	869	GAL	$0.25	$217
7.0	**Flushing the tank and ancillary piping**				
8.0	**Disassembly and loading of the tank and ancillary piping**	(not used - tank will be clean closed and remain in place for other service)			

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 114
Unit Name: Tank 1101A
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
9.0	**Demolition and removal of the containment system**	(not used - tank will be clean closed and remain in place for other service)			
10.0	**Removal of Contaminated Soils**	(not used)			
8.0	**Backfilling**	(not used)			
9.0	**Equipment Rental**	(not used - equipment costs included in work items above)			
10.0	**PE Closure Certification**				
	Observations & Inspections During Closure (assume mid-level environmental engineer)	16	HR	$100.00	$1,600
	Closure Certification Report (assume senior level environmental engineer)	16	HR	$150.00	$2,400
	Expenses & other direct costs during on-site work	15	days	$50.00	$750
11.0	**Engineering, mobilization, site preparation (rounded up to whole dollar)**				
	Subtotal Work Items 1 - 9 above	$13,558			
	(rounded up to whole dollar)	5%			$678
SUBTOTAL	(rounded up to whole dollar)				$18,986
CONTINGENCY	(rounded up to whole dollar)	10%			$1,899
ESTIMATED UNIT CLOSURE COST TOTAL					$20,885

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 115
Unit Name: Tank 1101B
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
1.0	**Removal of Waste**				
1.1	Load Waste onto Trucks				
	Permitted Capacity of Tank	195	GAL		
	Volume of Drums	55	GAL		
	Number of drums (roundup to whole number)	4	EA		
	Assume time to load a drum	1	HR		
	Total time to load trucks (roundup to whole number)	4	HR		
	Laborer (2)	8	HR	$51.30	$410
	Foreman	4	HR	$69.26	$277
1.2	Collect/contain/remove accumulated stormwater from secondary containment area	650	GAL		
	Laborer (2)	4	HR	$51.30	$205.20
	Foreman (assume half-time for this task)	2	HR	$69.26	$138.52
	Vacuum Truck (LS allowance for half day)	4	HR	$193.98	$775.92
2.0	**Purging of Tank System**	1	LS	$500.00	$500.00
3.0	**Decontamination of the Tank System and Equipment**				
3.1	Pressure wash/steam clean interior surfaces	116	SF		
	Secondary Containment	65	SF		
	Assume productivity of 400 SF/hour (20' x 20')	400	SF/hour		
	Work hours required	1	HR		
	Crew SC1: steam cleaner and laborers for pressure washing/steam cleaning units and secondary containment (ground level work)	1	HR	$172.66	$172.66

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 115
Unit Name: Tank 1101B
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
3.2	Collect rinsate	included in work item 3.1 above			
3.3	Sample rinsate for disposal characterization	see work item 4.3.1 below			
2.4	Analyze rinsate samples	see work item 4.3.2 below			
4.0	**Sampling & Analysis**				
4.1	Characterize Tank Contents				
4.1.1	Collect Samples				
	Number of samples - assume 2 samples per tank (liquid + sludge)	2	EA		
	Hours per sample	1	HR		
	Assume crew consists of 1 laborer and a helper (for sample packaging & decon)				
	Laborer	2	HR	$51.30	$103
	Helper	2	HR	$48.71	$97
	Courier Shipments to laboratory (1 shipment per 10-hour work day; roundup to next whole number)	1	EA	$150.00	$150
4.1.2	Analyze Samples				
	Number of Samples	2	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	3	EA		
	Total Number of Samples to be Analyzed	3	EA		
	Ignitability by SW-846 Method 1010	3	EA	$30.00	$90
	Corrosivity by EPA Method 9045	3	EA	$10.00	$30
	Cyanide Reactivity	3	EA	$30.00	$90

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 115
Unit Name: Tank 1101B
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Sulfice Reactivity	3	EA	$30.00	$90
	Metals by ICP/MS by SW-846 Method 6020A	3	EA	$150.00	$450
	Volatiles by SW-846 Method 8260	3	EA	$95.00	$285
	Semivolatiles by SW-846 Method 8270	3	EA	$195.00	$585
4.1.3	Summarize and Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
4.2	Accumulated Stormwater	650	GAL		
4.2.1	Collect Samples				
	Assume samples collected by same crew (already mobilized to site) as drum samples				
	Assume 1 sample of stormwater from containment area for disposal characterization	1	EA		
	Laborer	1	HR	$51.30	$51
	Courier Shipments to laboratory (1 shipment)	1	EA	$150.00	$150
4.2.2	Analyze Samples	1	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	2	EA		
	Assume analytes for deep well injection				
	Ignitability by SW-846 Method 1010	2	EA	$30.00	$60
	Corrosivity by EPA Method 9045	2	EA	$10.00	$20
	Cyanide Reactivity	2	EA	$30.00	$60
	Sulfice Reactivity	2	EA	$30.00	$60
	Metals by ICP/MS by SW-846 Method 6020A	2	EA	$150.00	$300

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 115
Unit Name: Tank 1101B
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Volatiles by SW-846 Method 8260	2	EA	$95.00	$190
	Semivolatiles by SW-846 Method 8270	2	EA	$195.00	$390
				$26.32	
4.2.3	Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
4.3	Decon Wastewater				
4.3.1	Collect Samples				
	Assume samples collected by same crew (already mobilized to site) as drum samples				
	Asume 1 sample of decon wastewater at end of decon operations				
	Laborer	1	HR	$51.30	$51
	Courier Shipments to laboratory (1 shipment)	1	EA	$150.00	$150
4.3.2	Analyze Samples	1	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	2	EA		
	Assume analytes for deep well injection				
	Ignitability by SW-846 Method 1010	2	EA	$30.00	$60
	Corrosivity by EPA Method 9045	2	EA	$10.00	$20
	Cyanide Reactivity	2	EA	$30.00	$60
	Sulfice Reactivity	2	EA	$30.00	$60
	Metals by ICP/MS by SW-846 Method 6020A	2	EA	$150.00	$300
	Volatiles by SW-846 Method 8260	2	EA	$95.00	$190

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 115
Unit Name: Tank 1101B
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Semivolatiles by SW-846 Method 8270	2	EA	$195.00	$390
4.3.3	Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
5.0	**Transportation of Wastes**				
5.1	Tank Content Wastes (# drums)	4	EA		
	Assume average number of drums per truckload	80	/load		
	Number of truckloads	1	Loads		
	Project manager to prepare manifests & documentation (assume 1 hour per load)	1	HR	$150.00	$150.00
	Truck transport (assume treatment/disposal facility within 50 miles; minimum charge per load)	1	loads	$1,275.00	$1,275.00
5.2	Accumulated Stormwater				
	Volume of accumulated stormwater (assume containment is full)	650	GAL		
	Water density	8.6	LB/GAL		
	Mass of stormwater	5590	LB		
	Net cargo capacity of tank truck	40000	LB		
	Number of truckloads (roundup)	1	Loads		
	Project manager to prepare manifests & documentation (assume 1.0 hour per load)	1	HR	$150.00	$150.00
	Disposal of waste, transportation mileage charges, tanker trailer, hazardous waste, min charge	1	loads	$1,060.00	$1,060.00
5.3	Decon Wastewater				

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 115
Unit Name: Tank 1101B
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Number of truckloads	1	Loads		
	Project manager to prepare manifests & documentation (assume 1.0 hour per load)	1	HR	$150.00	$150.00
	Disposal of waste, transportation mileage charges, tanker trailer, hazardous waste, min charge	1	loads	$1,060.00	$1,060.00
6.0	**Treatment and Disposal of Wastes**				
6.1	Tank Content Wastes				
	Dispose at approved facility (# drums)	4	EA	$480.18	$1,921
6.2	Accumulated Stormwater				
	Dispose at approved facility (assume UIC)	650	GAL	$0.25	$163
6.3	Decon Wastewater				
	Dispose at approved facility (assume UIC)	869	GAL	$0.25	$217
7.0	**Flushing the tank and ancillary piping**				
8.0	**Disassembly and loading of the tank and ancillary piping**	(not used - tank will be clean closed and remain in place for other service)			

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 115
Unit Name: Tank 1101B
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
9.0	**Demolition and removal of the containment system**	(not used - tank will be clean closed and remain in place for other service)			
10.0	**Removal of Contaminated Soils**	(not used)			
8.0	**Backfilling**	(not used)			
9.0	**Equipment Rental**	(not used - equipment costs included in work items above)			
10.0	**PE Closure Certification**				
	Observations & Inspections During Closure (assume mid-level environmental engineer)	16	HR	$100.00	$1,600
	Closure Certification Report (assume senior level environmental engineer)	16	HR	$150.00	$2,400
	Expenses & other direct costs during on-site work	15	days	$50.00	$750
11.0	**Engineering, mobilization, site preparation (rounded up to whole dollar)**				
	Subtotal Work Items 1 - 9 above	$13,558			
	(rounded up to whole dollar)	5%			$678
SUBTOTAL	(rounded up to whole dollar)				$18,986
CONTINGENCY	(rounded up to whole dollar)	10%			$1,899
ESTIMATED UNIT CLOSURE COST TOTAL					$20,885

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 032
Unit Name: Tank 3455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
1.0	**Removal of Waste**				
1.1	Load Waste onto Trucks				
	Permitted Capacity of Tank	284000	GAL		
	Assumed capacity of tanker truck (20,000 lbs net weight)	4600	GAL		
	Number of truckloads (roundup to whole number)	62	EA		
	Assume time to load a tanker truck (average 50 gpm)	1.5	HR		
	Total time to load trucks (roundup to whole number)	93	HR		
	Vacuum Truck (2)	186	HR	$76.74	$14,274
	Semi Truck (2)	186	HR	$50.79	$9,447
	Driver (2)	186	HR	$66.45	$12,360
	Laborer (3)	279	HR	$51.30	$14,313
	Foreman	93	HR	$69.26	$6,441
1.2	Collect/contain/remove accumulated stormwater from secondary containment area	Not used - tank is doubled walled and stormwater should not be present in interstitial zone			
2.0	**Purging of Tank System**	Not used - tank contains aqueous caustic waste			
3.0	**Decontamination of the Tank System and Equipment**				
3.1	Pressure wash/steam clean interior surfaces	6546	SF		
	Secondary Containment	3300	SF		

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 032
Unit Name: Tank 3455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Assume productivity of 200 SF/hour (10' x 20') for elevated work	200	SF/hour		
	Work hours required (assume 50% productivity due to confined space entry and 50% productivity loss due to elevated work)	197	HR		
	Crew SC2: steam cleaner and laborers for pressure washing/steam cleaning units and secondary containment (elevated work)	197	HR	$363.69	$71,646.93
	PPE Allowance	5	Week	$1,450.00	$7,250.00
3.2	Collect rinsate	included in work item 3.1 above			
3.3	Sample rinsate for disposal characterization	see work item 4.3.1 below			
2.4	Analyze rinsate samples	see work item 4.3.2 below			
4.0	**Sampling & Analysis**				
4.1	Characterize Tank Contents				
4.1.1	Collect Samples				
	Number of samples - assume 2 samples per tank (liquid + sludge)	2	EA		
	Hours per sample	1	HR		
	Assume crew consists of 1 laborer and a helper (for sample packaging & decon)				
	Laborer	1	HR	$51.30	$51
	Helper	1	HR	$48.71	$49

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 032
Unit Name: Tank 3455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Courier Shipments to laboratory (1 shipment per 10-hour work day; roundup to next whole number)	1	EA	$150.00	$150
4.1.2	Analyze Samples				
	Number of Samples	2	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	3	EA		
	Specific Gravity (Method 2710)	3	EA	$26.32	$79
	Total Solids (Method 2540B)	3	EA	$15.00	$45
	Total Dissolved Solids (Method 2540C)	3	EA	$15.00	$45
	Ignitability by SW-846 Method 1010	3	EA	$30.00	$90
	Corrosivity by EPA Method 9045	3	EA	$10.00	$30
	Cyanide Reactivity	3	EA	$30.00	$90
	Sulfice Reactivity	3	EA	$30.00	$90
	Metals by ICP/MS by SW-846 Method 6020A	3	EA	$150.00	$450
	Volatiles by SW-846 Method 8260	3	EA	$95.00	$285
	Semivolatiles by SW-846 Method 8270	3	EA	$195.00	$585
	Total Suspended Solids (Method 2540D)	3	EA	$15.00	$45
4.1.3	Summarize and Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 032
Unit Name: Tank 3455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
4.2	Accumulated Stormwater	Not used - tank is double walled and stormwater should not be present in interstitial zone			
4.3	Decon Wastewater				
4.3.1	Collect Samples				
	Assume samples collected by same crew (already mobilized to site) as tank content samples				
	Asume 1 sample of decon wastewater at end of decon operations				
	Laborer	1	HR	$51.30	$51
	Courier Shipments to laboratory (1 shipment)	1	EA	$150.00	$150
4.3.2	Analyze Samples	1	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	2	EA		
	Assume analytes for deep well injection				
	Ignitability by SW-846 Method 1010	2	EA	$30.00	$60
	Corrosivity by EPA Method 9045	2	EA	$10.00	$20
	Cyanide Reactivity	2	EA	$30.00	$60
	Sulfice Reactivity	2	EA	$30.00	$60
	Metals by ICP/MS by SW-846 Method 6020A	2	EA	$150.00	$300
	Volatiles by SW-846 Method 8260	2	EA	$95.00	$190

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 032
Unit Name: Tank 3455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Semivolatiles by SW-846 Method 8270	2	EA	$195.00	$390
4.3.3	Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
5.0	**Transportation of Wastes**				
5.1	Tank Content Wastes				
	Number of truckloads (roundup to whole number)	62	EA		
	Project manager to prepare manifests & documentation (assume 1 hour per load)	62	HR	$150.00	$9,300.00
	Truck transport (assume treatment/disposal facility within 50 miles; minimum charge per load)	62	loads	$1,275.00	$79,050.00
5.2	Accumulated Stormwater	Not used - tank is double walled and stormwater should not be present in interstitial zone			
5.3	Decon Wastewater				
	Number of truckloads	1	Loads		
	Project manager to prepare manifests & documentation (assume 1.0 hour per load)	1	HR	$150.00	$150.00
	Disposal of waste, transportation mileage charges, tanker trailer, hazardous waste, min charge	1	loads	$1,060.00	$1,060.00
6.0	**Treatment and Disposal of Wastes**				
6.1	Tank Content Wastes				

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 032
Unit Name: Tank 3455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Dispose at approved facility (assume UIC)	284000	GA	$0.25	$71,000
6.2	Accumulated Stormwater	Not used - tank is double walled and stormwater should not be present in interstitial zone			
6.3	Decon Wastewater				
	Dispose at approved facility (assume UIC)	1000	GAL	$0.25	$250
7.0	**Flushing the tank and ancillary piping**	(not used - tank contains aqueous caustic waste and will not require flushing)			
8.0	**Disassembly and loading of the tank and ancillary piping**	(not used - tank will be clean closed and remain in place for other service)			
9.0	**Demolition and removal of the containment system**	(not used - tank will be clean closed and remain in place for other service)			
10.0	**Removal of Contaminated Soils**	(not used)			
8.0	**Backfilling**	(not used)			
9.0	**Equipment Rental**	(not used - equipment costs included in work items above)			

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 032
Unit Name: Tank 3455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
10.0	**PE Closure Certification**				
	Observations & Inspections During Closure (assume mid-level environmental engineer)	80	HR	$100.00	$8,000
	Closure Certification Report (assume senior level environmental engineer)	25	HR	$150.00	$3,750
	Expenses & other direct costs during on-site work	8	days	$50.00	$400
11.0	**Engineering, mobilization, site preparation (rounded up to whole dollar)**				
	Subtotal Work Items 1 - 9 above	$300,507			
	(rounded up to whole dollar)	5%			$15,026
SUBTOTAL	(rounded up to whole dollar)				$327,683
CONTINGENCY	(rounded up to whole dollar)	10%			$32,769
ESTIMATED UNIT CLOSURE COST TOTAL					$360,452

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 031
Unit Name: Tank 4455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
1.0	**Removal of Waste**				
1.1	Load Waste onto Trucks				
	Permitted Capacity of Tank	284000	GAL		
	Assumed capacity of tanker truck (20,000 lbs net weight)	4600	GAL		
	Number of truckloads (roundup to whole number)	62	EA		
	Assume time to load a tanker truck (average 50 gpm)	1.5	HR		
	Total time to load trucks (roundup to whole number)	93	HR		
	Vacuum Truck (2)	186	HR	$76.74	$14,274
	Semi Truck (2)	186	HR	$50.79	$9,447
	Driver (2)	186	HR	$66.45	$12,360
	Laborer (3)	279	HR	$51.30	$14,313
	Foreman	93	HR	$69.26	$6,441
1.2	Collect/contain/remove accumulated stormwater from secondary containment area	Not used - tank is doubled walled and stormwater should not be present in interstitial zone			
2.0	**Purging of Tank System**	Not used - tank contains aqueous caustic waste			
3.0	**Decontamination of the Tank System and Equipment**				
3.1	Pressure wash/steam clean interior surfaces	6546	SF		
	Secondary Containment	3300	SF		
	Assume productivity of 200 SF/hour (10' x 20') for elevated work	200	SF/hour		

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 031
Unit Name: Tank 4455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Work hours required (assume 50% productivity due to confined space entry and 50% productivity loss due to elevated work)	197	HR		
	Crew SC2: steam cleaner and laborers for pressure washing/steam cleaning units and secondary containment (elevated work)	197	HR	$363.69	$71,646.93
	PPE	5	Week	$1,450.00	$7,250.00
3.2	Collect rinsate	included in work item 3.1 above			
3.3	Sample rinsate for disposal characterization	see work item 4.3.1 below			
2.4	Analyze rinsate samples	see work item 4.3.2 below			
4.0	**Sampling & Analysis**				
4.1	Characterize Tank Contents				
4.1.1	Collect Samples				
	Number of samples - assume 2 samples per tank (liquid + sludge)	2	EA		
	Hours per sample	1	HR		
	Assume crew consists of 1 laborer and a helper (for sample packaging & decon)				
	Laborer	1	HR	$51.30	$51
	Helper	1	HR	$48.71	$49
	Courier Shipments to laboratory (1 shipment per 10-hour work day; roundup to next whole number)	1	EA	$150.00	$150
4.1.2	Analyze Samples				

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 031
Unit Name: Tank 4455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Number of Samples	2	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	3	EA		
	Specific Gravity (Method 2710)	3	EA	$26.32	$79
	Total Solids (Method 2540B)	3	EA	$15.00	$45
	Total Dissolved Solids (Method 2540C)	3	EA	$15.00	$45
	Ignitability by SW-846 Method 1010	3	EA	$30.00	$90
	Corrosivity by EPA Method 9045	3	EA	$10.00	$30
	Cyanide Reactivity	3	EA	$30.00	$90
	Sulfice Reactivity	3	EA	$30.00	$90
	Metals by ICP/MS by SW-846 Method 6020A	3	EA	$150.00	$450
	Volatiles by SW-846 Method 8260	3	EA	$95.00	$285
	Semivolatiles by SW-846 Method 8270	3	EA	$195.00	$585
	Total Suspended Solids (Method 2540D)	3	EA	$15.00	$45
4.1.3	Summarize and Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
4.2	Accumulated Stormwater	Not used - tank is double walled and stormwater should not be present in interstitial zone			
4.3	Decon Wastewater				
4.3.1	Collect Samples				

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 031
Unit Name: Tank 4455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Assume samples collected by same crew (already mobilized to site) as tank content samples				
	Asume 1 sample of decon wastewater at end of decon operations				
	Laborer	1	HR	$51.30	$51
	Courier Shipments to laboratory (1 shipment)	1	EA	$150.00	$150
4.3.2	Analyze Samples	1	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	2	EA		
	Assume analytes for deep well injection				
	Ignitability by SW-846 Method 1010	2	EA	$30.00	$60
	Corrosivity by EPA Method 9045	2	EA	$10.00	$20
	Cyanide Reactivity	2	EA	$30.00	$60
	Sulfice Reactivity	2	EA	$30.00	$60
	Metals by ICP/MS by SW-846 Method 6020A	2	EA	$150.00	$300
	Volatiles by SW-846 Method 8260	2	EA	$95.00	$190
	Semivolatiles by SW-846 Method 8270	2	EA	$195.00	$390
4.3.3	Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
5.0	**Transportation of Wastes**				
5.1	Tank Content Wastes				
	Number of truckloads (roundup to whole number)	62	EA		

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 031
Unit Name: Tank 4455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Project manager to prepare manifests & documentation (assume 1 hour per load)	62	HR	$150.00	$9,300.00
	Truck transport (assume treatment/disposal facility within 50 miles; minimum charge per load)	62	loads	$1,275.00	$79,050.00
5.2	Accumulated Stormwater	Not used - tank is double walled and stormwater should not be present in interstitial zone			
5.3	Decon Wastewater				
	Number of truckloads	1	Loads		
	Project manager to prepare manifests & documentation (assume 1.0 hour per load)	1	HR	$150.00	$150.00
	Disposal of waste, transportation mileage charges, tanker trailer, hazardous waste, min charge	1	loads	$1,060.00	$1,060.00
6.0	**Treatment and Disposal of Wastes**				
6.1	Tank Content Wastes				
	Dispose at approved facility (assume UIC)	284000	GA	$0.25	$71,000
6.2	Accumulated Stormwater	Not used - tank is double walled and stormwater should not be present in interstitial zone			
6.3	Decon Wastewater				

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 031
Unit Name: Tank 4455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Dispose at approved facility (assume UIC)	1000	GAL	$0.25	$250
7.0	**Flushing the tank and ancillary piping**	(not used - tank contains aqueous caustic waste and will not require flushing)			
8.0	**Disassembly and loading of the tank and ancillary piping**	(not used - tank will be clean closed and remain in place for other service)			
9.0	**Demolition and removal of the containment system**	(not used - tank will be clean closed and remain in place for other service)			
10.0	**Removal of Contaminated Soils**	(not used)			
8.0	**Backfilling**	(not used)			
9.0	**Equipment Rental**	(not used - equipment costs included in work items above)			
10.0	**PE Closure Certification**				
	Observations & Inspections During Closure (assume mid-level environmental engineer)	80	HR	$100.00	$8,000
	Closure Certification Report (assume senior level environmental engineer)	25	HR	$150.00	$3,750
	Expenses & other direct costs during on-site work	8	days	$50.00	$400

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 031
Unit Name: Tank 4455
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
11.0	**Engineering, mobilization, site preparation (rounded up to whole dollar)**				
	Subtotal Work Items 1 - 9 above	$300,507			
	(rounded up to whole dollar)	5%			$15,026
SUBTOTAL	(rounded up to whole dollar)				$327,683
CONTINGENCY	(rounded up to whole dollar)	10%			$32,769
ESTIMATED UNIT CLOSURE COST TOTAL					$360,452

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 047
Unit Name: Tank 4383
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
1.0	**Removal of Waste**				
1.1	Load Waste onto Trucks				
	Permitted Capacity of Tank	12000	GAL		
	Volume of Drums	55	GAL		
	Number of drums (roundup to whole number)	219	EA		
	Assume time to load a drum	1	HR		
	Total time to load trucks (roundup to whole number)	219	HR		
	Laborer (2)	438	HR	$51.30	$22,469
	Foreman	219	HR	$69.26	$15,168
1.2	Collect/contain/remove accumulated stormwater from secondary containment area	10324			
	Laborer (2)	4	HR	$51.30	$205.20
	Foreman (assume half-time for this task)	2	HR	$69.26	$138.52
	Vacuum Truck (LS allowance for half day)	4	HR	$193.98	$775.92
2.0	**Purging of Tank System**	1	LS	$500.00	$500.00
3.0	**Decontamination of the Tank System and Equipment**				
3.1	Pressure wash/steam clean interior surfaces	1781	SF		
	Secondary Containment	1035	SF		
	Assume productivity of 400 SF/hour (20' x 20')	400	SF/hour		
	Work hours required	8	HR		

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 047
Unit Name: Tank 4383
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Crew SC1: steam cleaner and laborers for pressure washing/steam cleaning units and secondary containment (ground level work)	8	HR	$172.66	$1,381.28
3.2	Collect rinsate	included in work item 3.1 above			
3.3	Sample rinsate for disposal characterization	see work item 4.3.1 below			
2.4	Analyze rinsate samples	see work item 4.3.2 below			
4.0	**Sampling & Analysis**				
4.1	Characterize Tank Contents				
4.1.1	Collect Samples				
	Number of samples - assume 2 samples per tank (liquid + sludge)	2	EA		
	Hours per sample	1	HR		
	Assume crew consists of 1 laborer and a helper (for sample packaging & decon)				
	Laborer	2	HR	$51.30	$103
	Helper	2	HR	$48.71	$97
	Courier Shipments to laboratory (1 shipment per 10-hour work day; roundup to next whole number)	1	EA	$150.00	$150
4.1.2	Analyze Samples				
	Number of Samples	2	EA		

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 047
Unit Name: Tank 4383
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	3	EA		
	Total Number of Samples to be Analyzed	3	EA		
	Ignitability by SW-846 Method 1010	3	EA	$30.00	$90
	Corrosivity by EPA Method 9045	3	EA	$10.00	$30
	Cyanide Reactivity	3	EA	$30.00	$90
	Sulfice Reactivity	3	EA	$30.00	$90
	Metals by ICP/MS by SW-846 Method 6020A	3	EA	$150.00	$450
	Volatiles by SW-846 Method 8260	3	EA	$95.00	$285
	Semivolatiles by SW-846 Method 8270	3	EA	$195.00	$585
4.1.3	Summarize and Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
4.2	Accumulated Stormwater	10324	GAL		
4.2.1	Collect Samples				
	Assume samples collected by same crew (already mobilized to site) as drum samples				
	Assume 1 sample of stormwater from containment area for disposal characterization	1	EA		
	Laborer	1	HR	$51.30	$51
	Courier Shipments to laboratory (1 shipment)	1	EA	$150.00	$150

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 047
Unit Name: Tank 4383
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
4.2.2	Analyze Samples	1	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	2	EA		
	Assume analytes for deep well injection				
	Ignitability by SW-846 Method 1010	2	EA	$30.00	$60
	Corrosivity by EPA Method 9045	2	EA	$10.00	$20
	Cyanide Reactivity	2	EA	$30.00	$60
	Sulfice Reactivity	2	EA	$30.00	$60
	Metals by ICP/MS by SW-846 Method 6020A	2	EA	$150.00	$300
	Volatiles by SW-846 Method 8260	2	EA	$95.00	$190
	Semivolatiles by SW-846 Method 8270	2	EA	$195.00	$390
4.2.3	Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
4.3	Decon Wastewater				
4.3.1	Collect Samples				
	Assume samples collected by same crew (already mobilized to site) as drum samples				
	Asume 1 sample of decon wastewater at end of decon operations				
	Laborer	1	HR	$51.30	$51
	Courier Shipments to laboratory (1 shipment)	1	EA	$150.00	$150

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 047
Unit Name: Tank 4383
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
4.3.2	Analyze Samples	1	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	2	EA		
	Assume analytes for deep well injection				
	Specific Gravity (Method 2710)	2	EA	$26.32	$53
	Total Solids (Method 2540B)	2	EA	$15.00	$30
	Total Dissolved Solids (Method 2540C)	2	EA	$15.00	$30
	Total Suspended Solids (Method 2540D)	2	EA	$15.00	$30
	Volatiles by SW-846 Method 8260	2	EA	$95.00	$190.00
4.3.3	Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
5.0	**Transportation of Wastes**				
5.1	Tank Content Wastes (# drums)	219	EA		
	Assume average number of drums per truckload	80	/load		
	Number of truckloads	3	Loads		
	Project manager to prepare manifests & documentation (assume 1 hour per load)	3	HR	$150.00	$450.00
	Truck transport (assume treatment/disposal facility within 50 miles; minimum charge per load)	3	loads	$1,275.00	$3,825.00
5.2	Accumulated Stormwater				
	Volume of accumulated stormwater	10324	GAL		
	Water density	8.6	LB/GAL		

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 047
Unit Name: Tank 4383
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Mass of stormwater	88786	LB		
	Net cargo capacity of tank truck	40000	LB		
	Number of truckloads (roundup)	3	Loads		
	Project manager to prepare manifests & documentation (assume 1.0 hour per load)	3	HR	$150.00	$450.00
	Disposal of waste, transportation mileage charges, tanker trailer, hazardous waste, min charge	3	loads	$1,060.00	$3,180.00
5.3	Decon Wastewater				
	Number of truckloads	1	Loads		
	Project manager to prepare manifests & documentation (assume 1.0 hour per load)	1	HR	$150.00	$150.00
	Disposal of waste, transportation mileage charges, tanker trailer, hazardous waste, min charge	1	loads	$1,060.00	$1,060.00
6.0	**Treatment and Disposal of Wastes**				
6.1	Tank Content Wastes				
	Dispose at approved facility (# drums)	12000	GAL	$0.25	$3,000
6.2	Accumulated Stormwater				
	Dispose at approved facility (assume UIC)	10324	GAL	$0.25	$2,581
6.3	Decon Wastewater				
	Dispose at approved facility (assume UIC)	179	GAL	$0.25	$45

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 047
Unit Name: Tank 4383
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
7.0	**Flushing the tank and ancillary piping**				
8.0	**Disassembly and loading of the tank and ancillary piping**	(not used - tank will be clean closed and remain in place for other service)			
9.0	**Demolition and removal of the containment system**	(not used - tank will be clean closed and remain in place for other service)			
10.0	**Removal of Contaminated Soils**				
	Soil and Groundwater investigation (see *RACER* ™ cost estimate file named "CVO TK-4383 Investigation Estimate.pdf")	1	LS	$65,898.41	$65,898
8.0	**Backfilling**	(not used)			
9.0	**Equipment Rental**	(not used - equipment costs included in work items above)			
10.0	**PE Closure Certification**				
	Observations & Inspections During Closure (assume mid-level environmental engineer)	16	HR	$100.00	$1,600
	Closure Certification Report (assume senior level environmental engineer)	16	HR	$150.00	$2,400
	Expenses & other direct costs during on-site work	15	days	$50.00	$750

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 047
Unit Name: Tank 4383
Unit Type: Tank

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
11.0	**Engineering, mobilization, site preparation (rounded up to whole dollar)**				
	Subtotal Work Items 1 - 9 above	$59,564			
	(rounded up to whole dollar)	5%			$2,979
SUBTOTAL	(rounded up to whole dollar)				$133,192
CONTINGENCY	(rounded up to whole dollar)	10%			$13,320
ESTIMATED UNIT CLOSURE COST TOTAL					$146,512

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 022
Unit Name: Hazardous and Non-Hazardous Container Storage Area
Unit Type: Container Storage Area

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
1.0	**Removal of Waste**				
1.1	Load Drums onto Trucks	1130	EA		
	Assume load rate of 30 drums per hour (2 min per drum) in Level C PPE	30	/ HR		
	Duration of drum loading activitiy	37.67	HR		
	Crew A-3P: forklift and operator for moving drums on container storage area	37.67	HR	$295.95	$11,147.45
1.2	Collect/contain/remove accumulated stormwater	22048	GAL		
	Common Laborer	2	HR	$51.30	$102.60
	Foreman (assume half-time for this task)	2	HR	$69.26	$138.52
	Vacuum Truck & Semi w/ Driver	2	HR	$193.98	$387.96
2.0	**Decontamination of the CSA and Equipment**				
2.1	Pressure wash/steam clean surfaces	14968	SF		
	Assume productivity of 400 SF/hour (20' x 20')	400	SF/hour		
	Work hours required	37	HR		
	Crew SC1: steam cleaner and laborers for pressure washing/steam cleaning units and secondary containment (ground level work)	37	HR	$172.66	$6,388.42
2.2	Collect rinsate	included in work item 2.1 above			
2.3	Sample rinsate for disposal characterization	see work item 3.3.1 below			
2.4	Analyze rinsate samples	see work item 3.3.2 below			

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 022
Unit Name: Hazardous and Non-Hazardous Container Storage Area
Unit Type: Container Storage Area

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
3.0	**Sampling & Analysis**				
3.1	Characterize Drummed Wastes				
3.1.1	Collect Samples	1130	EA		
	Assume # of drums opened, sampled, documented, and reclosed per hour (Level B PPE)	8	/ HR		
	Work hours required (rounded up to next whole number)	142	HR		
	Assume crew consists of 1 laborer, a foreman, and a helper (for sample packaging & crew decon)				
	Foreman	142	HR	$69.26	$9,835
	Laborers	142	HR	$51.30	$7,285
	Helper	142	HR	$48.71	$6,917
	Courier Shipments to laboratory (1 shipment per 10-hour work day; roundup to next whole number)	15	EA	$150.00	$2,250
3.1.2	Analyze Samples				
	Number of Drums	1130	EA		
	Assume drums will be evaluated for compatibility/incompatibility during intial recon; assume 10% of drums will require sampling for disposal characterization	10%			
	Number of Samples	113	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	130	EA		
	Ignitability by SW-846 Method 1010	130	EA	$30.00	$3,900

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 022
Unit Name: Hazardous and Non-Hazardous Container Storage Area
Unit Type: Container Storage Area

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Corrosivity by EPA Method 9045	130	EA	$10.00	$1,300
	Cyanide Reactivity	130	EA	$30.00	$3,900
	Sulfice Reactivity	130	EA	$30.00	$3,900
	Metals by ICP/MS by SW-846 Method 6020A	130	EA	$150.00	$19,500
	Volatiles by SW-846 Method 8260	130	EA	$95.00	$12,350
	Semivolatiles by SW-846 Method 8270	130	EA	$195.00	$25,350
	Acetaldehyde by SW 8315	0	EA	$185.00	$0
3.1.3	Summarize and Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$1,000.00	$1,000
3.2	Accumulated Stormwater	22048	GAL		
3.2.1	Collect Samples				
	Assume samples collected by same crew (already mobilized to site) as drum samples				
	Assume 1 sample of stormwater from containment area for disposal characterization	1	EA		
	Laborer	1	HR	$51.30	$51
	Courier Shipments to laboratory (1 shipment)	1	EA	$150.00	$150
3.2.2	Analyze Samples	1	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	2	EA		
	Assume analytes for deep well injection				
	Ignitability by SW-846 Method 1010	2	EA	$30.00	$60

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 022
Unit Name: Hazardous and Non-Hazardous Container Storage Area
Unit Type: Container Storage Area

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Corrosivity by EPA Method 9045	2	EA	$10.00	$20
	Cyanide Reactivity	2	EA	$30.00	$60
	Sulfice Reactivity	2	EA	$30.00	$60
	Metals by ICP/MS by SW-846 Method 6020A	2	EA	$150.00	$300
	Volatiles by SW-846 Method 8260	2	EA	$95.00	$190
	Semivolatiles by SW-846 Method 8270	2	EA	$195.00	$390
	Acetaldehyde by SW 8315	0	EA	$185.00	$0
3.2.3	Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
3.3	Decon Wastewater				
3.3.1	Collect Samples				
	Assume samples collected by same crew (already mobilized to site) as drum samples				
	Asume 1 sample of decon wastewater at end of decon operations				
	Laborer	1	HR	$51.30	$51
	Courier Shipments to laboratory (1 shipment)	1	EA	$150.00	$150
3.3.2	Analyze Samples	1	EA		
	Assume 15% QA/QC samples (trip blanks, rinse blanks, duplicates, method spikes, MSDs, etc.)	15%			
	Total Number of Samples to be Analyzed	2	EA		
	Assume analytes for deep well injection				
	Ignitability by SW-846 Method 1010	2	EA	$30.00	$60

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 022
Unit Name: Hazardous and Non-Hazardous Container Storage Area
Unit Type: Container Storage Area

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Corrosivity by EPA Method 9045	2	EA	$10.00	$20
	Cyanide Reactivity	2	EA	$30.00	$60
	Sulfice Reactivity	2	EA	$30.00	$60
	Metals by ICP/MS by SW-846 Method 6020A	2	EA	$150.00	$300
	Volatiles by SW-846 Method 8260	2	EA	$95.00	$190
	Semivolatiles by SW-846 Method 8270	2	EA	$195.00	$390
	Acetaldehyde by SW 8315	0	EA	$185.00	$0
3.3.3	Evaluate Data & Submit Disposal Facility Acceptance Forms	1	LS	$300.00	$300
4.0	**Transportation of Wastes**				
4.1	Drummed Wastes	1130	EA		
	Assume average number of drums per truckload	80	/load		
	Number of truckloads	14.125	Loads		
	Project manager to prepare manifests & documentation (assume 1 hour per load)	14.125	HR	$150.00	$2,118.75
	Truck transport (assume treatment/disposal facility within 50 miles; minimum charge per load)	14.125	loads	$1,275.00	$18,009.38
4.2	Accumulated Stormwater				
	Volume of accumulated stormwater	22048	GAL		
	Water density	8.6	LB/GAL		
	Mass of stormwater	189613	LB		
	Net cargo capacity of tank truck	40000	LB		
	Number of truckloads (roundup)	5	Loads		

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 022
Unit Name: Hazardous and Non-Hazardous Container Storage Area
Unit Type: Container Storage Area

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
	Project manager to prepare manifests & documentation (assume 1.0 hour per load)	5	HR	$150.00	$750.00
	Disposal of waste, transportation mileage charges, tanker trailer, hazardous waste, min charge	5	loads	$1,060.00	$5,300.00
4.3	Decon Wastewater				
	Number of truckloads	1	Loads		
	Project manager to prepare manifests & documentation (assume 1.0 hour per load)	1	HR	$150.00	$150.00
	Disposal of waste, transportation mileage charges, tanker trailer, hazardous waste, min charge	1	loads	$1,060.00	$1,060.00
5.0	**Treatment and Disposal of Wastes**				
5.1	Drummed Wastes				
	Dispose at approved facility	1130	EA	$480.18	$542,603
5.2	Accumulated Stormwater				
	Dispose at approved facility (assume UIC)	22048	GAL	$0.25	$5,512
5.3	Decon Wastewater				
	Dispose at approved facility (assume UIC)	1500	GAL	$0.25	$375
6.0	**Demolition and Removal of Containment System**	(not used)			
7.0	**Removal of Contaminated Soils**	(not used)			

CLOSURE COST ESTIMATE

Estimate Date: 5/27/2015

Facility ID: TXD058275769
Facility Name: Equistar Chemicals, LP - Channelview Complex
TCEQ NOR: 022
Unit Name: Hazardous and Non-Hazardous Container Storage Area
Unit Type: Container Storage Area

Work Item	Description	Quantity	Unit of Measure	Price	Extended Cost
8.0	**Backfilling**	(not used)			
9.0	**Equipment Rental**	(not used - equipment costs included in work items above)			
10.0	**PE Closure Certification**				
	Observations & Inspections During Closure (assume mid-level environmental engineer)	100	HR	$100.00	$10,000
	Closure Certification Report (assume senior level environmental engineer)	25	HR	$150.00	$3,750
	Expenses & other direct costs during on-site work	8	days	$50.00	$400
11.0	**Engineering, mobilization, site preparation (rounded up to whole dollar)**				
	Subtotal Work Items 1 - 9 above	$694,692			
	(rounded up to whole dollar)	5%			$34,735
SUBTOTAL	(rounded up to whole dollar)				$743,578
CONTINGENCY	(rounded up to whole dollar)	10%			$74,358
ESTIMATED UNIT CLOSURE COST TOTAL					$817,936

CSA Stormwater Calculations

	Value	UOM	Source or Calculation
Step 1 - Calculate Containment Capacity of Uncovered and Covered Portions of CSA			
Uncovered Portion Width	35	FT	
Uncovered Portion Length	54.75	FT	
Uncovered Portion Footprint	1916	SF	Uncovered Portion Width x Length
Uncovered Portion Curb Height	0.5	FT	Use curb height to calculate amount of contained stormwater since wettest two consecutive months is greater than curb
Uncovered Portion Containment Capacity	958	CF	Uncovered Portion Footprint x Uncovered Portion Curb Height
Covered Portion Width	50	FT	
Covered Portion Length	97	FT	
Covered Portion Footprint	4863	SF	Covered Area Width x Length
Covered Portion Curb Height	0.5	FT	Use curb height to calculate amount of contained stormwater since wettest two consecutive months is greater than curb
Covered Portion Containment Capacity	2431	CF	Covered Portion Footprint x Covered Portion Curb Height
Step 2 - Calculate Number of Drums in Uncovered Portion of CSA			
Approach: pro-rate using footprints			
Covered Portion Width	50	FT	
Covered Portion Length	97	FT	
Covered Portion Footprint	4863	SF	Covered Area Width x Length
Total Footprint of CSA	6779	SF	Sum Footprints for Covered & Uncovered Portions
Ratio	0.28		Uncovered Portion Footprint / Total Footprint
Maximum Number of Drums in CSA	1130	EA	
Prorated Number of Drums in Uncovered Portion of CSA (rounded up)	320	EA	Calculated as Maximum Number of Drums x Ratio in Uncovered Portion
Step 3 - Calculate Volume within Containment Area Occupied by Drums			
Diameter of a 55-gallon Drum	22.5	IN	
Radius of a 55-gallon Drum	0.9375	FT	= (Diameter of a 55-gallon drum) / 2 / 12
Footprint of a 55-gallon Drum	2.76	SF	= pi x (Radius)^2
Volume of a Drum below top of curb	1.38	CF	Footprint of a 55-gallon drum x Uncovered Area Curb Height
Volume of Containment Occupied by Drums	442	CF	Volume of a Drum below top of curb x Prorated Number of Drums in Uncovered Portion of CSA
Step 4 - Calculate Net Volume of Stormwater in CSA			
Total Containment Capacity in Uncovered Portion	958	CF	Calculated in Step 1 above
Total Containment Capacity in Covered Portion	2431	CF	Calculated in Step 1 above
Volume Occupied by Drums in Uncovered Portion	442	CF	Calculated in Step 3 above
Net Volume of Stormwater in CSA	2947	CF	Calculated by subtraction
Net Volume of Stormwater in Uncovered Portion	22048	gallons	Conversion using 7.481 Gal/CF
Step 5 - Calculate Containment Capacity of 1101A and 1101 B (One Secondary Containment)			
Width	11	FT	
Length	12	FT	
Footprint	130	SF	Covered Area Width x Length
Curb Height	1.3	FT	
Containment Capacity	174	CF	
Net Volume of Stormwater	1300	gallons	Conversion using 7.481 Gal/CF
Net Volume of Stormwater associated with each tank	650	gallons	Divided by 2
Footprint for each tank	65	SF	Divided by 2
Step 5 - Calculate Containment Capacity of 4383			
Width	23	FT	
Length	45	FT	
Footprint	1035	SF	Covered Area Width x Length
Curb Height	1.3	FT	
Containment Capacity	1380	CF	
Net Volume of Stormwater	10324	gallons	Conversion using 7.481 Gal/CF
Step 6 - Calculate Containment Capacity of 3455 and 4455			
Width	55	FT	
Length	60	FT	
Footprint	3300	SF	Covered Area Width x Length
Curb Height	1.3	FT	

Decon Calculations

CSA - Areas to Decon			
1. Surface Area of Slab to be Cleaned	**Value**	**UOM**	**Source or Calculation**
Total Footprint of CSA	6779	SF	From Stormwater Calcs worksheet
2. Surface Area of Curbing in Uncovered Portion to be Cleaned			
Uncovered Portion Width	35	FT	
Uncovered Portion Length	54.75	FT	
Perimeter Curb Around Uncovered Portion	179.5	FT	= 2 x (Length + Width)
Curb Height	0.5	FT	
Curb Top Width	0.33	FT	assume 4-inch width
Surface Area of Uncovered Curbing (inside plus top)	149	SF	assume outside of curb is clean; value is rounded
3. Surface Area of Curbing in Covered Portion to be Cleaned			
Covered Portion Width	50	FT	
Covered Portion Length	97	FT	
Perimeter Curb Around Uncovered Portion	294.5	FT	= 2 x (Length + Width)
Curb Height	0.5	FT	
Curb Top Width	0.33	FT	assume 4-inch width
Surface Area of Covered Portion Curbing (inside plus top)	244	SF	assume outside of curb is clean; value is rounded
4. Internal Surfaces of Covered Portion			
Covered Portion Width	50	FT	
Covered Portion Length	97	FT	
Covered Portion Sidewall Length	244.5	FT	= (2 x Length) + Width (3-sided storage)
Sidewall Height	12	FT	assumed
Interior Surface Area of Sidewalls	2934	SF	= Covered Portion Sidewall Length x Height
Interior Surface Area of Roof	4863	SF	

Decon Calculations

5. TOTAL Surface Area to Decon			
Total Footprint of CSA	6779	SF	Item 1 above
Surface Area of Uncovered Curbing (inside plus top)	149	SF	Item 2 above
Surface Area of Covered Portion Curbing (inside plus top)	244	SF	Item 3 above
Interior Surface Area of Sidewalls	2934	SF	Item 4 above
Interior Surface Area of Roof	4863	SF	Item 4 above
Total Footprint of CSA	**14968**	**SF**	Sum items 1 through 4
Rate of generating decon rinsate	0.10	GAL/SF	per TCEQ Guide No. 10
Volume of Decon Rinsate	1500	GAL	roundup to next 100

Decon Calculations

Tank 3455 - Areas to Decon			
1. Underside of Floating Roof			
Tank Diameter	40	FT	
Radius	20	FT	
Area (pi x r^2)	1257	SF	
2. Floor			
Same as underside of Roof	1257	SF	
3. Sidewalls			
Tank Diameter	40	FT	
Circumference (pi x D)	126	FT	
Sidewall Height	32	FT	
Surface Area (Circumference x sidewall height)	4032	SF	
4. Total Interior Surface Area	6546	SF	
Secondary Containment Footprint	3300	SF	
Rinsate Quantity			
Rate of generating decon rinsate	0.10	GAL/SF	per TCEQ Guide No. 10
Volume of Decon Rinsate	1000	GAL	roundup to next 100

Tank 4455 - Areas to Decon			
Same dimensions and calculations as Tank 3455 above	6546	SF	

Decon Calculations

Tank 1101 - Areas to Decon			
1. Endwalls			
Diameter	2.33	FT	
Radius	1.17	FT	
Area (pi x r^2) x 2	9	SF	
2. Sidewalls			
Tank Diameter	2.33	FT	
Circumference (pi x D)	7	FT	
Tank Length	6	FT	
3. Secondary Containment			
Footprint	65	SF	
Surface Area (Circumference x sidewall height)	42	SF	
4. Total Interior Surface Area including Secondary Containment	116	SF	

Decon Calculations

Tank 4383 - Areas to Decon			
1. Endwalls			
Diameter	10.00	FT	
Radius	5.00	FT	
Area (pi x r^2) * 2	157	SF	
2. Sidewalls			
Tank Diameter	10.00	FT	
Circumference (pi x D)	31	FT	
Tank Length	19	FT	
Surface Area (Circumference x sidewall height)	589	SF	
3. Secondary Containment			
Footprint	1035	SF	
4. Total Interior Surface Area including Secondary Containment	1781	SF	

Rainfall Data

Climate Houston - Texas	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average high in °F:	62	65	72	78	84	90	92	93	88	81	71	63
Average low in °F:	44	46	54	60	66	72	74	74	70	61	52	45
Av. precipitation in inch:	3.7	3.23	2.4	3.43	4.45	3.82	5.16	3.54	3.82	3.58	4.06	4.09
Days with precipitation:	10	10	9	8	8	8	10	9	9	7	8	10
Hours of sunshine:	144	141	193	212	266	298	294	281	238	239	181	146
Rainfall - two consecutive months	**7.79**	**6.93**	**5.63**	**5.83**	**7.88**	**8.27**	**8.98**	**8.7**	**7.36**	**7.4**	**7.64**	**8.15**

Source: http://www.usclimatedata.com/climate/houston/texas/united-states/ustx0617

ANALYTICAL METHODS FOR CHARACTERIZATION OF PERMITTED WASTE CODES

Waste Code	CSA	Tanks 1101 A & B	Tank 3455	Tank 4455	Tank D-4383
D001	EPA 1010	EPA 1010	EPA 1010	EPA 1010	EPA 1010
D002	EPA 9040	EPA 9040	EPA 9040	EPA 9040	EPA 9040
D003	EPA 9010; ASTM D4978		EPA 9010; ASTM D4978	EPA 9010; ASTM D4978	EPA 9010; ASTM D4978
D004	6020A				
D005	6020A				
D006	6020A				
D007	6020A				
D008	6020A				
D009	6020A	6020A			
D010	6020A				
D011	6020A				
D018	8260	8260	8260	8260	8260
D019	8260	8260			
D022	8260	8260			
D027	8260				
D028	8260				
D035	8260	8260			
D038	8270	8270			
D039	8260				
D040	8260				
F002	8260	8260			
F003	8260	8260			
F005	8260/8270	8260/8270			
U002	8260				
U003	8260				
U019	8260				
U022	8270				
U055	8260				
U056	8270				
U077	8260				
U133	8270				
U147	8270				
U154	8260				
U159	8260				
U220	8260				
U226	8260				
U239	8270				

	Equipment	Rental Period	Charge	
1	DBI/SALA® Confined Space Tripod Kits - RENTAL	Weekly	$	135.00
2	Premier Safety Compressor Trailer-RENTAL	Weekly	$	333.00
3	iBRID™ MX6 Multi Gas Monitor - Rentals	Weekly	$	150.00
4	Cascade Breathing Air System RENTAL	Weekly	$	140.00
5	Personal Airline System Colt RENTAL	Weekly	$	141.00
6	Confined Space Ventilation Kits - RENTAL	Weekly	$	147.00
7	CLS Series Business Two-Way Radios	Weekly	$	169.00
8	Delta Crossover Type full body harness	Weekly	$	142.00
9	HP Lanyards with SofStop	Weekly	$	84.30
		Total	**$**	**1,441.30**

APPENDIX D: GROUNDWATER CLASSIFICATION

Kathleen Hartnett White, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
Larry R. Soward, *Commissioner*
Margaret Hoffman, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

June 24, 2004

Mr. Denny Wiseman
Plant Manager
Equistar Chemicals, LP
P. O. Box 777
Channelview, Texas 77530

Re: Groundwater Resource Classification, dated January 16, 2004
Equistar Chemicals, LP, Channelview Complex
TCEQ SWR No. 30030

Dear Mr. Wiseman:

The Texas Commission on Environmental Quality (TCEQ) has reviewed the Groundwater Resource Classification, dated January 16, 2004. Based on our review, the TCEQ approves the the TZ-1 groundwater bearing unit as Class 3 Groundwater and the TZ-2 groundwater bearing unit as Class 2 Groundwater. Please proceed with the assessment of the Equistar Chemicals, LP, Channelview Complex.

Please contact me at [redacted] or at (512) 239-2992 if you need additional information. Thank you for your cooperation in this matter.

Sincerely,

Chris Siegel

Chris Siegel, Project Manager
Team III, Corrective Action Section
Remediation Division
Texas Commission on Environmental Quality

CS/cs

cc: Waste Program Manager, TCEQ Region 12 Office, Houston

Appendix VIII: Financial Assurance

April 28, 2025

Executive Director
Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, TX 78753

Attention: Mr. Mark Stoebner, MC-184

Dear Mr. Stoebner:

Attached please find a rider to payment bond number K08088536 effective March 31, 2025 issued by Westchester Fire Insurance Company to demonstrate financial responsibility as specified in 30 TAC §37.404 for closure, post closure, corrective action and/or plugging and abandonment cost estimates for the following locations.

Equistar Chemicals, LP
Channelview Complex
SWR#30030
8280 Sheldon Road, Channelview, TX 77530
P.O. Box 777, Channelview, TX 77530

Closure:
$ 2,275,814

Equistar Chemicals, LP
Corpus Christi Complex
WDW #152 & #153

1501 McKinzie Road, Corpus Christi, TX 78410
P.O. Box 10940, Corpus Christi, TX 78460

WDW #152 Closure: $ 445,642

WDW #153 Closure: $ 444,370

Total Current Cost Estimates: $ 3,165,826

A revised Schedule A to the trust is also attached. Should you require further assistance, please contact me at (713) 855·5595.

Respectfully,

Addie Griffith
Sr. Risk & Insurance Analyst

Enclosures

CC: Stephen Weishar – LBT
Rebecca Hassan – Lyondell CXO
Francisca Deter – Equistar CCO
Karen Hefner - LBT

Sandra Graham

BNY Mellon – Corporate Trust
Specialty Products – Escrow Unit
101 Barclay Street
7th Floor East
New York, NY 10286

SCHEDULE A

Amendment to Trust Agreement
EQUISTARTNRC

This amended Schedule A is to the Trust Agreement dated April 22, 2002 by and between Equistar Chemicals, LP, as Gran tor, and The Bank of New York Trust Company, as trustee. Equistar Chemicals, LP is the owner of the following facilities for which financial assurance for

closure and post closure care is demonstrated through Westchester Fire Insurance Company bond 1{08088536 dated April 1, 2008. The cost estimates below are as of March 31, 2025.

Equistar Chemicals, LP
Channelview Complex
SWR#30030
8280 Sheldon Road, Channelview, TX 77530
P.O. Box 777, Channelview, TX 77530

Closure:	$ 2,275,814

Equistar Chemicals, LP
Corpus Christi Complex
WDW #152 & #153
1501 McKinzie Road, Corpus Christi, TX 78410
P.O. Box 10940, Corpus Christi, TX 78460

WDW #152 Closure:	$ 445,642
WDW #153 Closure:	$ 444,370

Total Current Cost Estimates:	$ 3,165,826

WESTCHESTER FIRE INSURANCE COMPANY
436 Walnut Street, Philadelphia, PA 19106

Bond Rider

To be attached to and made a part of Bond Number K08088536

On behalf of Equistar Chemicals, LP, as Principal, and executed by Westchester Fire Insurance Company, as Surety, in favor of the Texas Commission on Environmental Quality as Obligee.

In consideration of the mutual agreements herein contained, the Principal and the Surety hereby consent to the following changes: Amending bond penalty from $3,091,626.00 to $3,165,826.00

Channelview Complex
SWR #30030
8280 Sheldon Road, Channelview 77530
P.O. Box 777, Channelview 77530

Corpus Christi Complex
WDW #152 & #153
1501 McKinzie Road, Corpus Christi, TX 78410
P.O. Box 10940, Corpus Christi, TX 78460

Closure:	**$ 2,275,814.00**	**WDW #152 Closure**	**$ 445,642.00**
		WDW #153 Closure	**$ 444,370.00**

Total Penal Sum of Bond: $ 3,165,826.00

This change is to become effective March 31st, 2025.

All other terms and conditions of the above said bond shall remain unchanged.

Signed, sealed and dated this 4th day of April, 2025.

Westchester Fire Insurance Company

By: _____
Misty Wright, Attorney-in-fact

Equistar Chemicals, LP

By _____

Title: Sr. Director, Treasury Operations & Pensions Americas

CHUBB

Power of Attorney

Federal Insurance Company | Vigilant Insurance Company | Pacific Indemnity Company
Westchester Fire Insurance Company | ACE American Insurance Company

Know All by These Presents, that **FEDERAL INSURANCE COMPANY,** an Indiana corporation, **VIGILANT INSURANCE COMPANY,** a New York corporation, **PACIFIC INDEMNITY COMPANY,** a Delaware corporation, **WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY** corporations of the Commonwealth of Pennsylvania, do each hereby constitute and appoint Vanessa Dominguez, Amanda George, Jennifer Moore, Terri L. Morrison, Andrea M. Penaloza, Gina A. Rodriguez, Lupe Tyler, Lisa A. Ward, Donna L. Williams and Misty Wright of Houston Texas ----------

each as their true and lawful Attorney-in-Fact to execute under such designation in their names and to affix their corporate seals to and deliver for and on their behalf as surety thereon or otherwise, bonds and undertakings and other writings obligatory in the nature thereof (other than bail bonds) given or executed in the course of business, and any instruments amending or altering the same, and consents to the modification or alteration of any instrument referred to in said bonds or obligations.

In Witness Whereof, said **FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY** have each executed and attested these presents and affixed their corporate seals on this **25th** day of **October, 2024.**

Rupert HD Swindells, Assistant Secretary

Warren Eichhorn, Vice President

STATE OF NEW JERSEY
County of Hunterdon SS.

On this **25th** day of **October, 2024** before me, a Notary Public of New Jersey, personally came Rupert HD Swindells and Warren Eichhorn, to me known to be Assistant Secretary and Vice President, respectively, of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY, the companies which executed the foregoing Power of Attorney, and the said Rupert HD Swindells and Warren Eichhorn, being by me duly sworn, severally and each for himself did depose and say that they are Assistant Secretary and Vice President, respectively, of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY and know the corporate seals thereof, that the seals affixed to the foregoing Power of Attorney are such corporate seals and were thereto affixed by authority of said Companies; and that their signatures as such officers were duly affixed and subscribed by like authority.

Notarial Seal

Albert Contursi
NOTARY PUBLIC OF NEW JERSEY
No 50202369
Commission Expires August 22,2027

Notary Public

CERTIFICATION

Resolutions adopted by the Boards of Directors of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY on August 30, 2016; WESTCHESTER FIRE INSURANCE COMPANY on December 11, 2006; and ACE AMERICAN INSURANCE COMPANY on March 20, 2009:

"RESOLVED, that the following authorizations relate to the execution, for and on behalf of the Company, of bonds, undertakings, recognizances, contracts and other written commitments of the Company entered into in the ordinary course of business (each a "Written Commitment"):

(1) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise.

(2) Each duly appointed attorney-in-fact of the Company is hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise, to the extent that such action is authorized by the grant of powers provided for in such person's written appointment as such attorney-in-fact.

(3) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized, for and on behalf of the Company, to appoint in writing any person the attorney-in-fact of the Company with full power and authority to execute, for and on behalf of the Company, under the seal of the Company or otherwise, such Written Commitments of the Company as may be specified in such written appointment, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.

(4) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized, for and on behalf of the Company, to delegate in writing to any other officer of the Company the authority to execute, for and on behalf of the Company, under the Company's seal or otherwise, such Written Commitments of the Company as are specified in such written delegation, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.

(5) The signature of any officer or other person executing any Written Commitment or appointment or delegation pursuant to this Resolution, and the seal of the Company, may be affixed by facsimile on such Written Commitment or written appointment or delegation.

FURTHER RESOLVED, that the foregoing Resolution shall not be deemed to be an exclusive statement of the powers and authority of officers, employees and other persons to act for and on behalf of the Company, and such Resolution shall not limit or otherwise affect the exercise of any such power or authority otherwise validly granted or vested."

I, Rupert HD Swindells, Assistant Secretary of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY (the "Companies") do hereby certify that

(i) the foregoing Resolutions adopted by the Board of Directors of the Companies are true, correct and in full force and effect,
(ii) the foregoing Power of Attorney is true, correct and in full force and effect.

Given under my hand and seals of said Companies at Whitehouse Station, NJ, this 4th day of April, 2025

Rupert HD Swindells, Assistant Secretary

IN THE EVENT YOU WISH TO VERIFY THE AUTHENTICITY OF THIS BOND OR NOTIFY US OF ANY OTHER MATTER, PLEASE CONTACT US AT:
Telephone (908) 903-3493 Fax (908) 903-3656 e-mail: surety@chubb.com

April 28, 2025

Executive Director
Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, TX 78753

Attention: Mr. Mark Stoebner, MC-184

Dear Mr. Stoebner:

Attached please find a rider to payment bond K41629812, effective March 31, 2025, indicating the total penal sum of $8,955,552. This bond is issued by Federal Insurance Company to demonstrate financial responsibility as specified in 30 TAC §37.404 for closure, post closure, corrective action and/or plugging and abandonment. The revised cost estimates shown below are for the Lyondell Bayport and Channelview locations:

SWR #30676, WDW #148 & #162
Lyondell Chemical Company
Channelview Facility
2502 Sheldon Road
Channelview, TX 77530

Closure:	$ 3,738,805
Corrective Action:	$ 3,082,428
Plugging and Abandonment WDW #148	$ 523,403
Plugging and Abandonment WDW #162	$ 521,931

SWR #30368
Lyondell Chemical Company
Bayport Facility
10801 Choate Road
Pasadena, Texas 77507

Closure:	$ 677,329
Corrective Action:	$ 626,589

Total Current Cost Estimates: $ 9,170,485

Also attached is an amendment to Schedule A to the trust agreement. Should you require further assistance, please contact me at (713) 855·5595.

Sincerely,

Addie Griffith
Sr. Risk & Insurance Analyst

Enclosures

CC: Stephen Weishar – LBT
Nancy Ross – Lyondell CXO
Amanda Love – Lyondell BLO
Jim Gooris – CBO
Karen Hefner - LBT

Sandra Graham
BNY Mellon – Corporate Trust
Specialty Products – Escrow Unit
101 Barclay Street
7th Floor East
New York, NY 10286

SCHEDULE A

Amendment to Trust Agreement LYONTRUST#I

This amended Schedule A is to the Trust Agreement #1 by and between Lyondell Chemical Company, as Grantor, and the Bank of New York, as trustee. Lyondell Chemical Company is the owner of the following facilities for which financial assurance for closure and post closure care is demonstrated through Westchester Fire Insurance Company payment bond number K41629812. The cost estimates below are effective March 31, 2025.

SWR #30676, WDW #148 & #162
Lyondell Chemical Company
Channelview Facility
2502 Sheldon Road
Channelview, TX 77530

Closure:	$ 3,738,805
Corrective Action:	$ 3,082,428
Plugging and Abandonment WDW #148	$ 523,403
Plugging and Abandonment WDW #162	$ 521,931

SWR #30368
Lyondell Chemical Company
Bayport Facility
10801 Choate Road
Pasadena, Texas 77507

Closure:	$ 677,329
Corrective Action:	$ 626,589
Total Current Cost Estimates:	$ 9,170,485

RIDER

To be attached to and form part of:

Bond Number K41629812

dated November 1, 2023

issued by the FEDERAL INSURANCE COMPANY

on behalf of LYONDELL CHEMICAL COMPANY
(Principal)

and in favor of TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
(Obligee)

Now therefore, it is agreed that in consideration of the premium charged, the attached bond shall be amended as follows:

The bond amount **shall be amended** FROM: **$ 8,955,552.00** TO: **$ 9,170,485.00**

SWR #30676, WDW #148 & #162
Lyondell Chemical Company
Channelview Facility
2502 Sheldon Road
Channelview, Texas 77530

Closure:	$ 3,738,805.00
Corrective Action:	$ 3,082,428.00
Closure WDW #148	$ 523,403.00
Closure WDW #162	$ 521,931.00

SWR #30368
Lyondell Chemical Company
Bayport Facility
10801 Choate Road
Pasadena, Texas 77507

Closure:	$ 677,329.00
Corrective Action:	$ 626,589.00

Total Penal Sum of Bond: $ 9,170,485.00

It is further understood and agreed that all other terms and conditions of this bond shall remain unchanged.

This Rider is to be Effective this 31st day of March, 2025.

Signed, Sealed & Dated this 4th day of April, 2025.

LYONDELL CHEMICAL COMPANY
(Principal)

By: _____

FEDERAL INSURANCE COMPANY
(Surety)

By: _____
Misty Wright, Attorney-in-Fact

CHUBB

Power of Attorney

Federal Insurance Company | Vigilant Insurance Company | Pacific Indemnity Company
Westchester Fire Insurance Company | ACE American Insurance Company

Know All by These Presents, that **FEDERAL INSURANCE COMPANY**, an Indiana corporation, **VIGILANT INSURANCE COMPANY**, a New York corporation, **PACIFIC INDEMNITY COMPANY**, a Delaware corporation, **WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY** corporations of the Commonwealth of Pennsylvania, do each hereby constitute and appoint Vanessa Dominguez, Amanda George, Jennifer Moore, Terri L. Morrison, Andrea M. Penaloza, Gina A. Rodriguez, Lupe Tyler, Lisa A. Ward, Donna L. Williams and Misty Wright of Houston Texas ----------

each as their true and lawful Attorney-in-Fact to execute under such designation in their names and to affix their corporate seals to and deliver for and on their behalf as surety thereon or otherwise, bonds and undertakings and other writings obligatory in the nature thereof (other than bail bonds) given or executed in the course of business, and any instruments amending or altering the same, and consents to the modification or alteration of any instrument referred to in said bonds or obligations.

In Witness Whereof, said **FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY** have each executed and attested these presents and affixed their corporate seals on this **25th** day of **October, 2024.**

Rupert HD Swindells, Assistant Secretary

Warren Eichhorn, Vice President

STATE OF NEW JERSEY
County of Hunterdon SS.

On this **25th** day of **October, 2024** before me, a Notary Public of New Jersey, personally came Rupert HD Swindells and Warren Eichhorn, to me known to be Assistant Secretary and Vice President, respectively, of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY, the companies which executed the foregoing Power of Attorney, and the said Rupert HD Swindells and Warren Eichhorn, being by me duly sworn, severally and each for himself did depose and say that they are Assistant Secretary and Vice President, respectively, of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY and know the corporate seals thereof, that the seals affixed to the foregoing Power of Attorney are such corporate seals and were thereto affixed by authority of said Companies; and that their signatures as such officers were duly affixed and subscribed by like authority.

Notarial Seal

Albert Contursi
NOTARY PUBLIC OF NEW JERSEY
No 50202369
Commission Expires August 22,2027

Notary Public

CERTIFICATION

Resolutions adopted by the Boards of Directors of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY on August 30, 2016; WESTCHESTER FIRE INSURANCE COMPANY on December 11, 2006; and ACE AMERICAN INSURANCE COMPANY on March 20, 2009:

"RESOLVED, that the following authorizations relate to the execution, for and on behalf of the Company, of bonds, undertakings, recognizances, contracts and other written commitments of the Company entered into in the ordinary course of business (each a "Written Commitment"):

(1) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise.

(2) Each duly appointed attorney-in-fact of the Company is hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise, to the extent that such action is authorized by the grant of powers provided for in such person's written appointment as such attorney-in-fact.

(3) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized, for and on behalf of the Company, to appoint in writing any person the attorney-in-fact of the Company with full power and authority to execute, for and on behalf of the Company, under the seal of the Company or otherwise, such Written Commitments of the Company as may be specified in such written appointment, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.

(4) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized, for and on behalf of the Company, to delegate in writing to any other officer of the Company the authority to execute, for and on behalf of the Company, under the Company's seal or otherwise, such Written Commitments of the Company as are specified in such written delegation, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.

(5) The signature of any officer or other person executing any Written Commitment or appointment or delegation pursuant to this Resolution, and the seal of the Company, may be affixed by facsimile on such Written Commitment or written appointment or delegation.

FURTHER RESOLVED, that the foregoing Resolution shall not be deemed to be an exclusive statement of the powers and authority of officers, employees and other persons to act for and on behalf of the Company, and such Resolution shall not limit or otherwise affect the exercise of any such power or authority otherwise validly granted or vested."

I, Rupert HD Swindells, Assistant Secretary of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY (the "Companies") do hereby certify that

(i) the foregoing Resolutions adopted by the Board of Directors of the Companies are true, correct and in full force and effect,
(ii) the foregoing Power of Attorney is true, correct and in full force and effect.

Given under my hand and seals of said Companies at Whitehouse Station, NJ, this 4th day of April, 2025

Rupert HD Swindells, Assistant Secretary

IN THE EVENT YOU WISH TO VERIFY THE AUTHENTICITY OF THIS BOND OR NOTIFY US OF ANY OTHER MATTER, PLEASE CONTACT US AT:
Telephone (908) 903- 3493 Fax (908) 903- 3656 e-mail: surety@chubb.com

Appendix IX: Releases from Solid Waste Management Units and Corrective Action

Preliminary Review Facility Checklist
Preliminary Review Individual Checklist
Maps
TCEQ Determination Letter

Brown AND Caldwell

Preliminary Review Facility Checklist

Preliminary Review Facility Checklist

Facility:	Equistar Chemicals, LP	City	Channelview
ISW Reg. No:	30030	Date	2/19/2026
Permit No.	50117	Reviewer:	
EPA ID No.	TXD058275769		

A. Waste Management Units:

RCRA Regulated Units:

NOR. No.	Description	Status
006	T01, Tank 2606, West API Separator skimmings (permit number 008)	Closed
007	T01, Tank 3221, Poly BD API Separator Skimmings (permit number 003)	Closed
022	S01, Container Storage Area (permit unit 015)	Active
031	T01, Tank 4455 (permit unit 007)	Active
032	T01, Tank D-3455 (permit unit 006)	Active
042	T01, Tank D-3210 (permit unit 002)	Closed
043	T01, Tank D-59 (permit unit 009)	Closed
044	T01, Tank 2812 (permit unit 004)	Closed
045	T01, Tank 3110 (permit unit 001)	Closed
046	T01, Tank 3207 (permit unit 010)	Closed
047	T01, Tank D-4383 (former permit unit 005)	Active
053	D83, ECU-OP1 aeration basin (permit unit 016)	Closed
054	D83, ECU-OP2 aeration basin (permit unit 017)	Closed
056	T01, Tank D-82 (permit unit 013)	Closed
057	T01, Tank D-83 (permit unit 014)	Closed
114	T01, Tank 1101-A (permit unit 011)	Closed

NOR. No.	Description	Status
115	T01, Tank 1101-B (permit unit 012)	Closed
	Remove Last Row	Add Row

Solid Waste Management Units:

NOR. No.	Description	Status
009	T01, East Plant TK 36 Slop Oil Polymer Transfer	Active
020	S01, Container Storage Area	Inactive
037	OP-II Demin Pits	Active
050	S01, Greenwade Warehouse	Closed
058	S04, OP-1 C Pond	Closed
059	S04, OP-2 C Pond	Closed
060	T01, Tank-7039	Closed
081	T-01, ECU TK-1733 OP-II Trickling Filter	Active
100	S-01, Laydown Yard CSA	Active
107	S-01, Midplant CSA	Active
116	T80, Boiler B-1	Closed
117	T80, Boiler B-2	Closed
118	T80, Boiler B-3	Closed
119	T80, Boiler B-4	Closed
120	T-01, East Plant D-3075	Active
137	S-01, Catalyst Warehouse CSA	Active
140	S-01, Autoshop CSA	Active
158	T-01, D1086, Horizontal Skimming Tank	Active

NOR. No.	Description	Status
159	T-01, OP2 Flex D-4335	Closed
162	S-01East Plant Flare CSA	Inactive
170	T-01, IPOH Closed Loop Recycling Unit	Active
174	T-01, TK D-3227	Closed
175	T-01, TK-2810	Closed
176	T-01, Cumene Closed Loop Recycling Unit	Active
179	T-01, Methanol Closed Loop Recyling Unit	Active
180	T-01, ACN Closed Loop Recycling Unit	Active
181	T-01, ACN/Water Closed Loop Recycling Unit	Active
183	T-01, ACN Closed Loop Recycling Unit	Active
185	T-01, Tank D-420/D-0406 Neutralization Unit	Active
186	T-01, Tank D-421/TK-402 Neutralization Unit	Active
202	T-01, OP-1, U-3458 Caustic Area Collection Tank	Active
209	T-01, U-4458 Caustic Collection Tank	Active
218	S-01, Container Storage Area	Active
222	T-01, TK-2310A	Closed
223	T-01, TK-2310B	Closed
224	T-01, TK-2303A	Closed
225	T-01, TK-2303B	Closed
226	S-01, HTC CSA	Closed
227	T-01, HTC Tank 403	Active

NOR. No.	Description	Status
SWMU/AOC	OP-1	Post-Closure Care
SWMU/AOC	OP-2	Post-Closure Care
SWMU/AOC	Area 1 North	Post-Closure Care
SWMU/AOC	Area 1 South	Post-Closure Care
SWMU/AOC	Sulfolane Sump	Post-Closure Care
SWMU/AOC	NESHAP Area	Post-Closure Care
SWMU/AOC	West Meter Station	Post-Closure Care
SWMU/AOC	Area II East and West	NFA
SWMU/AOC	Acid Neutralization Pit	NFA
SWMU/AOC	East Plant	NFA
	Remove Last Row	Add Row

B. Reviewed Documents

RCRA:

Part A ☒

Part B ☒

Permit ☒

CERCLA:

Inspection Reports:	
Enforcement Actions	
Exposure Infomation	
Other Infomation:	RCRA Facility Assessment (RFA) December, 1993 RCRA Facility Investigation (RFI) Workplan, January 1995 Revised RFI Workplan, January 1998 - approved 1998 RFI Phase I Report (April 29, 1999) RFI Phase II Report (March 18, 2002) Affected Property Assessment Report (APAR), Area I North, NESHAP Area, Area I South, Area II East and West, Acid Neutralization Pit, and West Meter Station, 2006 Area II East and West APAR, June 2006 APAR addendum, AREA 1 North (RFI Units 1 and 3); OP-1 Area; Area 1 South (RFI Units 2 and 4); OP-2 Area; NESHAP Area; and the Sulfolane Sump Area 3/21/2007 Response Action Plan (RAP) 3/21/2007 approved 10/22/2013 Response Action Completion Report (RACR) 3/13/2014 approved 7/7/2014 OP-1 PMZ Evaluation - Area 1 North, Final Summary Report East Plant RFA (October 2024) East Plant APAR (October 2025)

C. Summary:

Permitted waste is managed in a CSA and tanks. Other areas have been investigated as follows. The RFA was completed in 1993 followed by a Phase I (soil) and Phase II RFI (groundwater). APARs have been completed for individual units and releases. Groundwater in the OP-1/OP-2/ NESHAP/sulfolane area is monitored in a voluntary fashion and a physical inspection is completed annually and documented every 5 years in a Post-Response Action Completion Report (PRACR) to the state. Groundwater under the facility has been determined to be Class 3.

D. Recommended Action::

Continue sentinel monitoring and inspections. Investigate releases as necessary.

Preliminary Review Individual Checklist

Preliminary Review Unit Checklist

Facility:	Equistar Chemicals, LP	City	Channelview
ISW Reg. No:	30030	Date	2/19/2026
Permit No.	50117	Reviewer:	
EPA ID No.	TXD058275769		

Waste Management Unit(s):

A. NOR No.:	047
B. Description:	Tank 4383; OP-2 Flex; Former Permit Unit 005
C. Dates of Operation:	unknown - present
Wastes Managed:	Waste caustic
Evidence of Release:	None
Pollutant Dispersal Pathways:	None
Summary:	This tank is an active tank in secondary containment. Spills are managed before a release to the environment. There are no evidences of releases. The tank was converted to a <90-day unit in the renewal in 2026. Closure will take place under the approved closure plan.
Recommended Action:	None

Preliminary Review Unit Checklist

Facility:	Equistar Chemicals, LP	City	Channelview
ISW Reg. No:	30030	Date	2/19/2026
Permit No.	50117	Reviewer:	
EPA ID No.	TXD058275769		

Waste Management Unit(s):

A. NOR No.:	114
B. Description:	Tank 1101A Permit Unit 011
C. Dates of Operation:	3/28/1996 - 1/2026
Wastes Managed:	Laboratory liquid waste; organics, inorganics, caustic
Evidence of Release:	None
Pollutant Dispersal Pathways:	None
Summary:	This tank is a tank in secondary containment. Spills are managed before a release to the environment. There were no reports of any spills. Tank will be closed in March 2026.
Recommended Action:	None

Preliminary Review Unit Checklist

Facility:	Equistar Chemicals, LP	City	Channelview
ISW Reg. No:	30030	Date	2/19/2026
Permit No.	50117	Reviewer:	
EPA ID No.	TXD058275769		

Waste Management Unit(s):

A. NOR No.:	115
B. Description:	Tank 1101B Permit Unit 012
C. Dates of Operation:	3/28/1996 - present
Wastes Managed:	Laboratory liquid waste; organics, inorganics, caustic
Evidence of Release:	None
Pollutant Dispersal Pathways:	None
Summary:	This tank was a tank in secondary containment. Spills are managed before a release to the environment. Closure will take place under the approved closure plan. There were no evidences of releases. The tank will be closed in March 2026.
Recommended Action:	None

Preliminary Review Unit Checklist

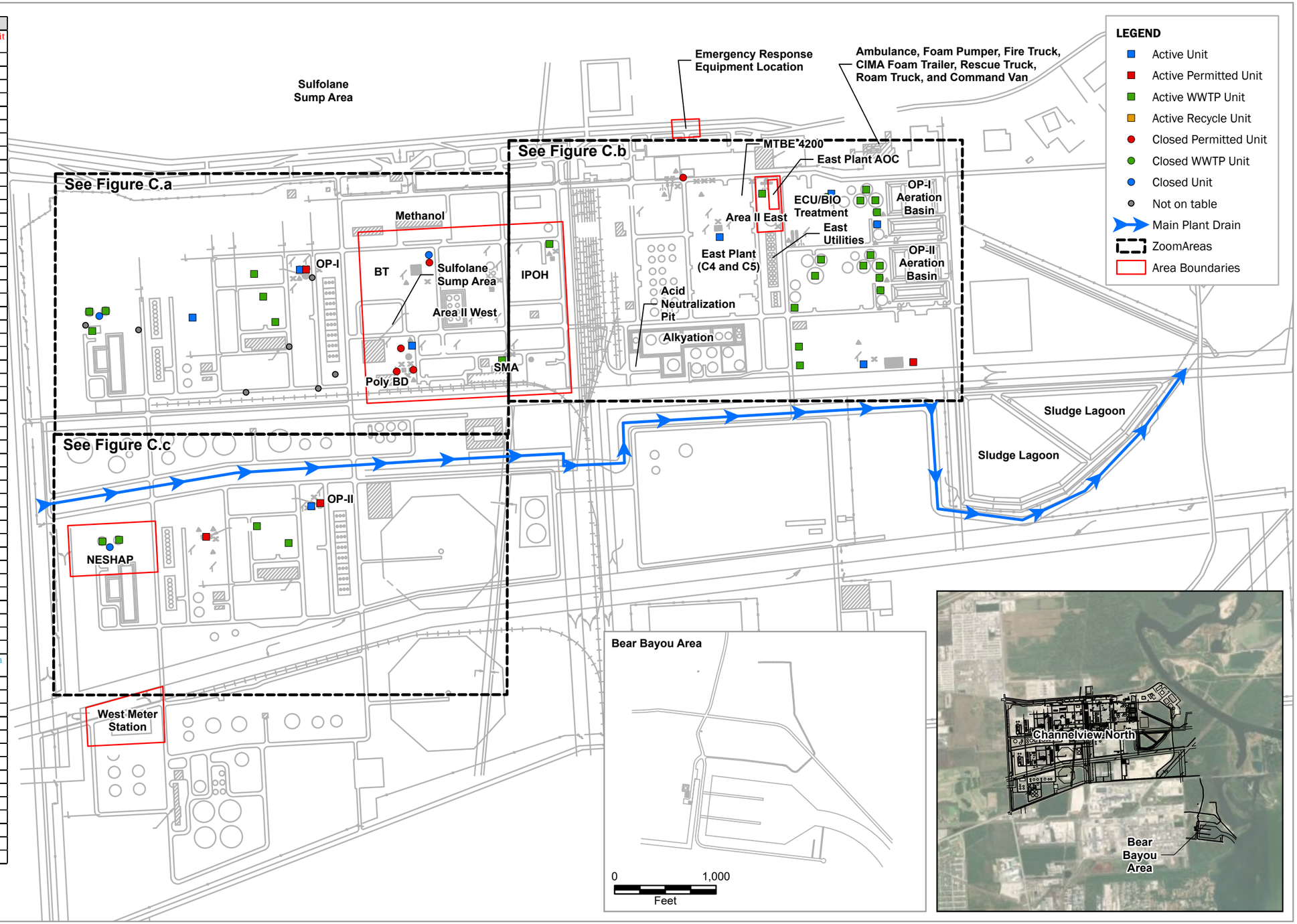
Facility:	Equistar Chemicals, LP	City	Channelview
ISW Reg. No:	30030	Date	2/19/2026
Permit No.	50117	Reviewer:	
EPA ID No.	TXD058275769		

Waste Management Unit(s):

A. NOR No.:	AOC
B. Description:	East Plant
C. Dates of Operation:	1950's - present
Wastes Managed:	used oil and diesel tanks
Evidence of Release:	soil sampling indicated evidence of a petroleum release
Pollutant Dispersal Pathways:	surface soil
Summary:	This area was identified in 2024 during a site construction project. Evidence of petroleum staining was found 3-4 ft below ground surface. Used oil tanks and diesel fuel tanks have been managed in that area but were moved to secondary containment in 2006. An RFA was submitted in October 2024 and an APAR in October 2025. The results indicate that the petroleum release is localized and will not migrate to groundwater. The site received a No Further Action determination on 1/12/26
Recommended Action:	NFA

Maps

NOR. No.	Description
007	Tank 3221, Poly BD API Separator Skimmings (permit number 003)
009	East Plant TK36, Slop Oil Polymer Transfer
020	Container Storage Area
022	Container Storage Area (permit unit 015)
031	Tank 4455 (permit unit 007)
032	Tank D-3455 (permit unit 006)
034	OP-I CPI, WWTP
035	OP-I Stormwater Lift Sta., WWTP
039	OP-II CPI, WWTP
042	Tank D-3210 (permit unit 002)
046	Tank 3207 (permit unit 010)
047	Tank D-4383 (permit unit 005)
050	Greenwade Warehouse
051	OP-II Stormwater Lift Stations, WWTP
053	ECU-OPI aeration basin (permit unit 016)
054	ECU-OPII aeration basin (permit unit 017)
060	MeOH Unit Tank-7039
064	Mid Plant SMA Sump
067	ECU TK-1719 OP-I Eq Tank WWTP
068	ECU TK-1720 OP-I Eq Tank WWTP
069	ECU TK-1721 Stab Tank WWTP
070	ECU TK-1722 EQ Tank WWTP
071	OP-I TK-1723 Trickling Filter Tank WWTP
075	ECU TK-1729 OP-I Eq Tank WWTP
076	ECU TK-1730 OP-I Eq Tank WWTP
077	ECU TK-1731 OP-I WW Stab Tank WWTP
080	ECU TK-1732 EQ Tank WWTP
081	ECU TK-1733 OP-II Trickling Filter
082	West API Separator WWTP
083	ECU TK-1708 Surge Tank WWTP
085	East API Separator
088	ECU TK-1715 Stab Tank WWTP
097	OP-I WW Storage
098	OP-2 WW storage
100	Laydown Yard CSA
114	Tank 1101-A (permit unit 011)
115	Tank 1101-B (permit unit 012)
120	East Plant D-3075
135	TK-38010, OP-I WWTP
136	TK-38011, OP-1 WWTP
137	Catalyst Warehouse CSA
138	Tk-48010, OP-2 WWTP
139	Tk-48011, OP-2 WWTP
158	D1086, horizontal Skimming Tank
160	OP-I NESHAP CPIs, WWTP
161	OP-II NESHAP CPIs, WWTP
202	OP-I U-3458 Caustic Area Hazardous Waste Collection Tank
209	OP-II U-4458 Caustic Collection Tank
214	ECU - TK1705 Splitter Box WWTP
215	ECU - TK-1709 Aerator/Clarifier WWTP
216	ECU - TK-1740 Aerator/Clarifier WWTP
SWMU	OP-1
SWMU	OP-II
SWMU	AREA 1 North
SWMU	Area 1 South
SWMU	Sulfolane Sump
SWMU	NESHAP Area
SWMU	West Meter Station
SWMU	Area II East and West
SWMU	Acid Neutralization Pit
SWMU	East Plant



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Brown AND Caldwell

CLIENT NAME: EQUISTAR CHEMICALS, LP
PROJECT: 2026 RCRA RENEWAL

DATE: 2/6/2026
PROJECT NUMBER: 196588

Spatial Reference Name: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

0 700
Feet

Part B - Figure IX.C
Hazardous Waste Management Units

February 2026



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Brown AND Caldwell

CLIENT NAME: EQUISTAR CHEMICALS, LP
PROJECT: 2026 RCRA RENEWAL

DATE: 2/6/2026
PROJECT NUMBER: 196588

Spatial Reference Name: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

0 200
Feet

Part B - Figure IX.Ca
Hazardous Waste Management Units

February 2026



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Brown AND Caldwell

CLIENT NAME: EQUISTAR CHEMICALS, LP
PROJECT: 2026 RCRA RENEWAL

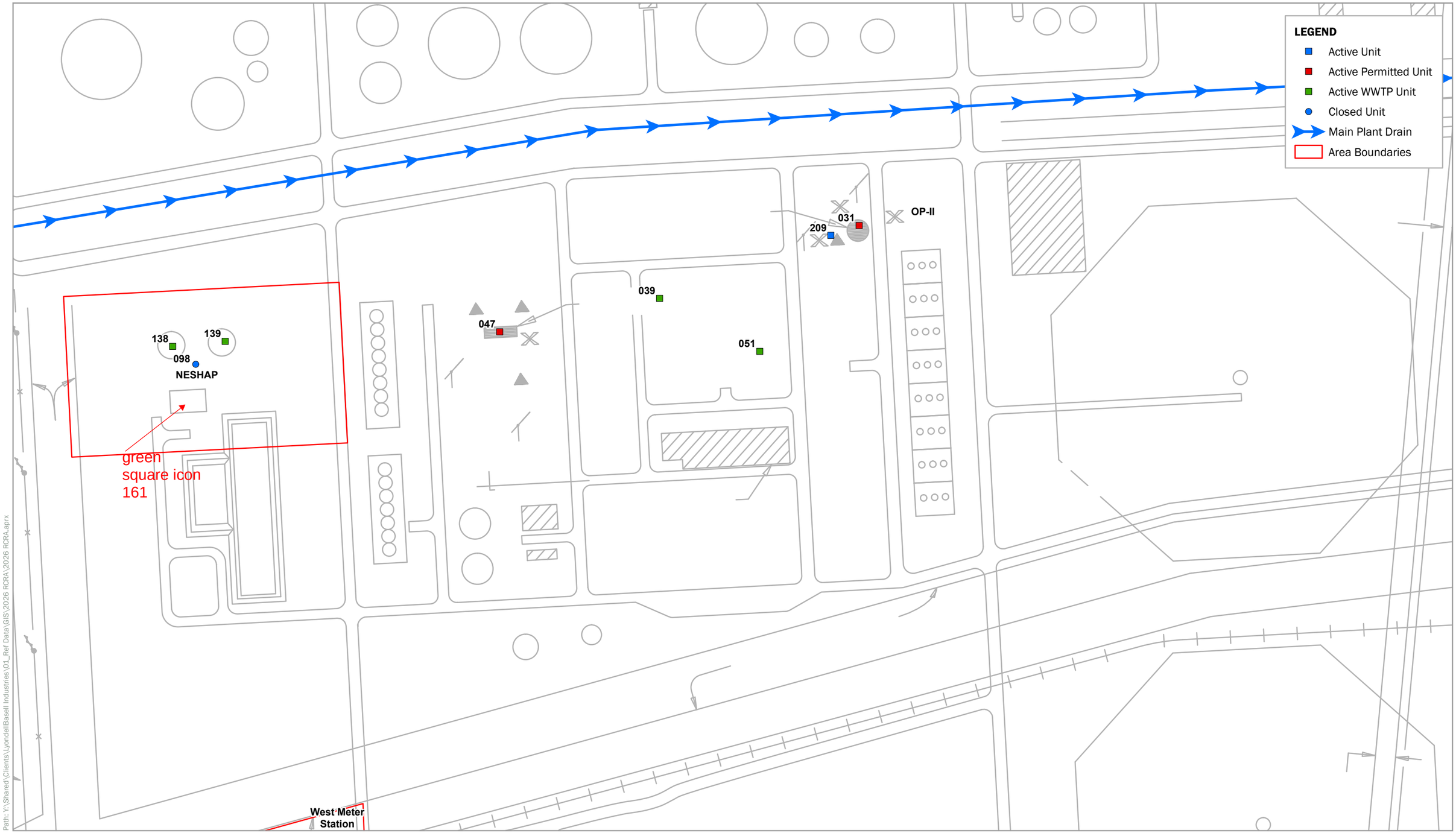
DATE: 2/6/2026
PROJECT NUMBER: 196588

Spatial Reference Name: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

0 200
Feet

Part B - Figure IX.Cb
Hazardous Waste Management Units

February 2026



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Brown AND Caldwell

CLIENT NAME: EQUISTAR CHEMICALS, LP
PROJECT: 2026 RCRA RENEWAL

DATE: 2/6/2026
PROJECT NUMBER: 196588

Spatial Reference Name: NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

0 200
Feet

Part B - Figure IX.Cc
Hazardous Waste Management Units

February 2026

TCEQ Determination Letter

Brown AND Caldwell

Brooke T. Paup, *Chairwoman*
Catarina R. Gonzales, *Commissioner*
Tonya R. Miller, *Commissioner*
Kelly Keel, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

January 12, 2026

Ms. Kendra Bernhagen
Equistar Chemicals, LP
8280 Sheldon Rd
Channelview, Texas 77530

Via email

Re: Approval of Remedy Standard A – Residential
Affected Property Assessment Report (APAR), East Plant, October 25, 2025
Equistar Chemicals, L.P - Channelview Complex (Harris County)
TCEQ SWR No. 30030; TCEQ Industrial and Hazardous Waste (IHW) Permit No. HW-50177; EPA ID No. TXD058275769; CN600124705; RN100542281

Dear Ms. Bernhagen:

The Texas Commission on Environmental Quality (TCEQ) has completed review of the above-referenced APAR for the East Plant that was submitted in response to TCEQ's letter[1] and per requirements of Permit Provision XI.H.4. During the construction of a new firewater line, stained soil was discovered at the north end of the East Plant. The above-referenced APAR summarizes the following:

- The site passed the Tier 1 Ecological Exclusion Checklist.
- Affected soils were delineated laterally and vertically at the site.
- Affected soil was excavated to a depth of 4 feet below ground surface, containerized and disposed of off-site at an authorized facility.
- Post-excavation confirmation soil samples collected were analyzed for volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), and metals. All soil sample results were below their respective residential Tier 1 ${}^{Tot}Soil_{Comb}$, ${}^{Air}Soil_{Inh\text{-}V}$, ${}^{GW}Soil_{IngClass3}$ [2] and calculated Tier 1 TPH mixture-specific protective concentration levels (PCLs).

The TCEQ concurs that the affected property assessment for the above-referenced release area has been completed in accordance with 30 Texas Administrative Code (TAC) §350.51.

[1] TCEQ Approval letter for East Plant RCRA Facility Assessment Report (RFA) dated October 25, 2024
[2] TCEQ Approval letter for Class 3 Groundwater Resource Classification dated June 24, 2004.

TCEQ agrees that Texas Risk Reduction Program (TRRP) Remedy Standard A Residential PCLs have been achieved such that no institutional control or post-response action care is required. Therefore, no further action is required under 30 TAC §350 for the above-referenced release area.

In order to attain Remedy Standard A under TRRP, all industrial solid waste and municipal hazardous waste and waste residues must be removed or decontaminated from affected media (i.e., soil, surface water, groundwater, air, etc.) to applicable human health and ecological based standards and criteria. In order to be released from the requirement to file an institutional control in accordance with 30 TAC §350 Subchapter F, contaminants that remain in place must not exceed Residential PCLs.

Please note that it is the continuing obligation of persons associated with a site or facility to ensure that industrial solid waste and/or municipal hazardous waste are managed in such a way that it does not cause a discharge of waste or an imminent threat of discharge, nor a nuisance or an endangerment to either human health or the environment as required by 30 TAC §335.4. Be advised that the burden remains upon the owner to take necessary and authorized action to correct such conditions whenever they exist.

Questions concerning this letter should be directed to me at (512) 239-2215 or [redacted]When responding by mail, please submit one paper copy and one electronic copy (on USB or disc) of all correspondence and reports to the TCEQ Remediation Division at Mail Code MC-127. The information in the reference block should be included in all submittals. Note that the electronic and hard copies should be identical, complete copies.

A Correspondence ID Form (TCEQ Form 20428) must accompany each document submitted to the Remediation Division and should be affixed to the front of your submittal. The Correspondence ID Form helps ensure that your documents are identified correctly and are routed to the applicable program for a timely response.

Sincerely,

Maureen Hatfield, P.G., Project Manager
VCP-CA Section
Remediation Division
Texas Commission on Environmental Quality

cc: Ms. Jean Youngerman, Project Manager, Brown and Caldwell, (email)