ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 – (217) 782-3397
JAMES R. THOMPSON CENTER, 100 WEST RANDOLPH, SUITE 11-300, CHICAGO, IL 60601 – (312) 814-6026

ROD R. BLAGOJEVICH, GOVERNOR DOUGLAS P. SCOTT, DIRECTOR

217/524-3300

April 3, 2006

Certified Mail
7004 2510 0001 8654 8809
7004 2510 0001 8654 8816

Clean Harbors Services, Inc.
Attn: James R. Laubsted
11800 South Stony Island Avenue
Chicago, Illinois 60617

Illinois International Port District
Attn: Anthony G. Ianello
3600 East 95th Street
95th & the Lakefront
Chicago, Illinois 60617-5193

Re: 0316000051 -- Cook County
Clean Harbors SVCS, Inc.
ILD000608471
Part B Log No. B-16R-M-1
RCRA Part B Administrative File

US EPA RECORDS CENTER REGION 5
1000486

Gentlemen:

This letter is in response to your class I modification request Log 16-M-59 dated March 3, 2005 to modify the contingency plan. The Illinois EPA has approved your request to change the phone number and addresses of emergency coordinators in your contingency plan.

This determination is based upon our review (1) the RCRA Part B issued to CHSI, (2) the regulations (35 Ill. Adm. Code, Subtitle G) and (3) the information contained in your submittal. Operations must be conducted in accordance with the approved RCRA Part B permit originally issued to CHSI and all subsequent modifications to the Part B Permit.

Since no changes in the permit conditions have resulted from this modification, a revised permit has not been issued; only the cover page of the permit reflecting the approval of this modification is being sent to you. Pursuant to 35 Ill. Adm. Code 703.281(a)(2), a notice of the modification shall be sent to all persons on the facility mailing list, and the appropriate units of the state and local government, as specified in 35 Ill. Adm. Code 705.163(a)(5). This notification must be made within ninety (90) days of the date of issuance of this letter. Also, please update the renewal application to reflect these changes.

Within 35 days after the notification of a final decision, the permittee may petition the Illinois Pollution Control Board to contest the issuance of the permit. The petition shall include a statement of the reasons supporting a review, including demonstration that any issues raised in the petition, were previously raised during the public comment period. In all other respects, the petition shall be in accordance with the requirements for permit appeals as set forth in 35 I.A.C.

Part 105. Nothing in this paragraph is intended to restrict appeal rights under Section 40(b) of the Environmental Protection Act (35 I.A.C. 705.212(a)).

Work required by this permit, your application or the regulations may also be subject to other laws governing professional services, such as the Illinois Professional Land Surveyor Act of 1989, the Professional Engineering Practice Act of 1989, the Professional Geologist Licensing Act, and the Structural Engineering Licensing Act of 1989. This permit does not relieve anyone from compliance with these laws and the regulations adopted pursuant to these laws. All work that falls within the scope and definitions of these laws must be performed in compliance with them. The Illinois EPA may refer any discovered violation of these laws to the appropriate regulating authority.

Should you have any questions or comments regarding this permit, please contact Mark A. Schollenberger, P.E. of my staff at 217/524-3307.

Sincerely,

Theodore J. Dragovich

Theodore J. Dragovich, P.E.
Acting Manager, Permit Section
Bureau of Land

TJD:MAS:bjh\052472s.doc

Attachment

cc: USEPA Region V, Harriet Croke

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 – (217) 782-3397
JAMES R. THOMPSON CENTER, 100 WEST RANDOLPH, SUITE 11-300, CHICAGO, IL 60601 – (312) 814-6026

ROD R. BLAGOJEVICH, GOVERNOR DOUGLAS P. SCOTT, DIRECTOR

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

HAZARDOUS WASTE MANAGEMENT RCRA PART B PERMIT

IEPA #0316000051 -- Cook County
USEPA ILD #000608471
Chicago/Clean Harbors Services, Inc.
Permit Log No. B-16R-M-1
RCRA -- Part B - Permit File

Issue Date: 11/04/05
Effective Date: 12/09/05
Expiration Date: 12/09/15
Modification Effective Date: 04/03/06

Illinois International Port District
3600 East 95th Street
95th & the Lakefront
Chicago, Illinois 60617-5193

Clean Harbors Services, Inc.
11800 South Stony Island Avenue
Chicago, Illinois 60617

A Part B permit is hereby proposed pursuant to the Resource Conservation and Recovery Act (RCRA), Illinois Environmental Protection Act, and Title 35 Ill. Adm. Code Parts 702, 703, 705, and 720 through 729 to Clean Harbors Services, Inc. and the Illinois International Port District (herein known as the Permittee(s)), to modify their existing permit to construct, maintain and operate a waste management facility involved in the treatment and storage of hazardous waste. The site is located at 11800 South Stony Island Avenue in Chicago, Illinois.

This permit consists of the conditions contained herein (including those in any attachments and appendices) and applicable regulations contained in the Illinois Environmental Protection Act and Title 35 Ill. Adm. Code. Parts 702, 703, 705 and 720 through 729 in effect on the effective date of this permit. The Environmental Protection Act ("Act") Ill. Rev. Stat., Ch. 111 1/2, par. 1039 grants the Illinois Environmental Protection Agency the authority to impose conditions on permits which are issued. This permit contains 253 pages including Attachments A through K.

If you have any questions regarding this draft permit, please contact Mark A. Schollenberger, P.E. at 217/524-3300

Theodore J. Dragovich

Theodore J. Dragovich, P.E.
Acting Manager, Permit Section
Bureau of Land

TJD:MAS:bjh\052472s.doc

cc: USEPA: Region V, Harriet Croke

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 – (217) 782-3397
JAMES R. THOMPSON CENTER, 100 WEST RANDOLPH, SUITE 11-300, CHICAGO, IL 60601 – (312) 814-6026

ROD R. BLAGOJEVICH, GOVERNOR DOUGLAS P. SCOTT, DIRECTOR

217/524-3300

November 14, 2005

Certified Mail
7002 3150 0000 1222 5691

Clean Harbors Services, Inc.
Attn: James R. Laubsted
11800 South Stony Island
Chicago, Illinois 60617

Re: 0316000051 -- Cook County
Clean Harbors Svcs Inc
ILD000608471
Part B Log B-16R
RCRA Part B -- Administrative File

Gentlemen:

Enclosed, please find a corrected copy of the first page of the permit for log no. B-16R issued November 4, 2005. The dates on the first page were not filled in and should have been November 4, 2005 for the issue date, December 9, 2005 for the effective date and December 9, 2015 for the expiration date. Please replace the signature page attached to our November 4, 2005 letter with the one attached to this letter.

Should you have any questions or comments regarding the contents of this letter, please contact Mark A. Schollenberger, P.E., of my staff at 217/524-3307.

Sincerely,

Joyce L. Munie, P.E.
Manager, Permit Section
Bureau of Land

JLM:MAS:bjh\051161s.doc

cc: Harriet Croke, USEPA

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 – (217) 782-3397
JAMES R. THOMPSON CENTER, 100 WEST RANDOLPH, SUITE 11-300, CHICAGO, IL 60601 – (312) 814-6026

ROD R. BLAGOJEVICH, GOVERNOR DOUGLAS P. SCOTT, DIRECTOR

RCRA Log B-16R

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

HAZARDOUS WASTE MANAGEMENT RCRA PART B PERMIT

IEPA 0316000051 -- Cook County
USEPA ILD000608471
Clean Harbors Svcs Inc
Permit B-16R
RCRA -- Part B - Administrative Record

Issue Date: November 4, 2005
Effective Date: December 9, 2005
Expiration Date: December 9, 2015
Modification Effective Date: November 14, 2005

Illinois International Port District
3600 East 95th Street
95th & the Lakefront
Chicago, Illinois 60617-5193

Clean Harbors Svcs Inc
11800 South Stony Island Avenue
Chicago, Illinois 60617

A Part B permit is hereby granted pursuant to the Resource Conservation and Recovery Act, Illinois Environmental Protection Act, and Title 35 Illinois Administrative Code (I.A.C.) parts 702, 703, 705, and 720 through 729 to Clean Harbors Svcs Inc and the Illinois International Port District (herein known as the Permittee(s)), to construct, maintain and operate a waste management facility involved in the treatment and storage of hazardous waste. The site is located at 11800 South Stony Island Avenue in Chicago, Illinois.

This permit consists of the conditions contained herein (including those in any attachments and appendices) and applicable regulations contained in the Illinois Environmental Protection Act and Title 35 I.A.C. Parts 702, 703, 705 and 720 through 729 in effect on the effective date of this permit. The Environmental Protection Act (Ill. Rev. Stat., Chapter 111 1/2, Section 1039) grants the Illinois Environmental Protection Agency the authority to impose conditions on permits which are issued. This Permit contains 225 pages including Attachments A through I.

If you have any questions regarding this final permit, please contact Mark A. Schollenberger at 217/524-3307

Joyce L. Munie, P.E.
Manager, Permit Section
Bureau of Land

JLM:MAS:bjh\051161s.doc

cc: USEPA

RECEIVED

NOV 1 9 2005

Technical Support [illegible] Section
Waste Management Branch
Waste, Pesticides and Toxics Division
U.S. EPA - Region 3

USEPA

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276
JAMES R. THOMPSON CENTER, 100 WEST RANDOLPH, SUITE 11-300, CHICAGO, IL 60601

ROD R. BLAGOJEVICH, GOVERNOR RENEE CIPRIANO, DIRECTOR

217/524-3300

March 4, 2004

CERTIFIED MAIL
7002 3150 0000 1222 5097
7002 3150 0000 1222 5103

Clean Harbors Services, Inc.
Attn: James R. Laubsted
11800 South Stony Island Avenue
Chicago, Illinois 60617

Illinois International Port District
Attn: Anthony G. Ianello
3600 East 95th Street
95th & the Lakefront
Chicago, Illinois 60617-5193

Re: 0316000051 -- Cook County
Clean Harbors Services, Inc. (CHSI)
ILD000608471
Part B Log No. B-16-M-57
RCRA Part B Administrative File

Gentlemen:

This letter is in response to your class I modification request Log 16-M-57 dated January 13, 2004 to modify the contingency plan. The Illinois EPA has approved your request to change the alternate emergency coordinators in your contingency plan.

This determination is based upon our review of (1) the RCRA Part B issued to CHSI, (2) the regulations (35 Ill. Adm. Code, Subtitle G) and (3) the information contained in your submittal. Operations must be conducted in accordance with the approved RCRA Part B permit originally issued to CHSI and all subsequent modifications to the Part B Permit.

Since no changes in the permit conditions have resulted from this modification, a revised permit has not been issued; only the cover page of the permit reflecting the approval of this modification is being sent to you. Pursuant to 35 Ill. Adm. Code 703.281(a)(2), a notice of the modification shall be sent to all persons on the facility mailing list, and the appropriate units of the state and local government, as specified in 35 Ill. Adm. Code 705.163(a)(5). This notification must be made within ninety (90) days of the date of issuance of this letter. Also, please update the renewal application to reflect these changes.

Within 35 days after the notification of a final decision, the permittee may petition the Illinois Pollution Control Board to contest the issuance of the permit. The petition shall include a statement of the reasons supporting a review, including demonstration that any issues raised in the petition, were previously raised during the public comment period. In all other aspects, the petition shall be in accordance with the requirements for permit appeals as set forth in 35 I.A.C. Part 105. Nothing in this paragraph is intended to restrict appeal rights under Section 40(b) of the Environmental Protection Act (35 I.A.C. 705.212(a)).

Work required by this permit, your application or the regulations may also be subject to other laws governing professional services, such as the Illinois Professional Land Surveyor Act of 1989, the Professional Engineering Practice Act of 1989, the Professional Geologist Licensing Act, and the Structural Engineering Licensing Act of 1989. This permit does not relieve anyone from compliance with these laws and the regulations adopted pursuant to these laws. All work that falls within the scope and definitions of these laws must be performed in compliance with them. The Illinois EPA may refer any discovered violation of these laws to the appropriate regulating authority.

Should you have any questions or comments regarding this permit, please contact Mark A. Schollenberger, P.E. of my staff at 217/524-3307.

Sincerely,

Joyce L. Munie, P.E.
Manager, Permit Section
Bureau of Land

JLM:MAS:bjh\963281s.doc

Attachment

cc: USEPA Region V, Harriet Croke

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276
JAMES R. THOMPSON CENTER, 100 WEST RANDOLPH, SUITE 11-300, CHICAGO, IL 60601

ROD R. BLAGOJEVICH, GOVERNOR RENEE CIPRIANO, DIRECTOR

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

HAZARDOUS WASTE MANAGEMENT RCRA PART B PERMIT

IEPA #0316000051 -- Cook County
USEPA ILD #000608471
Chicago/Clean Harbors Services, Inc.
Permit Log No. B-16-M-57
RCRA -- Part B - Permit File

Issue Date: September 30, 1993
Effective Date: November 4, 1993
Expiration Date: November 4, 2003
Modification Date: March 4, 2004

Illinois International Port District
3600 East 95th Street
95th & the Lakefront
Chicago, Illinois 60617-5193

Clean Harbors Services, Inc.
11800 South Stony Island Avenue
Chicago, Illinois 60617

A Part B Permit is hereby approved pursuant to the Resource Conservation and Recovery Act (RCRA), Illinois Environmental Protection Act, and Title 35 Ill. Adm. Code Parts 702, 703, 705, and 720 through 729 to Clean Harbors Services, Inc. and the Illinois International Port District (herein known as the Permittee(s)) to modify their existing permit to construct, maintain and operate a waste management facility involved in the treatment and storage of hazardous waste. The site is located at 1180 South Stony Island Avenue in Chicago, Illinois.

This permit consists of the conditions contained herein (including those in any attachments and appendices) and applicable regulations contained in the Illinois Environmental Protection Act and Title 35 Ill. Adm. Code Parts 702, 703, 705 and 720 through 729 in effect on the effective date of this permit. The Environmental Protection Act ("Act") Ill. Rev. Stat., Ch. 111-1/2, par. 1039 grants the Illinois Environmental Protection Agency the authority to impose conditions on permits which are issued. This permit contains 253 pages including Attachments A through K.

If you have any questions regarding this draft permit, please contact Mark A. Schollenberger, P.E. at 217/524-3300.

Sincerely,

Joyce L. Munie, P.E.
Manager, Permit Section
Bureau of Land

JLM:MAS:bjh\963281s.doc

cc: USEPA Region V, Harriet Croke

CleanHarbors®
ENVIRONMENTAL SERVICES, INC.

[redacted] South Stony Island Avenue
[redacted]ago, IL 60617
773.646.6202
Fax 773.646.6381

cc: Des Plaines
XC
T
MAS

0316000051

Via Overnight Delivery

October 29, 2003

Mr. Mark A. Schollenberger, P.E.
Illinois Environmental Protection Agency
Bureau of Land – Permit Section
1021 North Grand Avenue East
Springfield, IL 62702

Dear Mr. Schollenberger:

Clean Harbors Services, Inc. (CHSI) is submitting four copies of Appendix D-50 (Manufacturer Information Concerning Stacking of Non-Metallic Containers) for the RCRA Part B permit application. These pages were left out of the October 17, 2003 revision.

If you have any questions concerning this submittal, please contact me at (773) 646-6202, x233.

Sincerely,

James R. Laubsted
Facility Compliance Manager

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OCT 31 2003
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PERMIT SECTION

Packaging Technology
CENTER™

YOUR RESOURCE FOR
TOTAL PACKAGING PERFORMANCE

COPY

Test Report # 03-027
PTC ID# 0292

UNITED NATIONS PERFORMANCE ORIENTED PACKAGING TEST REPORT SUMMARY
UN PERFORMANCE TESTS (DANGEROUS GOODS)

Company Name: Polyethylene Containers, Inc

Packaging Design Type: 1H2 Description: 30 Gallon Open Head Plastic Drum

This packaging was tested and found to conform with all of the applicable requirements of the United Nations Recommendations for the Transport of Dangerous Goods Model Regulations, the International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air, the International Air Transport Association (IATA) Dangerous Goods Regulations, the International Maritime Dangerous Goods Code, and the U.S. Code of Federal Regulations (CFR) 49.

A summary of the results, which are described in greater details in the attached TEST REPORT, are as follows:

Test Description	UN Ref. #	CFR 49	UN Packaging Group # (Intensity)	Results
Drop Test	Chap. 6.1.5.3	178.603	Gp I (1.8 m)	Passed
Stacking Test	Chap. 6.1.5.6	178.606	3 m	Passed
Vibration Test		178.608	One hour at 280 RPM	Passed

The packaging design specified in Item 1 and in Appendix A attached to this test report is considered to meet all performance requirements and is authorized to bear the following mark:

u
n

1H2/X125/S/03
USA/+AM0644

Testing Officer

April 24, 2003
Approval Date

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OCT 31 2003
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PERMIT SECTION

CONFORMANCE TESTING TO STANDARD CAN/CGSB-43.150-97

PACKAGING DESIGN REPORT

INTRODUCTION

Company Name & Address:

Hunter Drums Limited
1121 Pioneer Road
Burlington, ON
Canada
L7M 1K5
Phone: 905-332-4800
FAX: 905-332-5515

UN Marking on Package:

UN/1H2/Y200/S/YY/CAN/HDL/REG. #/ 2.3 mm

Hazard Classification:

This drum will be qualified to contain for transporting various products within the UN Packaging Group II & III, Grade Y & Z, designation for packaging solids.

Description of Package:

H.D.P.E., 215 Litre, full open head drum

Standard to which Package is being certified:

CAN/CGSB-43.150-97
Publication date: December, 1997

COPY

Modes of Transport:

Road, Rail, Air, Marine

Plant location where packagings will be produced:

Hunter Drums Limited
300 Walker Drive
Bramalea, ON
L6T 4B3
Phone: 905-791-7155
FAX: 905-791-5424

CONFORMANCE TESTING TO STANDARD CAN/CGSB-43.150-97

PACKAGING DESIGN REPORT

DESIGN

The package drawings for component parts and assembly are as follows:

215 Litre, H.D.P.E. drum, Drawing No. 832-81-C-01, Appendix 1
Drum cover, Drawing, Appendix 2
Closing ring, Drawing No. Hxx-KS-HTT, Appendix 3

Assembly Method:

The assembly method and sequence, including a copy of the inspection and test plan are shown in Appendix 4.

Package Dimensions:

All package dimensions are shown in Assembly Drawings No. 832-81-C-01, Drum cover drawing, Hxx-KS-HTT, Appendix 1, 2, and 3.

Materials used:

Material	Supplier		
H.D.P.E.	Exxon Mobil Chemical Baton Rouge, LA **Recycled resin from drums previously made and used as noted below.	Chevron Phillips Houston, TX	Nova Chemicals Toronto, ON
Colour	Ampacet Kitchener, ON	Techmer PM Clinton, TN	Plastics Color Corp. Sommerset, NJ
Lids for drums	I.P.C.C. Lake Forest, IL	Hunter Drums Limited Bramalea, ON	Russell-Stanley Bridgewater, NJ
Locking Rings	Self Industries Birmingham AL	Drum Parts Cleveland, OH	Rieke Corp. Auburn, IN
Plugs & Gaskets	Rieke Canada Brampton, ON	Hunter Drums Limited Bramalea, ON	Russell-Stanley Bridgewater, NJ

Construction:

This plastic drum is made from a maximum 100% recycled resin from drums previously made in our process. The resin has been sorted, washed, re-pelletized and the properties have been recorded as prescribed in paragraph 10.3 of the standard. This drum also complies with paragraph 8.7 for marking and paragraph 7.6.1.1 for materials used. The plastic drum described is blow molded as per "Manufacture of Plastic Drums", Appendix 3. Also, please refer to the "Inspection and Test Plan", Appendix 2.

CONFORMANCE TESTING TO STANDARD CAN/CGSB-43.150-97

PACKAGING DESIGN REPORT

QUALIFICATION TESTING

Tests required as per the Standard:

Chemical Compatibility – Para. 9.4
Drop Test – Ambient and low temperature – Para. 9.5
Stacking (Compression Resistance) Test – Para. 9.6

Test Methods and Equipment:

Chemical Compatibility
Evidence of satisfactory user experience exists for all existing customer applications. All existing customers have been notified of the requirement to provide proof of satisfactory user experience as per the attached letter. (Appendix 6)
Drop Test – Ambient and Low Temperature
Drums are dropped in accordance with ASTM D997-80 without hazard. The filling substance shall not leak from the package except for a slight discharge from the closures upon impact, provided that no further leakage occurs. (Appendix 7 & 8)
Stacking (Compression Resistance) Test
The weight required for the test was calculated as per Appendix 9. The filling substance shall not leak from the packages. The packages shall not show any deformation that is likely to reduce their strength or integrity significantly to cause instability in stacks of packages. (Appendix 10)

Random Sample Statement:

All samples for the purposes of testing for CAN/CGSB-43.150-97, were randomly chosen from inventory.

Test Results:

For complete description of all test data including Pass/Fail, refer to Test Results Sheets on Appendix 7, 8, and 10. Test results can also be found on attachments and are kept on file for future reference.

Package Markings:

All tests performed on this submission for drum design approval on drum:
UN/1H2/Y200/S/YY/CAN/HDL/REG. #/2.3 mm "REC"
have been carried out in accordance with the requirements of standard CAN/CGSB-43.150-97.

QUALITY ASSURANCE

We are currently certified to ISO-9001-00 by Q.M.I.
A copy of the Inspection and Test plan is attached as Appendix 11.

IFICATION

Certification of completed tests as per Appendix 12.

CONFORMANCE TESTING TO STANDARD CAN/CGSB-43.150-97

PACKAGING DESIGN REPORT

APPENDIX 5

MANUFACTURE OF PLASTIC DRUMS

The manufacture of plastic drums is done by machine only. The only part of manufacture that is performed by an employee is trimming the excess plastic from the drums and installing the fittings, lids and closing rings.

1. Material is transferred from the silo to the blender.
2. Colour and regrind is transferred from the boxes to the blender in desired amounts.
3. The blender mixes the material, colour and regrind.
4. The mixture is then transferred to the top hopper.
5. The mixture is transferred to the screw and is homogenized at 210° C.
6. Parison comes down from the head and goes over the blowpins.
7. The blowpins expand.
8. The mold closes.
9. The air comes on to blow the drum against the mold.
10. The mold slides close.
11. The drum cools in the mold for approximately 60 to 100 seconds.
12. The mold opens.
13. The grabber brings the drum out.
14. The top portion of the drum is cut away by machine to create an open head drum.
15. Lids, closing rings and fittings are installed as required.

APPENDIX 6

To Our Customers

Dear Customer,

National Standard of Canada
Standard CAN/CGSB-43.150-97
Performance Packagings for Transportation of Dangerous Goods

This standard covers all packaging, including new steel and plastic drums, as it pertains to the shipment of dangerous goods.

It is a performance oriented standard which will harmonize our Canadian regulations with those of the U.S. Department of Transportation's HM-181 and the United Nations' Recommendations for the Transport of Dangerous Goods. Under these regulations, Transport Canada requires that all packaging used for dangerous goods must have its design registered in accordance with CAN/CGSB-43.150-97.

To meet the chemical compatibility requirements of this standard, it is acceptable to provide "evidence" that "satisfactory user experience exists". For new products where no previous history is available, complete chemical compatibility testing as per paragraph 6.1 of the standard will be required. We therefore ask for your assistance in completing the enclosed Certificate of Compatibility for each product you presently package in drums.

As in the past, the responsibility for selecting the correct container for your dangerous goods including the assurance of chemical compatibility lies with the shipper. The documentation of successful shipping experience helps to fulfill these obligations, as well as assisting us in more completely meeting your requirements.

Yours truly,

Miles M. Budnark
Quality Assurance/Technical Services

CONFORMANCE TESTING TO STANDARD CAN/CGSB-43.150-97

PACKAGING DESIGN REPORT

APPENDIX 9

CALCULATION TO DETERMINE STACK TEST

For Open Head Plastic Drum: UN/1H2/Y200/S/YY/CAN/HDL/REG. #/2.3 mm "REC"

Empty package mass:	9.4 kg.
Net package mass:	200 kg.
Gross package mass:	209.4 kg.
Volume of Inners:	215 L.
Volume at 95%:	204.25 L.
Package Height:	915 mm

Required mass of constant load: $M = m (3000 - h) / h$

$M = 209.4 (3000 - 915) / 915$

$M = 477.16$

NOTE: M = Mass of Constant Load
m = Gross Mass of Package
h = Height of Package

NOTE: Drums tested with weight of 500 kg.

CONFORMANCE TESTING TO STANDARD CAN/CGSB-43.150-97

PACKAGING DESIGN REPORT

APPENDIX 10

STACKING (COMPRESSION TEST)

Equipment

A concrete weight is placed on top of the drum and steel bars are placed on top of the concrete to reach the necessary weight.

Procedure

1. Randomly select 3 drums from inventory.
2. Fill the drums to 95% capacity with sand and plastic pellets to appropriate weight.
3. Install lids.
4. Calculate the constant load as per formula enclosed. (See Appendix 9)
5. Place concrete and steel bars on top of the drum to reach the required weight.
6. The constant load shall be applied for 24 hours at ambient temperature.
7. When the constant load is removed, check the drum for evidence of leakage, spillage or deformation.

Criteria for Passing the Test

Drums should show no evidence of leakage, spillage or deformation.

Results

Pass - no evidence of leakage or spillage
- no evidence of damage or deformation that will reduce the strength of the container

CONFORMANCE TESTING TO STANDARD CAN/CGSB-43.150-97

PACKAGING DESIGN REPORT

APPENDIX 11

INSPECTION AND TEST PLAN

Explanation

Item	Description
1.	Receiving Inspection – perform a melt flow to verify the quality data sheet supplied by the supplier.
2.	Transferred – transfer by machine to go through the blow molding process.
3.	Visual – a visual inspection is done by the shippers upon receiving to verify the colour.
4.	Final Drum – the drum is inspected when it comes out of the machine.
5.	Leak Test – drums are leak tested after being trimmed by the cutters.
	Visual – the shippers do a visual inspection of the fittings when received to verify they are correct.
7.	Visual – the shippers do a visual inspection of the gaskets when received to verify they are correct.
8.	Assemble – the cutters put the gaskets on the fittings at the machine.
9.	Visual – the drum is visually inspected inside and outside before being put into stock.
10.	Final Inspection – the shippers will visually inspect the drum before shipping.
T1.	Drop Test – one randomly selected drum per machine per shift is dropped at ambient temperature. One randomly selected drum per machine every other day is dropped at low temperature.
T2.	Thickness Test – one randomly selected drum per machine per shift is tested for wall thickness.
T3.	Hydrostatic Pressure Test – one randomly selected drum per machine per day is tested at required pressure for 30 minutes.
	Stacking Test – one randomly selected drum every 48 hours will be placed under the 2400 lb. weight.

B-10R

XC

CleanHarbors
ENVIRONMENTAL SERVICES, INC.

11800 South Stony Island Avenue
Chicago, IL 60617
773.646.6202
Fax 773.646.6381

RECEIVED
FEB 24 2004
IEPA - BOL
PERMIT SECTION

February 23, 2004

Ms. Joyce Munie
Illinois Environmental Protection Agency
Bureau of Land- #33
Permit Section
1021 North Grand Avenue East
PO Box 19276
Springfield, IL 62794-9276

Transmit via Federal Express #

RE: Notice of Deficiency – Technical Issues - Clean Harbors Services, Inc. ILD000608471

Dear Ms. Munie

Clean Harbors Services, Inc. (CHSI) is submitting requested deficiency responses from technical review per your letter dated November 25, 2003.

In order to clarify our response per each issue, we are responding in the same order as the issues raised in Attachment A of the November 25, 2003 letter.

CHSI is stating that no information from this submittal is exempt from public disclosure.

Should you have any questions, please contact me at (773) 646-6202.

Sincerely,

James R. Laubsted
Facility Compliance Manager

Cc:
File

Cross-Reference of Revisions (01/31/04 revision date):

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CHCI 4215/1
CHCI 4217/1
CHSI 4234
CHSI 4245
CHSI 4287

New Tables:
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Table H-1, page 2
Table I-2, page 7

New Appendices:

Appendix D-53	Engineering Assessment for modified Building 25 and Truck Pad
Appendix D-54	Engineering Assessment for Unit F1, Unit Q (including Q1), Unit V and Unit R2 (new portion)
Appendix D-55	Internal Tank Inspection Reports for Existing Tanks
Appendix D-56	Containment System Calculations for Unit Q and Unit X
Appendix D-57	Evaluation Data Sheets for Lab Pack Pour-off Hood Ventilation

Attachment A
RCRA Part B Notice of Deficiency
Technical Issues

Clean Harbor Services Inc.
0316000051-Cook County

B **Facility Description**

To better understand your operations, please indicate if the following activities will be conducted in only the following areas:

- The mobile compactor will only be used in the staging area of unit R1;
- Fuming acids will only be treated under the operating fume hood in the outdoor staging area of unit R1;
- The treatment of cyanide wastes in containers will only be conducted under the fuming hood in the outdoor staging area of unit R1;
- The treatment of peroxides in containers will only be conducted under the fuming hood in the outdoor staging area of unit R1;
- The stabilization of wastes in roll-off boxes will only be conducted in Process Building No. 3 (unit Z);
- The consolidation of lab packs can only occur under operating fume hoods in the following areas:
  Building 25, Building 26, Unit U, Unit G1, and Unit R1
- The pouring-off of containers that were in a lab pack will only occur under operating fume hoods in the following areas:
  Building 26, Unit F1, and Building 25
- The removal of residues from non-RCRA empty tank trucks will only occur in the following transporter storage/staging areas:
  Unit Q, Unit V, Unit X, Unit C, Unit 59, Unit 15 and Unit 62.

For any activities hat is different than described above, provide justification for expanding these operations to other areas of your facility, demonstrate compliance with the applicable regulations and address past safety concerns raised by the Agency and incidents, which resulted from those activities.

Indicate the locations where D002 liquid/solid mixtures will be treated to separate/remove free liquids.

Indicate the location where D002 compatible liquids in containers and tanks will be mixed or consolidated. Explain in detail how compatible liquids will be determined and describe in detail theD002 treatment process.

Indicate the location where treatment of hazardous wastes using physical (e.g., gravity) and/or chemical (e.g., emulsifying agents) means will be conducted in tanks and containers to phase separate waste. Phase separation in containers is prohibited in your current RCRA Part B permit.

Response:

- Section B-1a(3)(h) states "Under the terms of the November 1993 Part B License, CHSI is authorized to compact hazardous waste in containers with a mobile waste compactor. This compactor is only used in the staging area of the Outdoor Storage Area (Unit R1)."

- Section B-1a(3)(i) (second paragraph): The words "This treatment is" replaced with "The treatment of cyanide wastes in containers is only" to the sentence: This treatment is conducted under the operating fume hood in the Outdoor Storage Area (Unit R1). "Fuming acids will only be treated under the operating fume hood in the outdoor staging area of Unit R1." Will also be added. Page B-15 has been modified to reflect these changes.

- Section B-1a(3)(j): The word "only" has been added to the sentence: The treatment of organic peroxides in containers is **only** conducted under the operating fume hood in the Outdoor Storage Area (Unit R1). Page B-15 has been modified to reflect this change.

- In Section B-1a(3)(d)(A) (second sentence) : "As part of the special license conditions imposed by IEPA, CHSI is only authorized to conduct stabilization/fixation operations inside process building #3, the approved/not yet constructed listed waste treatment building (Unit Z)." is replaced with "The stabilization of wastes in roll-off boxes will only be conducted in Process Building No. 3, the approved/not yet constructed listed waste treatment building (Unit Z)." Page B-13 has been modified to reflect this change.

- In Section B-1a(3)(a), the following sentences are added to the first paragraph:

  The consolidation of lab packs can only occur under operating fume hoods or in that bay by employees wearing full-face respirators in the following areas:
  Building 25, Building 26, Unit U, Unit G1, and Unit R1

  The pouring-off of containers that were in a lab pack will only occur under operating fume hoods in the following areas:
  Building 26, Unit F1, and Building 25

  The removal of residues from non-RCRA empty tank trucks will only occur in the following transporter storage/staging areas:
  Unit Q, Unit V, Unit X, Unit C, Unit 59, Unit 15, Unit 62 and Unit W.
  The removal of residues from trucks undergoing offloading into the RCRA-exempt Clean Water Act wastewater treatment system in Units J1 and J2 are not subject to this requirement.

  Pages B-8 and B-9 have been modified to reflect these changes.

CHSI notes Units W, J1 and J2 were not included in the Notice of Deficiency, but these Units were included in the existing Part B permit (Section I (J)(19)). Thus these are not an expansion of activities and have met compliance with applicable regulations. Unit W has not been built and Units J1 and J2 are exempt from RCRA requirements.

The use of full-face respirators for lab pack consolidation (closed container) activities in the same bay will have the same level of safety as using an operating fume hood.

D002 liquid/solid mixtures will be treated to separate/remove free liquids in Unit G1, Unit R1, Unit R2, Unit 25, Unit 26, and Unit 61. B-1a(3)(f) on Page B-14 has been modified to reflect this.

D002 compatible liquids will be mixed or consolidated in containers in Unit G1, Unit R1, Unit R2, Unit 25, Unit 26, and Unit 61, and in tanks in Unit 16 and Unit 22. A description of how compatible liquids will be determined and the D002 treatment process has been added to B-1a(3)(g). Page B-14 has been modified to reflect this.

CHSI will conduct treatment of hazardous wastes using physical (e.g., gravity) and/or chemical (e.g., demulsifying agents) in tanks to phase separate wastes. CHSI is not requesting to phase separate hazardous wastes through treatment in containers. The tanks where this treatment can occur are in Unit 16 and Unit 22. B-1a(3)(k) on Page B-16 has been modified to reflect this.

B.5 Operating Record

B.5.1 Contents of Operating Record

Revise your procedures to include the following records in your operating record:

- Monitoring, testing or analytical data associated with corrective action at the site
- Documentation of any refusals from a state or local authority to enter into an agreement to coordinate emergency services with the facility.

Response:

CHSI has modified procedures to include these items in the facility operating record. Page B-23 has been modified to reflect these changes.

C. Waste Characteristics

C.1.3 Land Disposal Restrictions

On pg C-31, item 2 you state: "the notification must also include a 'generator certification' statement whose wording is identical to 268.7(a)(2)(ii)." This section of 40 CFR is marked "reserved". Please revise this section.

For residues from treatment that meets the treatment standards, explain the procedure used to document compliance with the LDR standards to notify receiving facilities.

Response:

CHSI has modified item 2 on page C-31 with the correct CFR reference.

For residues from treatment which meet treatment standards, the procedure to document compliance with the LDR standards has been added to page C-32.

C.1.3.3 For Treatment Facilities

Identify the frequency that the treatment residues will be analyzed to determine compliance with the treatment standards in Part 728 (e.g., the treatment of cyanide wastes in containers to remove the characteristic of reactivity, the stabilization of wastes in roll-off to remove free liquids).

Response:

CHSI will analyze each batch of treatment residue to determine compliance with the treatment standards in Part 728. Pages C-29 and C-30 have been modified to reflect this.

C.2 Waste Analysis Plan

C.2.3.4 Multi-Phase Wastes

Indicate if each phase of a waste will be sampled separately.

Response:

Each phase of a multi-phase waste will be sampled separately at the discretion of the Laboratory Manager. C-2c on page C-24 has been modified to reflect this change.

C.2.3.5 Safety

Indicate if the sampling personnel are ever required to wear respirators when sampling/pumping off drums of volatile organic wastes. If so, explain when they would be required to wear such equipment. The use of respirators appears to be standard procedure for lab pack pour–off activities. This is discussed in Attachment 1 of

Appendix D-1. There is some contradictory information contained within the application. Page 1 states full-face cartridge respirator or full–air respirator while page three states a full air respirator with supplied air is required. Please revise the application to explain when the different respirators will be used.

Response:

CHSI requires personnel to always wear full-face respirators during sampling or pumping of wastes from drums. Section C-2c on page C-23 has been modified to reflect this.

It is correct that the use of respirators is standard for lab pack operations. In Attachment 1 of Appendix D-1 (Acid/Base Lab Pack Pour-off Standard Operating Procedure, page 1 states both full-face cartridge and full-face air respirators are used during the operation. Page 2 explains full-face cartridge respirators are used for unpacking lab packs (when the individual lab pack containers are closed). On page 3 full-face air respirators are required for lab pack pour-off. Item 1 on page 3 states " All opening and pouring of unpacked materials is to be done under full air."

CHSI notes that the flammable lab pack pour-off operation allows either full-face cartridge respirators or full-face air respirators to be worn for both unpacking of lab packs and lab pack pour-off under the operating fume hood.

C.2.5 Additional Requirements for Wastes Generated Off-Site

Identify the criteria the laboratory manager may use to require a supplementary analysis (e.g., outside the boundary conditions in Table C-1 through C-8, outside a unit of the expected ph, etc.).

Response:

The laboratory manager will require supplementary analysis whenever treatment wastes are outside the boundary conditions in the appropriate Table C-1 through C-8. This is reflected in Section C-2a(2)(A) on page C-21.

D1 <u>Containers</u>

D.1.2.3 Arrangement

The following must be shown on a scale drawing of the storage unit:

The arrangement of containers when the storage is at maximum capacity;
The minimum aisle space that will be maintained;
The secondary containment system; and
The floor slope, if any, within the secondary containment system.

The information identified above was not provided for Unit F1.

Please provide the difference in elevation through out the secondary containment system for Unit 61.

Explain how Building 42 is designed to prevents a 4'x4' collection hopper from being in contact with a spilled liquid when a spill occurs from the drums?

The rate of slope for the Rail Car Unloading area could not be determined from Drawing No. 4217, 1 0f 3 as stated on Page D-25. Please provide this information.

Please indicate if Unit 25, Unit 42 and Unit 24 have a sloped floor and if applicable, the amount of slope and flow direction within the secondary containment area.

Provide secondary containment calculations for Unit 15.

Please indicate if waterstops are used in the concrete joints for Unit V.

The Illinois EPA was unable to determine the direction of flow, the amount of slope and the location of the sump from the drawings provided for Unit 68. Additionally, the text description for this unit stops in mid-sentence on page D-32. Please provide this information and complete the text on page D-32.

The secondary containment calculations on drawing no. 4287 conflict with the information on page D-39. The calculations used a height of 4 inches while the text on page D-39 states Unit 68 is surrounded by a 9-inch containment curb. Correct the application.

Response:

The drawing for Unit F-1 will be provided in a later submittal.

Additional elevation points have been added to CHSI Drawing No. 4245.

The 4'x4' collection hopper in Building 42 will be on a containment pallet elevating the hopper 6 inches above the floor level. This will keep the hopper from contact with spilled liquids. D-1a(3)(b)(B)(2) has been modified to reflect this.

CHCI Drawing No. 4217 (Sheet 1 of 3) has been modified to show the rate of slope.

Unit 25, Unit 42 and Unit 24 do not have sloped floors. This is indicated in D-1a(3)(b) in section A.5., B.2, and B.3 respectively.

Secondary containment calculations for Unit 15 are provided in Appendix D-49 (in Appendix 15-1)

Waterstops are used in the concrete joints in Unit V. These are now shown in CHSI Drawing 4234.

The direction of flow and sump location for Unit 68 are now provided on CHSI Drawing No. 4287. Pages D-33 and D-39 have been modified to complete the text description for Unit 68 and correct the text. CHSI notes that Unit 68 is surrounded by a 6-inch curb on three sides and a 9-inch curb on the border with Unit 24. The floor of Unit 68 is raised yielding a smaller height inside the unit than outside the unit.

D.1.2.5.1 Ignitable, Reactive or Incompatible Wastes (Scale Drawing)

Drawing 4204B (2/3) would seem to indicate that the flammable storage in Building 25 is not at least 50 feet from the facility's property line. From the drawings available, it appears that the property line is coinciding with the fence line, which places flammable storage at 30 feet from the property line.

Please clearly identify the property line on Drawing 4204B (2/3) and explain how the storage complies with the 1987 version of NFPA 30, Flammable and Combustible liquids Code and 35 Ill. Adm. Code 724.276.

Response:

CHSI Drawing No. 4204B has been modified to show the correct property line in the vicinity of Building 25. The property line is fifty feet west of Building 25 so the storage complies with the 1987 version of NFPA 30, Flammable and Combustible liquids Code and 35 Ill. Adm. Code 724.276.

D1.2.5.4 Ignitable, Reactive or Incompatible Wastes

There is a typographical error on page F-23, top of page. The sentence reads as follows: "In order to provide proper segregation for potentially incompatible materials that shall specifically designed "self-contained" pallets in the event that a waste material, which is incompatible with materials already present on the dock, is encountered." Please correct the text in this sentence.

Response:

Page F-23 has been corrected.

D1.2.6 Lab Packs

Please indicate if the lab packs are opened, repackaged or their contents poured off under a fume hood. Provide documentation that the fume hood provides sufficient ventilation.

Response:

Page D-27 of Section D-1a(2) has been modified to better define this operation. Appendix D-57 has been added with evaluation data sheets for lab pack pour-off hood ventilation.

D1.3.2 & D1.4.2 Base of Liner Design and Condition

Clarify that the February 13, 1992 engineering evaluation by Hoyer-Schlesinger-Turner, is only for Unit R, Unit U, Unit 61 and Unit Z1.

Verify that the assessments in Appendix D-7 & D-8 are for the following units: Buildings 25 and 26, Unit 61, Unit 59, Unit C, Unit W, Unit 13, Unit R, Unit U, Unit Z1 and Unit G1. Please provide assessments for Unit F1, Unit Q, Unit Q1, Unit V, Unit 15, Unit 62, Building 42, Unit 25 (loading pad), Unit 24, Unit 68, Unit X, and Unit 69.

Identify those units that have cold joints and no chemical resistant water stops and provide an explanation how liquids are prevented from migrating through the joints in these units.

Response:

The February 13, 1992 engineering evaluation by Hoyer-Schlesinger-Turner, is only for Unit R, Unit Q, Unit U and Unit Z. Unit Q was included with the Outdoor Container Storage Area, but was not coated.

The assessments in Appendix D-7 & D-8 are for the following units: Buildings 25 (old) and 26, Unit 61, Unit 59, Unit C, Unit W, Unit 13, Unit R, Unit Q (including Q1), Unit U, Unit Z (including Z1), Unit G1 and Unit 43. The assessment for modified Building 25 and loading pad are included as a new Appendix D-53. Building 42, Unit 24, Unit 68 and Unit 69 assessments are included in Appendix D-42. The Unit 15 and Unit 62 assessments are included in Appendix D-49. Unit F1, Unit Q (including Q1)(coating), Unit V, and Unit R2 (new portion) assessments are included as a new Appendix D-54.

There are no units with cold joints. All units have chemically resistant water stops.

D1.3.4 & D1.3.5 Containment System Capacity

Provide calculations which demonstrate that the containment system will have sufficient capacity to contain at least 10 percent of the volume of the containers or the volume of the largest container, whichever is greater and the volume from a 24-hour, 25-year storm event for the following units: Unit Q, Unit 25 (Truck Pad), Unit 15, and Unit X.

Response:

Unit Q, Unit X and Unit15 are covered by canopies and exempt from the 24-hour, 25-year storm event requirement. Unit 15 calculations are included in Appendix D-49 (as Appendix 15-1). Unit 25 (Truck Pad) calculations are included in the new Appendix 53. Unit Q and Unit X calculations are included in the new Appendix 56.

D1.4.1 Container Storage Area Drainage Without Free Liquids

Provide calculations, which demonstrate that the containment system will have sufficient capacity to contain the volume from a 24-hour, 25-year storm event for the following units: Unit Q1 and Z1.

Response:

Unit Q1 is located under a canopy and Unit Z1 is located in Process Building 3. The containment capacities are the same as those for Unit Q and Unit Z respectively.

D2 Tanks

D2.1.1 Description of Tanks

Please provide the year the dispersion tank and overflow tank were installed.

Response:

The dispersion tank and overflow tank were installed in 1995. This information has been incorporated into D-2(i)(A)(1) on page D-45.

D2.1.5 Tank History

Condition II.H.6 required CHSI to conduct ultrasonic testing annually on each tank and a detailed visual inspection of the tank's interior at least every fifth year to ensure the tank's integrity.

D2.1.5.1 Please provide a copy of the most recent internal tank inspection report and any photographs taken during the inspection.

Response:

The most recent internal tank inspection reports for each existing tank are included in the new Appendix D-55.

D2.1.5.2 Please provide the results of the thickness testing and the corrosion rates for the tank top, shell, and bottom of each tank system. At a minimum, this information must include:

- The calculations used to determine the corrosion rates;
- The original thickness measurements;
- A copy of the last testing report;
- A summary table of all testing conducted on each tank since the tank system was constructed (the test locations must be shown on scale drawings). Include the dates of each test, the results all comments, and the conclusions/recommendations from each report; and
- The projected service life of the tank based on the estimated corrosion rate.

Response:

This information will be supplied in a later submittal.

D2.4 Installation of a New Tank System

Please provide a copy of the installation report for the dispersion tank and overflow tank.

Response:

The installation report for the dispersion tank and overflow tank is included in Appendix D-48.

D2.6.2 Design

Drawing 4213, 2/3, does not show Unit 43's secondary containment system slope for draining and removing liquids resulting from spills or leaks, or the location of the sump.

Drawing 4215, 1/4, does not show/indicate how Unit 16 secondary containment system is sloped to drain and remove liquids resulting from spills or leaks.

Drawings, 4286 & 4287, do not show/indicate for Unit 22, Unit 24 and Unit 68 how the secondary containment system is sloped to drain and remove liquids resulting from spills or leaks, or the location of the sump.

Response:

Drawing 4213, 2/3 has been modified to show Unit 43's secondary containment system slope for draining and removing liquids resulting from spills or leaks, and the location of the sump.

Drawing 4215, 1/4, has been modified to show/indicate how Unit 16 secondary containment system is sloped to drain and remove liquids resulting from spills or leaks.

Drawings 4287 has been modified to show/indicate for Unit 22, Unit 24 and Unit 68 how the secondary containment system is sloped to drain and remove liquids resulting from spills or leaks, or the location of the sump

D2.10.4 Documentation

Provide documentation that the treatment method, chemical oxidation, will effectively treat the constituents identified with the wastes codes currently included in the Part B permit in Attachment D, Section I, and that each constituent can be treated at the concentration stated.

Response:

This documentation will be provided in a later submittal.

F.3.4 Water for Fire Control

Provide a statement signed by an independent fire control professional, or the responsible fire department, certifying that the facility has water at adequate volume and pressure to supply water hose streams, foam producing equipment, automatic sprinklers or water sprays for Building 42.

Response:

This statement will be provided in a later submittal.

G. Evaluation-Assessment of Potential Hazards & Contingency Plan

G.1 Evaluation-Assessment of Potential Hazards Report

The information used in the modeling approved in your previous Part B permit is outdated. A cursory review of the input data for the level of concerns indicates that this parameter has changed for most of the constituents. Please reevaluate the off-site impacts a waste-related emergency may have on the surrounding area by providing the information in this section (except G.1.5.3.7) using up-to-date information and modeling.

Response:

This information will be provided in a later submittal.

G.2.1.6 Worst Case Scenario

Provide a copy of the executive summary from the Hazards Evaluation Report required in Section G.1 above. Provide a description of the worst-case scenario for both a spill and a fire at the facility that includes:

- The location(s) of the worst-case spill and fire at the facility
- The chemicals involved

Response:

This information will be provided in a later submittal.

H Personnel Training

H.1.1 Training Director

Provide details of any additional training or educational courses that David Anderson has completed that would qualify him as Training Director.

Response:

This information will be provided in a later submittal.

H.1.4.1 Training Content, Frequency and Techniques

Please certify that the training given to personnel meets the requirements of 29 CFR 1910.120 for personnel handling hazardous waste.

Response:

The CHSI RCRA training program is meant to familiarize employees with the properties and nature of hazardous waste stored and handled at the facility, with the procedures to operate and maintain the facility in a safe manner, and with the procedures and equipment to be used in the event of an emergency at the facility. Although the training would meet the annual refresher requirements of 29 CFR 1910.120 for employees in hazardous operations (employee group numbers 3.1 and 3.2), CHSI did not intend for RCRA training to cover those requirements. Employees in group numbers 3.1 and 3.2 receive separate training for the initial (24-hour) and annual refresher (8-hour) requirements of 29 CFR 1910.120. Section H-1b on page H-2 has been modified to reflect this.

H.1.4.2 Training for Emergency Response

Revise your training for emergency response to include procedures to coordinate with local officials to effectively evacuate local areas in the event of an emergency.

Response:

CHSI has modified H-1e on page H-3 to reflect this.

I.1 Closure Plan

I.1.8 Closure Schedule

The dates for completion of activities contained in the verbal description of the closure schedule provided on page I-6 and the schedule in Table I-2 do not match. Please revise your application to correct this inconsistency.

Response:

Table I-2 has been corrected.

I.3 Survey Plat

I.3.2 Note on Plat

The plat submitted in Appendix I-1 does not appear to contain the required language:

(1) The land has been used to manage hazardous waste.

(2) Its use is restricted under 35 Ill. Adm. Code Subpart G so that disturbance of the unit is prevented.

Response:

This information will be provided in a later submittal.

I.4 Notice in Deed and Certification

I.4.2 Certification of Notification: Submit a certification, signed by the owner of the property, that the notice in deed has been properly recorded in accordance with 35 Ill. Adm. Code 724.219(a). Submit a copy of the notice in deed filed with the County Recorder and/or any local zoning authority.

Response:

This information will be provided in a later submittal.

Subpart BB Air Emission Standards for Equipment Leaks

Page BB-1 references Appendix A. The Illinois EPA was unable to find the referenced section.

Please revise the application to describe the standards for diaphragm pumps on page BB-5 to "...no detectable emissions (less than 500 ppm above background)".

Response:

CHSI is submitting Appendix A and has corrected page BB-5.

SECTION N
PART B CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direct 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.

John E. Lancaster 2/18/04

John E. Lancaster
VP-General Manager – Clean Harbors Services, Inc.

Anthony G. Ianello
Executive Director – Illinois International Port District

February 23, 2004

Permit Section, RCRA Unit
Bureau of Land Pollution Control
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, IL 62794-9276

RE: Clean Harbors Services, Inc.
11800 S. Stony Island Avenue
Chicago, IL 60617
Part B Permit Application Technical Deficiencies

Dear Sir or Madam:

Please refer to: 0316000051 – Cook County
Clean Harbors Services, Inc.
ILD000608471
RCRA Permit Log No. 16
RCRA Permit File

I hereby certify that I, the undersigned am a Professional Engineer, licensed to practice in the State of Illinois in accordance with Ill. Rev. State., par. 5101, Sec. 1 and par. 5119, Sec. 13.1.

I certify under penalty of law that this document with "Cross Reference of Revisions (01/31/04 revision date)" (one page) attached and all attachments were prepared under my direct supervision and 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 who manages 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 fines and imprisonment for knowing violations.

Respectfully submitted,

Kenneth D. Spaulding, P.E.

KENNETH D. SPAULDING
62-44249
REGISTERED
PROFESSIONAL
ENGINEER
STATE OF ILLINOIS

Feb 23, 04

Attachment: Cross Reference of Revisions (01/31/04 revision date)

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Appendix D-54	Engineering Assessment for Unit F1, Unit Q (including Q1), Unit V and Unit R2 (new portion)
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Appendix D-56	Containment System Calculations for Unit Q and Unit X
Appendix D-57	Evaluation Data Sheets for Lab Pack Pour-off Hood Ventilation

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C-5. Generator Waste Material Profile Sheet (GWMPS Form)
C-6. Container Compatibility Procedures (Revised 09/17/93)
C-7 Laboratory Equipment
C-8. Land Disposal Restriction Forms (Clean Harbors Forms LDR-1 and GC-1)

D-1. Process Descriptions for Existing and Proposed Activities at Clean Harbors of Chicago, Inc.
D-2. Container Management Guidelines
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D-4. Standard Operating Procedures for Acid Cyanide Treatment
D-5. Standard Operating Procedures for Organic Peroxide Treatment
D-6. Sample Labels/Markings
D-7. Professional Engineer (PE) Certification of the Construction of the Existing and Approved/Not Yet Constructed Container Storage Areas
D-8. Professional Engineer (PE) Certification of the Construction of the Proposed/ Modified Container Storage Areas
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D-12. Professional Engineer (PE) Assessment and Certification of the Design of Proposed/Modified Tank Storage System
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D-32. IEPA Closure Certification Approval
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D-35. Manufacturer's Literature; ENPAC Corporation "Poly-Spill pallet 3000" Self-Contained Pallets
D-36. Engineering Drawings and Design Specifications for Bulk Storage Tank Farm (Unit 16)
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D-40 Unit 25 Lab Pack Pour-off Emission Calculations, Engineering Certifications
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D-45 Engineering Certifications Units 16 and 25
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D-52 Compressed Gas Cylinder Program and Guidelines
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E-1. Borings Logs and Groundwater Monitoring Well Construction Summaries
E-2. Groundwater Assessment Program, Fourth Quarter 1991 Report
E-2A. Groundwater Elevation Data
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E-6. Groundwater Assessment Report, Golder and Associates, 1987 [Not Included]
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4221 1 of 3	Emergency & Safety Equipment Location Plan	H
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4228	Approved Lab pack Repack and Consolidation Area Elevations	C
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4234	Truck Loading Dock & Truck Sampling Pad Details	F
4235	Control Panel Face layout Drum Processing	C
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4237	Drum Processing System Schematic	C
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4249 1 of 2	Site Traffic Plan	A (Revision Note 0)
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4252	Preliminary Piping Arrangement Flammable Storage Tank Farm	B
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4257	Concrete Loading Dock – Container Mgt. Area	B
4258	Equipment and Piping Arrangement – Fuel BL. SYS.	0
4259	Process Flow, P & I – Fuels Blending System	2
4271	TF Nameplate & Legend Plate (5404-K-02)	1
4271	TF PLC Control Panel (5404-K-03)	0
4271	TF Annunciator Control Panel (5404-K-28)	0
4271	TF Annunciator Control Panel (5404-K-31)	0
4272	Drum Pumping Container Dock	A
4273	Process Piping – Between Building 43 and TF	0
4274	Roll-Off Storage Pad & Details	A
CHSI4280	Partial Site Plan Proposed Paint Container Crusher	B
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CHSI4282	Container Management Layout Building #25	A
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CHSI4287	Shredding Process Equipment Layout	G
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CHSI4295	Diluent Waste Storage Tank T-417 – Vessel Layout	A
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B-1a (3) Detailed Description of RCRA Hazardous Waste Activities

A complete description of the RCRA –regulated hazardous waste operations is presented in Sections B-1a (3) (a) through (q) below. The location of each existing, proposed, and modified hazardous waste management units is shown on the following drawings:

CHCI	Title	Issue
4200	Site Location & Surrounding Land Use	B
4201	Floodplain & Site Plan	D
4202	Site Plan & Topography – Entire Property	E
4203, 1 of 3	Site Plan Existing Facilities	E
4203, 2 of 3	Site Plan Existing Facilities	A
4203, 3 of 3	Site Plan Existing Facilities	A
4204B, 1 of 3	Site Plan – Existing, Approved, Modified & Proposed Activities	B
4204B, 2 of 3	Site Plan – Existing, Approved, Modified & Proposed Activities	D
4204B, 3 of 3	Site Plan – Existing, Approved & Modified	A

B-1a (3) (a) Storage/Transfer in Containers

CHSI accepts and stores containers of hazardous wastes, including lab packs that are generated offsite. The wastes are stored prior to onsite treatment, or for subsequent transfer to an offsite waste treatment or disposal facility. The wastes stored in containers are typically received in containers such as rolloffs, railcars, bulk tankers, box trucks, and non-bulk containers (e.g., 55-gallon drums, lab packs). Wastes in containers are treated on site or transferred to offsite treatment/disposal facilities in their original container or, whenever practicable, in consolidated (i.e., repackaged or bulked) form. The consolidation of lab packs can only occur under the operating fume hoods or in that bay by employees wearing full-face respirators in the following areas: Building 25, Building 26, Unit U, Unit G1 and Unit R1. The pouring-off of containers that were in a lab pack will only occur under operating fume hoods in the following areas: Building 26, Unit F1 and Building 25. The removal of residues from non-RCRA empty tank trucks will only occur in the following transporter storage/staging areas: Unit Q, Unit V, Unit X, Unit C, Unit 59, Unit 15, Unit 62 and Unit W. The removal of residues fro trucks undergoing offloading into the RCRA-exempt Clean Water Act wastewater treatment system in Units J1 and J2 are not subject to this requirement.

For the sake of clarity, CHSI notes that the container storage activities proposed under this license modification request represent a combination of units which are: 1) approved under CHSI's November 1993 Part B permit and currently in existence at CHSI; and 2) approved under CHSI's November 1993 Part B permit, but not yet constructed.

A summary of the container storage units and their licensed storage capacities is provided below. CHSI notes that each hazardous waste management unit that is located on the former CHCI portion of the property is assigned an identification letter (e.g., unit D), whereas each unit that is located on the former CWMCSI portion of the property is

assigned a unit identification number (e.g., unit 25). The referenced drawings reflect those unit identification numbers/letters.

A. Approved CHSI Drum/Rolloff Storage Activities (November 1993)

Under the terms of the November 1993 Part B License, CHSI is authorized to store up to 2,969 drums (55-gallon equivalent), (12) 30-cubic yard rolloffs and 31 transportation vehicles of hazardous waste. Drum storage is authorized for seven existing drum storage units and for four not-yet-constructed locations. Rolloff storage is authorized for two existing and one not –yet constructed locations. Transportation vehicle storage is authorized for seven existing and three not-yet constructed. These locations are as follows:

I. Existing CHSI Drum/Rolloff/Transportation Vehicle Storage Units

1. Drum Storage Area (Unit G1)

Staging	72	Drums
Alkaline	192	
Acidic-2	96	
Acidic-1	192	
	552	Drums (55-gallon equivalents)

2. Drum Storage Area (Unit R1)

Staging	160	Drums
Flammable-1	160	
Flammable-2	160	
Oxidizers	96	
Reactives	96	
Poisons	96	
	768	Drums (55-Gallon equivalents)

3. Drum Storage Area Expansion (Unit R2)

Oxidizers #2	96	Drums
Reactives #2	96	
Poisons #2	96	
Staging	80	
	368	Drums (55-Gallon equivalents)

4. Lab Pack Pouroff Station (Unit F1)

Pour-Off Area	8	Drums
	8	Drums (55-Gallon Equivalents)

5. Container Storage Building (Unit 25)

Alkaline/Poisons/PCBs	248	
Acids	136	
Flammable	184	
Truck Pad	88	
	656	Drums (55-gallon equivalents)

6. Ignitable Container Management Building (Unit 26)

Ignitable/PCB's	192	
	192	Drums (55-gallon equivalents)

C. Summary of RCRA-Regulated Tank Storage Activities

The total RCRA part B permits tanks storage capacity of the facility is 306,356 gallons of hazardous waste in 37 tanks. There are no changes proposed to the approved tank storage activities in this Permit request.

B-1a (3) (c) Storage and Blending of Hazardous Waste Fuels

CHSI receives and processes hazardous wastes, which may be burned for energy recovery as a hazardous waste fuel. The types of wastes to be processed by the facility through this operation include non-halogenated organic; high BTU lean waters; non-halogenated oils; organic liquids with halogens; and halogenated multi-layered organic. The hazardous waste fuel process involves the receipt and mixing/blending of liquids, semisolids, and solids. The blended fuel may be shipped in containers or pumped directly onto to bulk transport vehicles pending transfer to reuse facilities (e.g., cement kilns).

A. Approved Fuel Blending Activities (November 1993)

Under the terms of the November 1993 Part B License, CHSI is authorized to operate an existing automated hazardous waste fuel blending system designed by Pegasus Niagara, Inc. The Pegasus system is located in the Fuels Blending Operation Building (Unit 43). The drum feedstock for the unit is stored in the adjacent Ignitable Container Management Building (Unit 26) and fed to the Pegasus system in Building 43 by means of an enclosed conveyer system which is equipped with proper secondary containment features. There are no changes proposed to the approved fuel blending activities with this Permit request.

B-1a (3) (d) Stabilization and/or Fixation Prior to Offsite Disposal

Wastewater treatment residuals and certain characteristic (i.e., D-code) and listed (e.g., K062) hazardous wastes received from offsite generators may require stabilization and/or fixation prior to shipment to an offsite disposal facility.

Material accepted for stabilization/fixation shall be treated to meet applicable Land Disposal Restriction treatment standards (40 CFR Part 268) and the receiving facility's specific permit conditions. Treatability performance data documenting the success of stabilization/fixation activities shall be documented on a case-by-case basis and maintained onsite as part of the facility's operating record.

A. Approved Stabilization/Fixation Activities (November 1993)

Under the terms of the November 1993 Part B License, CHSI is authorized to conduct stabilization/fixation of certain characteristic and listed hazardous waste in bulk solid containers e.g., rolloffs, mix box). The stabilization of wastes in roll-off boxes will only be conducted in Process Building #3, the approved/not yet constructed listed waste treatment building (Unit Z). However, CHSI is authorized to add additional enclosed structures as stabilization processing areas upon submittal of a Class 1* permit modification request. As of the date of this Application, CHSI has not designated any stabilization processing areas in any of the existing buildings at the facility. There are no changes proposed to the approved stabilization/fixation activities with this Permit request.

B-1a (3) (e) Listed Waste Treatment System

Storage and treatment of listed (i.e., F-, K-, P-, U-code) hazardous waste liquids and solids in tanks or containers using wastewater treatment technology and/or specialized pretreatment technologies such as carbon absorption.

A. Approved Listed Waste Treatment Activities (November 1993)

Under the terms of the November 1993 Part B License, CHSI is authorized to construct and operate a new listed waste treatment system (Unit Z) in new building #3. Under the Permit request, no changes or other modifications are proposed for the approved listed waste treatment system.

B-1a (3) (f) Treatment of D002 Corrosive Liquid/Solid Mixtures in Containers

Storage and onsite treatment of corrosive (i.e., D002) hazardous waste in containers through removal of free liquid.

A. Approved D002 Waste Treatment Activities (November 1993)

Under the terms of the November 1993 Part B License, CHSI is authorized to "treat" solid/liquid mixture of hazardous waste identified by EPA Waste D002 through the removal of the free liquid layer. Once all the free liquid is removed, the remaining solid no longer meets the definition of corrosive, and the D002 wasted code may be dropped. D002 liquid/solid mixtures will be treated to separate/remove free liquids in Unit G1, Unit R1, Unit R2, Unit 25, Unit 26 and Unit 61. CHSI is not proposing any changes to this treatment activity.

B-1a (3) (g) Treatment of D002 Liquids in Tanks and Containers

A. Approved D002 Liquid Treatment Activities (November 1993)

Under the terms of the November 1993 Part B License CHSI is authorized to conduct treatment of D002 corrosive liquid hazardous waste in tanks and containers. Treatment of D002 corrosive liquids includes bulking/mixing with other compatible waste streams, until they no longer exhibit the characteristic of corrosively, as defined at 35 IAC 721.121(1). D002 compatible liquids will be mixed or consolidated in containers in Unit G1, Unit R1, Unit R2, Unit 25, Unit 26 and Unit 61, and in tanks in Unit 16 and Unit 22. Compatible liquids will be determined by performing Liquid Waste Compatibility Test D5058A from the Annual Book of ASTM Standards. Treatment involves adding a small amount of the material to the waste in the container or tank. If no reaction has occurred after several minutes (i.e., heat-up, bubbling, etc.), the waste can be tested for pH. The success of the treatment operation is confirmed though pH testing upon completion of the consolidation/mixing activity. Treatment is deemed successful when the resultant consolidated/mixed waste stream has a pH value that does not meet the D002 corrosively identification criteria (i.e., has a pH value greater than 2.0 but below 12.5 Units). If treatment has not been successful, the treatment can be repeated until successful. If treatment is successful, CHSI shall drop the D002 waste code from the final consolidated /mixed waste stream description accompanying outbound manifest. Without this treatment authorization, CHSI would be obligated to carry the D002 code, even in instances where the resultant waste stream has a pH value that does not meet the D002 corrosively identification criteria. Under the Permit request, no changes or modifications are proposed to the approved D002 liquid treatment activities.

B-1a (3) (h) Storage and Compaction of Hazardous Wastes in Containers

Approved Compaction Treatment Activities (November 1993)

Under the terms of the November 1993 Part B License, CHSI is authorized to compact hazardous waste in containers with a mobile waste compactor. This compactor is only used in the staging area of the Outdoor Storage Area (Unit R1). Hazardous wastes are reduced in volume prior to off-site shipment to a licensed treatment or disposal facility. Under the permit request, no changes or modifications are proposed from the approved compaction treatment activities.

B-1a (3) (i) Treatment of Acid Cyanide Wastes in Containers

A. Approved Acid/Cyanide Treatment Activities (November 1993)

Under the terms of the November 1993 Part B License, CHSI is authorized to conduct treatment of acid/cyanide hazardous waste in containers. Under US DOT shipping relations, such wastes cannot be transported. In the event that a non-bulk container of acid cyanide waste is identified during acceptance analysis, it is treated in the existing RCRA-exempt inorganic wastewater treatment system or directly in the original non-bulk or bulk container.

Treatment of acid cyanide waste in non-bulk containers is accomplished through the addition of sodium hydroxide or other suitable alkaline reagent. Sufficient alkaline would be added to raise the pH of the waste to the level where the waste is acceptable for transportation to an offsite treatment/disposal facility. The treatment of cyanide waste in containers is only conducted under the operating fume hood in the Outdoor Storage Area (Unit R1). Fuming acids will only be treated under the operating hood in the outdoor staging area of Unit R1. The exhaust from the fume hood is bubbled through a 55-gallon drum containing a caustic solution. Under the Permit request, no changes or modifications are proposed to the approved treatment of acid/cyanide wastes in containers.

B-1a (3) (j) Treatment of Organic Peroxides in Containers

A. Approved Organic Peroxide Treatment Activities (November 1993)

Under the terms of the November 1993 part B License, CHSI is authorized to conduct treatment of organic peroxide hazardous waste in containers. The treatment operation, the addition of water to the organic peroxide compound, is conducted in order to: 1) prepare the waste for disposal facility requirements; or 2) meet proper US DOT shipping requirements. Many hazardous waste incineration facilities will accept organic peroxides for treatment, but only at specified dilution levels. In other cases, the possibility exists in which an organic peroxide waste could arrive at CHSI and not meet dilution levels specified by US DOT shipping requirements. In either case water would be added to meet the required dilution level. The treatment of organic peroxides in containers is only conducted under the operating fume hood in the Outdoor Storage Area (Unit R1). The exhaust from the fume hood is fed through a carbon adsorption unit. Under this Permit request, there are no changes or modifications to the approved treatment of organic peroxides in containers.

B-1a (3) (k) Treatment of Hazardous Waste in Tanks through Phase Separation

A. Approved Phase Separation Treatment Activities (November 1993)

Under the terms of the November 1993 Part B License, CHSI is authorized to conduct treatment of hazardous waste in tanks through phase separation. The treatment operation involves the use of physical (e.g., filtration, gravity separation, and heat) and/or chemical (e.g., addition of demulsifiers) means to, for example, separate a solid layer from a liquid layer, or to separate two liquid layers. The tanks where this treatment can occur are in Unit 16 and Unit 22. CHSI is not requesting to phase separate hazardous wastes in containers. Phase separation may be conducted prior to onsite treatment (e.g., separation of an organic layer from a water stream) or prior to offsite shipment. Under this Permit request, there are no changes or modifications to the approved phase separation treatment activities.

B-1a (3) (l) Storage and Shredding of Hazardous Waste In Containers Including Metalwashing of Residual Metal

CHSI is authorized to receive and process hazardous wastes for shredding which may be blended into pumpable slurries or non-dispersable bulk solids. The primary types of wastes to be processed by the facility through this operation include organic liquid, semi-solid and solid materials. The system will also separate out and wash the resulting metal container fragments.

Approved Shredding and Metalwashing Activities (November 1993)

Under the terms of the November 1993 Part B License, CHSI is authorized to construct and operate a hazardous waste shredding system. The Shredder is located in the Unit 24. The drum feedstock for the unit is stored in the adjacent Building (Unit) 42 and fed to the system in by means of a conveyer system, which is equipped with proper secondary containment features. After passing through the dual shredder, shredded metal from containers are captured using a rotary magnet. In dispersible operation, wastes are conveyed to a hydropulpar tank and blended with low viscosity liquids into a thick flowable liquid. In non-dispersible materials operation, shredded materials are conveyed to a covered hopper and eventually to a roll-off/intermodal for off-site shipment. Shredded metal fragments from the shredder are cleaned using solvents in Unit 68. The cleaned metal will be sent off-site for reclamation. There are no changes proposed to the approved shredding/metalwashing activities with this Permit request.

B-1a (3) (m) Consolidation of Paint and Paint-Related Materials In Containers Using a Compactor

Approved Consolidation of Paint and Paint-Related Materials Activities (November 1993)

Under the terms of the November 1993 Part B License, CHSI is authorized to construct and operate a hazardous waste paint and paint-related materials consolidation system using a compactor. The compactor is located in the Building 42. The primary types of wastes to be processed by the facility through this operation include paints, coatings, sealants, turpentine, and mineral spirits used as paint thinner. The consolidated materials will be processed on-site as a hazardous waste fuel and/or sent off-site for disposal. There are no changes proposed to the approved shredding/metalwashing activities with this Permit request.

CHSI does not produce or maintain an onsite written hard copy record of each waste movement, but this information is readily available on the Company's computer system. To ensure security, this information is archived onto tape daily. All hazardous waste received at the facility is either treated onsite or shipped off-site to a properly licensed waste management facility within one year of receipt.

3. Manifests – The types and quantities of wastes received, treated and shipped off-site for disposal are recorded on manifests for hazardous and non-hazardous wastes. This information is summarized and submitted sent to IEPA: 1) on a quarterly basis, for non-hazardous wastes; and 2) on an annual basis, for all hazardous wastes.

4. Land Disposal Restriction (LDR) Documentation – As a treatment/storage facility, CHSI retains copies of all generator LDR notifications and certifications accompanying inbound restricted wastes subject to LDR regulations. In addition, as the generator of all hazardous waste shipped from the facility, CHSI retains copies of all LDR notifications and certifications for outbound shipments of restricted wastes and for the non-hazardous treatment residues for the primary treatment process.

5. Plan and Implementation Records – An up-to-date copy of the facility's Contingency Plan will be maintained on file at the facility. If releases or potential releases cause the Contingency Plan to be implemented, a report will be prepared and submitted to the Agency. Copies of these reports will also be maintained at the facility. CHSI's Contingency Plan is included in Section G of this Application.

6. Inspection and maintenance Records – All facility inspections (daily, weekly, monthly, and other) described in Section F – Procedures to Prevent Hazards will be documented on preprinted report forms. These reports, as well as other maintenance, monitoring, testing and/or analytical results pertinent to specific hazardous waste management units, storage operation and structural integrity, and secondary containment leak detection requirements, will be maintained on permanent file at the facility. This includes written statements by persons required to certify tank system designs and supervision of tank system installation in accordance with 724.292 (b) through (f). It will also include the written certification required in 702.126(d).

7. Notice to Generators – following initial prequalification and acceptance of prospective waste streams in accordance with WAP procedures, CHSI will send a notice to the generator informing the generator the material is suitable for acceptance at CHSI. Copies of the notifications will be maintained on file at the facility or by Clean Harbors Analytical Services in Braintree, MA.

8. Closure Cost Estimate – A copy of the approve closure Plan and the most-recent closure cost estimate will be filed at the facility.

9. Waste Minimization – A copy of the waste minimization certification for the facility will be filed at the facility.

10. Hazardous Waste Fuels Authorization – Documentation of a receiver facility's authority under 40 CFR 266 Subpart H to accept hazardous waste fuel containing less than 5,000 BTU per pound will be filed at the facility.

11. Corrective Action – Monitoring, testing or analytical data associated with corrective action at the site.

12. Documentation of any refusals from a state or local authority to enter into an agreement to coordinate emergency services with the facility.

B-6 Solid Waste Management Units

The following solid waste management units (SWMU's) were incorporated in the Part B issued in 1993. These SWMU's have been addressed in corrective action associated with the Part B.

C-2a(2) Conformance Testing

A. Treatment Wastes

Upon arrival at the facility, all treatment wastes will undergo mandatory conformance analysis. The conformance testing, or fingerprint, includes basic screening procedures that are performed to provide a general characterization of the waste, to insure that the waste shipped matches the wastes approved under the treat ability of the waste. The treatment waste fingerprint parameters for both hazardous and non-hazardous wastes include the Group I and Group III parameters identified in Table C-12.

In the event that the conformance screening is inconclusive or identifies any potential discrepancy, the Laboratory Manager may require one or more supplemental analyses to provide a more accurate evaluation of the incoming waste. The laboratory manager will require supplementary analysis whenever treatment wastes are outside the boundary conditions in the appropriate Table C-1 through C-8. Supplemental analyses listed an described in Table C-13.

B. Storage and Transfer Wastes

Upon arrival at the facility, all storage and transfer wastes will undergo mandatory conformance analysis. The screening procedures are performed to provide a general characterization of the waste, and insure that the wastes shipped matches the waste approved under the prequalification process. The storage and transfer waste fingerprint parameters for both hazardous and non-hazardous wastes include the Group I parameters identified in Table C-12. Additionally, non-hazardous storage and transfer wastes (other than wastes which will not be consolidated and will be shipped to an off-site facility outside of Illinois) require the two "Group IV" parameters identified in Table C-12 on the initial shipment or prequalification sample.

In the event that the conformance screening is inconclusive or identifies any potential discrepancy, the Laboratory Manager may require one or more supplemental analyses (Table C-13) to provide a more accurate evaluation of the incoming waste.

C. Lab Packed Wastes

Lab packed will not be subjected to conformance analyses at the facility. Instead, CHSI will rely on stringent preacceptance review procedures in Section C-2a(i).

For the hazardous waste fuel blending process and hazardous waste shredding process, CHSI shall conduct bench scale testing to determine compatibility, proper waste mixing ratios and final fuel bending or incineration specification. The final specifications will be based on the receiving facility acceptance criteria.

C. Lab Packed Wastes

The compatibility of the contents of a lab pack container with any hazardous wastes already in storage shall be assessed prior to placing the lab pack container into the storage bay. CHSI shall review the packing list for the lab pack container and utilize a chemical classification system based on 40 CFR 264 Appendix V to determine any potentially incompatible group. Lab packs shall be subject to the compatibility testing described in Section C-21a (iii) (B) (ii) prior to any handling activity which involves the consolidation (mixing) of the lab pack chemicals

.

C-2b Test Methods 724.113(b) (2)

Table C-14 lists the standard test methods to be used in the analyzing samples retrieved under this Plan. All analyses will be performed by CHSI, other Clean Harbors' analytical laboratories, or qualified independent laboratories. A summary of CHSI's on site laboratory capabilities is included in Appendix C-7.

C-2c Sampling Methods 724.113(b) (3), 40CFR 261 Appendix I

Any waste sampling that is required under this Plan should be performed by qualified CHSI personnel or approved testing laboratories retained by CHSI. All of the procedures and equipment used by CHSI for sampling purposes will conform with American Society for Testing Material (ASTM) and/or US EPA protocol ("Test Methods for Evaluation of Solid Waste:, SW – 846) to ensure the retrieval of reliable and upon the nature of the material and upon the type and size of container and shall follow CHSI's standard operating procedures sampling waste in containers. A summary of the sampling methods and equipment is presented in Table C-15. CHSI requires personnel to wear full-face respirators during sampling or pumping of waste.

The types of containers requiring sampling may include transportable units such as: drums, tanks, roll off containers, tank trucks, and railcars; or stationary units such as bulk storage tanks. The sampling devices are selected depending on the size and type of the container, and on the specific material involved.

Sampling of small containers (i.e., drums, cartons and small tanks) varies with the nature of the waste material. For flowable material, a Coliwasa unit or rigid tube is used to obtain a full vertical section sample. For non-flowable wastes, portions are taken from a vertical section, including any obvious layers.

Large containers of liquids are sampled with Coliwasa or tubing to obtain a vertical section, or by weighted bottle or bomb sample to allow for sampling at various depths. Light, dry powders and granules are sampled with a transparent tube to obtain a vertical core. Heavier solids are sampled by coring with heavy tubing. Tank sediments are sampled from a bottom-sampling valve when not accessible from the tip access ports. All tank trucks and rails cars will be sampled from top access ports.

Each phase of a multi-phase waste will be sampled separately at the discretion of the laboratory manager. This will be determined from differences with the original waste material profile and the final disposition of the waste.

C-2d Frequency of Analysis 724.113(b) (4)

The prequalification evaluation procedures will be repeated whenever: 1) the generator notifies CHSI that the process generating the waste has changed; or 2) CHSI has reason to suspect that the hazardous waste received at the facility is not as described in the prequalification documentation or manifest accompanying the shipment.

C-2e Additional requirements for Wastes Generated Offsite 724.113 (c)

In general, no material is accepted at the facility unless its arrival has been scheduled in advance. However, at the discretion of the Laboratory Manager, unscheduled arrivals may be received on a case-by-case emergency basis. Specific waste acceptance procedures and criteria re described in Sections C-2e (I) through C-2e (v) below.

C-2e(1) Bulk Transport Receiving Procedures

Upon arrival of each bulk container, CHSI will review the waste identification information (e.g., EPA waste codes, written description) on the accompanying manifest and Land Disposal Restriction documentation. A sample of the waste is retrieved and analyzed for the Groups I parameters identified in Table C-12. If the material is intended for onsite treatment, Group II fingerprint parameters will also be conducted. The analytical results are to be compared to the prequalification profiling data to verify the identity of the material. If the fingerprint data matches, the wastes will be deemed acceptable. If additional information is necessary the Laboratory Manager may choose one or more of the additional supplemental analyses to be conducted. If any waste material deemed unacceptable, the generator will be notified and the wastes will be shipped back to the generator or to an alternate approved waste management facility.

C-2g Waste Analysis Requirements of Land Disposal Restrictions (LDR) 40 CFR Part 268

C-2g(1) Waste Testing

A. Incoming Waste Testing

All incoming hazardous waste streams are subject to prequalification analyses and facility acceptance fingerprinting. All generators will be required to comply with the LDR documentation requirements described in Section C-2g(ii) below for each incoming shipment of restricted waste.

B. Outgoing Hazardous Waste Streams

As a generator /treated of hazardous wastes, CHSI will provide LDR documentation as described in Section C-2g (ii) below for each shipment of restricted hazardous waste shipped from CHSI to an offsite treatment or disposal facility. There are two types of hazardous waste which may shipped from CHSI:

1. Wastes that are actually produced by CHSI through an onsite treatment process (e.g., listed waste treatment, etc.), analytical procedures, or other associated activities.:

2. Waste originally accepted for storage/transfer only, including fuel blending and shredding, and that are transferred to an offsite facility in their original container or in consolidated (bulked) form.

CHSI will determine the LDR status of treatment residues produced at the site by conducting analytical testing on each batch prior to shipment. CHSI will determine the LDR status of other waste streams produced at the site by applying its knowledge of the waste or by conducting actual TCLP analytical testing prior to shipment. In the case of consolidated waste streams or shipments of waste in original container, CHSI will rely solely on the information provided by the original generator (as verified by the CHSI's waste acceptance procedures) to determine the specific LDR status of the waste.

C. Outgoing Non-Hazardous Treatment Residual

CHSI's CWA wastewater treatment system treats the following hazardous waste streams: D001 (Ignitable-Oxidizer), D002 (Corrosive), D003 (Reactive-Cyanide/Sulfide),D004-D011 (TCLP Toxic Metals),D018-D043 (TCLP Toxic Organic), and lime-stabilized K062 (Corrosive-Toxic for Hexavalent Chromium). The treatment process produces a residue (dewatered sludge). CHSI conducts TCLP analysis for each waste code treated in each batch of treatment residue to determine if the residue is non-hazardous (i.e., that it no longer exhibits any hazardous characteristics). If the treatment residue is determined to be non-hazardous the waste is shipped off-site to a solid waste landfill or to a RCRA

Subtitle C landfill as a non-hazardous solid waste.

Pursuant to 40 CFR 268.9(d) CHSI will, for each shipment of non-hazardous treatment solids to RCRA Subtitle D facilities, submit a one-time notification and certification to US EPA. The notification will include:

1. The name and address of the RCRA Subtitle D facility receiving the waste;

2. A description of the waste as initially generated, including the EPA Waste Code(s) of and the treatability group(s);

3. The treatment standards applicable to the waste at the initial point of generation.

The certification will be signed by an authorized representative of CHSI and will include the language found in 40 CFR 268.7(b) (I).

C-2g(2) LDR Documentation Requirements

Pursuant to 40 CFR 268.7 CHSI is responsible for maintaining copies of the Land Disposal Restrictions (LDR) documentation prepared by the original generator and accompanying each shipment into the facility or as a one-time notification. CHSI is also responsible for preparing and keeping LDR documentation for each load of hazardous waste generated at and shipped from the facility (each shipment or one-time notification). The content and format requirements for the various types of LDR documents are summarized below.

A <u>Incoming Waste Streams</u>

Prior to formal acceptance at the facility, all incoming waste shipments will be checked for compliance with the LDR documentation requirements specified in 40 CFR 268.7 (a). The actual documentation must meet one (or possibly more if the shipment is a mixed waste stream) the following three formats:

1. Generator Notification – Incoming shipment which contains a hazardous waste that does not meet the currently valid treatment standard must be accompanied by a "generator notification" (each shipment or one time) that has been completed and signed by the generator. The notification must includes the following information:

   - EPA Hazardous Waste No (s)
   - Treatability group {i.e., wastewater or nonwastewater)
   - Applicable wastecode subdivisions based on waste specific criteria

- Statement that the waste is subject to the LDRs
- Manifest number of the shipment
- Waste analysis data, where available

For F001-F005, the notification must include the name of the constituent(s)
For F039, the notification must include the F039 constituents must be identified
For D001 High TOC Ignitable Liquids subcategory, UHCs do not need to be identified for organic recovery (RORGS) or combustion technology (CMBST)

When not treated in a CWA or equivalent system or Class 1 SWDA

For D001 (other than High TOC Ignitable Liquids), D002, D003 (explosive, water-reactive or other reactive Subcategory), D004-D011, D012-D017, UHCs must be identified
Lab packs meeting the alternate lab pack treatment Standard under 40 CFR 268.42© do not require UHCs to be identified
Hazardous debris meeting the alternate debris Treatment technologies of 40 CFR 268.45 require CSTT's to be identified and a statement identifying the waste as such

2. Generator Certification – If the generator determines (either through actual testing or applying knowledge of the waste) that the shipment meets the applicable treatment standards, the generator must include a notification which also includes a "generator certification" statement whose wording is identical to 40 CFR 268.7(a)(3)(i).

3. Variances/Exemptions – If the shipment contains restricted wastes which are subject to a case-by-case extension, a no-migration petition, or a nationwide variance, the generator notification must also include the date that the waste becomes subject to the prohibitions.

For the sake of consistency, CHSI has developed standardized forms to be used for all incoming hazardous waste shipments. The forms include Form LDR-1, the "Land Disposal Restriction Notification Form"; and Form LDR-1 Addendum,, the "Land Disposal Restriction Notification Form Addendum". Copies of Forms LDR-1 and LDR-1 Addendum are presented in Appendix C-8.

B. Outgoing Hazardous Waste Streams

CHSI accepts hazardous waste for storage and consolidation prior to subsequent shipment to an offsite TSD for treatment and/or disposal. All outgoing wastes are shipped in their original container, or in consolidated (bulked) form without having undergone any "treatment". Under RCRA CHSI is considered the "generator " of all hazardous wastes shipped from the facility and must comply with the LDR'S generator recordkeeping requirements. CHSI will provide all appropriate LDR documentation (using CHSI Forms LDR-1 and LDR-1 Addendum or other such forms designated by the receiving TSD facility) for each outgoing shipment of restricted hazardous waste with each shipment or as a one-time notification.

For residues from treatment, CHSI will analyze each batch of treatment residue for all constituents of each waste code treated. If the residues meet treatment standards CHSI will provide to the receiving TSD facility a notification which includes a "generator certification" statement whose wording is identical to 40 CFR 268.7(a)(3)(i).

C. Records Retention

CHSI will retain onsite a copy of all notification, certifications, waste analysis data, and other LDR documentation (for both incoming and outgoing shipments) on file as part of the operating record at the facility for at least five years.

C-3 Quality Assurance 702.105

A. General

(i) Program Goal

It is the goal of the Clean Harbors Services, Inc. (CHSI) QA/QC program to insure the collection of accurate and precise analytical data. The success of the treatment processes are dependent upon the quality of the data. In addition only those waste characteristics that the process is permitted to treat. The anytical equipment available at the facility is listed in Appendix C-7

The laboratory follows the guidelines presented by the Environmental Protection Agency "Handbook for Analytical Quality Control in Water and Wastewater Laboratories: EPA SW-846" Test methods for Evaluating Solid Waste "and other EPA approved methods. Implicit in all procedures is the policy to immediately determine the cause of any abnormal result and to not allow data to be used unless the investing person in the QA/QC organization is confident of the validity of the data.

Decanting

"Decanting" refers to the pumping of liquids and sludges between containers (i.e., drums and vehicles), and between containers and the bulk storage/treatment tanks. Decanting is an open container activity which involves the mixing/commingling of compatible waste streams for storage and/or treatment. Decanting is performed using equipment such as the fixed-base drum pumping station inside Building 26, portable pumps, or vehicle-mounted equipment such as vacuum trucks.

Solids Bulking

Hazardous and non-Hazardous solids in drums, bags, or other containers are bulked into a rolloff container or other suitable DOT-approved solids container. Solids bulking is an "open container" activity on which the containers to be bulked are staged adjacent to the reliving container, lifted by manual or mechanical (e.g., fork lift) means, and then dumped into a polyethylene-lined rolloff container or other suitable container.

Pouring Off

"Pouring Off" is an open-container operation in which chemically compatible hazardous wastes form small individual containers (e.g., vials, jars, bottles, etc.) are poured/mixed into a common bulk container such as 16-gallon kiln pack, a 55-gallon drum or a 345-gallon tote tank, or directly into a waste treatment vessel such as the reactors in Process Building 1. Pour-off activities are performed in fixed-base ventilation hoods by personnel wearing full-face respirators. Evaluation data sheets for lab pack pour-off hood ventilation are included in Appendix D-56.

Consolidation

"Consolidation" refers to the sorting and repackaging of individual containers (bottles, jars, etc.) of chemically compatible wastes into a common lab pack container. "Consolidation" is a "closed-container" activity, which does not involve any actual mixing of waste streams. Compatibility is determined through the knowledge of the chemical (e.g., Label Information, MSDS's profile data) and use of standard chemical compatibility charts/references. Consolidation activities are performed under fixed-base or portable ventilation hoods, or by personnel wearing full-face respirators.

which slopes to a containment sump. The floor surface is topped with a minimum 3/16-inch coat of Protecto-Crete 900, a vinylester-based sealant manufactured by Dudick, Inc., or equivalent system (see Appendix D-10, Data Sheet #2). In addition, all construction joints are fitted with chemically resistant water stops.

The metalwashing operation will be utilized to clean shredded metal fragments from the shredding operation and off-site generated metal which can be reclaimed after cleaning.

C. Transportation Unit Staging/Storage

The floor surface of the secondary containment system (pad or vault) in each of the designated transpiration staging/storage areas area farm is constructed of smooth reinforced concrete which slopes to a liquid containment sump. The floor surface in each staging/storage area is topped with a monolithic sealant that is compatible with the waste materials being stored. In addition, all new construction joints are fitted with chemical resistant water stops. Each RCRA regulated vehicle storage area (i.e., Units B, C, Q, V, W, X, 13, 15, 59, 62 and 69) shall be topped with a minimum 3/16-inh coat of Protecto-Coat 900, a vinylester-based sealant manufactured by Dudick Inc., or equivalent system. Technical specifications for the Protecto-Coat system included in Appendix D-10, Data Sheet #2.

Bulk liquid transport vehicles containing potentially incompatible hazardous wastes shall not be managed in a common secondary containment system at any time. CHSI notes that the proposed truck staging area (Unit C) is sub-divided to provide segregated containment within the same vehicle storage Unit. To ensure that bulk liquid transport vehicles containing incompatible materials are not parked/stored in a common containment system, CHSI shall conduct a compatibility test whenever two or more vehicles are intended to be parked/staged together at any one time. Bulk solids transporters shall not be subject to the compatibility test procedures

Transport vehicles containing drum shipments shall not be subject to compatibility testing. However, containers on all vehicles in storage shall at all time comply with USDOT container segregation regulations as described in 49 CFR 177.848.

D-1a (3) (b) Containment System Drainage 703.201 (a) (3), 724.275 (b) (3)

A. Existing Container Storage Areas

1. Drum Storage Area (Unit G1)

As shown in CHCI DWG. 4209, Sheet 1 of 2, the floor of each storage bay within the existing drum Storage Area (Unit G1) inside building 2 slopes 1/8-inch per foot towards a collection trench which runs parallel to the building wall. The collection trench within each bay slopes 1/4-inch per foot in the direction indicated on the drawing. The trench is divided into sections by means of concrete block walls to isolate liquids, which accumulate in the individual storage bays, thus preventing the possible commingling of potentially incompatible materials.

B. Approved/Not Yet Constructed Container Storage Areas

1. Lab Pack Repack & Consolidation Area (Unit U)

As shown in CHCI DWG. No. 4211, all of the floor surfaces within the bays and staging area will be constructed of a minimum 8-inch thick concrete base. The general staging area slopes to a containment sump. The floor surface in the storage bays slope from front to back at the rate shown on the drawing. The containment wall at the front of each storage bay consists of a 2-inch high angle iron (3-inch high in the organic bay). Containers in the storage bays are elevated off the floor surface by means of a 2-inch high fiberglass reinforced plastic grating (3-inch high steel grating in organic bay).

2. Paint and Paint Related Material Processing Area (Unit 42)

Unit 42 has a smooth reinforced-concrete floor with a 6-inch containment curb at the perimeter of the building. The floor is not sloped: spills inside the will be localized and cleaned up immediately upon discovery. The 4'x4' collection hopper will be elevated on a containment pallet six inches high. This will keep the hopper from contact with spilled liquids.

3. Shredder Process Building Area (Unit 24)

Unit 24) has a smooth reinforced-concrete floor with a 6-inch containment curb at the perimeter of the building. The floor is not sloped: spills inside the will be localized and cleaned up immediately upon discovery.

4. Metal Wash Pad Area (Unit 68)

Unit 68 has a smooth reinforced-concrete floor with a 6-inch containment curb at the perimeter of the building. The floor is not sloped: spills inside the will be localized and cleaned up immediately upon discovery.

C. Transportation Staging /Storage Areas

The floor surface of the secondary containment system (pad or vault) in each of the designated transportation staging storage areas area farm is constructed of smooth reinforced concrete which slopes to a liquid containment sump. The rate of slope and direction of liquid flow is noted on the referenced drawing for each unit:

A Existing Areas

1. Truck unloading area & bulking area (Unit Q)
   No. 4210, 1 of 3.
2. Truck Loading Dock (Unit V) – No. 4234
2. Rail Car Unloading Area (Unit 13) – No. 4217, 1 of 3
4. Truck Unloading Platform (Unit 15)- No. 4248
5. Truck Staging Area (Unit 59) – No. 4247
6. Bulk solids Storage Pad (Unit B) – No. 4218
7. Truck Pad (Unit 62) – No. 4246
8. Truck Staging Area (Unit C) – No. 4218

7. Container Handling Dock (Unit 61)

The Container Handling Dock (Unit 61) has walls on 3 sides and a canopy roof structure. The drum staging dock is at an elevation of 17.5 feet, 4 feet higher than the surface of the truck-parking pad.

B. Approved/Not Yet Constructed Container Storage Areas

1. Lab Pack Repack and Consolidation Area (Unit U)

This area is inside a building, which is designed to be built at an elevation of 17.0 feet. The ground area around the building will be sloped away from the building at a minimum slope of one inch per 25 feet. Refer to CHCI DWG. No. 4204 for final topographic contours.

2. Paint and Paint Related Processing Area (Unit 42)

A portion of this area is in Building 42 which has a 6 inch curb with 3 inch ramps at each door. The Westside Pad is surrounded by a 6 inch curb. Ramps are raised to prevent run-on. Refer to CHSI DWG. No. 4287 for elevations.

3. Shredder Process Building Area (Unit 24)

Unit 24 is an enclosed building with a 6 inch containment curb. The building is surrounded by other contained areas (Units 42, 68 and 70) except on the east side, which is 6 inches lower. The conveyor overhangs Unit 70, but a steel pan provides containment for drums in that area. Ramps are raised to prevent run-on. Refer to CHSI DWG. No. 4287 for elevations.

4. Metal Wash Pad (Unit 68)

Unit 68 is surrounded by a 6-inch containment curb with raised ramps to prevent run-on. Refer to CHSI DWG No. 4287 for elevations.

C. Transportation Staging/Storage Areas

Each of the truck staging/storage pads (i.e., Units B, C, Q, V, X, W, 15, 59, 62 and 69) is constructed to prevent run-on. Each is equipped with a minimum 6-inch high concrete berm or apron to prevent run-on. In addition, the approach to each pad is sloped away from the containment structure.

For the railcar storage unit (Unit 13), the side walls of the concrete secondary containment vault are higher than the surrounding grade and slope away from the unit to prevent run-on into the unit. In addition, the containment structure is fully covered with a steel canopy roof. Refer to CHCI DWG. No. 4218 for design details.

Flammable Storage Tank Farm (Unit 16)

4207,	3 of 5	Process Flow, Piping and Instrumentation Diagram – Modified Fuels Blending Operations	1
4207,	4 of 5	Process Flow, Piping and Instrumentation Diagram – Modified Fuels Blending Operations	3
4207,	5 of 5	Process Flow, Piping and Instrumentation Diagram – Tank Farm Operation	1
4215		Modified Ignitable Storage Tank Form Details	F

Flammable Storage Tank Farm (Unit 22)

CHSI 4291	Proposed Tank Farm – Unit 22	A
CHSI 4293	Process Piping Between Unit 22 & Unit 16	B
CHSI 4294	Blended Liquid Storage Tanks T-415 & T-416	A
CHSI 4295	Diluent Waste Storage Tank T-417 –Vessel Lyt.	A
CHSI 4296	Metal Wash Solvent Storage Tank T-418	A
CHSI 4297B	Metal Wash Tank 424 – Vessel Layout	A
CHSI 4298B	Metal Wash Rinse Tank 427 – Vessel Layout	A

Black Clawson		
22375910-1	Assembly, Hydropulpar	3
22375910-2	Assembly, Hydropulpar	3

A description of each existing and approved/not yet constructed tank system is presented below. Detailed process descriptions for these tank operations are provided in Appendix D-1

A. Existing Tank Systems

1. Fuels Blending Operation (Unit 43)

CHSI is authorized to operate a hazardous waste fuels processing system designed by Pegasus Niagara, Inc. under the terms of the November 1993 Part B License, The Pegasus System is to be located in Building 43, the fuels blending operation (Unit 43). This operation includes the dispersion tank and overflow tank which were installed in 1995.

The Pegasus System utilizes a series of mixing tanks, pumps, and shredders/grinders to mix organic-based solids, sludges and liquids to produce a low viscosity liquid hazardous waste fuel that can be burned for energy recovery. Under the approved design, the finished liquid fuel product is pumped to the flammable bulk liquid tank farm (Unit 16) for blending and eventual shipment offsite in bulk liquid highway vehicles or railcars.

Details on the construction, design and operation of the tanks within the Pegasus processing system is provided in the operations manual in Appendix D-11 and in CHCI DWG. No. 4213, Sheet 2 of 3, and Nos. 4235 through 4241.

The container handling dock (Unit 61) is a single containment system unit that primarily intended for the receipt and handling of chemically-compatible organic liquids and solids which are intended for storage in Building 26 (Unit 26) and subsequent processing in the hazardous waste fuel blending system. However, the dock may also be used for the conveyance of containers of acid, alkaline, and PCB waste materials destined for storage in Building 25 (Unit 25). In order to provide proper segregation for potentially incompatible materials that may be managed on the container handling dock at the same time, CHSI shall use specially designed "self-contained" pallets in the event that a waste material, which is incompatible with materials already present on the dock, is encountered. CHSI shall maintain a readily available supply of ENPAC Corporation "Poly-Spillpallet 3000", or equivalent, for container dock handling activities. Manufacturer's literature for the self-contained pallet devices is provided in Appendix D-35.

F-5e **Management of Ignitable or Reactive Wastes in Tank Systems** 703.0202(f), 724.298

A. Ignitable Wastes

Ignitable wastes are managed in the following RCRA-regulated tank storage and treatment areas identified on CHSI DWG. No. 4204, sheets 1 and 2:

Tank Storage Area

16. Tank Farm (DWG. Nos. 4215 ,4250, & 4252)
    - T101 through T107,T109, T110 and T112
    - Ignitable Liquids (i.e., Flash Point less than 140° F)
22. Tank Farm (DWG. Nos. 4294 ,4295, & 4296)
    - T415 through T418
    - Ignitable Liquids (i.e., Flash Point less than 140° F)
Y. Listed Waste Storage Tanks (DWG. Nos. 4213 1/3 & 4216)
    - T208 Through T215
    - D001 Oxidizers (e.g. strong acids, permanganates, peroxides) only; no ignitable liquid with a flash point less than 140° F.

Tank Treatment

16. Tank Farm (DWG. Nos. 4215, 4250, & 4252)
    - Phase Separation
Y Listed Waste Storage Tanks (DWG. Nos. 4213 1/3 & 4216)
    - Phase Separation
    - Commingling of Corrosive Wastes
Z Listed Waste Treatment System (DWG. Nos. 4213 & 4207 2/4)
    - Physical/Chemical Testament

The two general waste handling operations for ignitable wastes in tanks are described below. Equipment and layout details for the various activities are shown in the drawings referenced table.

Table G-1: List of Emergency Coordinators

Coordinator/ Alternate	Address and Telephone Number

1. Primary Emergency Coordinator

Ron Casaday, Operations Manager
Clean Harbors Services, Inc.
11800 S. Stony Island Avenue, Chicago, IL 60617
(773) 646-6202

Home Address: 211 S. Wisconsin
Hobart, IN 46342
(219) 942-3012

24- hr emergency cell phone: 1-773-842-7964

2. First Alternate

Jeff Demeuse, Operations Manager
Clean Harbors Services, Inc.
11800 S. Stony Island Avenue, Chicago, IL 60617
(773) 646-6202

Home Address: 9639 Arthur Street
Crown Point, IN 46407
(219) 226-9722

24-hr emergency cell phone: 1-773-406-2962

3. Second Alternate

James Laubsted, Compliance Manager
Clean Harbors Services, Inc.
11800 S. Stony Island Avenue, Chicago, IL 60617
(773) 646-6202

Home Address: 424 Prairie Knoll Drive
Naperville, IL 60565
(630) 416-1931

24-hr emergency beeper: 1-800-884-4914 (Pin #222-0315)

Clerical	1.0
Secretary/Bookkeeper – Plant	1.0
Office Administrator	1.0

The Employee Group Number assigned by the Corporate Training Manager to the various job titles identifies the particular training curriculum for each job position at the facility. The program is designed to achieve an overall level of training, which meets the particular needs of each job position at the facility. The various training programs are described in Section H-1b below. Detailed job descriptions for each job title are included in Appendix H-1.

H-1b Training Content, Frequency, and Techniques 724.116 (c) and (d) (3)

The content of the CHSI's Training Program is listed in Table H-1. As discussed in Section H-1a above, employees receive varying level of training based on their job title, job description, and Employee Group Number. Administrative and other support personnel assigned to Employee Group Number 1.0 (i.e., those individuals who are not directly involved in hazardous waste handling activities) receive a reduced level of training which includes Company Orientation, Right-to-Know/ Hazard Communication, Contingency/SPCC Plan, and Nature and Properties of Hazardous Waste. All other employees at CHSI are assigned to Employee Group Number 3.1 or 3.2 and receive instruction on the training topics listed in Table H-1. Additionally, employees assigned to Employee Group Number 3.1 or 3.2 receive separate training for the initial (24-hour) and annual refresher (8-hour) requirements of 29 CFR 1910.120. A summary of the training topics relevant to each Employee Group Number is presented in Table H-2.

Training is accomplished through a combination of classroom instruction, on-the-job training, mock exercises, or other training techniques appropriate for each topic.

H-1c Training Director 724.116 (a) (2)

David Anderson directs the Clean Harbors Corporate Training Program. Mr. Anderson has four years of experience in hazardous waste facility management operations/compliance and commercial environmental training. The Professional resumes for Mr. Anderson is presented in Appendix H-2.

H-1d Relevance of Training to Job Position 724.116 (a) (2)

Each new employee that is involved in hazardous waste management activities is required to attend the pre-employment Introductory Training program. New employees also receive Facility-Specific training, which is tailored to meet their specific job duties and responsibilities. No employee may work without supervision without having completed the Introductory Training program. All employees must complete the Facility-Specific Training program within six months of hire.

Continuing Training in the form of an annual review session will be mandatory for all facility personnel. The annual review will focus on the topics covered as part of the employee's introductory training. Other training in the form of weekly or monthly safety meetings and compliance updates will be conducted on an as-needed basis at the discretion of the General Manager, the Facility Compliance Manager and the Corporate Training Manager. The purpose of the periodic training sessions will be to review and reinforce previous training topics, and to instruct employees on new techniques, procedures, regulations or other relevant topics.

In addition, optional Continuing Training sessions on topics such as cardiopulmonary resuscitation (CPR) will be given periodically on an as-needed basis at the discretion of the General Manager, The Facility compliance Manager and the Corporate Training Manager. Instructors may be drawn from in-house expertise or a qualified outside contractor, such as a certified CPR instructor. Training may use classroom, on-the-job, drills and/or other techniques as appropriate for the particular training topic. Courses may be conducted either on-site or off-site.

H-1e Training for Emergency Response 724.116 (a) (3)

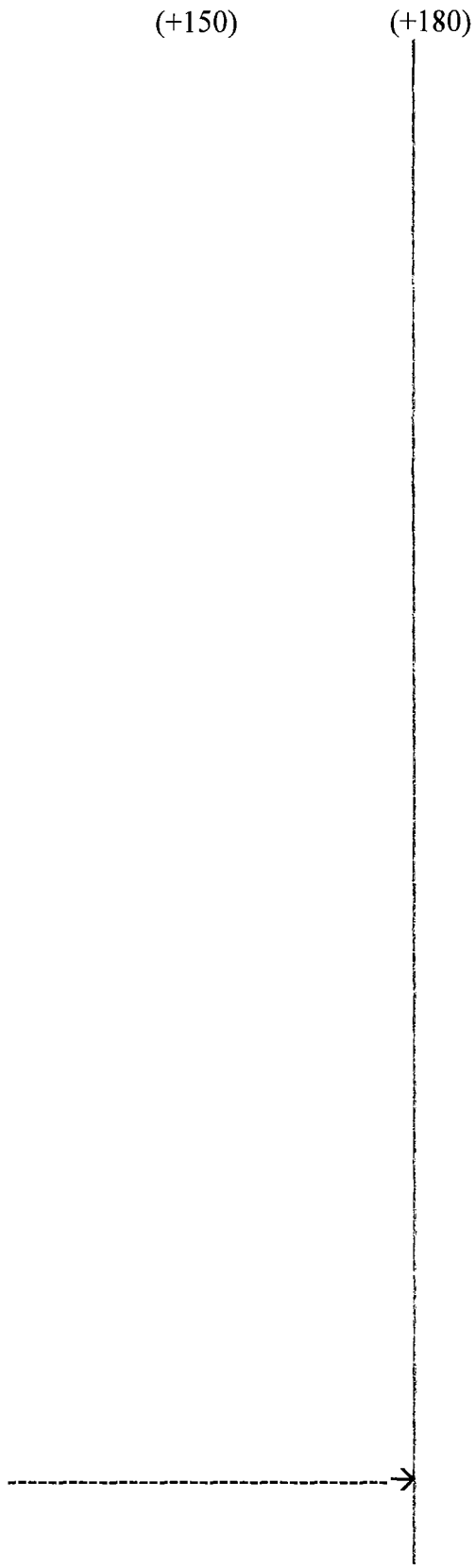
In an effort to ensure that facility personnel are able to respond effectively to emergencies at the facility, CHSI has structured the Introductory Training Program to include a detailed review of the facility's Contingency Plan and Spill Prevention, Control and Countermeasure (SPCC) Plan. Contingency Plan and SPCC Plan training is required of all facility employees regardless of Employee Group Number. Refer to Item B.2 of Table H-1 for a complete listing of the topics discussed as part of the emergency response training session.

Program	Content
B. Facility-Specific Training:	
1.	CHSI Licenses, Permits and Approvals
2.	Contingency and SPCC Plan Training - Use of communication and alarm systems - Emergency coordinators - Notification requirements - Response procedures in the event of injury, fire, explosion and/or spills - Response to potential groundwater and/or surface water contamination incidents - Shutdown of operations - Location and use of emergency and monitoring equipment - Automatic and manual waste feed shutdown systems - Evacuation and decontamination procedures - Procedures to coordinate with local officials to effectively evacuate local areas
3.	Properties and Nature of Hazardous Waste - Properties and hazards of hazardous waste
4.	Waste Analysis Plan - Sampling Methods - Acceptance Criteria
5.	Inspection Plan - Procedures for using, inspection, repairing and replacing facility emergency and monitoring equipment -
6.	Standard Operating Procedures - Tanker loading/unloading procedures - Transfer pump operation and shutdown - Use of hazardous waste storage and transfer equipment - Container handling procedures - Waste treatment system operations - Sampling and receiving procedures

(Continued)

Table I-2: Closure Timeline

Day	(-45)	(-30)	(-15)	0	(+15)	(+30)	(+45)	(+60)	(+75)	(+90)	(+105)	(+120
Closure Activity												
Notify IEPA of Closure	X											
Notify Generators of Last Date For Waste Acceptance		X	→									
Discontinue Waste Acceptance				X								
Container Storage Closure												
- Building 2				X	→	→	→	→	→	→		
- Out Door Storage				X	→	→	→	→	→	→		
- Building 25				X	→	→	→	→	→	→		
- Building 26				X	→	→	→	→	→	→		
- Container Dock				X	→	→	→	→	→	→		
Lab Pack Area				X	→	→	→	→	→	→		
Fuel Blending												
- Process Building				X	→	→	→	→	→	→		
- Tank Farm/Unloading Pad				X	→	→	→	→	→	→		
Shredding												
- Process Building				X	→	→	→	→	→	→		
- Tank Farm/Unloading Pad				X	→	→	→	→	→	→		
- Metalwash Area				X	→	→	→	→	→	→		
Drum Crushing				X	→	→	→	→	→	→		
Listed Waste												
- Tank Farm				X	→	→	→	→	→	→		
- Process Building				X	→	→	→	→	→	→		
Bulk Solids				X	→	→	→	→	→	→		
Transportation Staging/Storage				X	→	→	→	→	→	→		
- Unit Q				X	→	→	→	→	→	→		
- Unit V				X	→	→	→	→	→	→		
- Unit C				X	→	→	→	→	→	→		
- Unit 59				X	→	→	→	→	→	→		
- Unit 15				X	→	→	→	→	→	→		
- Unit 62				X	→	→	→	→	→	→		
- Unit 13				X	→	→	→	→	→	→		
- Unit B				X	→	→	→	→	→	→		
- Unit W				X	→	→	→	→	→	→		
- Unit 69				X	→	→	→	→	→	→		
Final Closure Inspection And Certification				X	—	—	—	—	—	—	—	—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BB.4.2.4 Monthly Monitoring For Leaks

All gear pumps and centrifugal pumps affected by this plan shall be monitored monthly by methods specified in Appendix C.

All diaphragm pumps shall be designated as being in "No Detectable Emissions Service" because there are no penetrations of the pump housing. These pumps shall be visually inspected weekly for indications of leakage, and monitored with an instrument at least once per year to demonstrate compliance with the emissions standards. If indications of leakage are discovered during the visual inspection, the diaphragm pumps shall be monitored with an instrument within 5 days of the discovery of the potential leak. Confirmed leaks shall be repaired within 15 calendar days.

A list of all affected pumps and the methods for compliance can be found in Appendix A.

BB.4.2.1 Visual Inspection of Pump Seals

The pumps shall also be inspected visually once per week for indications of liquids dripping from the pump seal.

BB.4.2.4.1 Leak Detection and Identification

A leak is detected if: 1) the leak detection instrument reads 500 ppm or greater above background (diaphragm pumps) or 10,000 ppm or greater above background (gear pumps and centrifugal pumps); or 2) there are indications of liquid dripping form the pump seal.

BB.4.3 Leak Repair as soon as Practicable

If a leak has been detected in a piece of equipment that is affected by this plan, the first attempt at repair shall occur within 5 calendar days of the detection of a leak and shall be completed within 15 calendar days unless a standard for Delay of Repair is met (See Table 5.2).

APPENDIX A
List of Subpart BB Regulated Equipment
Clean Harbors of Chicago, Inc.
as of 15-Jun-1995

PUMPS

Fuel Dispersion system

Tag No.	Equip. ID Designation	Type of Equipment	Svc Method of Compliance
	1. P-167 Return Pump	Air Op. Dbl Diaphragm	LL No Detectable emissions, Monitor Annually
02-05	Reserved for Future Use		

Tank Farm

Tag No.	Equip. ID Designation	Type of Equipment	Svc Method of Compliance
	6. P-162 TK-112 Rcv Pump	Cent. w/DS &BF	LL Inspect Weekly, sensor Daily, Alarm Monthly
	7. P-176 Port Xfer Pump	Air Op. Dbl Diaphragm	LL No Detectable emissions, Monitor Annually
	8. P-178 TK-112 Rcv Pump	Cent. w/DS &BF	LL Inspect Weekly, sensor Daily, Alarm Monthly
	9. P-181 TK-112 Rcv Pump	Cent. w/DS &BF	LL Inspect Weekly, sensor Daily, Alarm Monthly
	10. P-184 TK-112 Rcv Pump	Cent. w/DS &BF	LL Inspect Weekly, sensor Daily, Alarm Monthly
11-20	Reserved for Future Use		

Tank Manifolds

Tag No.	Equip. ID Designation	Type of Equipment	Svc Method of Compliance
	20 P-160A Rcv Pump	Dbl Diaphragm	LL No Detectable emissions, Monitor Annually
	21 P-160B Rcv Pump	Cent. w/DS &BF	LL Inspect Weekly, sensor Daily, Alarm Monthly
	22 P-163A Recirc Pump	Dbl Diaphragm	LL No Detectable emissions, Monitor Annually
	23 P-163B Recirc Pump	Cent. w/DS &BF	LL Inspect Weekly, sensor Daily, Alarm Monthly
	24 P-173A Booster Pump	Cent. w/DS &BF	LL Inspect Weekly, sensor Daily, Alarm Monthly
	25 P-173B Booster Pump	Closed Loop Seal	LL Inspect Weekly, sensor Daily, Alarm Monthly
0025-0050	Reserved for Future Use		

Valves

Tank 103

Tag No.	Equip. ID Designation	Type of Equipment	Svc Method of Compliance
51	V-401 Outlet	Manual Ball Valve	LL Inspection Weekly, Monitor Monthly
52	V-402 Outlet	Manual Ball Valve	LL Inspection Weekly, Monitor Monthly
53	V-403 Outlet	Manual Ball Valve	LL Inspection Weekly, Monitor Monthly
54	V-404 Inlet	Check Valve	LL Inspection Weekly, Monitor Monthly
55	V-405 Inlet	Manual Ball Valve	LL Inspection Weekly, Monitor Monthly
56	V-406 Sample Port	Manual Ball Valve	LL Open Ended Valve, Cover with Cap
57	V-407 Sample Port	Manual Ball Valve	LL Open Ended Valve, Cover with Cap
58	V-408 Flame Arrester		GV Inspect and Monitor Every 6 Months
59	V-409 Conservation Vent		GV Inspect and Monitor Every 6 Months
60	V-410 Emergency Vent		GV No Detectable Emissions, Monitor Annually
61	V-411 N2 Inlet	Manual Ball Valve	N/A Exempt, In Nitrogen Service Only
62	V-412 N2 Inlet	Air Actuated Valve	N/A Exempt, In Nitrogen Service Only
63	V-413 N2 Inlet	Self Pressure Reg Valve	N/A Exempt, In Nitrogen Service Only
64	V-414 N2 Inlet	Manual Ball Valve	N/A Exempt, In Nitrogen Service Only
65	V-415 Drain Valve	Manual Ball Valve	LL Open Ended Valve, Cover withV-412

66	V-416	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
67	V-417	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak

Tank 104

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
68	V-418	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
69	V-419	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
70	V-420	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
71	V-421	Inlet	Check Valve	LL	Inspect Weekly, Monitor Monthly
72	V-422	Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
73	V-423	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
74	V-424	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
75	V-425	Flame Arrester		GV	Inspect and Monitor Every 6 Months
76	V-426	Conservation Vent		GV	Inspect and Monitor Every 6 Months
77	V-427	Emergency Vent		GV	No Detectable Emissions, Monitor Annually
78	V-428	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
79	V-429	N2 Inlet	Air Actuated Valve	N/A	Exempt, In Nitrogen Service Only
80	V-430	N2 Inlet	Self Pressure Reg Valve	N/A	Exempt, In Nitrogen Service Only
81	V-431	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
82	V-432	Drain Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
83	V-433	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
84	V-434	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak

Tank 105

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
85	V-435	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
86	V-436	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
87	V-437	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
88	V-438	Inlet	Check Valve	LL	Inspect Weekly, Monitor Monthly
89	V-439	Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
90	V-440	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
91	V-441	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
92	V-442	Flame Arrester		GV	Inspect and Monitor Every 6 Months
93	V-443	Conservation Vent		GV	Inspect and Monitor Every 6 Months
94	V-444	Emergency Vent		GV	No Detectable Emissions, Monitor Annually
95	V-445	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
96	V-446	N2 Inlet	Air Actuated Valve	N/A	Exempt, In Nitrogen Service Only
97	V-447	N2 Inlet	Self Pressure Reg Valve	N/A	Exempt, In Nitrogen Service Only
98	V-448	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
99	V-449	Drain Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
100	V-450	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
101	V-451	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak

Tank 106

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
102	V-452	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
103	V-453	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
104	V-454	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
105	V-455	Inlet	Check Valve	LL	Inspect Weekly, Monitor Monthly
106	V-456	Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
107	V-457	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
108	V-458	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
109	V-459	Flame Arrester		GV	Inspect and Monitor Every 6 Months
110	V-460	Conservation Vent		GV	Inspect and Monitor Every 6 Months
111	V-461	Emergency Vent		GV	No Detectable Emissions, Monitor Annually
112	V-462	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only

113	V-463	N2 Inlet	Air Actuated Valve	N/A	Exempt, In Nitrogen Service Only
114	V-464	N2 Inlet	Self Pressure Reg Valve	N/A	Exempt, In Nitrogen Service Only
115	V-465	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
116	V-466	Drain Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
117	V-467	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
118	V-468	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak

Tank 109

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
119	V-469	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
120	V-470	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
121	V-471	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
122	V-472	Inlet	Check Valve	LL	Inspect Weekly, Monitor Monthly
123	V-473	Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
124	V-474	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
125	V-475	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
126	V-476	Flame Arrester		GV	Inspect and Monitor Every 6 Months
127	V-477	Conservation Vent		GV	Inspect and Monitor Every 6 Months
128	V-478	Emergency Vent		GV	No Detectable Emissions, Monitor Annually
129	V-479	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
130	V-480	N2 Inlet	Air Actuated Valve	N/A	Exempt, In Nitrogen Service Only
131	V-481	N2 Inlet	Self Pressure Reg Valve	N/A	Exempt, In Nitrogen Service Only
132	V-482	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
133	V-483	Drain Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
134	V-484	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
135	V-485	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak

Tank Drain Manifold

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
	Tank 103				
136	V-486	Recycle to Fill	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
137	V-487	Pump Off to Truck	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
138	V-488	Blend Feed	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
139	V-489	Tank Drain	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
140	V-490	Drain Line Bleed	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
	Tank 104				
141	V-491	Recycle to Fill	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
142	V-492	Pump Off to Truck	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
143	V-493	Blend Feed	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
144	V-494	Tank Drain	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
145	V-495	Drain Line Bleed	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
	Tank 105				
146	V-496	Recycle to Fill	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
147	V-497	Pump Off to Truck	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
148	V-498	Blend Feed	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
149	V-499	Tank Drain	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
150	V-500	Drain Line Bleed	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
	Tank 106				
151	V-501	Recycle to Fill	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
152	V-502	Pump Off to Truck	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
153	V-503	Blend Feed	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
154	V-504	Tank Drain	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
155	V-505	Drain Line Bleed	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
	Tank 109				
156	V-506	Recycle to Fill	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
157	V-507	Pump Off to Truck	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly

158	V-508	Blend Feed	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
159	V-509	Tank Drain	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
160	V-510	Drain Line Bleed	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
161	V-511	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
162	V-512	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
163	V-513	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
Tank 103					
164	V-514	Blend Return	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
165	V-515	Drum Consolidation	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
166	V-516	Truck to Tank Fill	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
167	V-517	Alternate Fill	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
168	V-518	Line Bleed	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
Tank 104					
169	V-519	Blend Return	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
170	V-520	Drum Consolidation	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
171	V-521	Truck to Tank Fill	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
172	V-522	Alternate Fill	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
173	V-523	Line Bleed	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
Tank 105					
174	V-524	Blend Return	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
175	V-525	Drum Consolidation	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
176	V-526	Truck to Tank Fill	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
177	V-527	Alternate Fill	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
178	V-528	Line Bleed	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
Tank 106					
179	V-529	Blend Return	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
180	V-530	Drum Consolidation	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
181	V-531	Truck to Tank Fill	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
182	V-532	Alternate Fill	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
183	V-533	Line Bleed	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
Tank 109					
184	V-534	Blend Return	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
185	V-535	Drum Consolidation	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
186	V-536	Truck to Tank Fill	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
187	V-537	Alternate Fill	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
188	V-538	Line Bleed	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
189	V-539	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
190	V-540	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
191	V-541	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
192	V-542	Check Valve		LL	No Detectable Emissions, Monitor Annually
193	V-543	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
194	V-544	Air Actuated Valve		LL	Inspect Weekly, Monitor Monthly
195	V-545	Check Valve		LL	No Detectable Emissions, Monitor Annually
From Truck/Rail Car					
196	V-546	ST-174 Inlet	MBV w/ Indicator	LL	Inspect Weekly, Monitor Monthly
197	V-547	ST-174 Outlet	MBV w/ Indicator	LL	Inspect Weekly, Monitor Monthly
198	V-548		Check Valve	LL	No Detectable Emissions, Monitor Annually
199	V-549		Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
200	V-550	Aux Input	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
201	V-551	Pump 160B Inlet	MBV w/ Indicator	LL	Inspect Weekly, Monitor Monthly
202	V-552	Pump 160A Inlet	MBV w/ Indicator	LL	Inspect Weekly, Monitor Monthly
203	V-553	Air Supply Line	Manual Ball Valve	N/A	Not Required
204	V-554	Air Supply Regulator	Solenoid Valve	N/A	Not Required
205	V-555	Pressure Relief		LL	No Detectable Emissions, Monitor Annually
206	V-556	Pump 160B Outlet	MBV w/ Indicator	LL	Inspect Weekly, Monitor Monthly

207	V-557	Pump 160A Outlet	MBV w/ Indicator	LL	Inspect Weekly, Monitor Monthly
208	V-558	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
	Rail Car & Truck Fill				
209	V-559	Pump 173B Inlet	MBV w/ Indicator	LL	Inspect Weekly, Monitor Monthly
210	V-560	Pump 173B Outlet	MBV w/ Indicator	LL	Inspect Weekly, Monitor Monthly
211	V-561	Pump 173A Inlet	MBV w/ Indicator	LL	Inspect Weekly, Monitor Monthly
212	V-562	Pump 173A Outlet	MBV w/Indicator	LL	Inspect Weekly, Monitor Monthly
213	V-563	Pump 173B Bypass	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
214	V-564	Pump 173A Bypass	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
215	V-565	Car & Truck Fill	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
216	V-566	Return to Tank	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
217	V-567	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
	Fuels Blending Feed				
218	V-568	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
219	V-569	Pump 163B Inlet	MBV w/ Indicator	LL	Inspect Weekly, Monitor Monthly
220	V-570	Pump 163A Inlet	MBV w/ Indicator	LL	Inspect Weekly, Monitor Monthly
221	V-571	Air Supply Line	Manual Ball Valve	N/A	Not Required
222	V-572	Air Supply Regulator	Solenoid Valve	N/A	Not Required
223	V-573	Pressure Relief		LL	Inspect Weekly, Monitor Monthly
224	V-574	Pump 163A Outlet	MBV w/ Indicator	LL	Inspect Weekly, Monitor Monthly
225	V-575	Pump 163B Outlet	MBV w/ Indicator	LL	Open Ended Valve, Cover with Cap
226	V-576	Rupture Disk		LL	Inspect Weekly, Monitor Monthly

Tank 101

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
227	V-577	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
228	V-578	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
229	V-579	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
230	V-580	Inlet	Check Valve	LL	Inspect Weekly, Monitor Monthly
231	V-581	Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
232	V-582	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
233	V-583	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
234	V-584	Flame Arrester		GV	Inspect and Monitor Every 6 Months
235	V-585	Conservation Vent		GV	Inspect and Monitor Every 6 Months
236	V-586	Emergency Vent		GV	No Detectable Emissions, Monitor Annually
237	V-587	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
238	V-588	N2 Inlet	Air Actuated Valve	N/A	Exempt, In Nitrogen Service Only
239	V-589	N2 Inlet	Self Pressure Reg Valve	N/A	Exempt, In Nitrogen Service Only
240	V-590	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
241	V-591	Drain Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
242	V-592	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
243	V-593	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak

Tank 107

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
244	V-594	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
245	V-595	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
246	V-596	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
247	V-597	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
248	V-598	Inlet	Check Valve	LL	No Detectable Emissions, Monitor Annually
249	V-599	Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
250	V-600	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
251	V-601	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
252	V-602	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
253	V-603	Flame Arrester		GV	Inspect and Monitor Every 6 Months

254	V-604	Conservation Vent		GV	Inspect and Monitor Every 6 Months
255	V-605	Emergency Vent		GV	No Detectable Emissions, Monitor Annually
256	V-606	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
257	V-607	N2 Inlet	Air Actuated Valve	N/A	Exempt, In Nitrogen Service Only
258	V-608	N2 Inlet	Self Pressure Reg Valve	N/A	Exempt, In Nitrogen Service Only
259	V-609	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
260	V-610	Drain Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
261	V-611	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
262	V-612	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak

TK-101 & TK-107 Pump Pad

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
263	V-613	TK-101 Drain	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
264	V-614	Drain Bleed Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
265	V-615	TK-107 Drain	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
266	V-616	Drain Bleed Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
267	V-617	TK-107 Recycle Valve	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
268	V-618	TK-101 Recycle Valve	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
269	V-619	ST-179 Inlet Valve	MBV w/ Indicator	LL	Inspect Weekly, Monitor Monthly
270	V-620	ST-179 Outlet Valve	MBV w/Indicator	LL	Inspect Weekly, Monitor Monthly
271	V-621	Check Valve		LL	Inspect Weekly, Monitor Monthly
272	V-622	Pump 178 Inlet Valve	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
273	V-623	Pump 176 Inlet	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
274	V-624	Pump 178 Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
275	V-625	Pump 176 Outlet	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
276	V-626	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
277	V-627	Return to Truck	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
278	V-628	TK-101 Feed	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
279	V-629	TK-107 Feed	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
280	V-630	Air Supply Line	Manual Ball Valve	N/A	Not Required
281	V-631	Air Supply Regulator	Solenoid Valve	N/A	Not Required

Tank 112

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
282	V-632	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
283	V-633	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
284	V-634	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
285	V-635	Inlet	Check Valve	LL	Inspect Weekly, Monitor Monthly
286	V-636	Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
287	V-637	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
288	V-638	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
289	V-639	Flame Arrester		GV	Inspect and Monitor Every 6 Months
290	V-640	Conservation Vent		GV	Inspect and Monitor Every 6 Months
291	V-641	Emergency Vent		GV	No Detectable Emissions, Monitor Annually
292	V-642	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
293	V-643	N2 Inlet	Air Actuated Valve	N/A	Exempt, In Nitrogen Service Only
294	V-644	N2 Inlet	Self Pressure Reg Valve	N/A	Exempt, In Nitrogen Service Only
295	V-645	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
296	V-646	Drain Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
297	V-647	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
298	V-648	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
299	V-649	TK-112 Drain	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
300	V-650	Drain Bleed Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap

TK-112 Pump Pad

301	V-651	TK-112 Recycle Valve	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
302	V-652	ST-175 Inlet Valve	MBV w/ Indicator	LL	Open Ended Valve, Cover with Cap

303	V-653	ST-175 Outlet Valve	MBV w/Indicator	LL	Inspect Weekly, Monitor Monthly
304	V-654	Check Valve		LL	No Detectable Emissions, Monitor Annually
305	V-655	Pump 176 Inlet Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
306	V-656	Pump 162 Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
307	V-657	Pump 162 Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
308	V-658	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
309	V-659	Pump 176 Outlet	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
310	V-660	Return to Truck	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
311	V-661	TK-112 Feed	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
312	V-662	Air Supply Line	Manual Ball Valve	N/A	Not Required
313	V-663	Air Supply Regulator	Solenoid Valve	N/A	Not Required

Tank 102

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
314	V-664	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
315	V-665	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
316	V-666	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
317	V-667	Inlet	Check Valve	LL	No Detectable Emissions, Monitor Annually
318	V-668	Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
319	V-669	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
320	V-670	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
321	V-671	Flame Arrester		GV	Inspect and Monitor Every 6 Months
322	V-672	Conservation Vent		GV	Inspect and Monitor Every 6 Months
323	V-673	Emergency Vent		GV	No Detectable Emissions, Monitor Annually
324	V-674	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
325	V-675	N2 Inlet	Air Actuated Valve	N/A	Exempt, In Nitrogen Service Only
326	V-676	N2 Inlet	Self Pressure Reg Valve	N/A	Exempt, In Nitrogen Service Only
327	V-677	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
328	V-678	Drain Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
329	V-679	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
330	V-680	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
331	V-681	TK-102 Drain	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
332	V-682	Drain Bleed Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
	TK-102 Pump Pad				
333	V-683	TK-102 Recycle Valve	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
334	V-684	ST-182 Inlet Valve	MBV w/ Indicator	LL	Open Ended Valve, Cover with Cap
335	V-685	ST-182 Outlet Valve	MBV w/Indicator	LL	Inspect Weekly, Monitor Monthly
336	V-686	Check Valve		LL	No Detectable Emissions, Monitor Annually
337	V-687	Pump 176 Inlet Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
338	V-688	Pump 181 Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
339	V-689	Pump 181 Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
340	V-690	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
341	V-691	Pump 176 Outlet	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
342	V-692	Return to Truck	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
343	V-693	TK-102 Feed	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
344	V-694	Air Supply Line	Manual Ball Valve	N/A	Not Required
345	V-695	Air Supply Regulator	Solenoid Valve	N/A	Not Required

Tank 110

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
346	V-696	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
347	V-697	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
348	V-698	Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
349	V-699	Inlet	Check Valve	LL	No Detectable Emissions, Monitor Annually
350	V-700	Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
351	V-701	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap

352	V-702	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
353	V-703	Flame Arrester		GV	Inspect and Monitor Every 6 Months
354	V-704	Conservation Vent		GV	Inspect and Monitor Every 6 Months
355	V-705	Emergency Vent		GV	No Detectable Emissions, Monitor Annually
356	V-706	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
357	V-707	N2 Inlet	Air Actuated Valve	N/A	Exempt, In Nitrogen Service Only
358	V-708	N2 Inlet	Self Pressure Reg Valve	N/A	Exempt, In Nitrogen Service Only
359	V-709	N2 Inlet	Manual Ball Valve	N/A	Exempt, In Nitrogen Service Only
360	V-710	Drain Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
361	V-711	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
362	V-712	Rupture Disk		LL	Inspect Weekly, Monitor if Evidence of Leak
363	V-713	TK-110 Drain	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
364	V-714	Drain Bleed Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap

TK-110 Pump Pad

365	V-715	TK-110 Recycle Valve	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
366	V-716	ST-185 Inlet Valve	MBV w/ Indicator	LL	Open Ended Valve, Cover with Cap
367	V-717	ST-185 Outlet Valve	MBV w/Indicator	LL	Inspect Weekly, Monitor Monthly
368	V-718	Check Valve		LL	No Detectable Emissions, Monitor Annually
369	V-719	Pump 176 Inlet Valve	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
370	V-720	Pump 184 Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
371	V-721	Pump 184 Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
372	V-722	Sample Port	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
373	V-723	Pump 176 Outlet	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
374	V-724	Return to Truck	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
375	V-725	TK-110 Feed	Air Actuated Valve	LL	Inspect Weekly, Monitor Monthly
376	V-726	Air Supply Line	Manual Ball Valve	N/A	Not Required
377	V-727	Air Supply Regulator	Solenoid Valve	N/A	Not Required

Mist Eliminator and Dual Carbon Bed Scrubber

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
378	V-728	From Rail Cars	Manual Ball Valve	GV	Open Ended Valve, Cover with Cap
379	V-729	Flame Arrester		GV	Inspect Weekly, Monitor if Evidence of Leak
380	V-730	From Rail Cars	Manual Ball Valve	GV	Open Ended Valve, Cover with Cap
381	V-731	Flame Arrester		GV	Inspect Weekly, Monitor if Evidence of Leak
382	V-732	From Rail Cars	Manual Ball Valve	GV	Open Ended Valve, Cover with Cap
383	V-733	Flame Arrester		GV	Inspect Weekly, Monitor if Evidence of Leak
384	V-734	From Rail Cars	Manual Ball Valve	GV	Open Ended Valve, Cover with Cap
385	V-735	Flame Arrester		GV	Inspect Weekly, Monitor if Evidence of Leak
386	V-736	Check Valve		GV	No Detectable Emissions, Monitor Annually
387	V-737	Check Valve		GV	No Detectable Emissions, Monitor Annually
388	V-738	Mist Elim Drain	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap
389	V-739	Mist Elim Drain	Manual Ball Valve	LL	Open Ended Valve, Cover with Cap

Fuels Blending System

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
390	V-740	Disp Tank Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
391	V-741	Disp Tank Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
392	V-742	Ovfl Tank Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
393	V-743	Disp Tank Solids Out	Knife Valve	LL	Inspect Weekly, Monitor Monthly
394	V-744	Disp Tank Recycle	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
395	V-745	Disp Prcs Valve	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
396	V-746	Disp Prcs Valve	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
397	V-747	Pump 167 Inlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly
398	V-748	Check Valve		LL	No Detectable Emissions, Monitor Annually
399	V-749	Pump 167 Outlet	Manual Ball Valve	LL	Inspect Weekly, Monitor Monthly

0400-0500 Reserved for Future Use

FLANGES

Fuels Blending System

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
0501-0600	Reserved for Flanges, Fuels Blending System			LL	Inspect Weekly, Monitor if Evidence of Leak

Tank Farm & Tank Manifold

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
0601-1000	Reserved for Flanges, Tank Farm & Manifold			LL	Inspect Weekly, Monitor if Evidence of Leak

OPEN ENDED LINES

Fuels Blending System

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
1001-1025	Reserved for Open Ended Lines, Blending System			LL	Close with Cap

Tank Farm & Tank Manifold

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
	1026OEL-1	TK-101 & 107 Discharge Line		LL	Close with Cap
	1027OEL-2	TK-102 Disharge Line		LL	Close with Cap
	1028OEL-3	TK-110 Disharge Line		LL	Close with Cap
	1029OEL-4	TK-112 Disharge Line		LL	Close with Cap
1030-1050	Reserved for Open Ended Lines, Tank Farm and Manifold				

OTHER EQUIPMENT

Fuels Blending System

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
1051-1075	Reserved for Other Regulated Equipment, Fuels Blending				

Tank Farm & Tank Manifold

Tag No.	Equip. ID	Designation	Type of Equipment	Svc	Method of Compliance
1076	ST-174	Trnsfr Pump Strainer		LL	Inspect Weekly, Monitor if Evidence of Leak
1077	ST-175	Trnsfr Pump Strainer		LL	Inspect Weekly, Monitor if Evidence of Leak
1078	ST-179	Trnsfr Pump Strainer		LL	Inspect Weekly, Monitor if Evidence of Leak
1079	ST-182	Trnsfr Pump Strainer		LL	Inspect Weekly, Monitor if Evidence of Leak
1080	ST-185	Trnsfr Pump Strainer		LL	Inspect Weekly, Monitor if Evidence of Leak

1081 – 1150 Reserved for Future Use

Key to Equipment Identification

MBV: Manual Ball Valve
DS: Dual Mechanical Seal
BF: Barrier Seal Fluid

Key to Type of Service

GV: Gas Vapor
LL: Light Liquid

See drawings in Appendix H for approximate locations within the facility
All Hazardous Waste Streams are assumed to be greater than 10% organics by weight.
The Hazardous Waste State at each piece of equipment is indicated by the type of service.
All liquid service is assumed to be Light Liquid.

CleanHarbors®
SERVICES, INC.
11800 SOUTH STONY ISLAND AVENUE • CHICAGO, IL 60617
(773) 646-6202 • FAX (773) 646-6381
Visit our Website at www.cleanharbors.com

January 31, 2001

Mr. Mark A. Schollenberger, P.E.
Illinois Environmental Protection Agency
Bureau of Land – Permit Section
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Dear Mr. Schollenberger:

Clean Harbors Services, Inc. (CHSI) is submitting a Construction Certification Report for the Building 25 Truck Loading/Unloading Pad. I am enclosing three copies. An additional copy is being sent to the Field Operations Office in Des Plaines, IL. Construction certification of Building 25 will be sent after its completion.

If you have any questions or require additional information, please contact me at (773) 646-6202, x233.

Sincerely,

James R. Laubsted
Facility Compliance Manager

CONSTRUCTION CERTIFICATION

This statement is to be completed by both the responsible officer and the registered professional engineer upon completion of construction in accordance with 35 IAC Section 702.126. Submit one copy of the certification with original signatures and two additional copies (four additional copies for UIC wells). Forward these certification statements and any information required by the permit to the following address:

Illinois Environmental Protection Agency
Bureau of Land - #33
Permit Section
1021 North Grand Avenue East
Post Office Box 19276
Springfield, Illinois 62794-9276

FACILITY NAME: Clean Harbors Services, Inc.

IEPA SITE CODE: 0 3 1 6 0 0 0 0 5 1

U.S. EPA ID NO.: IL D 0 0 0 6 0 8 4 7 1

PART B PERMIT LOG #/UIC PERMIT #: 16

PERMIT (OR MODIFICATION) ISSUANCE DATE: September 12, 2000

PERMIT CONDITION NO. REQUIRING CERTIFICATION: Section I, K.1

The Truck Loading/Unloading Pad- Unit 25 has been constructed in accordance with the specifications in the Part B/UIC Permit. Documentation that the construction was in accordance with the permit is contained in the enclosed report. 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.

Signature of Owner/Operator

Christopher J. Murphy
V.P. - General Manager
Name and Title

Signature of Registered P.E.

AMOS TURNER 062-019471
Name of Registered P.E. and Illinois Registration Number

EXP. DATE 11/30/01

01-29-2001
Date

AMOS TURNER
19471
LICENSED PROFESSIONAL ENGINEER OF ILLINOIS
(P.E. SEAL)

This Agency is authorized to require this information under Illinois Revised Statutes, 1979, Chapter 111 ½, Section 1039. Disclosure of this information is required under that Section. Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

Container Storage Building - Unit 25
Truck Loading/Unloading Pad

The Truck Loading/Unloading Pad is a new concrete pad without a canopy. The pad was constructed as shown on the attached CHSI Drawing No. 4283 (As-Built).

The containment calculations are included as an attachment.

The entire secondary containment was coated with Chem-Rock Novo Poxi, 30 mils thick, as manufactured by Rock Tred, Inc. Technical data, application and chemical resistance for this coating is included as an attachment.

During the visual inspection, the Truck Loading/Unloading Pad was in excellent condition. There were no cracks, gaps, scratches or other damage. No penetrations are present within the containment structure.

AMOS TURNER
19471
LICENSED PROFESSIONAL ENGINEER OF
ILLINOIS

Amos Turner

EXPIRATION DATE
11-30-2001

STATE OF ILLINOIS
PETER J. BERNES
3659
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11.30.01

HOYER-SCHLESINGER-TURNER inc.
ENGINEERS - CONSTRUCTORS
300 west adams street chicago illinois 60606 telephone 263-0556 area code 312

CONTAINMENT CAPACITY CALCULATIONS FOR UNIT 25 TRUCK PAD

REQUIRED CAPACITY

(A) Volume of 88-55 Gal. drums= 88x55= 4840 gallons
10% of total volume = 484 gallons

(B) Precipitation allowance for maximum rainfall of 4.7 inches
(4.7/12)'x45'x13.34'x7.481 = 1,759 gallons

TOTAL REQUIRED CAPACITY = 2,243

AVAILABLE CAPACITY

(A) Volume of the sump
=2'x2'x2'x7.481 = 59 gallons

(B) Volume of large sloped section
=1/2x12'x43'x2.67'x7.481 = 5,153 gallons

(C) Volume of small sloped section
=1/2x12'x2'x2.62'x7.481 = 235 gallons

TOTAL AVAILABLE CONTAINMENT CAPACITY = 5,447 gallons

Amos Turner 08-26-99

Amos Turner
Licensed Professional Engineer
Illinois License No. 19471; expiration date 11/30/99

AMOS TURNER
19471
LICENSED PROFESSIONAL ENGINEER OF
ILLINOIS

Chem-Rock Novo-Poxi

DATA SHEET

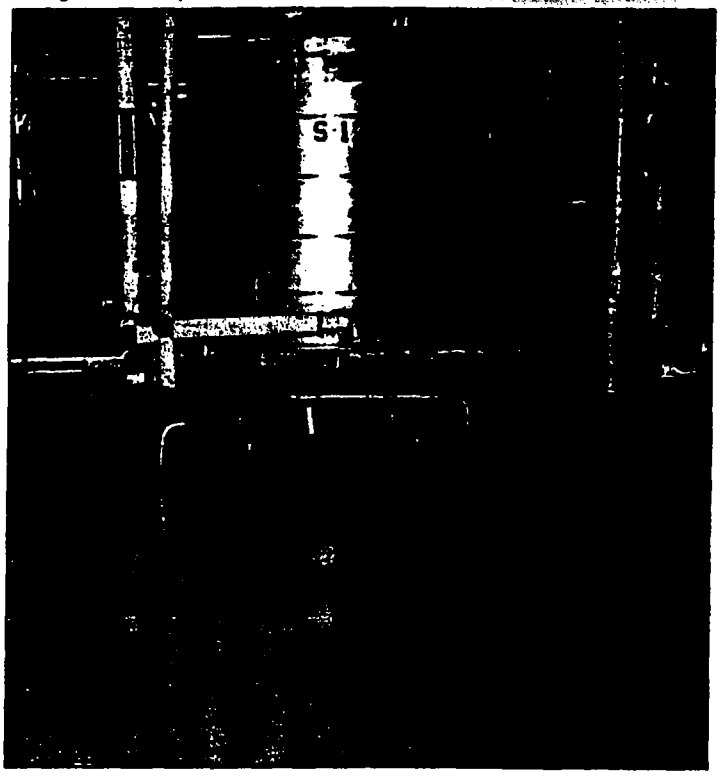
DESCRIPTION:
Chem-Rock® Novo-Poxi is a two-component, 100% solids epoxy-novolac floor coating system, designed for application between 10-16 mils. Chem-Rock Novo-Poxi also will withstand hot spillages. This system meets all of the USDA guidelines for use in federally inspected poultry and meat plants. Available in clear, gray and 16 standard colors, when Chem-Rock Novo-Poxi Colorbase is used in combination with Chem-Rock Colorants.
Chem-Rock is also available in a standard, high build (HB), and low temp. curing (LT) formulations

RECOMMENDED USES:
Chem-Rock Novo-Poxi is used on concrete floors that are subjected to moderate to heavy traffic and severe chemical spillages, such as chemical processing and storage rooms. Chem-Rock Novo-Poxi is also used as a binder in broadcast type applications where extreme chemical resistance and/or heat resistance is required.

FEATURES:

- Solvent-Free ... low odor
- Excellent Chemical Resistance
- Higher heat resistance to 250°F
- Novolac epoxy formulation
- Easy to apply
- Extensive Range of Colors
- Gloss Finish or Anti-Slip
- VOC Compliant
- Good Abrasion Resistance

PACKAGING:
Chem-Rock Novo-Poxi is available in pre-proportioned small ¾-gal and larger 2-Batch 6-gal units for easy job-site mixing and application. The smaller ¾-gal unit consists of one container of Part-A Hardener and one container of Part-B Resin, both of which are packaged together in a single carton. The larger 2-batch unit consists of 2 containers of Part-A Hardener, which are packaged together in a single carton. The two (2) Part-B Resins are packaged in individual 4.25-gal pails. When combined, each batch contains a total of 3-gal of mixed product.



General Properties:	Data
Shelf Life	2 Years
Application Temp & Humidity	55°F to 85 F @ less than 75% R H
Induction	None
Mixing Ratio: (A to B)	1 to 2 by volume
Coverage	100 to 160 sq ft per gal @ 10 to 16 wet mils
Colors	Clear, Gray & Variety with Chem-Rock Colorants
Packaging	¾-gal and 6-gal Units, 15-Gal and 165-Gal Bulk Units
Working Time @ 75 °F	28 minutes
Application Methods	Flat Squeegee & High quality 3/8" nap roller
Cure Rate @ 75 °F	
Recoat	8 hrs
Foot Traffic	12 hrs.
Heavy Traffic	24+ hrs
Chemical Resistance	72+ hrs

Test	Method	Typical Values
Bond Strength (psi)	ACI COM #503 (pp. 1139-1141)	400+ w/ concrete failure
% Solids by Volume	ASTM D-1644	100.0
Flash Point	Pensky-Martens CC	>200°F
UV Light Resistance	Q-U-V Accelerated Weather Tester	Good
Hardness-Shore D	ASTM D-2240	82+
VOC	EPA Method 24	0.10 lbs/gal
Gloss (60°)	BYK-Gardner Tri-Gloss	90+
Impact Resistance	ASTM D-2794	160 in-lbs.
Indentation	MIL-D-3134F	None
Abrasion Resistance (mg) (CS-17 wheel, 1000 GM load, 1,000 cycles)	ASTM D-1044	75
Flammability	ASTM D-635	Self-Extinguishing
Dry Heat Resistance		180 °F Constant 250 °F Intermittent
Water Absorption (%)	ASTM C-413	0.15%

ROCK-TRED Corporation. 3415 Howard St., Skokie, IL 60076 . (800)762-8733 . Fax (847)679-6665

Also available in 15-gal and 165-gal bulk units for large areas. The 15-gal bulk unit consists of one 5-gal pail of Part-A and two 5-gal pails of Part-B. The 165-gal drum unit consists of one 55-gal drum(Part A) and two 55-gal drums(Part B).

COVERAGE:

This product should be applied at the rate of approximately 100-160 sq. ft. per gallon, which is between 10 to 16 wet mils. As with all coatings, coverage is dependent on the smoothness and porosity of the surface.

SURFACE PREPARATION:

The substrate must be clean, dry and sound with new concrete cured for at least 30 days at 70 °F. Remove dust, laitance, grease, curing compounds, waxes, foreign particles, disintegrated or soft base materials, and any previously applied potentially incompatible coatings. Create a surface profile on concrete by either steel shot blasting or acid etching. Repair cracks and joints with ROCK-TRED's Crack 'N Patch® or Elasti-Poxi® Joint Fill.
For additional concrete preparation information and methods, refer to ROCK-TRED's "14 Ways to Prepare a Floor" bulletin. If the concrete surface is not prepared properly, product adhesion will fail and warranties will be voided.

FOR BEST RESULTS:

- For Interior Use Only.
- New Concrete Must Cure For at Least 30 Days @ 70°F
- DO NOT Thin the Chem-Rock Novo-Poxi.
- Apply a Test Patch to Ensure Compatibility Over Old Paint
- DO NOT Allow Material to Puddle During Application.
- Allow Each Coat to Dry Tack-Free Before Recoating.
- DO NOT Use when Humidity Exceeds 75% Indoors.
- Apply Topcoat within 24 Hours of Previous Coat.
- Discard any Material Subjected to Freezing.
- DO NOT Apply to Structurally Unsound Surfaces.
- DO NOT Apply heavier than recommended wet film thickness.

PRIMING:

For optimum results, prime the prepared concrete floor first with Agua-Rock®Primer/Sealer. The Agua-Rock Primer/Sealer can be applied at the rate of 350-450 sq. ft. per gallon. On rougher areas and shot-blasted floors, the coverage rates will be reduced to about 300-350 sq. ft. per gallon.

Allow the Agua-Rock Primer/Sealer to dry thoroughly before mixing and applying the Chem-Rock Seal/Coat. The primed floor should be tack free and clear in appearance before applying Chem-Rock Novo-Poxi coating system. This will vary with temperature and humidity but is normally between 4-5 hours @ 75°F and 50% R.H.

Review ROCK-TRED'S Material Safety Data Sheets (MSDS) for this product prior to mixing and applying. In addition, thoroughly review the Application Guide and product labels.

MIXING:

Avoid mixing and application of this product if the floor temperature is below 55°F or above 85°F. Also avoid application if the humidity if higher than 75% R.H. The temperature of the floor, materials and air in the area of the installation all play a role in how the product will apply and cure.
If Chem-Rock Colorants are to be used with the clear or colorbase, the appropriate quantity of Colorant is added (see mix ratios chart on Chem-Rock Colorant Data Sheet) to the Part-B Resin and mixed in uniformly before the Part-A Hardener is added.
Pour entire contents of Part A container into Part B container. DO NOT change the ratio of A to B. Blend thoroughly for a minimum of 2 minutes with a spiral mixing blade (available from ROCK-TRED) attached to a low-speed (400-600 RPM) electric drill. Take care not to induce air into the material when mixing. This will cause "bubbles" in the coating when applied.

APPLICATION:

This product can be applied from a roller tray or by pouring in a bead directly onto the concrete surface. A high quality, 3/8" nap roller should be used. The individual(s) applying the Chem-Rock Novo-Poxi should be wearing "spiked sandals" available from ROCK-TRED. The coating must be rolled as evenly as possible. Avoid excess agitation of the liquids with the roller. This will lessen chances of bubbling of the final film.

POT LIFE:

At 75°F and 50% R.H., both clear and pigmented systems have a useful working time or pot life of 25-35 minutes. Using any product beyond this time will result in variable results and therefore any mixed product beyond the pot life should be discarded.

CLEAN UP:

Application equipment should be cleaned using soap and water or solvent where necessary. Roller covers should be discarded after use.

DISPOSAL:

Empty containers may contain product residue, including flammable or combustible vapors. Do not cut, puncture or weld near these containers. Label warnings must be observed until containers have been commercially cleaned or reconditioned. Containers to be thrown out must be disposed in accordance with federal, state and local regulations. Use only licensed hazardous waste disposal companies.

CUSTOMER NOTE:

For information on application situations not covered above, contact your local ROCK-TRED representative or the corporate office at 1-800-ROC-TRED.

WARRANTY STATEMENT
Information about ROCK-TRED products is given to the best of our knowledge, based on tests and experience. However, as products are often applied or used under conditions beyond our control, ROCK-TRED cannot guarantee anything but the quality of the products. ROCK-TRED warrants its products meet specifications set by ROCK-TRED, but we reserve the right to change given specifications without notice. ROCK-TRED DISCLAIMS ALL WARRANTIES RELATING TO THE PRODUCTS AND THEIR APPLICATION, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Receipt of ROCK-TRED products constitutes acceptance of the terms of this limited warranty and the terms and the conditions set out in our invoice, contrary provisions of buyer's purchase documents not withstanding. Upon receipt of merchandise, purchaser has 30 days to notify ROCK-TRED in writing that materials are defective. In the event ROCK-TRED finds that the product delivered is off specification, ROCK-TRED will, at its sole discretion, either replace the product or refund the purchase price thereof, and ROCK-TRED's choice of one of these remedies is the buyer's sole remedy. In no event shall the liability of ROCK-TRED exceed the purchase price of shipped merchandise. ROCK-TRED will under no circumstances be liable for special, incidental or consequential damages. Claims must be in writing. Claims after 30 days are void

ROCK TRED
Flooring Solutions Since 1939
Manufacturing and Headquarters: 3415 Howard St., Skokie, IL 60076-4032 U.S.A.
(800) ROC-TRED • (800) 762-8733 • (847) 673-8200 • FAX (847) 679-6665

CHEM-ROCK Novo-Poxi

CHEMICAL RESISTANCE GUIDE

The following tests were run on CHEM-ROCK® NOVO-POXI® under close laboratory supervision. The samples for testing were prepared in accordance with standard procedures and cured for 7 days @ 77°F. The samples were subjected to the chemicals listed below and inspected at each interval indicated. The results and the corresponding recommendations will indicate the potential suitability of this ROCK-TRED product for your particular requirements. All tests were conducted at approximately 77°F.

No warranty is expressed or implied regarding this information. Specific results obtained by the customer are affected by conditions which are beyond ROCK-TRED's control. Therefore customers must make their own tests to determine product suitability for a particular purpose.

EFFECT CODE

A-None
B-Stains
C-Softens
D- Slight Erosion
E- Moderate Erosion
F- Disintegrates

RECOMMENDATION CODE

1- Recommended Constant Exposure
2- Recommended Intermittent Exposure
3- Recommended with Immediate Washdown
4- Not Recommended

ACIDS-INORGANIC

CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Boric	30%	A	A	1
Boric	Sat.	A	A	1
Chromic Acid	20%	A	A	1
Chromic Acid	40%	A	A	1
Chromic Acid	60%	A	A	1
Fluoboric Acid	12%	A	A	1
Fluoboric Acid	24%	A	A	1
Hydrochloric	10%	A	A	1
Hydrochloric	20%	A	A	1
Hydrochloric	37%	A	A	1
Hydrofluoric	10%	A	A	1
Hydrofluoric	30%	A	A	1
Hypochlorous	5%	A	A	1
Nitric	10%	A	A	1
Nitric	20%	A	B	2
Nitric	50%	B	C	2
Nitric	Conc	C	C	3
Perchloric	70%	A	A	1
Phosphoric	10%	A	A	1
Phosphoric	50%	A	A	1
Phosphoric	75%	A	A	1
Sulfuric	20%	A	A	1
Sulfuric	50%	A	A	1
Sulfuric	70%	A	A	1
Sulfuric	Conc	A	A	1

AUTO-BRAKE & HYDRAULIC FLUIDS

CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Brake Fluid	100%	A	A	1
Hy-JetFuel#3	100%	A	A	1
Motor Oil	100%	A	A	1
Skydrol 500A	100%	A	A	1
Skydrol 500B	100%	A	A	1
Transmission Fluid	100%	A	A	1

ACIDS-ORGANIC

CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Acetic	10%	A	A	1
Acetic	20%	A	A	1
Acetic	50%	A	A	1
Acetic	Glacial	A	A	1
Benzoic Acid	Conc	A	A	1
Butyric	10%	A	A	1
Citric	20%	A	A	1
Citric	50%	A	A	1
Cresylic	10%	A	A	1
Formic	30%	A	A	1
Lactic	40%	A	A	1
Lactic	80%	A	A	1
Maleic	30%	A	A	1
Maleic	60%	A	A	1
Malic	50%	A	A	1
Monochloric Acetic	5%	A	A	1
Monochloric Acetic	10%	A	A	1
Trichloro Acetic	5%	A	A	1
Oleic	Sat.	A	A	1
Oxalic	Sat.	A	A	1
Picric	Sat.	A	A	1
Stearic	Conc	A	A	1
Tannic	30%	A	A	1

ALCOHOLS

CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Diacetone Alcohol	100%	A	A	1
Ethyl Alcohol	100%	A	A	1
Ethylene Glycol	100%	A	A	1
Glycerine	100%	A	A	1
Isopropyl Alcohol	100%	A	A	1
Methyl Alcohol	100%	A	A	1
Phenol	5%	A	A	1
Triethylene Glycol	100%	A	A	1

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ALKALIES & SALTS				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Ammonium Chloride	50%	A	A	1
Ammonium Hydroxide	10%	A	A	1
Ammonium Hydroxide	20%	A	A	1
Ammonium Hydroxide	50%	A	A	1
Ammonium Nitrate	Sat.	A	A	1
Ammonium Persulfate	Sat.	A	A	1
Ammonium Sulfate	Sat.	A	A	1
Calcium Chloride	50%	A	A	1
Calcium Hydroxide	Sat.	A	A	1
Calcium Hypochlorite	15%	A	A	1
Ferric Chloride	Sat.	A	A	1
Ferric sulfate	Sat.	A	A	1
Potassium Hydroxide	40%	A	A	1
Sodium Bicarbonate	Sat.	A	A	1
Sodium Bisulfate	Sat.	A	A	1
Sodium Carbonate	Sat.	A	A	1
Sodium Chloride	20%	A	A	1
Sodium Hydroxide	10%	A	A	1
Sodium Hydroxide	50%	A	A	1
Sodium Sulfate	Sat.	A	A	1
Sodium Sulfide	Sat.	A	A	1
Trisodium Phosphate	10%	A	A	1

KETONES/ESTERS				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Acetone	100%	A	A	1
Amyl Acetate	100%	A	A	1
Butyl Acetate	100%	A	A	1
Ethyl Acetate	100%	A	A	1
Methyl Ethyl Ketone	100%	A	A	1
Methyl Isobutyl Ketone	100%	A	A	1
PM Acetate	100%	A	A	1

MISCELLANEOUS				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Acrylontrile	100%	A	B	2
Aniline	100%	A	A	1
Beer	100%	A	A	1
Bromine	100%	A	B	2
Butyl Lactate	100%	A	A	1
Carbon Disulfide	100%	A	A	1
Carbon Tetrachloride	100%	A	A	1
Chloroform	100%	A	A	1
Cola	100%	A	A	1
Corn Oil	100%	A	A	1
Cyclohexane	100%	A	A	1
Cyclohexane	100%	A	A	1
Diethyl Phthalate	100%	A	A	1

MISCELLANEOUS				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Dimethyl Phthalate	100%	A	A	1
Ethylene Dichloride	100%	A	B	2
Formaldehyde	100%	A	A	1
Fruit Juice	100%	A	A	1
Grease	100%	A	A	1
Hydrogen Peroxide	50%	A	A	1
Ketchup	100%	A	A	1
Lanolin	100%	A	A	1
Lard	100%	A	A	1
Linseed Oil	100%	A	A	1
Mayonnaise	100%	A	A	1
Methyl Salicylate	50%	A	B	2
Milk	100%	A	A	1
Mustard	100%	A	A	1
2-Nitro-Propane	100%	A	A	1
Pyridine	Sat.	B	C	3
Sugar	Sat.	A	A	1
Tannic Acid	Sat.	A	A	1
Tartaric Acid	2%	A	A	1
Tide Solution	100%	A	A	1
Triacetin	100%	A	A	1
Triethanolamine	100%	A	A	1
Turpentine	100%	A	A	1
Water	100%	A	A	1
Wine	100%	A	A	1

SOLVENTS-ALIPHATIC				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Gasoline	100%	A	A	1
Hexane	100%	A	A	1
Jet Fuel A-1	100%	A	A	1
Mineral Spirits	100%	A	A	1
Naphtha	100%	A	A	1

SOLVENTS-AROMATIC				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Chlorobenzene	100%	A	A	1
SC-100	100%	A	A	1
Toluene	100%	A	A	1
Xylene	100%	A	A	1

SOLVENTS-CHLORINATED				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Dichlorobenzene	100%	A	A	1
Methylene Chloride	100%	A	C	2
Perchloroethane	100%	A	A	1
1,1,1,trichloroethane	100%	A	A	1
Tetrachloroethylene	100%	A	A	1

Chem-Rock Novo-Posi CR Guide Rev.: 1 1/99

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CleanHarbors
CLEAN HARBORS SERVICES, INC.
11800 SOUTH STONY ISLAND AVENUE • CHICAGO, IL 60617
(773) 646-6202 • FAX (773) 646-6381
Visit our Website at www.cleanharbors.com

Certified Mail #7099 3400 0015 2715 2203

March 20, 2001

Mr. Mark A. Schollenberger, P.E.
Illinois Environmental Protection Agency
Bureau of Land - Permit Section
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Dear Mr. Schollenberger:

Clean Harbors Services, Inc. (CHSI) is submitting a Construction Certification Report for Building 25 (Unit 25). This report covers the building itself and air pollution control devices except for pouroff hoods, scrubbers and associated tanks for the acid and alkaline pouroffs. Certification for the Building 25 Truck Pad was submitted January 31, 2001.

Enclosed are three copies of the report. An additional copy is being sent to the Field Operations Office in Des Plaines, IL.

If you have any questions or require additional information, please contact me at (773) 646-6202.

Sincerely,

James R. Laubsted
Facility compliance Manager

IEPA Field Office, Des Plaines, IL
Certified Mail #7099 3400 0015 2715 2197

CONSTRUCTION CERTIFICATION

This statement is to be completed by both the responsible officer and the registered professional engineer upon completion of construction in accordance with 35 IAC Section 702.126. Submit one copy of the certification with original signatures and two additional copies (four additional copies for UIC wells). Forward these certification statements and any information required by the permit to the following address:

Illinois Environmental Protection Agency
Bureau of Land - #33
Permit Section
1021 North Grand Avenue East
Post Office Box 19276
Springfield, Illinois 62794-9276

FACILITY NAME: Clean Harbors Services, Inc.

IEPA SITE CODE: 0 3 1 6 0 0 0 0 5 1

U.S. EPA ID NO.: ILD 0 0 0 6 0 8 4 7 1

PART B PERMIT LOG #/UIC PERMIT #: 16

PERMIT (OR MODIFICATION) ISSUANCE DATE: September 12, 2000

PERMIT CONDITION NO. REQUIRING CERTIFICATION: Section I, K.1

The Unit 25 has been constructed in accordance with the specifications in the Part B/UIC Permit. Documentation that the construction was in accordance with the permit is contained in the enclosed report. 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.

Signature of Owner/Operator	Christopher J. Murphy V.P. - General Manager Name and Title
Signature of Registered P.E.	AMOS TURNER 19471 Name of Registered P.E. and Illinois Registration Number
3-9-2001 Date	(P.E. SEAL)

AMOS TURNER
19471
LICENSED PROFESSIONAL ENGINEER OF ILLINOIS

This Agency is authorized to require this information under Illinois Revised Statutes, 1979. Chapter 111 ½, Section 1039. Disclosure of this information is required under that Section. Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

Unit 25

Unit 25 - Container Management Building is an existing structure.The building was previously used for storage of acids, alkalines, poisons and PCBs, consolidation of lab packs and venting of atmospheric compressed gases. The new usage of the building includes the addition of storage of flammables and reactives, and the consolidation and pour-off of lab pack containers for flammables and solids.

Unit 25 was modified to include:

1) addition of an overhead door to the Alkaline/Poison Bay

2) addition of a firewall separating the Acid and Flammable Bays

3) removal of a curb in the new Flammable Bay

4) relocation of two existing lab pack consolidation stations in Building 25 and the addition of a fire protection system for the flammable lab pack consolidation station

5) addition of a Flammable and Solids pour-off hood and emission controls for lab packs

6) addition of fireproofing to roof, walls and structural supports in Flammable storage and staging areas

7) upgrading the fire protection system in the Flammable Bay

8) addition of skylights to the roof

The acid and alkaline pour-off hoods and emission control systems have not been constructed at this time.

The storage capacity of each bay and containment volumes are:

	Capacity (55 gallon equivalents)	Containment Volume
Alkaline/Poisons/PCBs	248 drums	7189 gallons
Acids	136 drums	4322 gallons
Flammable	184 drums	7302 gallons

Building 25 is 200 feet long and 28 feet wide and has a six inch thick reinforced concrete floor slab. The storage bays are divided by six inch high curbs with six inch high curbs on the perimeters. For dividing curb location, locations of stored drums, secondary containment calculations and other details, see as-built CHSI Drawing No. 4282 (4630-M-05).

The final inspection of the containment did not reveal and cracks, gaps, scratches or other damage. The floor coating is Protecto-Crete 900, 1/4 inch thick. The dike walls are coated with Protecto-Coat 900, 30 mils thick. The area in the Flammable Bay where the curb was removed was coated with Poxi-Rock CR-Flooring, 1/4 inch thick, as manufactured by Rock Tred, Inc. Technical data, application and chemical resistance for this coating is included as an attachment.

STATE OF ILLINOIS
PETER J. BERNES
3659
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11.30.2001

MARCH 8TH 2001
Peter J. Bernes

AMOS TURNER
19471
LICENSED PROFESSIONAL ENGINEER OF ILLINOIS

EXP. DATE 11-30-2001

Poxi-Rock CR-Flooring

DATA SHEET

DESCRIPTION:

POXI-ROCK® CR-Flooring is a unique, 3- component, 100% solids epoxy resin-based floor surfacing material formulated to have superior chemical resistance. It has been designed for patching and surfacing large floor areas, which are subjected to corrosive chemical spillages and abrasive traffic. POXI-ROCK CR-Flooring meets all of the USDA guidelines for use in federally inspected poultry and meat plants.

POXI-ROCK is also available in Standard, Power Trowel (PT), and Cooler (LT) flooring formulas.

RECOMMENDED USES:

When the three components of POXI-ROCK CR-Flooring are combined, they become an easily troweled mortar which cures chemically to an extremely tough, corrosion, and abrasion resistant surface. POXI-ROCK CR-Flooring is used on concrete floors that are subjected to moderate to heavy traffic and severe chemical spillages, such as chemical processing and storage rooms.

FEATURES:

- Superior Chemical Resistance
- Novalac-Epoxy Based Formulation
- 100% Solids
- Wears 10x Better Than Concrete
- High Compressive Strength
- Cures Fast
- USDA Accepted
- VOC Compliant

PACKAGING:

POXI-ROCK CR-Flooring is packaged in pre-proportioned units for error-free mixing and application. Available in two unit sizes.

The small (1½-batch) unit consists of 12 individual batches. One batch consists of one Part-A, one Part-B and one bag of Part-C. The Part-A Hardeners are packaged in quart containers and are shipped 4 to a carton for a total of three cartons per kit. The Part-B Resins are packed in gallon cans and shipped four per carton as well. The Part-C is packed in individual bags.

The large (4-batch) unit consists of four individual batches of Parts A & B liquids and 12 bags of aggregate. One large batch consists of one Part-A, one Part-B and three bags of Part-C Aggregate. The Part-A Hardeners are packaged in 3-pint containers and shipped four to a carton. The Part-B Resins are packed in 2-gallon containers and shipped loose along with 12 bags of Part-C Aggregate.

General Properties	Data
Shelf Life	2 Years
Coverage	200 ft^2 @ nominal ¼" for Small & Large Units
Application Temp & Humidity	55°F to 65°F @ less than 75% R.H.
Colors	Gray & Variety with Chem-Rock Colorants
Packaging	Small & Large 200 ft^2 Units
Working Time @ 75 °F	20 minutes
Application Methods	Screed then finish with steel finishing trowel and/or power trowel
Cure Rate @ 75 °F	
Foot Traffic	4-6 hrs.
Medium Traffic	16-20 hrs.
Heavy Traffic	48+ hrs.
Chemical Resistance	72+ hrs.

Test	Method	Typical Values
Bond Strength (psi)	ACI COM #503 (pp. 1139-1141)	400+ w/ concrete failure
Compressive Strength (psi)	ASTM C-579	11,600 psi
Tensile Strength (psi)	ASTM C-307	2,300 psi
Flexural Strength (psi)	ASTM D-790	4,400 psi
Flexural Modulus of Elasticity (psi)	ASTM D-790	2.08×10^6 psi
Hardness-Shore D	ASTM D-2240	86+
Thermal Coefficient of Linear Expansion	ASTM D-696	3.6×10^{-5} in/in/°F
% Solids by Volume	ASTM D-1644	99.5
Indentation	MIL-D-3134F	None
Abrasion Resistance (mg) (CS-17 wheel, 1000 GM load, 1,000 cycles)	ASTM D-1044	90
Water Absorption (%)	ASTM C-413	0.18%

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COVERAGE:

The two pre-proportioned units will cover approximately 200 sq. ft. @ a nominal 1/4' thickness per unit over a relatively smooth concrete surface. Each individual small batch will cover about 16.67 sq.ft. , while the larger batch will cover about 50 sq. ft @ ¼".

SURFACE PREPARATION:

The substrate must be clean, dry and sound with new concrete cured for at least 30 days at 70 °F. Remove dust, laitance, grease, curing compounds, waxes, foreign particles, disintegrated or soft base materials, and any previously applied potentially incompatible coatings. Create a surface profile on concrete by either steel shot blasting or acid etching. Repair cracks and joints with ROCK-TRED's Crack 'N Patch® or Elast-Poxi®SR-Joint Fill.

For additional concrete preparation information and methods, refer to ROCK-TRED's "14 Ways to Prepare a Floor" bulletin. If the concrete surface is not prepared properly, product adhesion will fail and warranties will be voided.

FOR BEST RESULTS:

- POXI-ROCK CR-PRIMER must be applied before application of the POXI-ROCK CR-Flooring.
- DO NOT Use POXI-ROCK CR-Flooring in areas where floor temperature will exceed 180°F continuously or 240°F intermittently.
- DO NOT Apply POXI-ROCK CR-Flooring over brick, slate, ceramic tile, quarry tile or asphaltic materials.
- POXI-ROCK CR-Flooring may be installed on any structurally sound and properly prepared concrete, metal or wood surface.
- POXI-ROCK CR-Flooring is designed for Interior Use Only
- DO NOT Thin POXI-ROCK CR-Flooring.
- DO NOT Use when Humidity Exceeds 75% Indoors.
- New Concrete Must Cure For at Least 30 Days @ 70°F.

PRIMING:

The POXI-ROCK CR-Flooring is always applied to a "wet" primed surface. Before beginning the mixing and application of the CR-Primer, be sure that the concrete floor to be surfaced is thoroughly dried. The Primer is applied at the rate of approx. 250 sq. ft. per gallon with a 3/8" nap roller or in combination with a flat rubber squeegee.

Do not apply the POXI-ROCK CR-Flooring if the Poxi-Rock CR-Primer has cured to a hard film. If this occurs, you will need to re-apply the Primer.

Review ROCK-TRED'S Material Safety Data Sheets (MSDS) for this product prior to mixing and applying. In addition, thoroughly review the Application Guide and product labels.

MIXING:

Note: Before beginning the mixing and application of the POXI-ROCK CR-Flooring, set up the mixing area in a convenient location near the area to be surfaced.

If the Neutral Part-C Aggregate is to be used, the Chem-Rock Colorant is first mixed into the Part-B Resin at the rate of 1.5-2.5 oz. for the small batch unit and 4.5-7.5 oz. for the larger batch unit.

Pour entire contents of Part A container into the Part B pail and mix thoroughly with a Spiral Mixing Blade (available from ROCK-TRED) attached to a low speed drill (400-600 rpm) for approximately 3-5 minutes. Take care not to induce air into the material when mixing.

Add the mixed liquids slowly into a Rock-Tred "Epoxy Mortar" mixer and add the Part-C Aggregate into the mixer while running. Mix thoroughly to make sure all three components are well blended, which should take about 60-90 seconds.

APPLICATION:

The mixed mortar is immediately spread evenly over the "primed" surface using a ROCK-TRED 24"-Wheeled Screed Unit. Spread the small batch unit over approx. 16.67 sq.ft. and the larger batch unit over approx. 50 sq.ft. The 24" Wheeled Screed Unit is typically set for 5/16" screed for a final ¼" thickness after compaction.

Finish using clean 3" x 12" steel finishing trowel for the edges, cove bases and the larger areas. The finished floor should be free of trowel marks and relatively smooth with no porosity.

In areas not abutting a vertical surface, the Poxi-Rock CR-Flooring should be troweled into "chase", which is a special groove cut into the concrete at the time of preparation.

POT LIFE:

At 75°F and 50% R.H., the Poxi-Rock CR-Flooring has a useful working time or pot life of 18-20 minutes.

CLEAN UP:

Application equipment should be cleaned using soap and water or solvent where necessary.

DISPOSAL:

Empty containers may contain product residue, including flammable or combustible vapors. Do not cut, puncture or weld near these containers. Label warnings must be observed until containers have been commercially cleaned or reconditioned. Containers to be thrown out must be disposed in accordance with federal, state and local regulations. Use only licensed hazardous waste disposal companies.

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POXI-ROCK CR-Flooring

CHEMICAL RESISTANCE GUIDE

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C-Softens
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RECOMMENDATION CODE

1- Recommended Constant Exposure
2- Recommended Intermittent Exposure
3- Recommended with Immediate Washdown
4- Not Recommended

ACIDS-INORGANIC

CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Boric	30%	A	A	1
Boric	Sat.	A	A	1
Chromic Acid	20%	A	A	1
Chromic Acid	40%	A	A	1
Chromic Acid	60%	A	A	1
Fluoboric Acid	12%	A	A	1
Fluoboric Acid	24%	A	A	1
Hydrochloric	10%	A	A	1
Hydrochloric	20%	A	A	1
Hydrochloric	37%	A	A	1
Hydrofluoric	10%	A	A	1
Hydrofluoric	30%	A	A	1
Hypochlorous	5%	A	A	1
Nitric	10%	A	A	1
Nitric	20%	A	B	2
Nitric	50%	B	C	2
Nitric	Conc	C	C	3
Perchloric	70%	A	A	1
Phosphoric	10%	A	A	1
Phosphoric	50%	A	A	1
Phosphoric	75%	A	A	1
Sulfuric	20%	A	A	1
Sulfuric	50%	A	A	1
Sulfuric	70%	A	A	1
Sulfuric	Conc	A	A	1

AUTO-BRAKE & HYDRAULIC FLUIDS

CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Brake Fluid	100%	A	A	1
Hy-JetFuel#3	100%	A	A	1
Motor Oil	100%	A	A	1
Skydrol 500A	100%	A	A	1
Skydrol 500B	100%	A	A	1
Transmission Fluid	100%	A	A	1

ACIDS-ORGANIC

CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Acetic	10%	A	A	1
Acetic	20%	A	A	1
Acetic	50%	A	A	1
Acetic	Glacial	A	A	1
Benzoic Acid	Conc	A	A	1
Butyric	10%	A	A	1
Citric	20%	A	A	1
Citric	50%	A	A	1
Cresylic	10%	A	A	1
Formic	30%	A	A	1
Lactic	40%	A	A	1
Lactic	80%	A	A	1
Maleic	30%	A	A	1
Maleic	60%	A	A	1
Malic	50%	A	A	1
Monochloric Acetic	5%	A	A	1
Monochloric Acetic	10%	A	A	1
Trichloro Acetic	5%	A	A	1
Oleic	Sat.	A	A	1
Oxalic	Sat.	A	A	1
Picric	Sat.	A	A	1
Stearic	Conc	A	A	1
Tannic	30%	A	A	1

ALCOHOLS

CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Diacetone Alcohol	100%	A	A	1
Ethyl Alcohol	100%	A	A	1
Ethylene Glycol	100%	A	A	1
Glycerine	100%	A	A	1
Isopropyl Alcohol	100%	A	A	1
Methyl Alcohol	100%	A	A	1
Phenol	5%	A	A	1
Triethylene Glycol	100%	A	A	1

ROCK-TRED Corporation, 3415 Howard St., Skokie, IL 60076 . (800)762-8733 . Fax (847)679-6665

ALKALIES & SALTS				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Ammonium Chloride	50%	A	A	1
Ammonium Hydroxide	10%	A	A	1
Ammonium Hydroxide	20%	A	A	1
Ammonium Hydroxide	50%	A	A	1
Ammonium Nitrate	Sat.	A	A	1
Ammonium Persulfate	Sat.	A	A	1
Ammonium Sulfate	Sat.	A	A	1
Calcium Chloride	50%	A	A	1
Calcium Hydroxide	Sat.	A	A	1
Calcium Hypochlorite	15%	A	A	1
Ferric Chloride	Sat.	A	A	1
Ferric sulfate	Sat.	A	A	1
Potassium Hydroxide	40%	A	A	1
Sodium Bicarbonate	Sat.	A	A	1
Sodium Bisulfate	Sat.	A	A	1
Sodium Carbonate	Sat.	A	A	1
Sodium Chloride	20%	A	A	1
Sodium Hydroxide	10%	A	A	1
Sodium Hydroxide	50%	A	A	1
Sodium Sulfate	Sat.	A	A	1
Sodium Sulfide	Sat.	A	A	1
Trisodium Phosphate	10%	A	A	1

KETONES-ESTERS				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Acetone	100%	A	A	1
Amyl Acetate	100%	A	A	1
Butyl Acetate	100%	A	A	1
Ethyl Acetate	100%	A	A	1
Methyl Ethyl Ketone	100%	A	A	1
Methyl Isobutyl Ketone	100%	A	A	1
PM Acetate	100%	A	A	1

MISCELLANEOUS				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Acrylontrile	100%	A	B	2
Aniline	100%	A	A	1
Beer	100%	A	A	1
Bromine	100%	A	B	2
Butyl Lactate	100%	A	A	1
Carbon Disulfide	100%	A	A	1
Carbon Tetrachloride	100%	A	A	1
Chloroform	100%	A	A	1
Cola	100%	A	A	1
Corn Oil	100%	A	A	1
Cyclohexane	100%	A	A	1
Cyclohexane	100%	A	A	1
Diethyl Phthalate	100%	A	A	1

MISCELLANEOUS				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Dimethyl Phthalate	100%	A	A	1
Ethylene Dichloride	100%	A	B	2
Formaldehyde	100%	A	A	1
Fruit Juice	100%	A	A	1
Grease	100%	A	A	1
Hydrogen Peroxide	50%	A	A	1
Ketchup	100%	A	A	1
Lanolin	100%	A	A	1
Lard	100%	A	A	1
Linseed Oil	100%	A	A	1
Mayonnaise	100%	A	A	1
Methyl Salicylate	50%	A	B	2
Milk	100%	A	A	1
Mustard	100%	A	A	1
2-Nitro-Propane	100%	A	A	1
Pyridine	Sat.	B	C	3
Sugar	Sat.	A	A	1
Tannic Acid	Sat.	A	A	1
Tartaric Acid	2%	A	A	1
Tide Solution	100%	A	A	1
Triacetin	100%	A	A	1
Triethanolamine	100%	A	A	1
Turpentine	100%	A	A	1
Water	100%	A	A	1
Wine	100%	A	A	1

SOLVENTS-ALIPHATIC				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Gasoline	100%	A	A	1
Hexane	100%	A	A	1
Jet Fuel A-1	100%	A	A	1
Mineral Spirits	100%	A	A	1
Naphtha	100%	A	A	1

SOLVENTS-AROMATIC				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Chlorobenzene	100%	A	A	1
SC-100	100%	A	A	1
Toluene	100%	A	A	1
Xylene	100%	A	A	1

SOLVENTS-CHLORINATED				
CHEMICAL	CONC	1-HR	24-HRS	RECOMMENDATION
Dichlorobenzene	100%	A	A	1
Methylene Chloride	100%	A	C	2
Perchloroethane	100%	A	A	1
1,1,1,trichloroethane	100%	A	A	1
Tetrachloroethylene	100%	A	A	1

WARRANTY STATEMENT
Information about ROCK-TRED products is given to the best of our knowledge, based on tests and experience. However, as products are often applied or used under conditions beyond our control, ROCK-TRED cannot guarantee anything but the quality of the products. ROCK-TRED warrants its products meet specifications set by ROCK-TRED, but we reserve the right to change given specifications without notice. ROCK-TRED DISCLAIMS ALL WARRANTIES RELATING TO THE PRODUCTS AND THEIR APPLICATION, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Receipt of ROCK-TRED products constitutes acceptance of the terms of this limited warranty and the terms and the conditions set out in our invoice, contrary provisions of buyer's purchase documents not withstanding. Upon receipt of merchandise, purchaser has 30 days to notify ROCK-TRED in writing that materials are defective. In the event ROCK-TRED finds that the product delivered is off specification, ROCK-TRED will, at its sole discretion, either replace the product or refund the purchase price thereof, and ROCK-TRED's choice of one of these remedies is the buyer's sole remedy. In no event shall the liability of ROCK-TRED exceed the purchase price of shipped merchandise. ROCK-TRED will under no circumstances be liable for special, incidental or consequential damages. Claims must be in writing. Claims after 30 days are void.

ROCK TRED
Flooring Solutions Since 1939

Manufacturing and Headquarters: 7440 N. St. Louis Ave., Skokie, IL 60076-4032 U.S.A.
(800) ROC-TRED • (800) 762-8733 • (847) 673-8200 • FAX (847) 679-6665

CleanHarbors®
OF CHICAGO, INC.
11800 SOUTH STONY ISLAND AVENUE • CHICAGO, IL 60617
(312) 646-6202 • FAX (312) 646-6381

Certified Mail - Return Receipt Requested - #P873791856

October 7, 1994

Illinois Environmental Protection Agency
Division of land Pollution Control #24
Planning and Reporting Section
2200 Churchill Road
Post Office Box 19276
Springfield, IL 62794-9276

Dear Sir:

Enclosed is documentation submitted as a requirement of the Clean Harbors of Chicago, Inc. RCRA Part B Permit (RCRA Log No. 16, 0316000051). This is required by Attachment D, Part E, Number 2(c) on page D-5.

This project consists of:

(a) providing an impervious surface coating to the existing concrete slab, the curbs and the walls that are used as part of the containment for the outside container storage area unloading dock. The surface coating is compatible with the waste, or any liquid, stored in the containment system; and will prevent migration of the waste into the concrete slab or wall.

(b) installing a compatible caulking or sealant at each existing joint in the secondary containment system of the above area to make the joint liquid tight. These joints include but are not limited to, all construction joints within the slab, walls and curbs and joints between the slab and curb, two curbs, between the slab or curb and wall and joints between two walls. The caulking or sealant shall be compatible with the stored waste, or any liquid, stored in the same containment system with the hazardous waste.

The surface coating was applied to the existing secondary containment of the unloading dock on September 10th and 11th, 1994. The caulking/sealant was installed September 12th.

CleanHarbors

A Certification by an Illinois Registered Professional Engineer is enclosed along with technical literature describing the surface coating and caulking/sealant. Please note the concrete secondary containment was existing and approved in the Part B Permit.

If you have any further questions, please contact me at (312)646-6202.

Sincerely,

James R. Laubsted
Facility Compliance Manager

CERTIFICATION

This statement is to be completed by both the responsible officer and the registered professional engineer upon completion of construction in accordance with 35 IAC Section 702.126. Submit one copy of the certification with original signatures and two additional copies (four additional copies for UIC wells). Forward these certification statements and any information required by the permit to the following address:

Illinois Environmental Protection Agency
Division of Land Pollution Control - #24
Permit Section
2200 Churchill Road
P.O. Box 19276
Springfield, Illinois 62794-9276

FACILITY NAME: Clean Harbors of Chicago, Inc.

IEPA SITE CODE: 0 3 1 6 0 0 0 0 5 1

U.S. EPA ID NO.: IL D 0 0 0 6 0 8 4 7 1

PART B PERMIT LOG #/UIC PERMIT #: 16

PERMIT (OR MODIFICATION) ISSUANCE DATE: September 30, 1993

PERMIT CONDITION NO. REQUIRING CERTIFICATION: Attachment D, E.2.

The **** has been constructed in accordance with the specifications in the Part B/UIC Permit. Documentation that the construction was in accordance with the permit is contained in the enclosed report. 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.

Signature of Owner/Operator

Joseph L. McNally Vice President/General Manager
Name and Title

Signature of Registered P.E.

Bhuphendra Patel, 062-048690
Name of Registered P.E. and Illinois Registration Number

October 6, 1994
Date

(P.E. SEAL)

BC:dks/3924j, 27

**** Impervious coating and joint sealants for secondary containment of drum unloading area.

TRIPLE G COATINGS INC.

Product Data
CENTRON 415 PIGMENTED

1714 Bernard Street
Riverton, NJ 08077
609/829-1575
FAX# 609/829-8066

Description:

A two part, odorless, pigmented, epoxy novolac coating.

Features:

* Flexible, Resilient, Hard
* Outstanding Chemical Resistance
* Excellent Thermal, Impact and Abrasion Resistance
* Self-Leveling, Smooth, Glossy Cure
* Cures as low as 40°F in variable mil thickness up to 60 mils
* Self-Priming over Concrete and Steel
* Excellent Non Porous Barrier for Trenches, Ducts, Pipes, Tank Linings and Floors

Uses:

* Monolithic Floor Coatings with optional Fiberglass Cloth or Non-Skid Media
* Anti-Corrosion Barrier Coating for Concrete Slabs, Masonry or Block Walls and Structural Steel, Beams or Equipment
* Outstanding Tank Lining for Concrete or Steel Tanks holding various liquid chemicals, solvents, potable water, grains, pelletized or slurry forms
* Restoration of existing surfaces, such as; plastics, polyester or other construction media suffering from attack, wear or thermal shock
* General corrosion protection in pulp and paper mils, industrial plants, food plants, marine industry, power plants, etc.

Product Credentials:

* Complies with F.D.A. Chapt. 121.2514 for use in Food Plants. Film is non-toxic when dry and fully cured.

Relevant Publications:

* Centron 415 M.S.D.S. Publication
* Centron 415 Spray Recommendation
* Centron 415 Floor Coatings

Physical Properties:

* Color: Centron Tan, Gray & Custom Colors
* Solids: 100% N.V.
* W.P.G.: 9.8 lbs. mixed
* Viscosity: 98 Ku, mixed
* Flash Point: Over 300°F
* Package: Two Package, Part A & Part B
* Container: Kits, 5 Gallon and Activator
  3 gallons Part B + 1 gallon Part A
  Total Mixed Kit, 4 Gallons

Storage and Handling:

Store inside a clean, dry room zoned for flammable products; temp. 50°F-90°F. Use ground clamps and avoid sparks or electrical discharge.

Shelf Life:

12 months from date of manufacture.

Solvents and Diluents:

* Thinning and Reduction: Use M.E.K.
* Clean Up: Use M.E.K.

Accessories: N/A

Basic System:

* General Service Floors
  Smooth Glossy
  First Coat: 5-8 mils
  Second Coat: 10 mils

* Textured, Slip Resistant
  First Coat: 10 mils
  Non-Skid: Silica Sand Blend
  Second Coat: 15 mils

REV: 11/86

TRIPLE G COATINGS INC. warrants that the Product shall conform to its standard specifications in effect at time of shipment. TRIPLE G COATINGS INC. MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED WITH RESPECT TO THE PRODUCT AND DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE. Any liability of TRIPLE G COATINGS INC. arising out of the sale, use or application of the Product shall be limited to replacement of the Product used.

These instructions are not intended to show product recommendations for specific service. They are issued as an aid in determining correct surface preparation, mixing instructions, and application procedure. It is assumed that the proper product recommendations have been made. These instructions should be followed closely to obtain the maximum service from the materials.

To the best of our knowledge the technical data contained herein are true and accurate at the date of issuance and are subject to change without prior notice. User must contact TRIPLE G COATINGS INC. to verify correctness before specifying or ordering. No guarantee of accuracy is given or implied. We guarantee our products to conform to TRIPLE G COATINGS INC. quality control. We assume no responsibility for coverage, performance or injuries resulting from use. Liability, if any, is limited to replacement of products. Prices and cost data if shown, are subject to change without prior notice. NO OTHER WARRANTY OR GUARANTEE OR ANY KIND IS MADE BY THE SELLER, EXPRESS OR IMPLIED, STATUTORY, BY OPERATION OR LAW, OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Preparation Method: Refer to individual job specification

* Steel: S.S.P.C. 1, 2, 3 and S.S.P.C. 6 - Commercial Sandblast to a 1.5 - 2 mil profile. Recommended S.S.P.C. - 10 for immersion.
* Concrete: Sandblast, vacuum blast, acid etch, degrease, detergent and/or solvent clean and dry. Prepared surface should equal medium sandpaper.
* Wood: Power sand, degrease, strip and remove all existing finish, stains and unsound wood.
* Basic: The surface must be structurally sound, clean, dry and free of intervening barriers to block or interfere with penetration and adhesion.
* Old Paint: Sand, degrease, clean and dry. Test apply and inspect for solvent attack, lifting and wrinkling.

Application Methods: Refer to individual job specification

* Brush: Natural fiber or solvent resistant synthetic.
* Roller: Short-medium nap roller, solvent resistant.
* Lambswool: Not Recommended.
* Spray: Air pressure or airless spray. Refer to publication.

Application Parameters:

* Environment: 40°F-100°F @ 90%-20% R.H.
* Coverage: 1,604 mil feet per gallon.
* Recommended Coverage: 160 sq. ft./gallon, per coat. 10 mils wet and dry.
* Mix Ratio: 3:1 by volume. Pot Life: 60 minutes @ 77°F
* Induction Time: Not required. Mix well for 3 minutes.
* Dry Time: Laboratory determined @ 77°F and 50% R.H.
  Tack Free: 8-12 hours Nail Hard: 12-18 hours
  Hard: 24 hours Full Cure: 5 days.
* Repairs: Clean, degrease and sand rough to a texture of medium grit sandpaper. Solvent wipe clean, reapply.

Safety Precautions:

Centron 415 M.S.D.S. Data Sheet
Read Project Specifications

Waste Disposal:

Remove and dispose of in accordance with M.S.D.S. Data Sheet, and local, state and federal Environmental Protection Agency and Department of Environmental Protection Regulations.

Appearance and Acceptance:

The cured dry finish should be smooth, glossy and hard. Centron 415 should be well bonded with no bubbles, wrinkles or surface defects. Non-skid texture for floors creates a finish commensurate with size and type of media and thickness of finish coat.

CAUTION: CONTAINS FLAMMABLE SOLVENTS. KEEP AWAY FROM SPARKS AND OPEN FLAMES. IN CONFINED AREAS WORKMEN MUST WEAR FRESH AIRLINE RESPIRATORS. HYPERSENSITIVE PERSONS SHOULD WEAR GLOVES OR USE PROTECTIVE CREAM. ALL ELECTRIC EQUIPMENT AND INSTALLATIONS SHOULD BE MADE AND GROUNDED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE. IN AREAS WHERE EXPLOSION HAZARDS EXIST WORKMEN SHOULD BE REQUIRED TO USE NON-FERROUS TOOLS AND TO WEAR

TECHNICAL AND PERFORMANCE DATA
CENTRON 415

Chemical Resistance

1. **Exposure Media**

Exposure Media	Term	Results
Sulfuric Acid 38%	9 Months	No Effect
Hydrocloric Acid 38%	9 Months	No Effect
Acetic Acid 10%	6 Months	No Effect
Caustic Soda 30%	9 Months	No Effect
Nitric Acid 10%	9 Months	No Effect
Skydrol (reg) 500B	9 Months	No Effect
Water, Deionized	9 Months	No Effect
Water, Salt 3%	9 Months	No Effect
Xylol	9 Months	No Effect
Ethanol	9 Months	No Effect
Unleaded Gasoline	9 Months	No Effect

2. **Chemical Resistance, A.S.T.M. D-1308**

Citric Acid 10%	No Effect
Sodium Hydroxide 10%	No Effect
Hydrochloric Acid 10%	No Effect
Sulfuric Acid 10%	No Effect
Petroleum Oils	No Effect
Acetic Acid 10%	No Effect
Ammonia 10%	No Effect
Sodium Chloride 10%	No Effect
Potassium Hydroxide 10%	No Effect
Calcium Hydroxide 10%	No Effect

3. **Flexibility**

Mandrel 1" Wrap	No Failure

4. **Hot Immersion Tests**

Test Media	Term	Results
H_2O @ 149°F	30 Days	No Defect
H_2SO_4 10% @ 149°F	15 Days	No Defect
HCl 10% @ 149°F	15 Days	No Defect
NaOH 10% @ 149°F	15 Days	No Defect
NaOH 25% @ 149°F	15 Days	No Defect

5. **Tensile Properties**

Cured Strength	PSI
Test @ 77°F	10,500
Test @ 200°F	8,000

Modulus of Elasticity	
Test @ 77°F	4.6×10^5
Test @ 200°F	3.4×10^5

TECHNICAL AND PERFORMANCE DATA - CENTRON 415 - (Continued)

6. Overcoat Adhesion

Test #1

Cured panel 10 days @ 77°F, dry, solvent wiped (MEK) and overcoated with CENTRON 415, no solvent reduction, cured 5 days.

Result: Excellent bond, adhesion. No separation under stress

Test #2

Cured panel 10 days @ 77°F, dry, brush blasted, solvent wiped (MEK) overcoated with CENTRON 415 and 15% solvent (MEK) reduction, cured 5 days.

Result: Excellent bond, adhesion. No separation under stress.

7. Temperature Limitations, Two Weeks

Dry Heat	300°F	No Change
Dry Heat	500°F	Color Change (Dark)
Wet, Steam and Condensate	250°F	No Change
Wet, Steam and Condensage	350°F	No Change

8. F.D.A. Status

Centron 415 resin and activator (curing agent) conforms to Federal Register Section 175.300, F.D.A. Supplemental data will be provided to comply and conform to listings in 21 CFR(b) (3) (VIII) which is cured epoxy coatings prepared from resins allowed in 21 CFR(b) (3) (VIII) and may be safely used as the food contact surface of articles intended for use in producing, manufacturing, packaging, processing, preparing, treating, holding or transporting food.

Centron 415 has limited classification when solvents are added to the mixed formula. Solvent reduction with Methyl Ethyl Ketone (MEK) permits cured film properties for intermittent contact with food in compliance with Chapter 121 of F.D.A. register. Solvents are not covered by F.D.A. and must be removed in the final cure by heating, baking, extended cure (10 days @ 77°F) and steam clean or detergent wash prior to use.

1 part. P.174

GE Silicones

One-Component RTV Adhesive Sealants

PRODUCT DESCRIPTION

RTV102, RTV103, RTV106, RTV108, RTV109, RTV112, RTV116 and RTV118 one-component, ready-to-use adhesive sealants are extremely versatile. They cure to a tough, durable, resilient silicone rubber on exposure to atmospheric moisture at room temperature. Acetic acid vapors are released from the sealant surface as a by-product of cure.

RTV102, RTV103, RTV108 and RTV109 sealants are standard strength paste consistency products which can be applied to vertical and overhead surfaces where pourable/self-leveling sealants are not practical.

RTV112 and RTV118 sealants are self-leveling products which are preferable to paste-consistency sealants when flow into small crevices and hard-to-reach places is desired.

RTV106 sealant is paste-consistency sealant; RTV116 sealant is a self-leveling sealant. Both RTV106 and RTV116 sealants are standard strength high-temperature sealants.

Since all these sealants utilize a moisture cure system, they must not be used in thicknesses of greater than 6mm (1/4 in.).

Where section depths exceed 6mm (1/4 in.), GE Silicones two-component silicone rubber compounds are recommended.

KEY PERFORMANCE PROPERTIES

- One-component products
- Capability to cure at room temperature and ambient humidity
- Self adhesion properties
- Low temperature flexibility
- High temperature performance
- Excellent weatherability and ozone and chemical resistance
- Excellent electrical insulation properties

APPLICATIONS

Product	Features	Potential Applications	UL	Food Contact
RTV102 White RTV103 Black RTV108 Translucent RTV109 Aluminum	General purpose pastes	General purpose bonding, sealing, electrical insulation, formed-in-place gaskets. Can be applied to vertical or overhead surfaces.	File 36952	FDA 21 CFR 177.2600 USDA NSF Std. No. 51
RTV106 Red	High temperature paste	Sealing heating elements, gasketing, electrical insulation, and other critical bonding and sealing applications where parts must perform at high temperatures. Can be applied to vertical or overhead surfaces.	File 36952	FDA 21 CFR 177.2600 USDA NSF Std. No. 51
RTV116 Red	High temperature self leveling	Thin section potting, filling small surface voids, protective coating, electrical insulation where high temperature performance is required.	File 36952	FDA 21 CFR 177.2600 USDA NSF Std. No. 51
RTV112 White RTV118 Translucent	General purpose self leveling	Electrical insulation, thin section potting, protective coatings. Will flow into small crevices and hard to reach places.	File 36952	FDA 21 CFR 177.2600 USDA NSF Std. No. 51

These sealants were not designed for and should not be used for applications intended for permanent implantation into the human body.

These sealants are not for use in delicate electrical and electronic applications in which corrosion of copper, brass or other sensitive metals is undesirable.

TYPICAL PRODUCT DATA

Uncured Properties	RTV102, RTV103 RTV108, RTV109	RTV106	RTV116	RTV112, RTV118
Consistency	Paste	Paste	Self leveling	Self leveling
Color	RTV102 White RTV103 Black RTV108 Translucent RTV109 Aluminum	Red	Red	RTV112 White RTV118 Translucent
Viscosity, poises	–	–	250	200
Application Rate, (g/min)	400	400	–	–
Specific Gravity	1.05	1.07	1.09	1.05
Tack-Free Time, min.	20	20	30	20

Cured Properties[1]	RTV102, RTV103 RTV108, RTV109	RTV106	RTV116	RTV112, RTV118
Mechanical:				
Tensile Strength, kg/cm² (lb/in²)	28 (400)	26 (375)	25 (350)	23 (325)
Elongation, %	450	400	350	325
Hardness, Shore A	30	30	20	25
Tear Strength, kg/cm (lb/in)	8 (45)	7 (40)	–	–
Shear Strength, kg/cm² (lb/in²)[2]	14 (200)	14 (200)	7 (125)	7 (100)
Peel Strength, kg/cm (lb/in)[3]	7 (40)	7 (40)	3 (25)	3 (15)
Electrical:				
Dielectric Strength, kv/mm (v/mil)	20 (500)	20 (500)	16 (400)	16 (400)
Dielectric Constant @ 60 Hz	2.8	2.8	2.8	2.8
Dissipation Factor @ 60 Hz	.001	.001	.001	.001
Volume Resistivity, ohm-cm	$3x10^{15}$	$3x10^{15}$	$2x10^{15}$	$6x10^{15}$
Thermal:[4]				
Brittle Point, °C (°F)	-60 (-75)	-60 (-75)	-60 (-75)	-60 (-75)
Maximum continuous operating temperature, °C (°F)	204 (400)	260 (500)	260 (500)	204 (400)
Maximum intermittent operating temperature, °C (°F)	260 (500)	315 (600)	315 (600)	260 (500)
Additional Information:[4]				
Linear Shrinkage, %	1.0	1.0	1.0	1.0
Thermal Conductivity, cal/sec/cm², °C/cm (Btu/hr/ft², °F/ft)	.0005 (.12)	.0005 (.12)	.0005 (.12)	.0005 (.12)
Coefficient of Expansion cm/cm, °C (in/in, °F)	$27x10^{-5}$ ($15x10^{-5}$)	$27x10^{-5}$ ($15x10^{-5}$)	$27x10^{-5}$ ($15x10^{-5}$)	$27x10^{-5}$ ($15x10^{-5}$)

[1] Cure time 3 days/25C (77F)/50% relative humidity.
[2] At 100% cohesive failure.
[3] At 100% cohesive failure using 1 in. x 8 in. stainless steel screen at 180° pull angle.
[4] Information is provided for customer convenience only. These properties are not tested on a routine basis.

SPECIFICATIONS

Typical property data values should not be used as specifications. Assistance and specifications are available by contacting GE Silicones.

INSTRUCTIONS FOR USE

Surface Preparation

RTV102, RTV103, RTV106, RTV108, RTV109, RTV112, RTV116 and RTV118 sealants will bond to many clean surfaces without the aid of primers. These surfaces typically include many metals, glass, ceramic, silicone rubber and some rigid plastics. These adhesive sealant products will also produce fair bonds to organic rubber and to some flexible plastics not containing fugitive plasticizers (which migrate to the surface, impairing adhesion). An evaluation should be made to determine bond strength for each specific application. For difficult-to-bond substrates, use of a primer is suggested. Primers SS4004, SS4044 and SS4179 are recommended for use with these sealants. (Complete information and usage instructions for these primer products are contained in a separate product data sheet, CDS1532).

Where adhesion is required, surfaces should be thoroughly cleaned with a suitable solvent such as naphtha or methyl ethyl ketone (MEK) to remove dirt, oil and grease. The surface should be wiped dry before applying the adhesive sealant.

When solvents are used, proper safety precautions must be observed.

Application and Cure Time Cycle

Paste-consistency products may be applied directly to clean or primed substrates. Where broad surfaces are to be mated, the sealant should be applied in a thin, less than 6mm (1/4 in.) diameter, bead or ribbon around the edge of the surface to be bonded.

Flowable products may be applied to clean or primed substrates by pouring directly from the original container or dipping. These products will self-level on a surface, filling small crevices and surface voids. Depth of poured sections should not exceed 6mm (1/4 in.).

The cure process begins with the formation of a skin on the exposed surface of the sealant and progresses inward through the material. At 25C (77F) and 50% relative humidity, RTV102, RTV103, RTV106, RTV108, RTV109, RTV112 and RTV116 sealants will form a surface skin which is tack-free to the touch in 15 to 30 minutes. Once the tack-free skin has begun to form, further tooling of the adhesive sealant is not advisable.

Higher temperatures and humidity will accelerate the cure process; low temperatures and low humidity will slow the cure rate.

As the adhesive sealant cures, acetic acid vapors are released from the sealant surface. The odor of acetic acid will completely disappear when curing is completed.

A 3mm (1/8 in.) section of adhesive sealant will cure through in approximately 24 hours at 25C (77F) and 50% R.H. Since cure time increases with thickness, use of these adhesive sealants should be limited to section thicknesses of 6mm (1/4 in.) or less.

Bond Strength Development

In addition to the effects of temperature and relative humidity, development of maximum bond strength will depend on joint configuration, degree of confinement, sealant thickness and substrate porosity. Normally, sufficient bond strength will develop in 12 to 24 hours to permit handling of parts. Minimum stress should be applied to the bonded joint until full adhesive strength is developed. Eventually the adhesive strength of the bond will exceed the cohesive strength of the silicone rubber sealant itself. Always allow maximum cure time available for best results.

PACKAGING AND DISPENSING

RTV adhesive sealants from GE Silicones are supplied ready-to-use in collapsible aluminum squeeze tubes, caulking cartridges and in bulk containers.

Collapsible aluminum tubes may be squeezed by hand or with the aid of mechanical wringers which allow more complete removal of material from the tube. Air-operated dispensing guns may also be used with aluminum tubes and offer the advantages of improved control and faster application for production line use. The sealant may be dispensed from caulking cartridges by using simple mechanical caulking guns or air-operated guns. Air-operated guns will allow greater control and application speed. Both tubes and cartridges are easy to use, can be put into production quickly and require minimal capital investment.

Note: Do not exceed 45 psig when used in air-powered caulking guns.

Bulk containers require a larger initial investment in dispensing equipment, but offer the most economical packaging for volume production. Bulk dispensing systems are air-operated extrusion pumps coupled to hand or automated dispensing units. Pumps which are specifically designed for pumping one-component RTV silicone rubber have TEFLON® seals, packings and lined hoses to prevent moisture permeation and pump cure problems. Specific details on dispensing systems and manufacturers are available in a separate GE Silicones RTV Silicone Rubber Equipment Guide (CDS1541).

CLEAN UP AND REMOVAL

Before curing, solvent systems such as naphtha or methyl ethyl ketone (MEK) are most effective. Refer to solvent use warnings in the section on surface preparation.

After cure, selected chemical strippers which will remove the silicone rubber are available from other manufacturers. Specific product information may be obtained on request.

FDA STATUS

RTV102, RTV103, RTV106, RTV108, RTV109, RTV112, RTV116 and RTV118 sealants can be used in food contact applications where FDA regulations apply. Reference CDS4319 "Food Contact Applications, Silicone Rubber Compounds", for specific regulations, limitations and conditions of use.

USDA STATUS

RTV102, RTV103, RTV106, RTV108, RTV109, RTV112, RTV116 and RTV118 sealants may be used on equipment which may contact edible products in official establishments operating under the Federal meat and poultry products inspection program. See USDA letter of Authorization.

NSF STATUS

The National Sanitation Foundation lists RTV102, RTV103, RTV106, RTV108, RTV109, RTV112, RTV116 and RTV118 sealants under NSF Standard No. 51 (Plastic Materials and Components for Use in Food Equipment), as satisfactory for use on food contact surfaces. Refer to GE bulletin CDS4319 before use.

UL STATUS

RTV102, RTV103, RTV106, RTV108, RTV109, RTV112, RTV116 and RTV118 silicone rubber adhesive sealants are recognized by Underwriters Laboratories, Inc., under their Component Recognition Program (UL File No. E-36952). Refer to CDS4320 for additional information.

MILITARY SPECIFICATION

MIL-A-46106B

Group I	Type I	General Purpose Paste RTV102, RTV103, RTV108, RTV109
	Type II	General Purpose Flowable RTV112, RTV118
Group III	Type I	High Temperature Paste RTV106
	Type II	High Temperature Flowable RTV116

Testing for referenced MIL Spec is performed in accordance with current GE Silicones quality test methods, laboratory conditions, and procedures, frequency and sampling, which are not necessarily identical with the methods, conditions, procedures, frequency and sampling stated or referenced in the listed specification. Any certification will be limited to listed properties and will not imply or state conformity to any other aspect of the referenced specification, including but not limited to marking, packaging, bar coding, testing, or sampling. Contact GE Silicones for a comparison review.

HANDLING AND SAFETY

These products are manufactured and sold for industrial use only.

Material Safety Data Sheets are available upon request from GE Silicones. Similar information for solvents and other chemicals used with our products should be obtained from your suppliers.

STORAGE WARRANTY PERIOD

When stored in the original unopened containers in a dry location at temperatures less than 27C (80F), RTV102, RTV103, RTV106, RTV108, RTV109, RTV112 and RTV116 sealants offer a storage life of up to one year from date of shipment from the manufacturer.

AVAILABILITY

GE Silicones rubber sealants may be ordered from GE Silicones, Waterford, NY 12188, the GE Silicones Sales office nearest you or an authorized GE silicone product distributor.

GOVERNMENT REQUIREMENT

Prior to considering use of a GE Silicones product in fulfilling any Government requirement, contact GE Silicones Government Programs Office.

LIMITED WARRANTY

GE Silicones warrants that its product will conform to GE Silicones' internal specifications at the time of application or use, provided that the product is stored in accordance with GE Silicones' recommendations and used or applied before the earliest of (1) the "Use Before Date" indicated on the product package, (2) one year from date of shipment, or (3) expiration of such other period or recommended storage time stated in the GE Silicones' literature for the product. If notified in writing of a claim within six months of the product's use or application, GE Silicones will, at its option, replace or refund the purchase price of any GE Silicones product which does not satisfy the foregoing warranty.

THE FOREGOING SHALL CONSTITUTE THE SOLE AND EXCLUSIVE REMEDY FOR DEFECTS OR FAILURE OF THE PRODUCT, AND THE SOLE AND EXCLUSIVE LIABILITY OF GE. THE WARRANTIES STATED ABOVE ARE IN LIEU OF ALL OTHER WARRANTIES, WRITTEN OR ORAL, STATUTORY, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE.

LIMITATION OF LIABILITY: GE shall, in no event, whether the claim is based on warranty, contract, tort, strict liability, negligence or otherwise, be liable for incidental or consequential damages, or for any other damages in excess of the amount of the purchase price.

NOTE: For many products, GE Silicones may be able to offer a more extensive, application specific warranty. For further information, contact your GE Silicones field representative.

GE Silicones

World Wide Offices

General Electric Company
260 Hudson River Road
Waterford, NY 12188
Phone: 800-255-8886

General Electric Canada, Inc.
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Mississauga, Ontario
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GE Pacific PTE Ltd.
150 Beach Road
#24-00 Gateway West
Singapore, 0719
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GE Silicones Korea
c/o Dongyang Silicones Co., Ltd.
Oriental Chem. Bldg.
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Seoul, Korea, 100-070
Phone: 82-2-774-2641

General Electric Plastics, B.V.
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4600 AC Bergen op Zoom
The Netherlands
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GE Silicones
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Victoria, 3175
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Phone: 61-3-791-6777

General Electric Technical
Service Co., Inc.
Taiwan Branch
7F, Formosa Plastics Building
201, Tun Hua North Road
Taipei, Taiwan
Phone: 886-2-514-9521

CDS4312 (10/92)

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COPY

HOYER-SCHLESINGER-TURNER inc.
ENGINEERS - CONSTRUCTORS
300 west adams street chicago illinois 60606 telephone 263-0556 area code 312

May 14, 1993

Illinois Environmental Protection Agency
Division of Land Pollution Control – #24
Permit Section
PO Box 19276
Springfield, Illinois 62794-9276

Re: Clean Harbors of Chicago, Inc.
Response to Deficiencies - RCRA Part B License Application

Gentlemen:

This letter shall serve as a clarification to certification submitted on March 15, 1993 as Response to Deficiencies - RCRA Part B License Application.

The Certification by Professional Engineer (see Appendix K-2) does include certificate of existing Inorganic Lab-Pack Pouring Station - Item No. 30.

Inorganic Lab-Pack Pouring Station is positioned over 3 compartments Reactor vessel - Item No. 3. The station consists of Work Bench, Emptying Station, Rinsing Station and Empty Bottle chute. Installation is L-shaped and exhaust hood is arranged above. All chutes are constructed from 3/16" stainless steel. Neoprene flexible duct connects Empty Bottle chute with collecting drum.

Vapors are exhausted through exhaust hood. Total exhaust is 3000 CFM. Average slot velocity is 630 fpm if balancing damper is fully open. Duct velocity is in the range of 1400 fpm to 1650 fpm, satisfactory to carry vapors away. See attached calculations Sheet 1 of 2.

The floor of Process Building No. 1 is the containment for spills in Inorganic Lab-Pack Pouring Station. Containment volume is approximately 10,000 gallons. Maximum volume of stored liquids for this operation is 400 gallons. That is much less than containment volume available. See attached calculations Sheet 2 of 2.

Please feel free to contact me at 312/263-0556 if you have any questions.

Sincerely,

HOYER-SCHLESINGER-TURNER, INC.

Marie Vanagas

Marie Vanagas, PE

MARIE VANAGAS
62-40801
REGISTERED
PROFESSIONAL
ENGINEER
OF
ILLINOIS

Paul A. Ahearn
James R. Laubsted

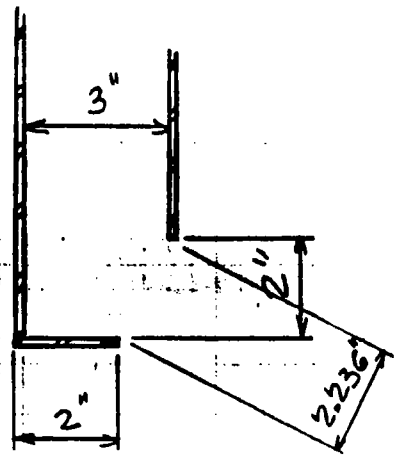
MV/ar

HOYER-SCHLESINGER-TURNER, INC.

SHEET 1 OF 2
PROJECT NO. 1785
DATE 5-13-93
BY M.V.

PROJECT CLEAN HARBORS

SUBJECT Item #30 - INORGANIC LAB-PACK POURING STATION



SLOTS AREA:

(6) SLOTS @ 2.236 x 29.25" L = 392.4 in^2
= 2.73 ft^2

(4) SLOTS @ 2.236 x 32.625" L = 291.8 in^2
= 2.026 ft^2

TOTAL = 4.76 ft^2

EXHAUST FAN:
NEW YORK BLOWER MODEL GPA-180 ⇒ 3000 CFM @ 3/4" SP at 1000 RPM

Velocity thru Slots:

SLOTS FULLY OPEN: $\frac{3000}{4.76}$ = 630 ft/min

SLOTS HALF CLOSED WITH DAMPER: $\frac{3000 \times 2}{4.76}$ = 1260 ft/min

DUCT 14"ϕ, TWO CONNECTIONS @ 1500 CFM = 1400 ft/min
18"ϕ & 3000 CFM ⇒ 1650 ft/min

HOYER-SCHLESINGER-TURNER, INC.

SHEET 2 OF 2
PROJECT NO. 1785
DATE 5-13-93
BY MV

PROJECT CLEAN HARBORS

SUBJECT PROCESS BUILDING #1 - CONTAINMENT VOLUME

BUILDING SIZE : $78' \times 101' = 7878\ ft^2$

Height of curb = 4" => $2626\ ft^3 \times 50\% =$

$= 1313.0\ ft^3 = 9{,}820$ gal

SAY 10,000 gal

50% is taken on account of miscellaneous volume taking conc. pads, tanks, curbs etc. 4" Min. rised sill at all doors. No slope toward trench or floor drain is taken into consideration.

Lab-Pack storage is on two pallets. Each pallet can accommodate 4 barrels at 50 gal/max.

Total = $2 \times 4 \times 50 = 400$ gal << 10,000 gal of containment volume

HOYER-SCHLESINGER-TURNER inc.
ENGINEERS - CONSTRUCTORS
300 west adams street chicago illinois 60606 telephone 263-0556 area code 312

December 22, 1997

Mr. Mark A. Schollenberger, PE
Illinois Environmental Protection Agency
Bureau of Land - Permit Section
PO Box 19276
Springfield, Illinois 62794-9276

Dear Mr. Schollenberger:

This letter is to provide certification for the Clean Harbors Services, Inc. newTruck Loading- Unloading Dock, (Unit V) and Drum Storage Area Extension-(Unit R2).

The Truck Loading- Unloading Dock and The Drum Storage Extension are new concrete structures. The Dock and Drum Storage area is adjacent to the west side of the existing Drum Storage area. The existing structure is in operation. The new Dock will be used to load and unload drums,which will be moved by fork lift trucks to and from the new Drum Storage Area.

The new Truck Loading- Unloading Dock and the New Drum Storage Extension are constructed from10-inch thick reinforced concrete slab with a side dike wall, 6 inches high. The dock is sloped to the south . Since the Dock and The Drum Storage Area are used for drums with hazardous waste , concrete coating is required(see the Certification of the coatings by Mr.Bhupendra Patel,Registered Professional Engineer in the State of Illinois). The provision for a canopy over the dock and the Drum Storage Area was incorporated into the design.

For construction data, see CHCI Dwg. No. 4277 (Dwg. No. 1121-S-04, Rev. B, dated 7/15/97)and CHCI Dwg. No.4278(Dwg.No.1121-S-05),Rev.C,dated 8/27/97.Calculations of the structural integrity and certification letter by Mr. Peter J.Bernes,Licensed Stuctural Engineer are included. Quality control during the construction was performed by Clean Harbors Plant Engineer, Mr. Gregory Jones.

During my visual inspection on December 4, 1997 and on December 22,1997 the Truck Loading- Unloading Dock and the Drum Storage Area Extension were not in use and were empty. There were no visible cracks, gaps or any other visible structural damage.

I believe that the Truck Loading- Unloading Dock -Unit V and the Drum Storage Area Extension -Unit R2 are suitable for intended use.

Very truly yours,

HOYER-SCHLESINGER-TURNER, INC.
Consulting Engineers

Peter J. Bernes

Peter J. Bernes
Licensed Illinois Structural Engineer
Encl.

STATE OF ILLINOIS
PETER J.
BERNES
3659
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes
PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11.30.98

CERTIFICATION

This statement is to be completed by both the responsible officer and the registered professional engineer upon completion of construction in accordance with 35 IAC Section 702.126. Submit one copy of the certification with original signatures and two additional copies (four additional copies for UIC wells). Forward these certification statements and any information required by the permit to the following address:

Illinois Environmental Protection Agency
Bureau of Land - #33
Permit Section
2200 Churchill Road, P.O. Box 19276
Springfield, Illinois 62794-9276

FACILITY NAME: CLEAN HARBORS SERVICES, INC.

IEPA SITE CODE: 0 3 1 6 0 0 0 0 5 1

U.S. EPA ID NO.: IL D 0 0 0 6 0 8 4 7 1

PART B PERMIT LOG #/UIC PERMIT #: B-16

PERMIT (OR MODIFICATION) ISSUANCE DATE: 09/30/93

PERMIT CONDITION NO. REQUIRING CERTIFICATION: I.K.L.A.

The * has been constructed in accordance with the specifications in the Part B/UIC Permit. Documentation that the construction was in accordance with the permit is contained in the enclosed report. 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.

Signature of Owner/Operator

CHRISTOPHER MURPHY, GENERAL MANAGER
Name and Title

Peter J. Bernes
Signature of Registered P.E.

PETER BERNES, P.E. IL REG #081-003659
Name of Registered P.E. and Illinois Registration Number

DECEMBER 22, 1997
Date

(P.E. SEAL)

STATE OF ILLINOIS
PETER J. BERNES
3659
LICENSED STRUCTURAL ENGINEER

* DRUM STORAGE AREA EXPANSION (UNIT R2) - (OXIDIZERS STORAGE #2, REACTIVES STORAGE #2, AND POISONS STORAGE #2) AND TRUCK LOADING DOCK (UNIT V)

This Agency is authorized to require this information under Illinois Revised Statutes, 1979. Chapter 111 ½, Section 1039. Disclosure of this information is required under that Section. Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

CleanHarbors®
ENVIRONMENTAL SERVICES, INC.
2605 EGYPT ROAD, SUITE #204 • TROOPER, PA 19403
(610) 539-6633 • FAX (610) 539-3094

This certification is in reference to the impervious coatings used at the Clean Harbors Services, Inc. facility at 11800 South Stony Island Avenue in Chicago, IL (ILD000608471).

Truck Unloading Dock - Unit V

The secondary containment system is sealed with a minimum 30-40 mil coat of NOVO-POXI Dressing which has a chemical resistance equivalent to that of Protecto-Coat 900.

Drum Storage Area Expansion - Unit R2

The secondary containment system of the Oxidizers Storage #2, Reactives Storage #2 and Poisons Storage #2 are sealed with a minimum 3/16 inch coat of NOVO-POXI SLR which has a chemical resistance equivalent to that of Protecto-Crete 900.

Bhupendra Patel

Signature of Registered P.E.

Bhupendra Patel, 062-048690
Name of Registered P.E. and
Illinois Registration Number

December 19, 1997
Date

P.E. Seal

HOYER-SCHLESINGER-TURNER, INC.

SHEET 1 OF 13

PROJECT CLEAN HARBORS SERVICES, INC - CHICAGO, ILL.

PROJECT NO. 1785-

DATE 7.1.97

SUBJECT FOUNDATIONS FOR PROPOSED TRUCK LOADING DOCK

BY P. BERNES, S.E

DESIGN IS BASED ON LATEST EDITION OF CITY OF CHICAGO BUILDING CODE.

FOUNDATION DESIGN IS BASED ON LOADS PROVIDED BY VARCO-PRUDEN PREFAB. BUILDINGS REACTION REPORT.

VALUES SHOWN ON FOLLOWING SEVEN PAGES ARE RESISTING FORCES OF THE FOUNDATION.

THE FOUNDATIONS HAVE BEEN DESIGNED FOR A SAFE SOIL BEARING CAPACITY OF 1500 PSF. IF SOIL OR REQUIRED STRENGTH IS NOT FOUND AT THE FOOTING DESIGN ELEVATION, THE CONDITION MUST BE REPORTED TO THE OWNER OR PROJECT ENGINEER IMMEDIATELY BEFORE PROCEEDING. THE SOIL REPORT WAS PREPARED BY PROFESSIONAL SERVICE INDUSTRIES, INC.

THE FOUNDATION IS DESIGNED WITH SUFFICIENT THICKNESS AND REINFORCING TO WITHSTAND SEISMIC ACTIVITY THAT MAY OCCUR IN THIS AREA.

STATE OF ILLINOIS
PETER J. BERNES
3659
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11.30.98

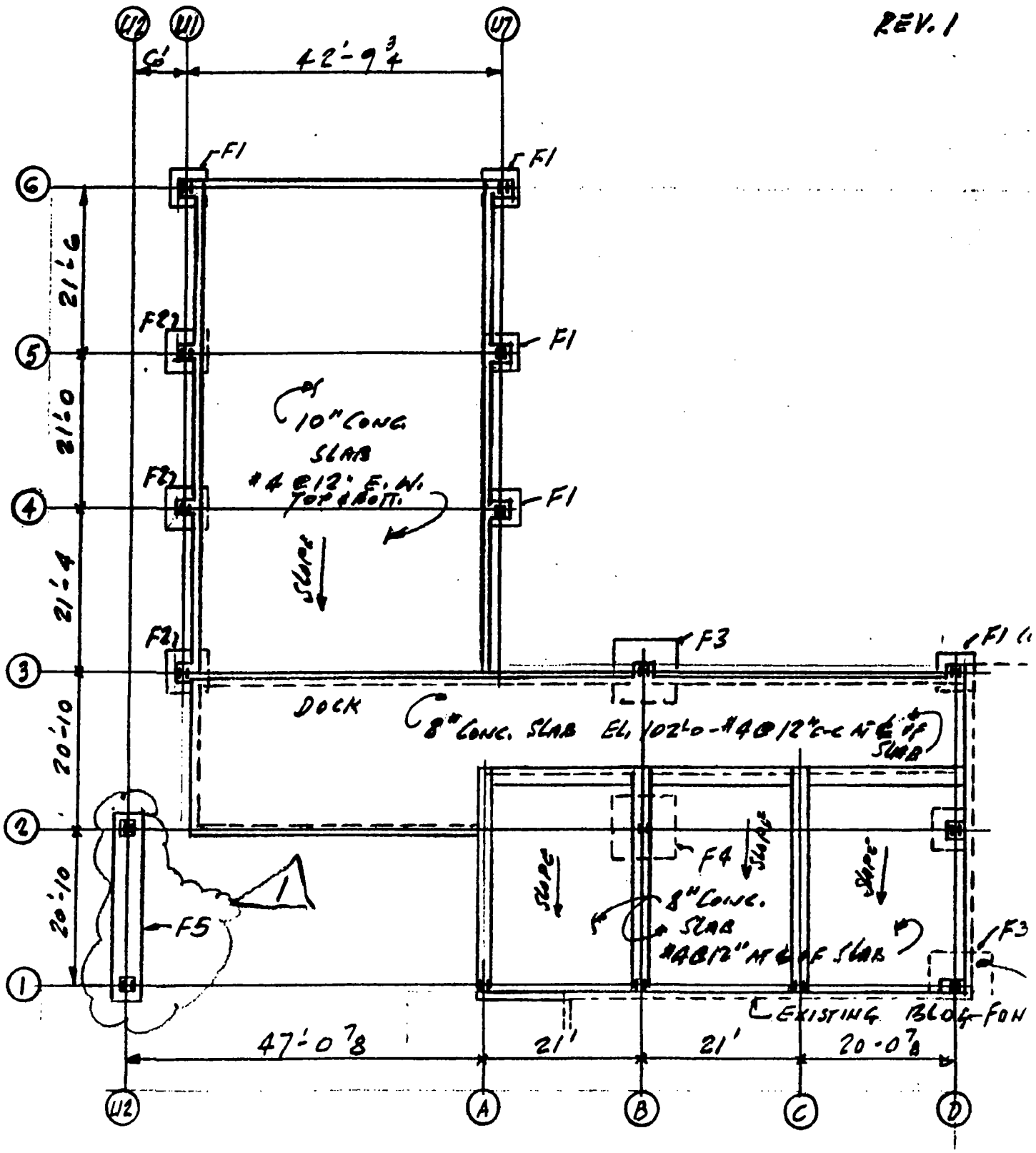
HOYER-SCHLESINGER-TURNER, INC.

PROJECT CLEAN HARBORS SERVICES, INC. - CHICAGO, ILL.

SUBJECT FOUNDATIONS FOR PROPOSED TRUCK LOADING DOCK

SHEET 2 OF 13
PROJECT NO. 1785-2
DATE 7.1.97
BY P. BERNES, S.E.

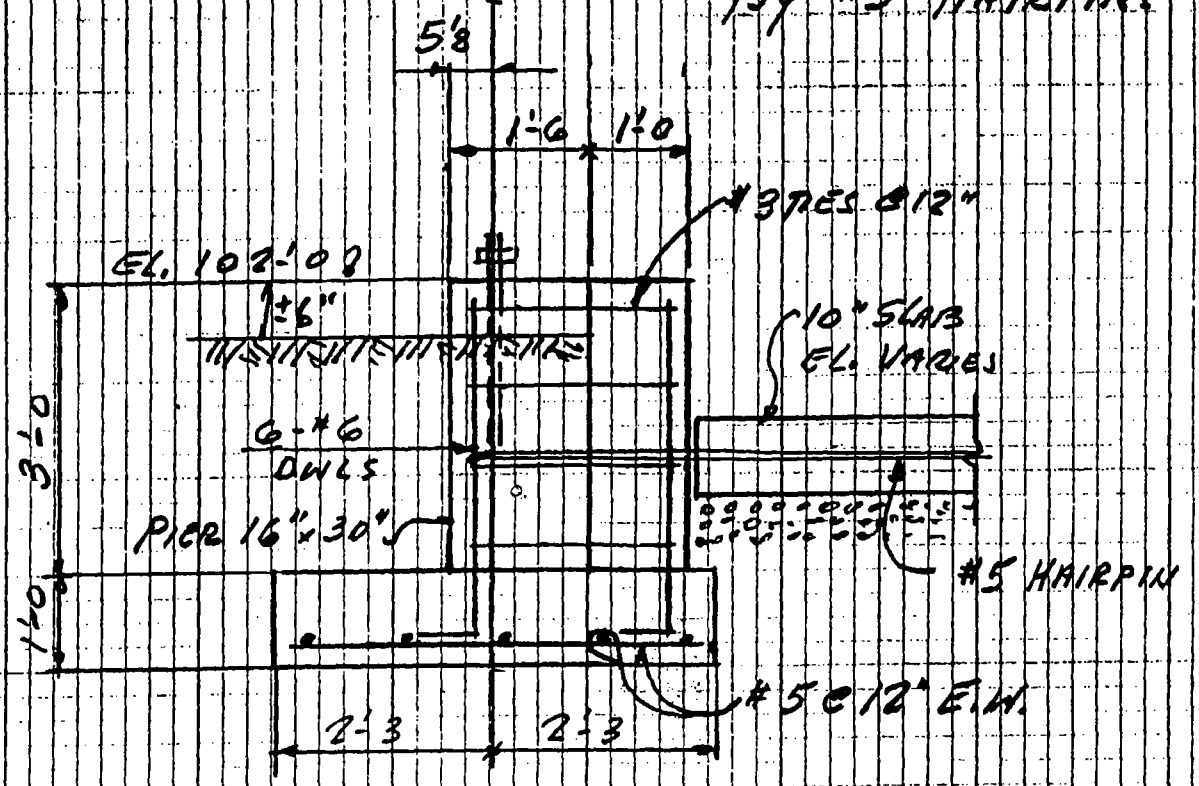
REV. 8.27.97
REV. 1



FOUNDATION PLAN

1. FOOTING MK F1 (4'-6" x 4'-6")

GOVERNING LOADS ARE AT LT-5 (VARCO-PRUDEN)
+V = 20^k (D.L. + L.L.)
HORIZONTAL FORCE OF -9^k TAKEN BY #5 HAIRPINS



ADDITIONAL LOAD (PIER, WALL, FTG. SLAB + SOIL)

FTG. = 4.5' x 4.5' x 1.0' x .15 KCF = 3.04^k
WALL = 3.0' x 1.0' x 4.5' x .15 " = 2.03^k
PIER = 1.5' x 1.33' x 3.0' x .15 " = .90^k
SOIL = 3.3' x 4.5' x 2.5' x .10 " = 3.71^k

9.68^k

TOTAL VERTICAL LOAD =

= 20^k + 9.68^k = 29.68^k

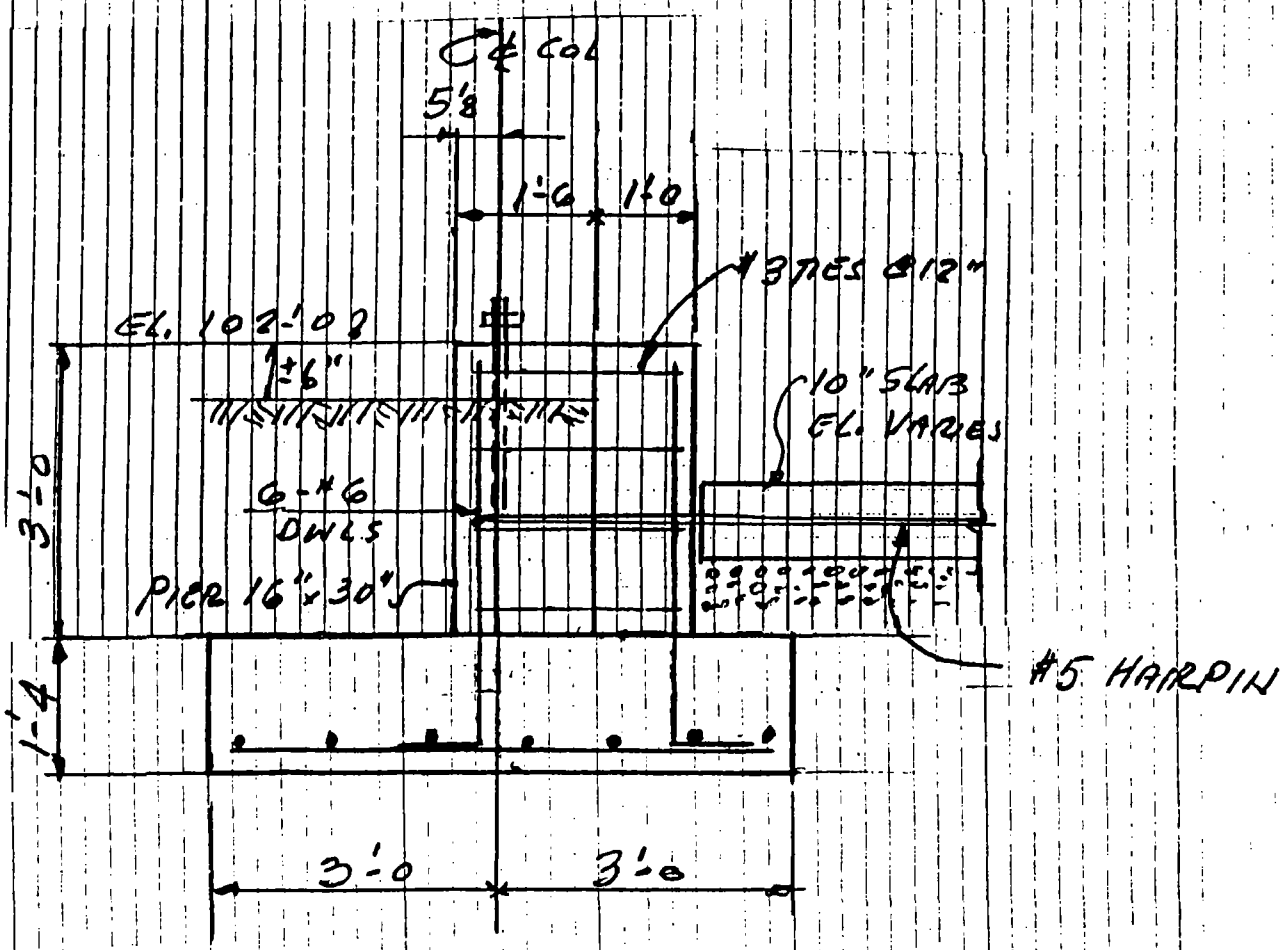
MAX. SOIL PRESSURE =

$$= \frac{29.68^k}{4.5' \times 4.5'} = 1.47 \text{ KSF} < 1.50 \text{ KSF} \quad \text{O.K}$$

FROM CRSI HANDBOOK
REINF. REQ'D = 4-#5 O.K.

2. FOOTING MK F2 (6'-0 x 6'-0 x 1'-4)

GOVERNING LOADS ARE AT U2-2 (VARCO-PRUDEN)
+V = 31.3^k
HORIZONTAL FORCE OF -4.1^k IS TAKEN
BY #5 HAIRPIN



PROJECT CLEAN HARBORS SERVICES, INC. - CHICAGO, ILL

SUBJECT FOUNDATIONS FOR PROPOSED TRUCK LOADING DOCK

ADDITIONAL LOAD (PIER, WALL, FTG. SLAB & SOIL)

FTG. = 6.0' x 6.0' x 1.33' x .15 KCF = 7.18 K

WALL = 3.0' x 1.0' x 6.0' x .15 " = 2.70 K

PIER = 1.5' x 1.33' x 3.0' x .15 " = .90 K

SOIL = 4.0' x 6.0' x 2.5' x .10 " = 6.00 K

10" CONC. SLAB = .83' x 1.0' x 6.0' x .15 " = .75 K

17.53 K

TOTAL VERTICAL LOAD =

= 31.30 K + 17.53 K = 48.83 K

MAX. SOIL PRESSURE =

$$= \frac{48.83\,K}{6.0' \times 6.0'} = 1.36\ KSF < 1.50\ KSF \quad O.K.$$

FROM CRSI HANDBOOK

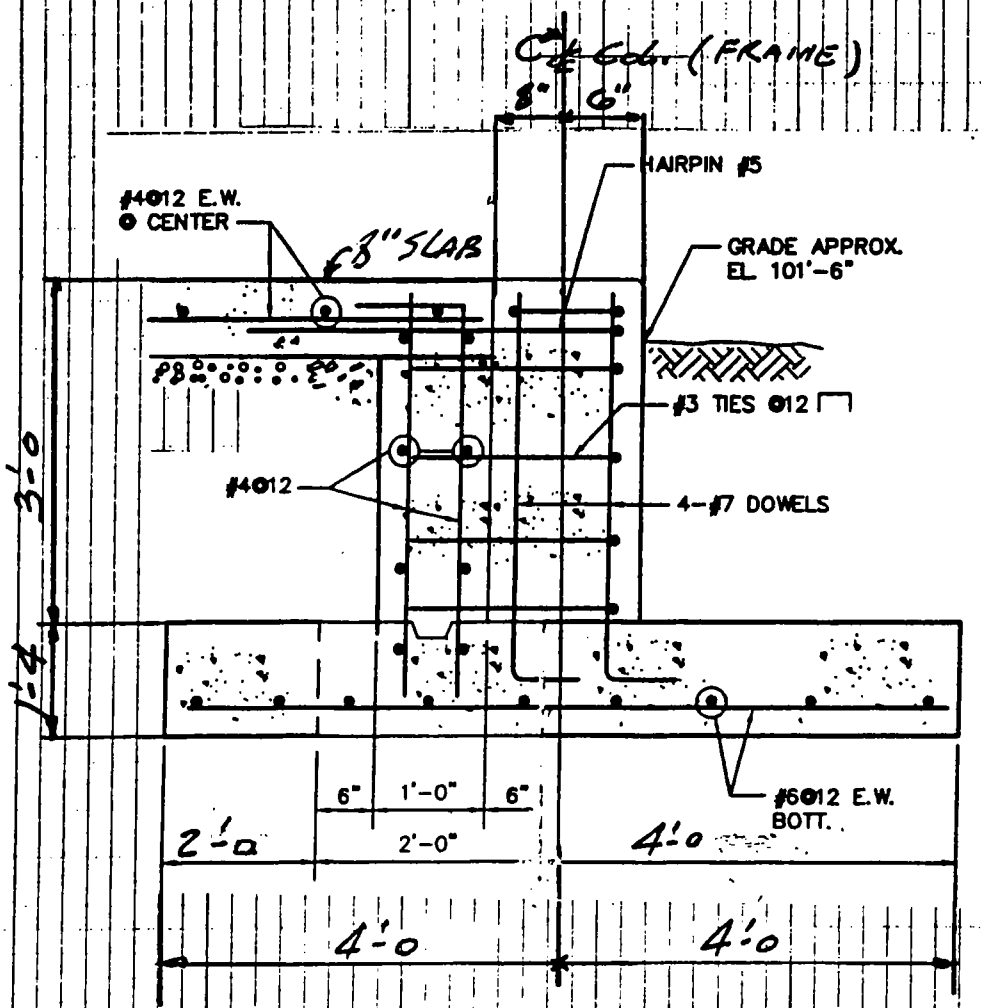
REINF. REQ'D = 5 - #5 (USE 7 - #5 E.W.)

PROJECT CLEAN HARBORS SERVICES, INC. - CHICAGO, ILL

SUBJECT FOUNDATIONS FOR PROPOSED TRUCK LOADING DOCK

3. FOOTING MK F3 (9'-0 x 9'-0 x 1'-6)

GOVERNING LOAD IS AT 4-B (VARCO-PRUDEN)
+V = 57.4^k



ADDITIONAL LOAD (PIER, WALL, SLAB, FILL & SOIL)

FTG. = 8.0' x 8.0' x 1.33' x .15 KCF	=	12.77^k
WALL = 1.0' x 2.33' x 7.0' x .15 "	=	2.45^k
PIER = 1.17' x 1.33' x 3.0' x .15 "	=	.70^k
8" SLAB = .67' x 3.33' x 8.0' x .15 "	=	2.68^k
FILL + SOIL = 2.33' x 7.0' x 8.0' x .10 "	=	13.05^k
		31.65^k

TOTAL VERTICAL LOAD =

$= 31.65^k + 57.4^k = 89.05^k$

MAX. SOIL PRESSURE =

$= \frac{89.05^k}{8.0' \times 8.0'} = 1.39\ KSF < 1.50\ KSF$ O.K.

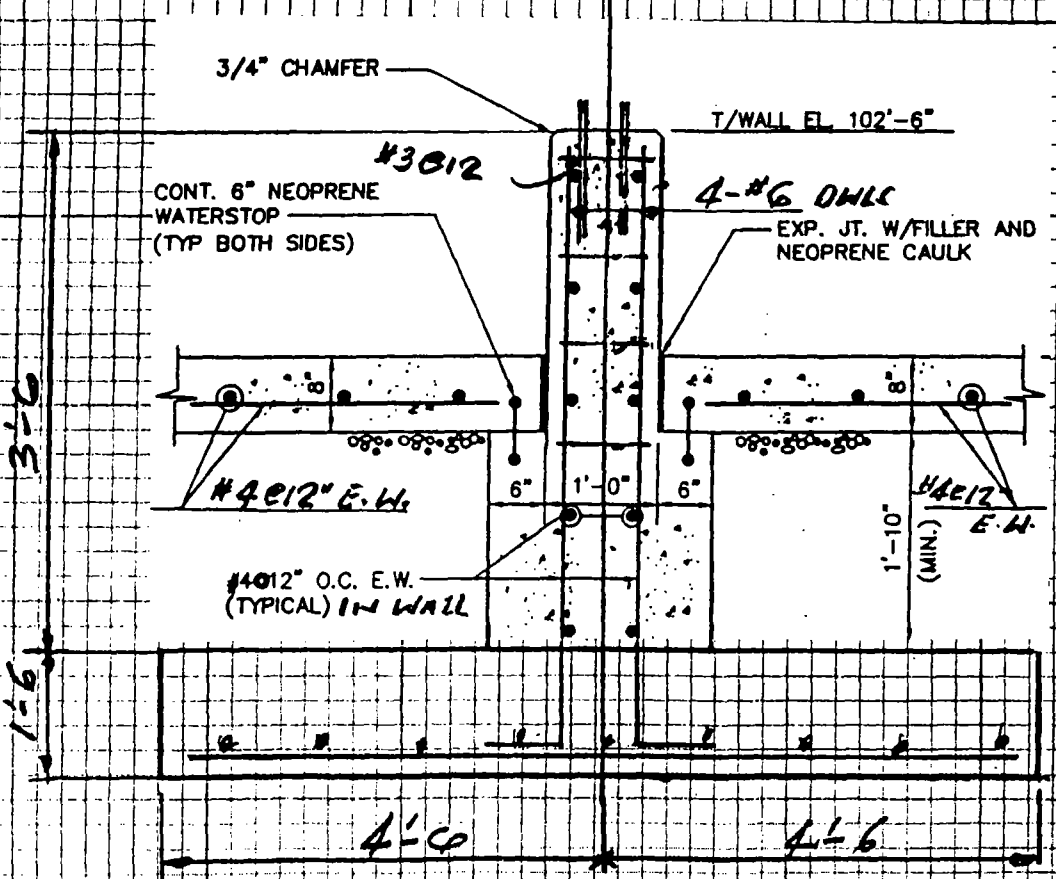
FROM CRSI HANDBOOK

REINF. REQ'D = 7-#5 (USE 7-#6)

4. FOOTING NK F4

GOVERNING LOAD IS AT 2-B (VARCO-PRUDEN)

$+V = 77.4^k$



PROJECT CLEAN HARBORS SERVICES, INC. - CHICAGO, ILL

SUBJECT FOUNDATIONS FOR PROPOSED TRUCK LOADING DOCK

ADDITIONAL LOAD (PIER, WALL, FTG. SOIL & SLAB)

FTG. = 9.0' x 9.0' x 1.5' x .15 KCF = 18.23k

WALL = 1.0' x 3.5' x 9.0' x .15 = 4.73k

LEDGER = 1.0' x 1.0' x 9.0' x .15 = 1.35k

8" SLAB = .67' x 8.0' x 9.0' x .15 = 7.24k

SOIL (FILL) = 1.0' x 7.0' x 9.0 x .10 KCF = 6.30k

37.85k

TOTAL VERTICAL LOAD =

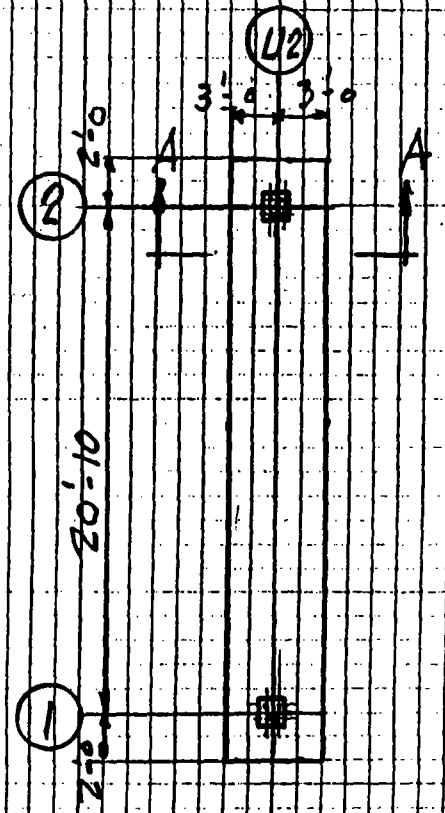
= 37.85k + 77.40k = 115.25k

MAX. SOIL PRESSURE =

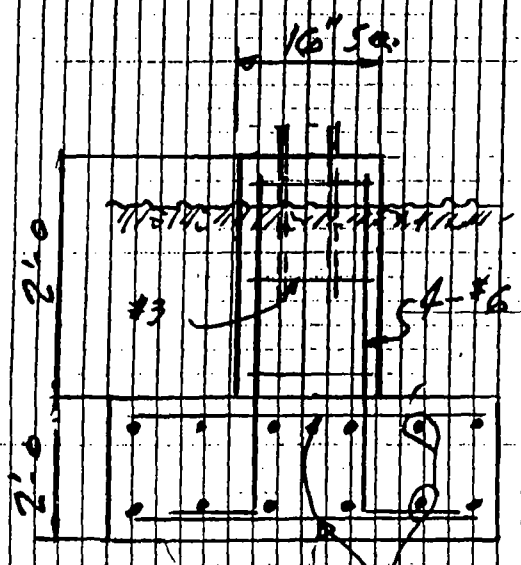
$$= \frac{115.25^k}{9.0' \times 9.0'} = 1.42 \text{ KSF} < 1.50 \text{ KSF} \quad \text{O.K.}$$

PROJECT CLEAN HARBORS SERVICES, INC. - CHICAGO, ILL

SUBJECT FOUNDATIONS FOR PROPOSED TRUCK LOADING DOCK



PLAN



#5 @12 EA. WAY
TOP & BOTT.

SECTION "A-A"

FOOTING MARK F5

NET UPLIFT = 23.53^k − 1.5^k = 22.03^k

TOTAL VERTICAL LOAD =

FTG. = 24.83' × 6' × 2' × .15 KCF = 44.69

PIERS = 2 × 1.33 × 1.33 × 2' × .15 = 1.06

SOIL = (24.83' × 6 − 2 × 1.33²) × 1.5' × .10 KCF = 21.82

67.57^k

M_O = 22.03^k × 22.83' = 502.94$^{'k}$

M_R = 67.57^k × 12.42' + 22.03 × 2' = 883.28$^{'k}$

S.F. = 883.28/502.94 = 1.75 > 1.5 O.K.

MAX. SOIL PRESSURE =

= 67.57^k/24.83 × 6 + 16.9^k × 29.5^k/6 × 24.83²

= .454 + .58 KSF < 1.5 × 1.33 KSF

O.K.

DISTRIBUTED UPLIFT LOAD PER LIN. FT. =

22.03^k/20.4' = 1.08 KLF

$M_{NEG.}$ = 1.08^k × 20.42²/8 =

= −56.29$^{'k}$

A_s = 56.29$^{'k}$/1.76 × 20 = 1.60 IN²

USE #5 @ 12" EA. WAY
BOTTOM OF FOOTING

TOTAL VERTICAL LOAD PER FRAME =
D.L + L.L + SNOW + COLLAT = 20(1.5 + 1.6 + 4.9 + 4.9) =
= 25.8 K

DISTRIBUTED UNIFORM LOAD PER LIN. FT. =
= 25.8K / 20.42 = 1.26 KLF

M_{pos} = 1.26 × 20.42²/8 = 65.85 K

A_s = 65.85 / 1.76 × 20 = 1.87

USE #5 @ 12" EA. WAY
TOP OF FOOTING

BY INSPECTION UPLIFT LOADS ON COL. LINE (D) ARE TAKEN BY VERY HEAVY EXIST. BLDG. FOUNDATIONS, WALL & SLAB. THEY HAVE MUCH LARGER VERTICAL LOADS IN COMPARISON TO UPLIFT LOADS WHICH IS O.K.

LOADING: ILLINOIS DEPARTMENT OF TRANSPORTATION STANDARD HIGHWAY LOADING OF H20-S16-44

a) DATA FOR TRAILER

AXLE LOAD = 42^k - DUAL WHEEL LOADING
WHEEL SPACING 15" x 56" x 18"
No. OF WHEELS ON AXLE = 4
TIRE INFLATION PRESSURE = 100 PSI

TIRE CONTACT AREA = $\frac{42{,}000^{\#}}{4 \times 100}$ = 105 SQ. IN

b) SUBGRADE & CONCRETE DATA:

CONCR. FLEXURAL STRENGTH MR = 640 PSI @ 28 DAYS
K-VALUE = 100 PCI

DESIGN

1.) SAFETY FACTOR = 2.0

2.) CONC. WORKING STRESS (WS)

$WS = \frac{MR}{SF} = 640/2 = 320$ PSI

3.) EQUIVALENT SINGLE-WHEEL LOAD FROM FIG. 4 (SEE SHEET #12)

$= .775 \times 42^k = 32.55^k$

4.) SLAB STRESS PER 1,000# OF AXLE LOAD =

$= WS/\text{AXLE LOAD} = 320/32.55 = 9.83$ PSI

5.) FROM FIG. 3 (SEE SHEET #13)

SLAB THICKNESS REQ'D = 8.75" < 10" O.K.

6.) REINFORCEMENT

$A_s = \frac{2 \times L \times w}{2 \times f_s} = \frac{2 \times 70.67 \times 125}{2 \times 24{,}000} = .37 \text{ IN}^2$

USE #4 @ 12" C-C TOP & BOTT.

HOYER-SCHLESINGER-TURNER, INC.

SHEET 12 OF 13

PROJECT CLEAN HARBORS - CHICAGO, IL

PROJECT NO. 17851

DATE 7.1.97

SUBJECT PROPOSED TRUCK LOADING SLAB

BY BERNES, S.E

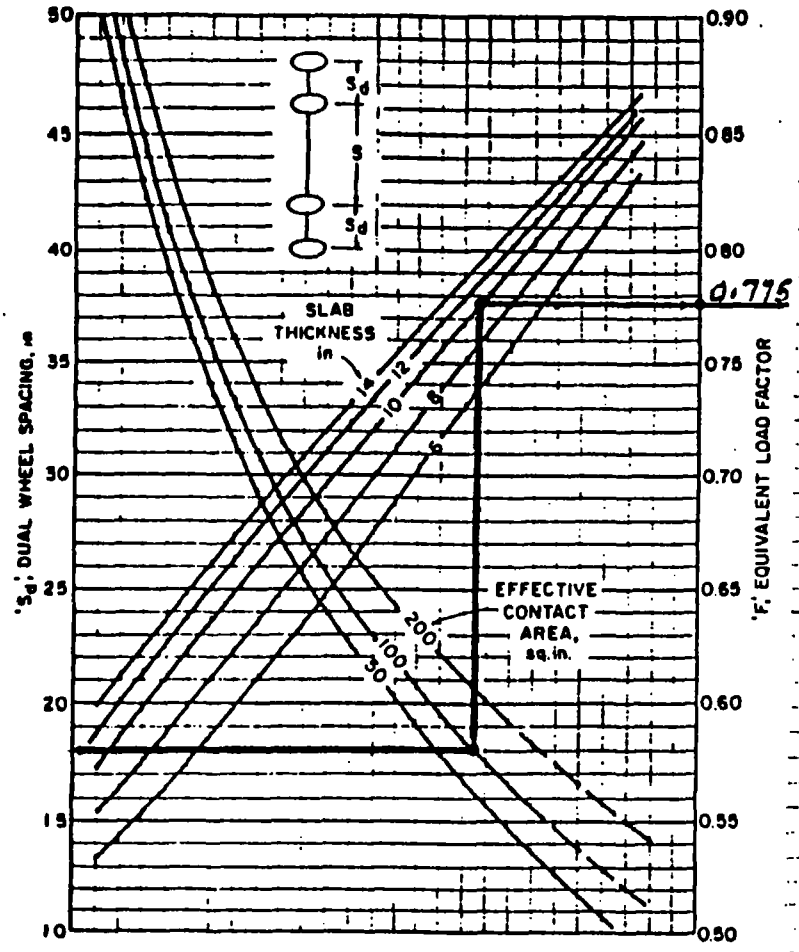


Fig. 4. Design chart for axles with dual wheels.

HOYER-SCHLESINGER-TURNER, INC.

SHEET 13 OF 13
PROJECT NO. 17851
DATE 7.1.97
BY BERNES, S.E

PROJECT CLEAN HARBORS - CHICAGO, IL
SUBJECT PROPOSED TRUCK LOADING SLAB

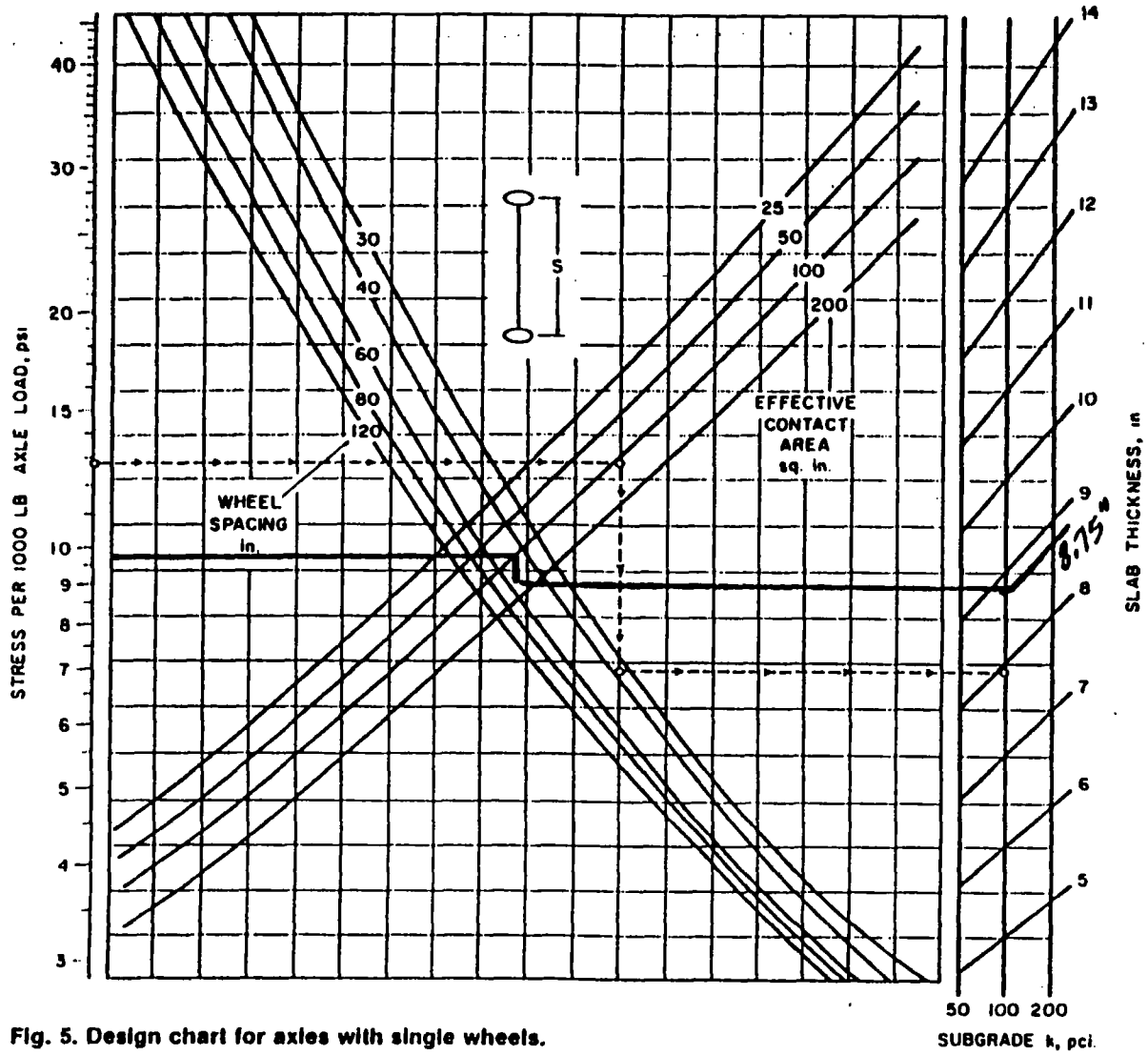


Fig. 5. Design chart for axles with single wheels.

CleanHarbors
CLEAN HARBORS SERVICES, INC.
11800 SOUTH STONY ISLAND AVENUE • CHICAGO, IL 60617
(773) 646-6202 • FAX (773) 646-6381
Visit our Website at www.cleanharbors.com

November 25, 2002

Mr. Mark A. Schollenberger, P.E.
Illinois Environmental Protection Agency
Bureau of Land – Permit Section
1021 North Grand Avenue East
Springfield, IL 62794-9276

Dear Mr. Schollenberger:

Clean Harbors Services, Inc. (CHSI) has completed construction of the Drum Storage Expansion (Unit R2) Staging Area. As required in RCRA Part B Permit Log B-16 Section I(K)(1)(a), CHSI is submitting the Construction Certification Form for operating approval. A copy of this is being sent directly to the Field Operations Section in Des Plaines, IL.

If you have any questions or require additional information, please contact me at (773) 646-6202, x233.

Sincerely,

James R. Laubsted
Facility Compliance Manager

MECA

MECA ENGINEERING CORP. OF AMERICA

5539 Indianapolis Blvd. East Chicago, IN 46312 (219) 397-0100 FAX (219) 397-0164 e-mail mecaeng@netnitco.net

November 22, 2002

Mr. Mark A. Schollenberger, P.E.
Illinois Environmental Protection Agency
Bureau of Land - Permit Section
1021 North Grand Avenue East
Springfield, IL 62794-9276

Dear Mr. Schollenberger:

This letter is to provide certification for Clean Harbors Services, Inc. new Staging Area of the Drum Storage Extension - (Unit R2).

The Staging Area of Unit R2 is a new concrete structure. This area is adjacent to the west side of Oxidizer Bay #2 of Unit 2 and south of Unit V. The Staging Area will be used to load drums which will be moved by fork lift from existing drum bays and onto trucks.

The Staging Area is constructed from 10-inch thick reinforced concrete with a side dike wall 9 inches high. The bay is sloped to the south. The bay is sealed with a minimum 3/16 inch coat of NOVO-POXI SLR which has a chemical resistance equivalent to that of Protecto-Crete 900. There is an existing canopy covering the Staging Area.

For construction data, see drawing CHCI Drawing No. 4210, revision date 7/20/94. During my visual inspection on November 22, 2002 the Staging Area was empty and not in use. There were no visible cracks, gaps or other visual structural damage.

I believe that the Staging Area of Unit R2 is suitable for its intended use.

Very truly yours,

MECA Engineering Corporation of America

Kenneth D. Spaulding
Licensed Illinois Professional Engineer
Illinois License No. 62-44249; Expiration Date: 2/28/03

KENNETH D. SPAULDING
62-44249
REGISTERED
PROFESSIONAL
ENGINEER
OF
ILLINOIS

CONSTRUCTION CERTIFICATION

This statement is to be completed by both the responsible officer and the registered professional engineer upon completion of construction in accordance with 35 IAC Section 702.126. Submit one copy of the certification with original signatures and two additional copies (four additional copies for UIC wells). Forward these certification statements and any information required by the permit to the following address:

Illinois Environmental Protection Agency
Bureau of Land - #33
Permit Section
1021 North Grand Avenue East
Post Office Box 19276
Springfield, Illinois 62794-9276

FACILITY NAME: CLEAN HARBORS SERVICES, INC.

IEPA SITE CODE: 0 3 1 6 0 0 0 0 5 1

U.S. EPA ID NO.: IL D 0 0 0 6 0 8 4 7 1

PART B PERMIT LOG #/UIC PERMIT #: 8-16

PERMIT (OR MODIFICATION) ISSUANCE DATE: 09-30-93

PERMIT CONDITION NO. REQUIRING CERTIFICATION: I.K.L.A.

The Drum Storage Area Expansion (Unit R2 - Staging Area) has been constructed in accordance with the specifications in the Part B/UIC Permit. Documentation that the construction was in accordance with the permit is contained in the enclosed report. 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.

Signature of Owner/Operator — Michael Petkovich, General Manager (Name and Title)

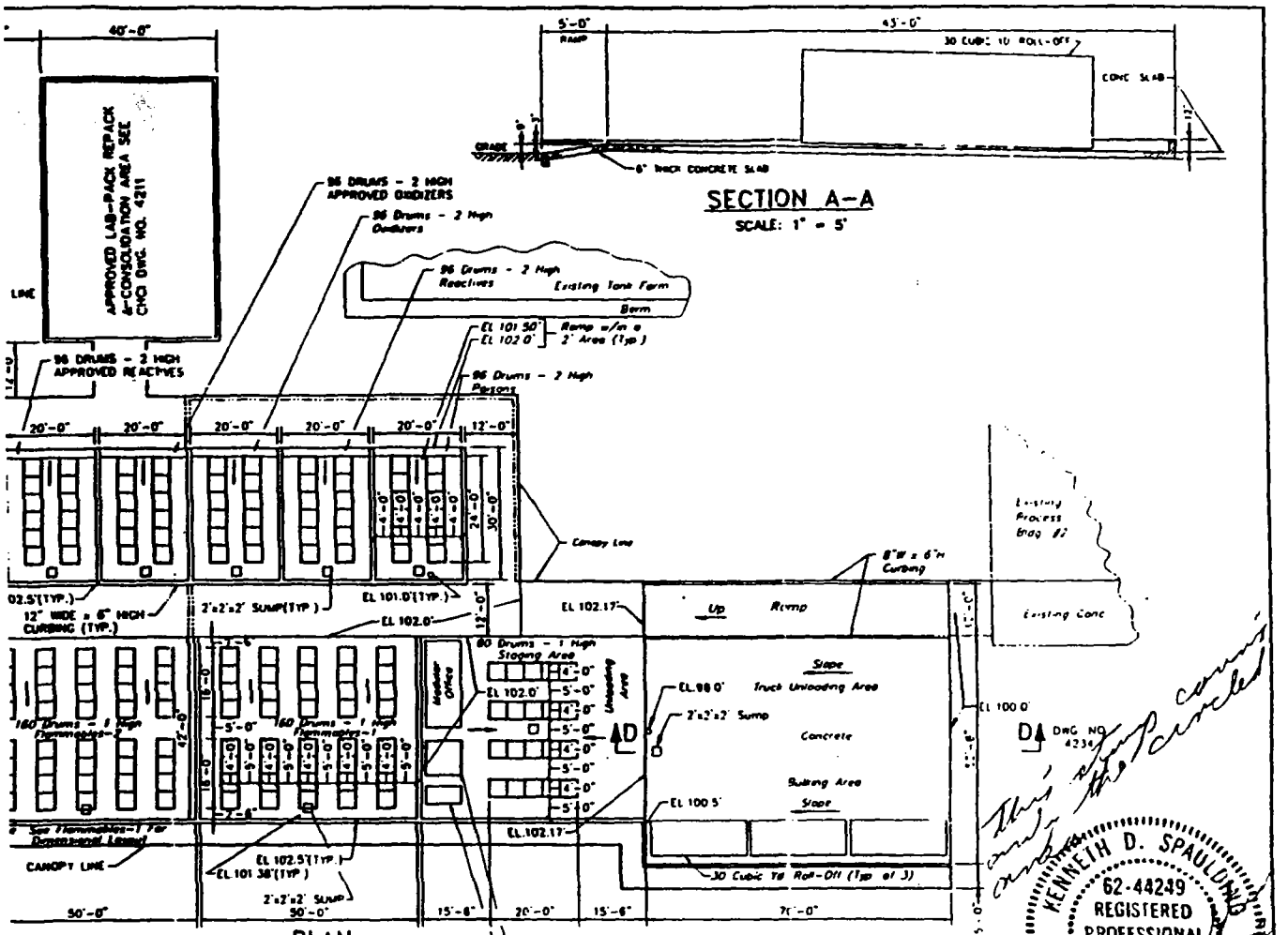
Signature of Registered P.E. — Kenneth D. Spaulding, 62-44249 (Name of Registered P.E. and Illinois Registration Number)

November 22, 2002
Date

(P.E. SEAL)

KENNETH D. SPAULDING
62-44249
REGISTERED
PROFESSIONAL
ENGINEER
OF
ILLINOIS

This Agency is authorized to require this information under Illinois Revised Statutes, 1979. Chapter 111 2, Section 1039. Disclosure of this information is required under that Section. Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

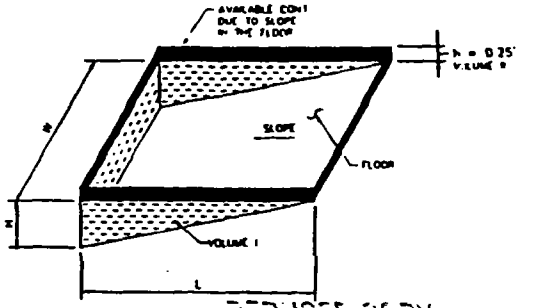


PLAN
SCALE: 1" = 15'

SECTION A-A
SCALE: 1" = 5'

CITY OF CHICAGO REQUIREMENT (GALS) @ 50%	VOLUME @ RECTANGULAR: UNIFORM HEIGHT INCREASE h = 0.25	VOLUME @ RECTANGULAR: Vh VOLUME (GALS)	TOTAL CAPACITY (GALS) Vt=S+A+Vh-P
2,640	0.25	1,125	2,767
2,640	0.25	1,125	2,767
2,640	0.25	1,125	2,767
4,400	N/A	N/A	4,693
4,400	N/A	N/A	4,693
2,300	N/A	N/A	2,500

CITY OF CHICAGO REQUIREMENT (GALS) @ 50%	VOLUME @ RECTANGULAR: UNIFORM HEIGHT INCREASE h = 0.25	VOLUME @ RECTANGULAR: Vh VOLUME (GALS)	TOTAL CAPACITY (GALS) Vt=S+A+Vh-P
2,640	0.25	1,125	2,767
2,640	0.25	1,125	2,767
2,640	0.25	1,125	2,767
4,400	N/A	N/A	4,693
2,200	N/A	N/A	2,600



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KENNETH D. SPAULDING
62-44249
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

CHCI DWG. NO. 4210

D	RCRA PART B MODIFICATION				
C	US EPA PART B SUBMITTAL	MC	FAA	PAA	
B	RCRA PART B SUBMITTAL UPDATE	MC	BHP	BHP	
A	RCRA PART B SUBMITTAL	MC	W	P W	

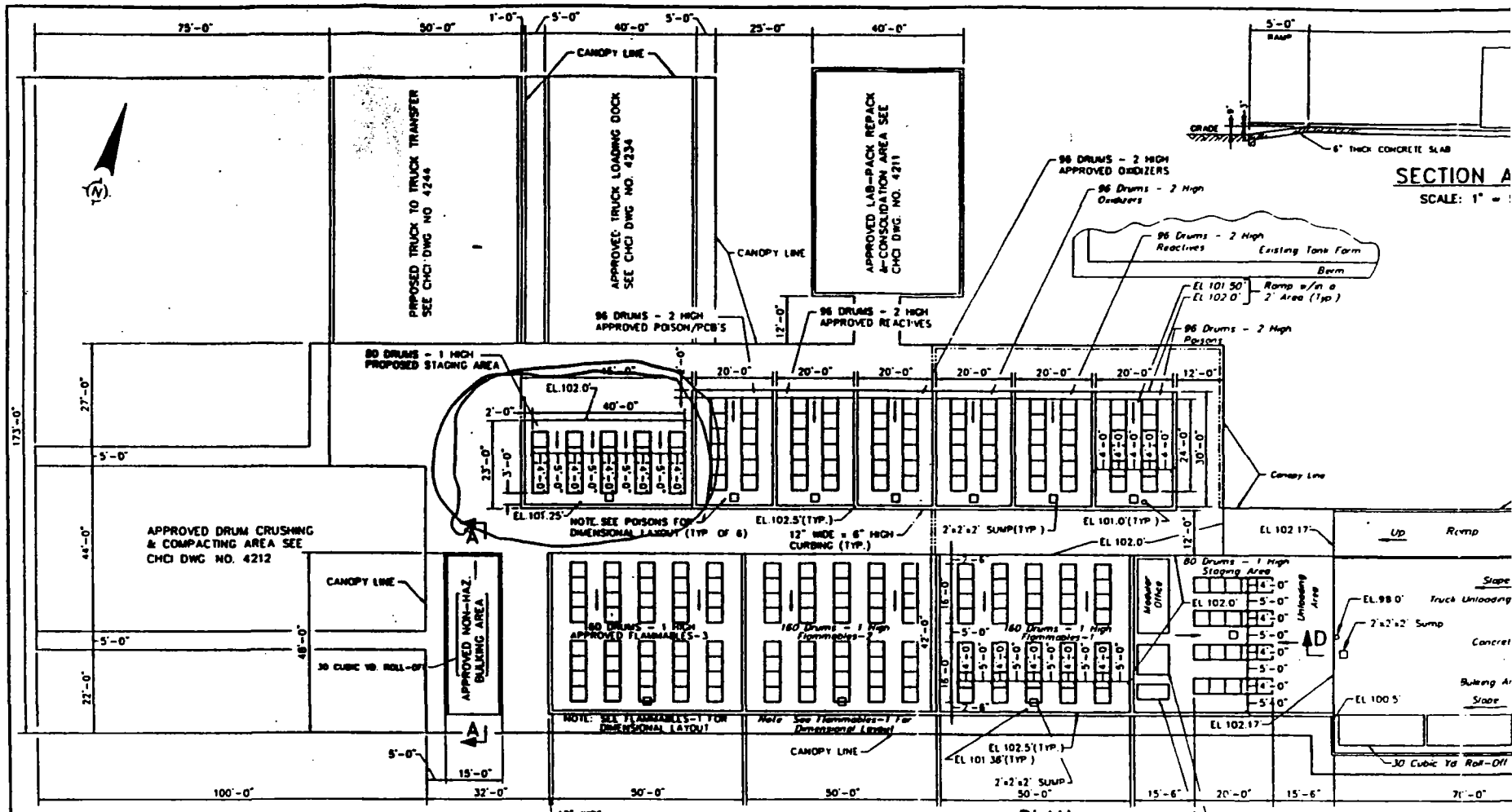
CleanHarbors
ENVIRONMENTAL SERVICES, INC.

CLEAN HARBORS OF CHICAGO, INC.
11800 S STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617

EXISTING, APPROVED AND PROPOSED CONTAINER MANAGEMENT AREA LAYOUT & DETAILS
SHEET 1 OF 3

GW-2

2916-M-04



SECTION A

SCALE: 1" = 1

PLAN

SCALE: 1" = 15'

EXISTING ACTIVITIES

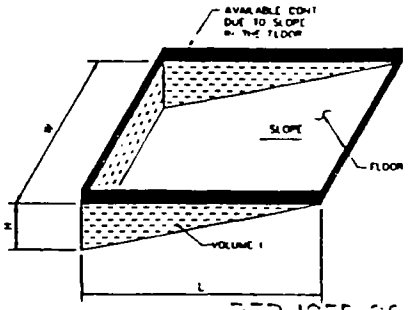
AREA DESCRIPTION	REQ'D CONTAINMENT PER RCRA			S	VOLUME 1 TRIANGULAR AREA				VOL OCC BY PALLETS	
	D	V	R		W	L	H	A	N	P
	NO OF DRUMS	TOTAL VOL OF WASTE IN GALS.	CONT CAP REQ'D (D.I.V.) IN GALS	SUMP CAPACITY IN GALS.	AREA WIDTH IN FT.	AREA LENGTH IN FT.	MAX. SLOPE IN FT.	CONT. CAP OF AREA 1/2 (W)(L)(H)7.5	NO OF PALLETS ON FLOOR	VOL OCC BY PALLETS (N) x 8.7 GALS
OXIDIZERS	96	5,280	528	80	20	30	0.75	1,687 GAL	12	105
REACTIVES	96	5,280	528	80	20	30	0.75	1,687 GAL	12	105
POISONS	96	5,280	528	80	20	30	0.75	1,687 GAL	12	105
FLAMMABLE - 1	160	8,800	880	120	50	42	0.625	4,920 GAL	40	348
FLAMMABLE - 2	160	8,800	880	120	50	42	0.625	4,920 GAL	40	348
	D	V	R	S	W	L	H	A=1/3(W)(L)(H)7.5		
STAGING	80	4,400	440	80	42.0	51.0	0.5	2,614	20	174

CITY OF CHICAGO REQUIREMENT (GALS) @ 50%	VOLUME 2 RECTANGULAR		TOTAL CAPACITY (GALS) Vt=S+A+Vs-P
	UNIFORM HEIGHT INCREASE h = 0.25	Vs VOLUME (GALS)	
2,640	0.25	1,125	2,767
2,640	0.25	1,125	2,767
2,640	0.25	1,125	2,767
4,400	N/A	N/A	4,693
4,400	N/A	N/A	4,693
2,200	N/A	N/A	2,500

APPROVED & PROPOSED ACTIVITIES

AREA DESCRIPTION	REQ'D CONTAINMENT PER RCRA			S	VOLUME 1 TRIANGULAR AREA				VOL OCC BY PALLETS	
	D	V	R		W	L	H	A	N	P
	NO OF DRUMS	TOTAL VOL OF WASTE IN GALS.	CONT CAP REQ'D (D.I.V.) IN GALS.	SUMP CAPACITY IN GALS.	AREA WIDTH IN FT.	AREA LENGTH IN FT.	MAX SLOPE IN FT.	CONT. CAP OF AREA 1/2 (W)(L)(H)7.5	NO OF PALLETS ON FLOOR	VOL OCC BY PALLETS (N) x 8.7 GALS
OXIDIZERS	96	5,280	528	80	20	30	0.75	1,687 GAL	12	105
REACTIVES	96	5,280	528	80	20	30	0.75	1,687 GAL	12	105
POISONS/PCB'S	96	5,280	528	80	20	30	0.75	1,687 GAL	12	105
FLAMMABLE - 3	160	8,800	880	120	50	42	0.625	4,920 GAL	40	348
PROPOSED STAGING	80	4,400	440	[illegible]	[illegible]	42	0.75	2,777 GAL	20	174

CITY OF CHICAGO REQUIREMENT (GALS) @ 50%	VOLUME 2 RECTANGULAR		TOTAL CAPACITY (GALS) Vt=S+A+Vs-P
	UNIFORM HEIGHT INCREASE h = 0.25	Vs VOLUME (GALS)	
2,640	0.25	1,125	2,767
2,640	0.25	1,125	2,767
2,640	0.25	1,125	2,767
4,400	N/A	N/A	4,693
4,400	N/A	N/A	4,693
2,200	N/A	N/A	[illegible]



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MECA

MECA ENGINEERING CORP. OF AMERICA

5539 Indianapolis Blvd. East Chicago, IN 46312 (219) 397-0100 FAX (219) 397-0164 e-mail mecaeng@netnitco.net

October 25, 2002

Mr. James R. Laubsted
Facility Compliance Manager
CLEAN HARBORS SERVICES, INC.
11800 S. Stony Island Avenue
Chicago, IL 60617

Subject: Inspection Report
Tank T-101

MECA Job
No. 29-157

Dear Mr. Laubsted:

On October 25, 2002, I visually inspected the interior and exterior of Tank T-101. The internal and external visual inspection did not reveal any defects. The welds around nozzles and tank shell welds inspected from inside the tank were in good condition. There were not any visible defects on the interior of the tank. It is not possible to inspect the entire exterior of the tank by visual inspection because the tank is insulated with 2" thick insulation with metal jacket.

Tank T-101 is located in the north-west corner of the Flammable Storage Tank Farm (Unit 16). Tank T-101 is located outdoors and has a dedicated concrete dike. Tank T-101 is a stainless steel vessel fabricated in 1986. Tank T-101 was empty at the time of inspection and was cleaned by Clean Harbors personnel.

Historic information supplied by Clean Harbors:

- The previous visual internal inspections include December 4, 1997, March 19, 1996 and. June 7, 1995.
- Hydrostatic testing was completed in July, 1995 and annually thereafter.
- From time to time of the earliest inspection, the tank was used for storing acidic wastewaters, lean waters and Class I flammable hazardous waste fuels.
- The containment is coated with Protecto-Coat 900, 30 mils thick as manufactured by Dudick, Inc. This coating is compatible with the stored materials. The containment dike for T-101 and the remaining tanks within the tank farm were inspected August 30, 2002.
- The tank is operated at ambient temperature and under 2" WC pressure from nitrogen blanketing. The tank is equipped with a conversation vent and is vented through a carbon bed.

- Tank T-101 stores Class I information liquids contaminated with acids. Maximum specific gravity of stored liquids is 1.5 and pH may vary from 1 to 10. The tank is constructed from 316 stainless steel. It is 12'0" in diameter and 14'0" high straight side with a cone bottom and top. The operating capacity is 12,000 gallons. The tank was built to the UL-142 standard.

- The tank is supported by steel legs on caissons. The steel legs are encased in concrete.

- The insulation and jacketing was removed where nozzles were added in 1995. At that time the welds could be inspected from the outside. The condition of the welds was good; there were no vertical defects.

- In October, 2002 Clean Harbors performed NDE-ultrasonic thickness measurements from the interior of the tank. In December, 2001, November, 2000, October, 1999 and October, 1998 external NDE-ultrasonic thickness measurements were taken. These ultrasonic thickness test results and prior results are listed in Appendix TK-101-1.

- The top of the tank estimated as-built thickness was 0.313 inches. The four latest readings each show virtually no change in thickness compared to the 1997 ultrasonic thickness results. The minimum reading was 0.318 inches which is 369% over the minimum of 0.086 inches recommended by the UL-142 standard.

- The wall estimated as-built thickness was 0.313 inches. The twenty-eight latest readings each show slight increases in thickness compared to the 1997 ultrasonic thickness results. The minimum reading was 0.324 inches which is 281% over the minimum of 0.115 inches recommended by the UL-142 standard. A review of external readings from October 1998 through December 2001 for twelve locations show an average increase of 0.007 inches with a maximum decrease of 0.017 inches.

- The bottom of the tank estimated as-built thickness was 0.438 inches. The four latest readings show increases in thickness compared to the 1997 ultrasonic thickness readings. The minimum reading was 0.458 inches which is 384% over the minimum of 0.158 inches recommended by the UL-142 standard. A review of external readings from October, 1998 through December, 2001 for four locations show an average of no change with a maximum decrease of 0.020 inches.

- For tank evaluations, modifications and calculations, see certification reports by Mr. Lee F. Mount, PE, dated January 1995 and March 14, 1995 in Appendix TK-101-2.

- For tank nozzle orientation and description, see Appendix TK-101-3.

- For Tank T101 supports evaluation, see calculations by Mr. Peter J. Bernes, SE, dated January 19, 1995 in Appendix TK-101-4.

Therefore, I certify that after visual inspection, the tank is structurally sound, properly supported and set. No evidence of cracks, bulging, corrosion pits or scales or weld defects were observed. Based on my inspection, the tank can be used for the intended purpose.

Very truly yours,

MECA Engineering Corporation of America

Kenneth D. Spaulding P. E.
Licensed Professional Engineer
Illinois License No. 62-44249; Expiration Date: 2/28/03

KENNETH D. SPAULDING
62-44249
REGISTERED
PROFESSIONAL
ENGINEER
OF
ILLINOIS

KDS/dv

APPENDIX TK-101-1

NDE Examination Report/Ultrasonic Thickness

T-101

October 23, 2002

	North	South	East	West
Roof	.321	.322	.326	.318
Shell	.372	.375	.371	.362
	.364	.368	.350	.358
	.330	.351	.332	.340
	.344	.344	.341	.338
	.348	.346	.344	.346
	.344	.332	.331	.348
	.324	.338	.326	.344
Bottom	.458	.464	.458	.458

All measurements in inches, shell readings taken at 2 foot intervals.

Wall Average: 0.321

Shell Average: 0.346

Bottom Average: 0.459

CLEAN HARBORS

MQS

NDE Examination Report/Ultrasonic Thickness

FORM 22-4 2496-4215

CLIENT Clean Harbor
LOCATION 11800 S. Stoney Island Ave. Chicago Ill.
ITEM DESCRIPTION 12'φ ~~14'~~ Dia x 14' High (insulated) S/S storage tank

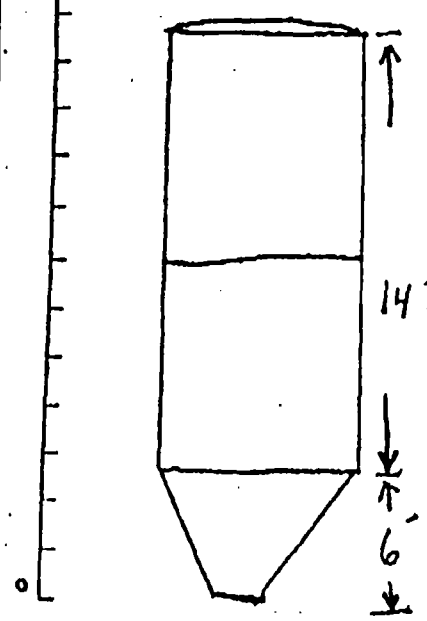
PROCEDURE 22.A.700/95
TRANSDUCER SIZE .312"
FREQUENCY 5 MHz
COUPLANT Cellulose/CMC 92415

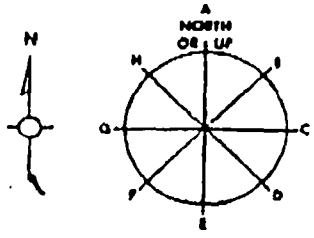
UT INSTRUMENT Panametrics 26 DL+ SN 952080808
ANGLE 0°
TYPE Pulse Echo
ACCURACY +/- .005

DIAGRAM

T-101

WALL AVG. = 0.330
BTM. AVG. = 0.426





THICKNESS MEASUREMENTS

	A	B	C	D	E	F	G
Roof	.318						
	.350		.338		.339		.338
	.348		.336		.337		.336
	.324		.329		.331		.328
	.314		.318		.306		.321
	.329		.338		.329		.325
	.330		.345		.336		.338
	.333		.336		.326		.338
14' shell	.314		.316		.302		.321
	.436		.435		.425		.426
	.449		.430		.433		.422
Slope Bottom	.432		.408		.400		.415

REMARKS

Readings are taken about 2' apart.
Readings are in inches.

Spec/Code: ASME Sec V/95
Accept: Client Info.

UT Operator	UT Interpretor	Date
Clifford R Bush	Clifford R Bush	3-25-96

APPENDIX A

CLEAN HARBORS OF CHICAGO, INC.

CWM TANK FARM

EXISTING TANK STATUS FORM

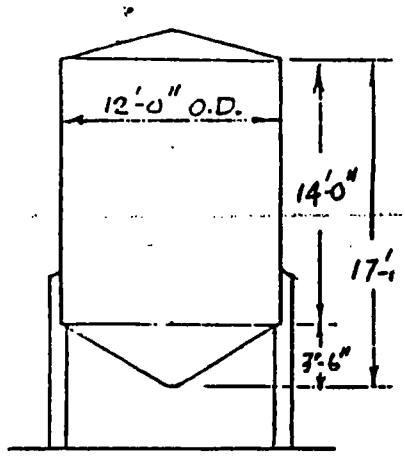
Tank No. T-101

Nominal Capacity 12,000 gals.

Mat'l. of Const. 316 Stainless

Approx. Year of Build 1986

Designed Corrosion Allow. 1/16"



Stored Waste Characteristics:

	Past	Future
Specific Grav.	1.5 (design)	0.5 → 1.5
Class	NFPA CLASS 2 - AQUEOUS PCB/FUEL BLEND	ACIDIC WATERS, LEAN WATERS, AND/OR HAZARDOUS WASTE FUELS (NFPA CLASS 1-3 LIQUIDS)

Material Thicknesses (Inches):

Surface	per UL-142 Std.	As Built A	As Built E	Ultrasonic Test Results 08/89 B Avg.	08/89 B Min.	10/91 C Avg.	10/91 C Min.
Top	0.086	0.250	0.313	0.320	0.316	0.316	0.305
Shell	0.115	0.313	0.313	0.323	0.310	0.332	0.320
Bottom	0.158	0.375	0.438	0.437	0.429	0.445	0.416

01/23/95 D

TOP	0.316	0.303
SHELL	0.339	0.324
BOTTOM	0.439	0.411

NOTES:

A. FROM IMPERIAL STEEL FABRICATION DWG. '86

B. FROM ALPHA CONSULTANTS JAN. '90 RPT.

C. FROM SIRRINE ENVIR. CONSULTANTS NOV. '91 RPT.

D. ADD'L. READINGS BY MQS TAKEN 23 JAN. '95

E. ESTIMATED ACTUAL AS BUILT t BASED ON ULTRASONIC RDGS. TO DATE

	T-101	T-102	T-103	T-104	T-105	T-106	T-107	T-109	T-110	T-112
Bottom North	.456	.360	.334	.314	.348	.334	.400	.278	.220	.230
Bottom South	.404	.366	.330	.302	.316	.342	.396	.278	.210	.214
Bottom East	.432	.362	.342	.308	.338	.326	.396	.274	.226	.214
Bottom West	.446	.360	.342	.310	.334	.326	.386	.250	.198	.230
Lower side North	.328	.298	.282	.268	.218	.231	.320	.226	.298	.278
Lower side South	.328	.290	.276	.278	.228	.238	.320	.226	.230	.278
Lower side East	.332	.288	.294	.274	.214	.248	.316	.296	.230	.282
Lower side West	.328	.298	.278	.273	.242	.242	.320	.206	.296	.278
Upper side North	.328	.274	.290	.274	.250	.248	.318	.274	.290	.276
Upper side South	.326	.280	.284	.280	.250	.242	.322	.274	.290	.250
Upper side East	.330	.270	.284	.270	.250	.250	.320	.262	.282	.246
Upper side West	.330	.270	.272	.262	.282	.250	.320	.273	.296	.250
Top side North	.340	.300	.296	.292	.266	.294	.320	.288	.296	.248
Top side South	.340	.300	.296	.286	.270	.294	.372	.284	.294	.254
Top side East	.340	.282	.298	.286	.266	.292	.318	.284	.294	.250
Top side West	.340	.290	.296	.286	.270	.274	.322	.284	.296	.260
Top North	.302	.220	.212	.218	.296	.296	.264	.236	.401	.358
Top South	.322	.226	.226	.212	.292	.216	.272	.218	.402	.370
Top East	.326	.218	.210	.242	.192	.206	.272	.206	.386	.360
Top West	.302	.218	.212	.212	.213	.212	.272	.206	.398	.386

TANK FARM - Thickness Testing

12/01

TANK FARM THICKNESS TESTING
(Inches)

Location	T-101	T-102	T-103	T-104	T-105	T-109	T-107	T-106	T-110	T-112
Bottom-North	0.462	0.364	0.346	0.316	0.352	0.278	0.404	0.334	0.408	0.362
Bottom-South	0.428	0.368	0.346	0.316	0.338	0.282	0.404	0.336	0.408	0.372
Bottom-East	0.436	0.368	0.344	0.308	0.340	0.250	0.402	0.334	0.388	0.360
Bottom-West	0.448	0.364	0.344	0.324	0.340	0.274	0.396	0.332	0.400	0.380
Lower Side-North	0.332	0.268	0.282	0.274	0.220	0.220	0.324	0.234	0.296	0.244
Lower Side-South	0.333	0.268	0.282	0.268	0.228	0.228	0.324	0.234	0.296	0.244
Lower Side-East	0.340	0.300	0.282	0.282	0.218	0.212	0.332	0.240	0.300	0.240
Lower Side-West	0.332	0.300	0.282	0.280	0.228	0.224	0.318	0.236	0.296	0.250
Upper Side-North	0.330	0.280	0.292	0.272	0.250	0.280	0.320	0.250	0.300	0.250
Upper Side-South	0.328	0.280	0.280	0.280	0.248	0.280	0.324	0.248	0.296	0.240
Upper Side-East	0.332	0.272	0.290	0.274	0.250	0.264	0.324	0.248	0.296	0.244
Upper Side-West	0.338	0.264	0.276	0.272	0.288	0.274	0.324	0.252	0.296	0.240
Top Side-North	0.361	0.300	0.288	0.276	0.266	0.292	0.362	0.266	0.304	0.252
Top Side-South	0.362	0.304	0.280	0.276	0.276	0.292	0.360	0.264	0.300	0.254
Top Side-East	0.360	0.300	0.282	0.300	0.276	0.292	0.364	0.266	0.304	0.254
Top Side-West	0.360	0.302	0.284	0.282	0.276	0.292	0.364	0.266	0.300	0.252
Top-North	0.320	0.224	0.224	0.220	0.200	0.215	0.324	0.200	0.215	0.215
Top-South	0.32[illegible]	0.228	0.224	0.220	0.180	0.215	0.324	0.220	0.220	0.200
Top-East	0.32[illegible]	0.228	0.196	0.2[illegible]	0.172	0.220	0.322	0.196	0.22[illegible]	0.220
Top-West	0.320	0.224	0.200	0.264	0.180	0.215	0.324	0.200	0.215	0.220

11/00

TANK # 10

Roof	North	East	South	WEST
	294	296	294	294
TOP	328	364	348	346
middle	340	388	336	344
Bottom	336	340	328	344
CONE	464	448	368	440

10/99

ULTRA SONIC THICKNESS TESTING
T-101

October 17, 1998

TOP

East	South	West	North
#1 .318	#2 .301	#4 .307	#3 .315

SHELL

#6 .256	#12 .342	#5 .337	#11 .357
#10 .329	#15 .330	#7 .336	#14 .318
#9 .328	#16 .319	#8 .323	#13 .323

BOTTOM

#20 .452	#17 .401	#19 .432	#18 .453

APPENDIX TK-101-2

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

RECEIVED
JUN 20 1995
HOYER-SCHLESINGER-TURNER, INC.

19 June 1995

Marie Vanagas
Hoyer-Schlesinger-Turner, Inc.
300 West Adams Street
Chicago, ILL. 60606

Subject: Clean Harbors of Chicago, Inc.
CWM Tank Farm

Enclosure: 1) Review and Assessment of Structural Integrity of Existing Tanks; LFMount Report dated January 1995

Dear Ms Vanagas,

In response to Clean Harbors' request, enclosure 1) is herewith forwarded for your information and records.

Yours truly,

Lee F. Mount

Lee F. Mount

REVIEWED BY
Peter J. Bernes
PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11.30.96

INTRODUCTION

This report was prepared in response to the Illinois EPA's request for additional information on the structural condition of the existing hazardous waste storage and/or fuel tanks scheduled for reuse at your CWM Tank Farm.

The work scope involved a technical review of all available tank related documents furnished by Clean Harbors. Pertinent data was then summarized and tabulated for each tank on a "Existing Tank Status Form". The ultrasonic test measurements for thickness, shown on the status forms, were then analyzed in order to make estimates of corrosion rates and projected service life.

Reference documents consulted during the course of this study include:

* RCRA Tank Assessment - Tank Farm System, prepared for CWM Chemical Services Inc. by ALpha Consultants, Ltd. Jan. 1990

* Tank System Inspection, prepared for CWM Chemical Services Inc. by Sirrine Environmental Consultants Nov. 1991

* Straubing, Rubin & Kenes, Inc. Tank Design Drawings

* Imperial Steel Tank Co. Fabrication Drawings

* Supplemental ultrasonic thickness measurements taken on stainless steel Tank No. T-101 on 23 January '95 by MQS Inspection, Inc. (raw data)

TANK GENERAL DESCRIPTIONS AND HISTORY

The ten (10) existing tanks, numbered T-101 to T-107, T-109, T-110, & T-112, are 12 ft. dia. vertical, cone bottomed, leg supported, above ground, insulated tanks.

Tank T-112 has a nominal capacity of 20,000 gals. All other tanks are of 12,000 gal. capacity each.

Tank nos. T-101 and T-107 are of stainless steel construction. All others are of carbon steel.

The four (4) newer tank nos. T-101 to T-104, fabricated by Imperial Steel Tank Co., were placed in service during 1986. The remaining older six (6) tanks date from 1981.

Available records and fabrication drawings for tank nos. T-101 to T-104 indicate they were built to the Underwriters Laboratories, Inc. Standard UL-142 for steel above ground tanks and were to be labeled as such. The published UL-142 Standards "do not cover vertical tanks that are elevated by means of legs" and are not intended for liquids having a specific gravity exceeding that of water. In order to satisfy these exceptions, it was necessary for Imperial Steel to apply for Underwriters Lab review and inspection to obtain the UL Listing for these cone bottomed above ground steel tanks on legs.

The Imperial fabrication drawings list the following tank design parameters:

Design Pressure = hyrdostatic head due to contents

Design Temperature = 250° F

Specific Gravity = 1.5

Corrosion Allowance = 1/16 "

Although no fabrication drawings were found for the six (6) older tanks, the Straubing, Rubin & Kenes design plans indicate the same material thicknesses for the top, shell, and bottom as shown on the Imperial plans. Since these thicknesses have been further verified by ultrasonic test measurements, it seems reasonable to conclude that these older tanks were also built to the design standards of UL-142.

The most recent ultrasonic thickness measurements include those taken by Alpha Consultants in Aug. '89 and by MQS Inspection in Oct. '91 for the Serrine report.

Alpha Consultants conducted visual internal inspections on all tanks (except T-110, which was in service) in early Dec. '89 and an external site inspection on 3 Jan. '90. Serrine Environmental Consultants conducted a visual site inspection, including all tank externals, in Sept. '91.

SPECIFIC TANK DETAILS

For tabulation of existing tank detail design information and summary of latest ultrasonic thickness measurements, refer to the tank status form provided in Appendix A for each of the ten (10) tanks.

PROJECTED SERVICE LIFE

The following table summarizes results of calculations undertaken to establish corrosion rates, based on past service, in order to predict an expected service life for the eight (8) carbon steel tanks. For calculation details, refer to Appendix B.

Surface	Estimated Corrosion Rate	Estimated Retirement Thickness	% of "as built" Thickness Remaining at Retirement	Projected Life as of 1995
Tank Top T-110	2.5 Mils/yr	0.156"	62%	24 yrs.
Side Shell T-105&T-112	3.6 Mils/yr	0.188"	60%	21 yrs.
Cone Bottom T-102	3.0 Mils/yr	0.281"	71%	28 yrs.

NOTE:

The following assumptions were used in the development of this table:

Corrosion rates for the tank top and shell surfaces were arrived at by subtracting the lowest recorded minimum ultrasonic thickness reading to date from the "as built" thickness and then dividing by the tank age at time of thickness reading.

In arriving at an estimated corrosion rate for the bottom cone surface, it was found necessary to develop an adjusted "as built" thickness. This was required since the average recorded bottom thickness measurement for all tanks, and in most cases the minimum value also, exceeded the 0.375" thickness shown on the fabrication drawing. The "as built" thickness was therefore adjusted to 0.392" to more accurately reflect the ultrasonic readings which ten years later were giving averages and minimums greater than 0.375".

INSPECTION/TESTING PLAN PRIOR TO REUSE

In order to assess each tank's internal condition, material thickness, and integrity prior to being placed back in service, it is planned to do the following, once the tank has been found safe for man-entry:

* Conduct an initial visual inspection by a tank experienced technician in company with a registered professional engineer to determine general tank condition. A standard check list, similar to that used by Alpha Consultants for Tank T-109 and shown in Figure 1 will be used as a guide and for recording findings. Suspicious areas will be noted for a more rigorous inspection and scheduled for ultrasonic measurement if deemed necessary.

* Since these tanks are insulated, past ultrasonic readings taken from the tank exterior have been limited to those areas where a removable patch permits direct access to the plate surface beneath. Past surveys have included at each of 4 - 90° quadrants, 1 top point, 3 side points and 1 cone bottom point giving a total of 20 readings/tank. With the tank out of service and clean, it would seem desirable to take additional ultrasonic thickness measurements from within. The cone bottom and tank height will make this difficult and require a tank ladder or other means to reach the underside of the top plate.

* It is recommended that a minimum of 12 readings each be taken in a + pattern on the top and bottom surfaces. For the shell at mid-height, a girth sample of about 20 points around the circumference is desirable. Finally, a vertical row sample, top to bottom, of about 10 points at a location determined from the visual inspection to be most worthy of further exploration, should provide more than enough data to verify the existing surface thicknesses and to form a base for comparison with past and future thickness measurement readings. The ultrasonic test readings are to be taken by personnel qualified and certified as competent to use the test equipment. The test results are to be analyzed by a registered professional engineer experienced in steel tank design and construction.

SUMMARY DISCUSSION

Projected Service Life - The projected useful service life for the eight (8) carbon steel tanks is estimated to be on the order of 20 years from today.

- The projected service life for the two (2) stainless steel tanks (T-101 & T-107) is estimated to be more than 20 years as evidenced by the ultrasonic thickness readings which indicate little, if any significant material loss as of '91.

- These projected service life estimates are believed to be conservative in that minimum point readings, rather than average readings, were used to establish the corrosion rates. Furthermore, the projected service life calculations assume that corrosion has continued at the same rate during the past 3 years when the tanks have been out of service.

- These estimated rates can be expected to remain in effect so long as the future stored waste product corrosivity characteristics are compatible with and do not differ significantly from those products stored in the past. Also, the integrity of the external insulation cladding material must be maintained to prevent exterior corrosion from the weather.

- It is anticipated that these tanks, once returned to service, will be ultrasonically tested on an annual basis, at which time these estimated corrosion rates should be reviewed and modified if necessary to suit existing service conditions.

Type of Wastes Stored - The individual tank status forms, Appendix A, list the typical types of waste products stored in past service as well as those planned for future operations. Before any wastes are stored, the facility management is required to assess the compatibility of the waste with (1) the storage unit materials of construction and (2) the wastes being presently stored.

Conclusion - Based on a detailed technical review of the page 1 referenced documents, it is my opinion that the ten (10) existing tanks proposed for reuse at the CWM Tank Farm are structurally sound, free from leaks, and exhibit sufficient material thickness, as determined by ultrasonic measurements. They appear to meet applicable design guidance standards and the past visual inspection reports indicate them to be substantially free from corrosion. Therefore, it is my opinion that the existing reported condition and structural integrity of these storage tanks demonstrate suitability for continued service.

CERTIFICATION

"I certify, under penalty of law, that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately 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 possible fines and imprisonment"

Registered Professional Engineer

Name: Lee F. Mount

Signature Lee F. Mount

Date: 24-January 1995

Massachusetts Registration No: 21193

1785

LEE F. MOUNT, P.E.

CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

23 May 1995

Mr. Alan F. Mount, Project Manager
Clean Harbors of Chicago, Inc.
11800 S. Stony Island Avenue
Chicago, Illinois 60617

Subject: CWM Tank Farm
Tank Agitator Mounting and Nozzle Details

Enclosure: 1) Design Calculations and Fabrication Details
(10 sheets, original issue date 14 March 1995)

Dear Alan,

Enclosure 1) is submitted herewith for your information and records. Sheet nos. 1, 5, 6 & 9 have been updated and revised where necessary to reflect your actual "as built" conditions.

Yours truly,

Lee F. Mount

Lee F. Mount

Reviewed by:

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-96

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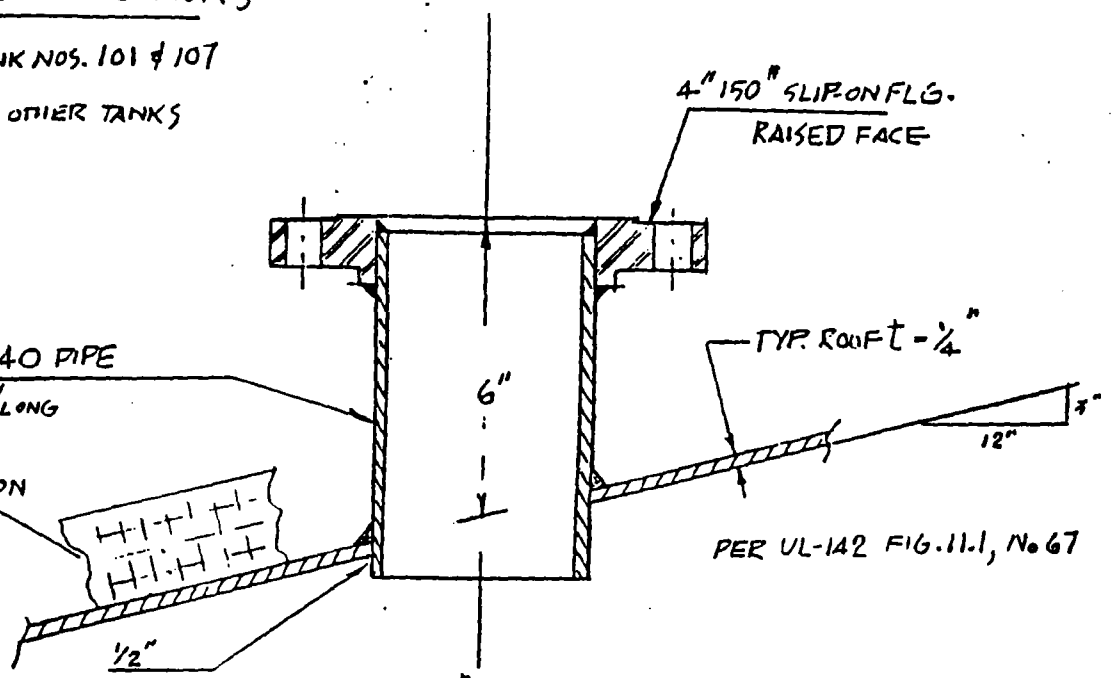
JOB CWM/CHI TANKS
SHEET NO. 5 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR.'95
REV. 15 MAR.95
CHECKED BY DATE
SCALE 3" = 1'-0" 22 MAY'95
"AS BUILT"

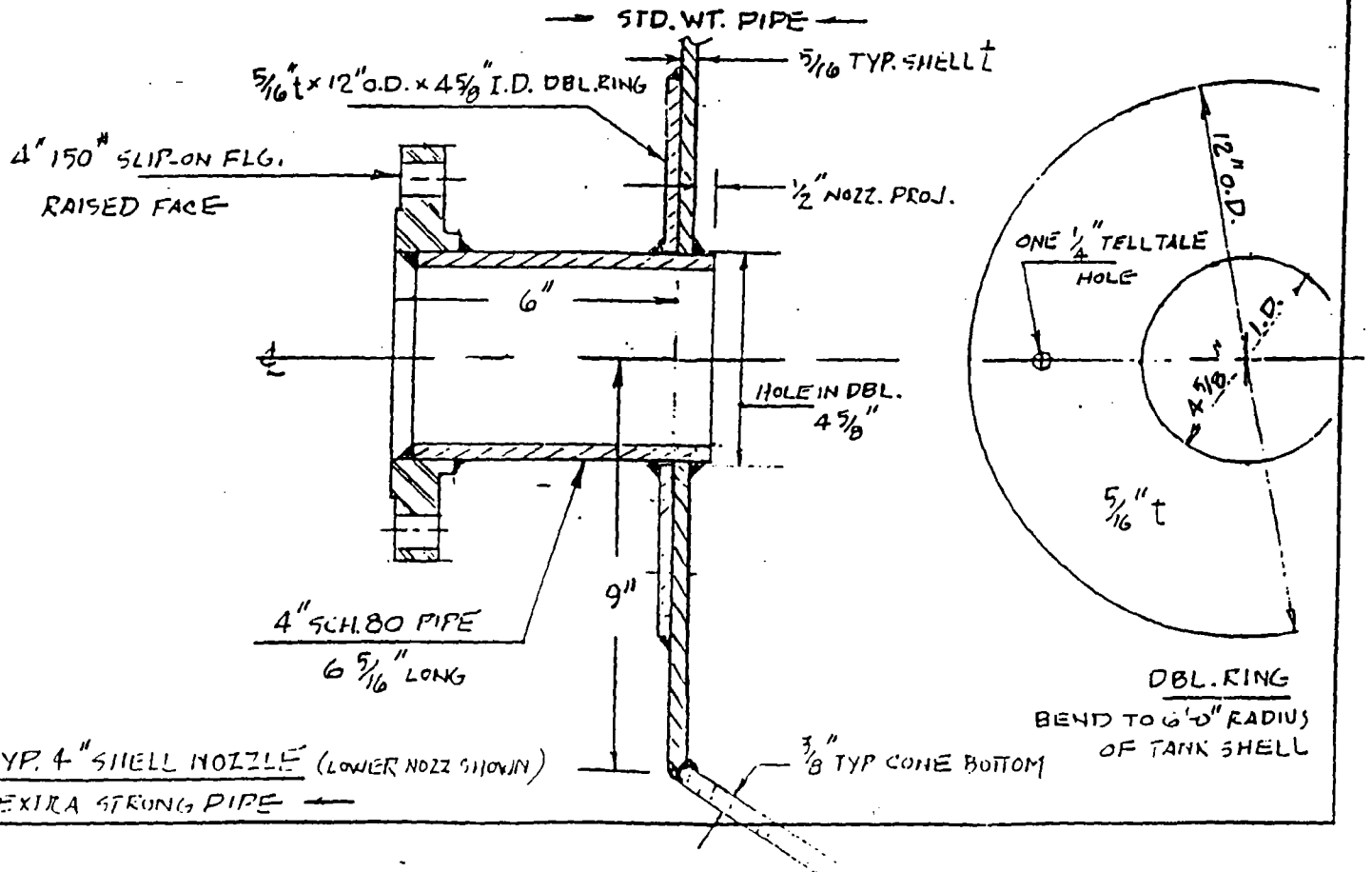
4" NOZZLE INSTALLATIONS

STAINLESS FOR TANK NOS. 101 & 107

CARBON STEEL OTHER TANKS



TYP. 4" ROOF NOZZLE



TYP. 4" SHELL NOZZLE (LOWER NOZZ SHOWN)
EXTRA STRONG PIPE

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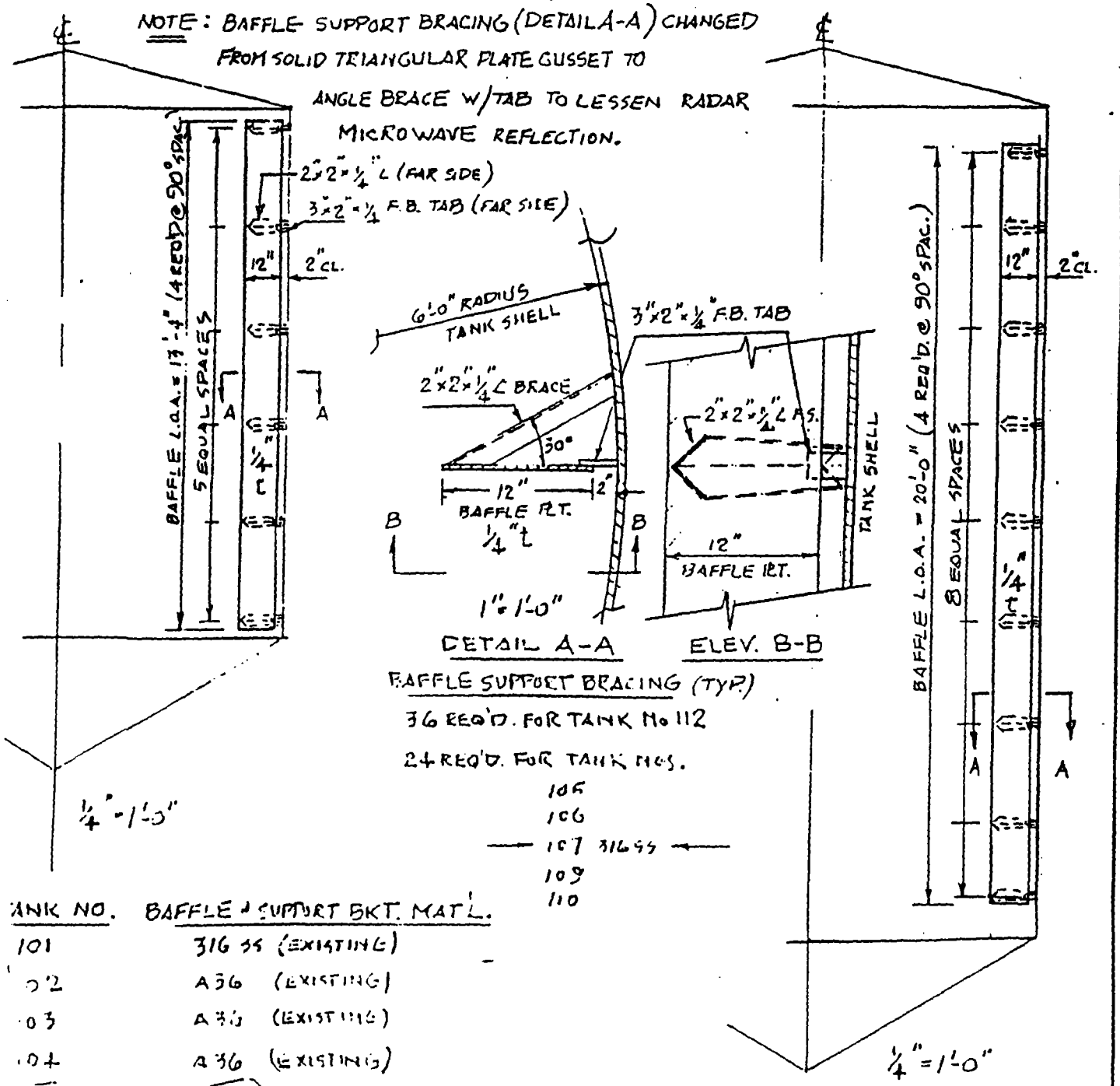
JOB C.WM/CHI TANKS
SHEET NO. 6 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. '95
REV. 15 MAR. '95
CHECKED BY DATE
SCALE → AS NOTED "AS BUILT" 22 MAY '95

BAFFLE PLATE DESIGN (SIZES AS RECOMMENDED IN REF. 1)

NOTE: BAFFLE SUPPORT BRACING (DETAIL A-A) CHANGED FROM SOLID TRIANGULAR PLATE GUSSET TO ANGLE BRACE W/TAB TO LESSEN RADAR MICROWAVE REFLECTION.



BAFFLE SUPPORT BRACING (TYP.)
36 REQ'D. FOR TANK No 112
24 REQ'D. FOR TANK NOS.
105
106
107 316 SS
109
110

TANK NO.	BAFFLE & SUPPORT BKT. MAT'L.
101	316 SS (EXISTING)
102	A36 (EXISTING)
103	A36 (EXISTING)
104	A36 (EXISTING)
105	A36 NEW
106	A36 NEW
107	316 SS NEW
108	A36 NEW
109	A36 NEW

TANK No 112
BAFFLE & SUPPORT BKTS.
A36 STEEL (NEW)

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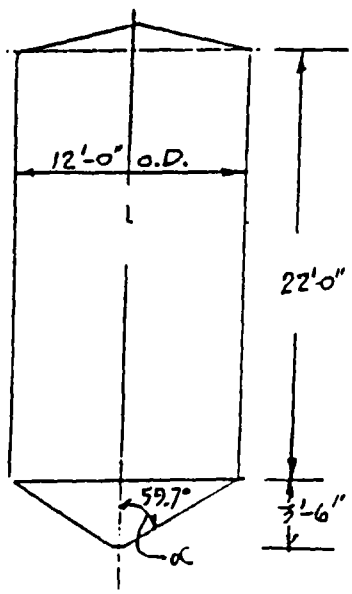
JOB CWM/CHI TANKS
SHEET NO. 7 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR '95
CHECKED BY DATE
SCALE

CHECK FOR TANK SERVICE OPERATION WITH 1.0 PSIG INTERNAL VAPOR PRESSURE (4FT. 24" WATER)

USE TANK NO 112 WHICH HAS GREATEST DEPTH

ASSUME S.G. @ 1.5



MAX PRESSURE @ CONE BOTTOM $= \frac{62.4 \times 1.5 \times 25.5'}{144} = 16.6$ PSI

PLUS VAPOR PRESSURE 1.0 PSI

17.6 PSI

USE 18 PSI = P

USE ASME SECT VIII - DIV 1, APPENDIX 1 TO DETERMINE MIN. REQ'D RT. t FOR SHELL & CONE BOTTOM

FOR CYLINDRICAL SHELL:

$$t = \frac{PR_o}{SE + 0.4P}$$

WHERE: $P = 18$ PSI

$R_o = \frac{12}{2}(12) = 72''$

$$t = \frac{18(72)}{(13800).7 + 0.4(18)}$$

$S = 13{,}800$ PSI FOR A 285-C STL.

$E = 0.7$

$t = 0.134'' + .0625'' = 0.197$ IN. (UL-142 WOULD REQUIRE $t = 0.167$ IN)

CORR ALLOW.

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $0.30'' > .197''$ O.K.

FOR CONE BOTTOM:

$$t = \frac{PD_o}{2\cos\alpha\,(SE + .4P)}$$

WHERE: $D_o = 144''$

$\alpha = 59.7°$

$$= \frac{18(144)}{2\cos 59.7°\,(13{,}800 \times .7 + .4 \times 18)}$$

$= 0.266'' + .0625'' = 0.329$ IN.

CORR ALLOW

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $.375'' > .329$ O.K.

LEE F. MOUNT, P.E.
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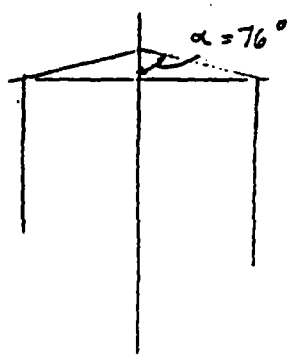
CHECK FOR 1.0 PSIG INTERNAL VAPOR PRESSURE (CON'D.)

FOR CONE TOP



FROM ASME SECT. VIII - DIV. 1

SOLVE FOR P:

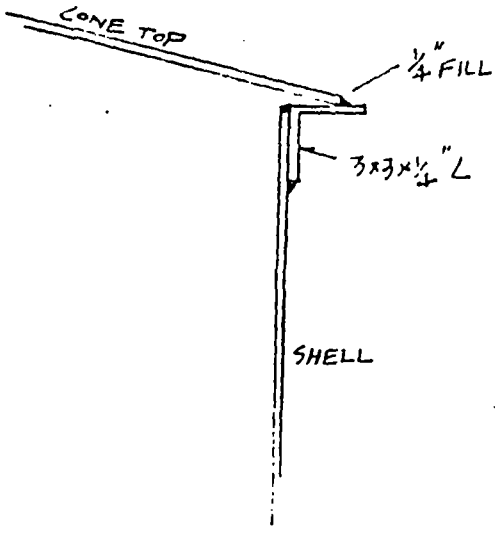
$$P = \frac{2SEt\cos\alpha}{D_o - 0.8t\cos\alpha}$$

WHERE $S = 13{,}800$ PSI
$E = 0.7$
$D_o = 144$ IN
$\alpha = 76°$
t = USE .25 − 1/16" CORR ALL. = .1875"

$$P = \frac{2(13{,}800)(.7)(.1875)(.242)}{144 - [.8(.1875)(.242)]}$$

$$= \frac{876.65}{144} = \boxed{6 \text{ PSI} > 1.0 \quad \text{O.K.}}$$

CHECK ROOF TOP CONNECTION WELD DETAIL



EST. LATERAL SURFACE AREA CONE TOP SUBJECTED TO 1.0 PSI PRESSURE

DIA. ≈ 149" (ROOF OVERHANGS SHELL)

LATERAL AREA = BASE CIRCUM. × 1/2 SLANT HT

$$= \pi D \times \frac{76.2''}{2}$$

$$= \pi(149) \times 38.1 = 17{,}715 \text{ IN}^2$$

∴ LOAD TO ROOF = 17,715 IN² × 1 LB/IN² = 17,715 LBS

CIRCUM. OF 1/4" FILLET ATTACHMENT WELD = πD = π(149) = 467 IN

∴ LOAD/IN ON 1/4" FILLET WELD = $\frac{17715}{467}$ = 38 #/IN O.K.

VS

ALLOWABLE WELD LOAD OF 11,200 × .25 = 2800 #/IN

CWM/CHI TANK AGITATORS
L.F. MOUNT 10 MAR 95
REV. 15 MAR 95
SHT 10 OF 10

EXISTING AGITATED TANKS

TANK I.D.	AGITATOR SPECS. (FROM REF. 1) TYPE	HP	RPM	SHAFT L IN.	SHAFT DIA. IN.	WT. LBS.	NOZZLE BEND. MOM FT.-LBS	NOZZLE TORQUE FT.-LBS.	BAFFLE REQ'D.	CASE SIZE	TANK PROPERTIES TOP HEAD t"	MIN HEAD t" (TBL. 3)	NOZZLE SIZE	REINF. PAD DIMENS. B (TBL. 2)	C	D FIG 3	
101 S.S.	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.313 S.S.		12" EXIST				
102	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.250		12" EXIST				
103	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.250	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5	17" 12.375	(ACTUAL)
104	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.241	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5"	17" 12.375	AS MODIFIED (ACTUAL)
105	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"	
106	C NEW	15	45	190.5	3.5	2745	5036 MAX.	4274 MAX.	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"	
107 S.S.	EXIST. FROM 103	3.0							YES (NEW)	2 DESIGN FOR 4	.250 S.S.	.500	12"	8"	11.5"	17"	
109	C NEW	15	45	190.5	3.5	2745	5036	4274	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"	
110	EXIST. FROM 104	3.0							YES (NEW)	2 DESIGN FOR 4	.230	.500	12"	8"	11.5"	17"	
112	B NEW	5	30	270.0	3.5	2872 MAX.	2898	2337	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"	

NO CHANGE

MOD. FY (SHT. 9) MOUNTING

NEW MOUNTING (SHT. 1)

FROM ULTRASONIC TEST RESULTS

REINF. PAD t FROM REF. 5

APPENDIX TK-101-3

APPENDIX A

CLEAN HARBORS OF CHICAGO, INC.

CWM TANK FARM

EXISTING TANK STATUS FORM

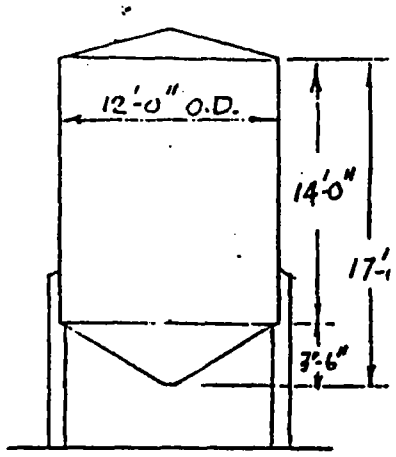
Tank No. T-101

Nominal Capacity 12,000 gals.

Mat'l. of Const. 316 Stainless

Approx. Year of Build 1986

Designed Corrosion Allow. 1/16"



Stored Waste Characteristics:

	Past	Future
Specific Grav.	1.5 (design)	0.5 → 1.5
Class	NFPA CLASS 2 - AQUEOUS PCB/FUEL BLEND	ACIDIC WATERS, LEAN WATERS, AND/OR HAZARDOUS WASTE FUELS (NFPA CLASS 1-3 LIQUIDS)

Material Thicknesses (Inches):

Surface	per UL-142 Std.	As Built A	As Built E	Ultrasonic Test Results 08/89 B Avg.	08/89 B Min.	10/91 C Avg.	10/91 C Min.
Top	0.086	0.250	0.313	0.320	0.316	0.316	0.305
Shell	0.115	0.313	0.313	0.323	0.310	0.332	0.320
Bottom	0.158	0.375	0.438	0.437	0.429	0.445	0.416

01/23/95 D

TOP	0.316	0.303
SHELL	0.339	0.324
BOTTOM	0.439	0.411

NOTES:

A. FROM IMPERIAL STEEL FABRICATION DWG. '86

B. FROM ALPHA CONSULTANTS JAN. '90 RPT.

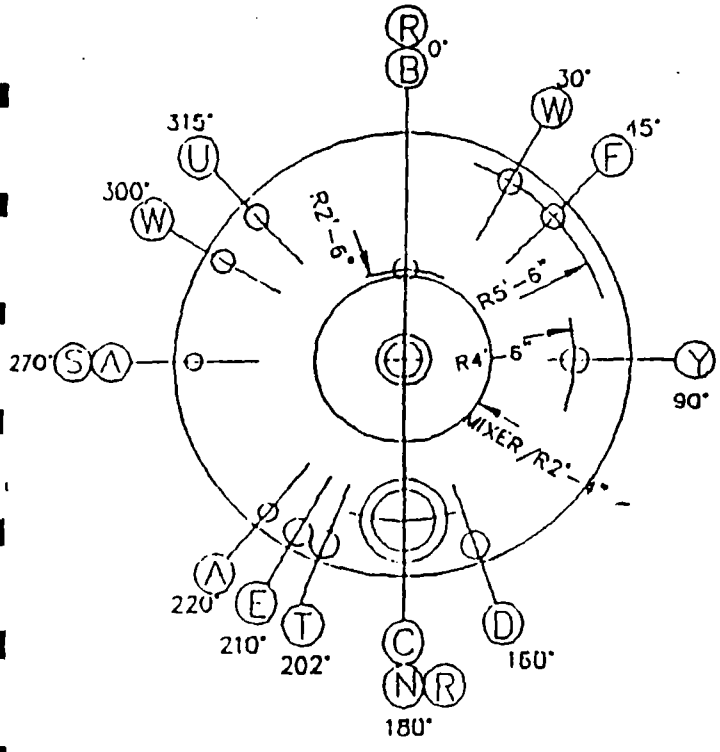
C. FROM SIRRINE ENVIR. CONSULTANTS NOV. '91 RPT.

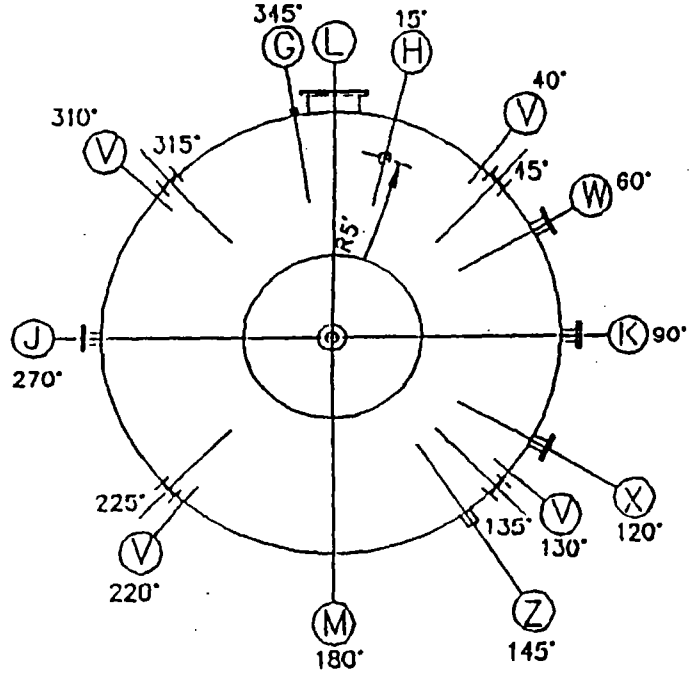
D. ADD'L READINGS BY MQS TAKEN 23 JAN. '95

E. ESTIMATED ACTUAL AS BUILT t BASED ON ULTRASONIC RDGS. TO DATE

MARK	REQD.	SIZE	TYPE	ELEVATION	DESCRIPTION
A	2	2"	150# RFSO	ROOF	NITROGEN BLANKET
B	1	3"	150# RFSO	ROOF	~~COV~~ CV - FA
C	1	20"	150#	ROOF	EMERGENCY VENT
D	1	4"	150# RFSO	ROOF	FILL
E	1	4"	150# RFSO	ROOF	HIGH LEVEL-LSH101
F	1	3"	150# RFSO	ROOF	SPARE
G	1	2"	3000# CPLG	12" F/CONE	SPARE
H	1	2"	3000# CPLG	CONE	SAMPLE
J	1	3"	150# RFSO	6" F/CONE	LOW LEVEL-LSL101
K	1	3"	150# RFSO	13" F/CONE	SPARE
L	1	24"	150#	12" F/CONE	MANWAY W/COVER
M	1	4"	150#TB-VALVE	CONE	DRAW-OFF
N	1	12"	150# RFSO	ROOF	MIXER MOUNT
R	AS SHWN		-	6'-3" F/ROOF	SUPPORT CLIP
S	AS SHWN		-	3'-9" F/ROOF	SUPPORT CLIP
T	1	4"	150# RFSO	ROOF	DPSL101 & DPSH101
U	1	3"	150# RFSO	ROOF	SPARE
V	4		-	SHELL	BAFFLE
W	2	3"	150# RFSO	ROOF	SPARE
W	1	3"	150# RFSO	6" F/CONE	SPARE
X*	2	4"	150# RFSO	9", 6'-6" F/C	DRAW-OFF
Y*	1	4"	150# RFSO	ROOF	LEVEL MONITOR-LT101
Z*	2	2"	3000# CPLG	9", 6'-6" F/C	SAMPLE

NOTE: * DESIGNATES NEW NOZZLE





TK-101

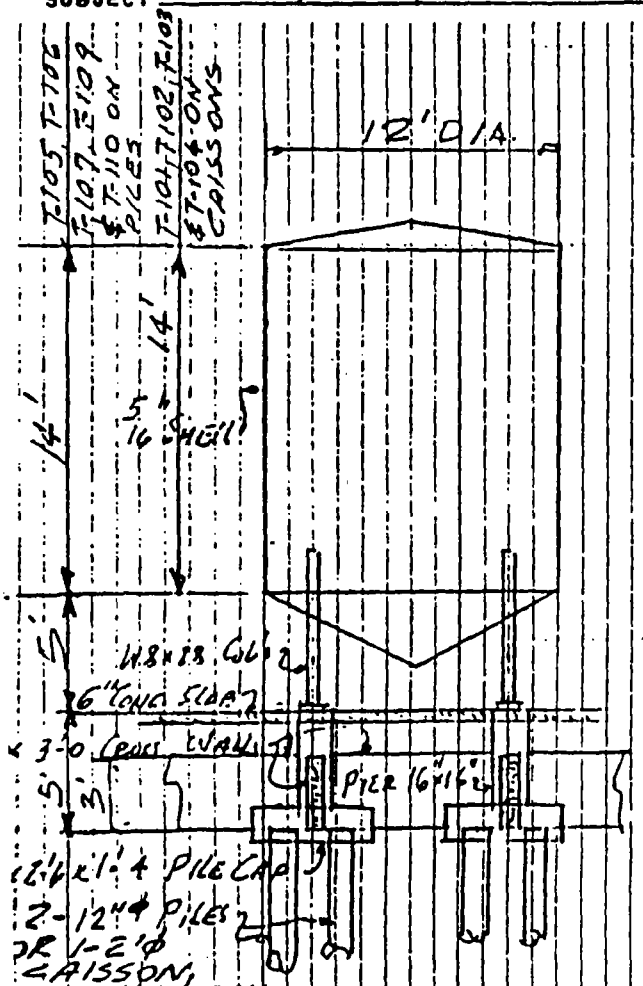
APPENDIX TK-101-4

HOYER-SCHLESINGER-TURNER, INC.

SHEET 2 OF 8
PROJECT NO. 17851
DATE 1.19.95
BY BERNES
CHK. C.K. 1.27.95

PROJECT CLEAN HARBORS - CHICAGO, IL

SUBJECT EXIST. TANK FARM SUPPORT COMPUTATIONS



SECTION "A-A"
SEE SH-1

TANKS T-101 TRU T-107, T-109 & T-110

EMPTY TANK =
$= \pi(12 \times 14' + 12^2/4 + 6 \times \sqrt{3^2 \times 12^2}) \times 12.8 \times 1.05$
$= 11.985 + 4 \text{ LEGS} \times 7 \times 28 = 184$
TOTAL = 12,170#

PLUS NOZZLES, FLANGES AND SUPPORT =
= 7,830#

TOTAL EMPTY TANK = 12,170 + 7,830 =
= 20,000# ✓

LIQUID = 12,100 GAL × 8.336 × 1.5 =
= 151,298# ✓

TOTAL EMPTY + LIQUID =
= 20,000 + 151,298# = 171k

EACH LEG = 171/4 = 43k/LEG ✓

CONCRETE + SNOW

PILE CAP	= 4.5' × 2.5 × 1.33 × .15	= 2.25k
PIER	1.33 × 1.33 × 5' × .15	= 1.33k
CROSS WALL	3' × .67' × 16 × .15	= 4.82k
FILL	4.5 × 2.5 × 3.5 × .10	= 3.94k
6" CONC. SLAB	= 4.5 × 2.5 × .5 × .15	= .84k
SNOW	$\pi R^2 \times 25^{\#}$	= 2.83k
		16.01k/LEG.

TOTAL LOAD PER LEG ON PILES
= 43k + 16k = 59k

TWO 2-12"φ WOOD PILES = 20 TON CAP. EACH
= 2 × 40k = 80k > 59k O.K.

CAISSON CAP = $\pi \times R^2 \times 9^k = \pi \times 2.25^2 \times 9 = 143^k > 59^k$ O.K.

H-S-T

HOYER-SCHLESINGER-TURNER,Inc.
ENGINEERS-ARCHITECTS
3074 University Ave.
Highland Park,IL 60035
Phone:847-461-0470 Fax:847-266-9829

November 18, 1999

Mr. James R. Laubsted
Facility Compliance Manager
CLEAN HARBORS SERVICES, INC.
11800 S. Stony Island Avenue
Chicago, IL 60617

RE: Inspection Report
Tank T-102

Dear Mr. Laubsted:

On October 28, 1999 I visually inspected the interior and exterior of Tank T-102.

Tank T-102 is located on the south side of the Flammable Storage Tank Farm (Unit 16). Previous visual inspections include July 7, 1995. Hydrostatic testing was completed in July, 1995. From the time of the earlier inspection, the tank was used for storing Class I flammable hazardous wastes and is intended to store PCB contaminated wastes also. Tank T-102 is located outdoors and has a dedicated concrete dike. The containment is coated with Protecto-Coat 900, 30 mils thick as manufactured by Dudick, Inc. This coating is compatible with the stored materials. The containment dike for T-102 and the remaining tanks within the tank farm were inspected August 31, 1999.

Tank T-102 is a carbon steel vessel fabricated in 1986. Tank T-102 was empty at the time of inspection and was cleaned by Clean Harbors personnel. The tank is operated at ambient temperature and under 2" WC pressure from nitrogen blanketing. The tank is equipped with a conversation vent and is vented through a carbon bed.

Tank T-102 stores Class I flammable liquids including hazardous waste fuels and is intended for PCB contaminated wastes. Maximum specific gravity of stored liquids is 1.5 and pH may vary from 4 to 10. The tank is constructed from A-285-carbon steel. It is 12'0" in diameter and 14"0" high straight side with a cone bottom and top. The operating capacity is 12,000 gallons. Available records and fabrication drawings indicate this tank was fabricated to the UL-142 standard.

The tank is supported by steel legs on caissons. The steel legs are encased in concrete.

The internal and external visual inspection did not reveal any defects. The welds around nozzles and tank shell welds inspected from inside the tank were in good condition. The roof had areas with rust. The rust was sandblasted by Clean Harbors. There was no sign of pitting or other visible defects.

It is not possible to inspect the entire exterior of the tank by visual inspection. The tank is insulated with 2" thick insulation with metal jacket. The insulation and jacketing was removed where nozzles were added in 1995. At that time the welds could be inspected from the outside. The condition of the welds was good; there were no vertical defects.

In October, 1999 Clean Harbors performed NDE-ultrasonic thickness measurements from the interior of the tank. In October, 1998 external NDE-ultrasonic thickness measurements were taken. These ultrasonic thickness test results and prior results are listed in Appendix TK-102-1.

The top as-built thickness was 0.250 inches. The four latest readings each show decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.192 inches which is 56% over the minimum of 0.123 inches recommended by the UL-142 standard.

The wall as-built thickness was 0.313 inches. The twelve latest readings each show minor decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.292 inches which is 75% over the minimum of 0.167 inches recommended by the UL-142 standard.

The bottom as-built thickness was 0.375 inches. The four latest readings each show decreases in thickness compared to the 1991 ultrasonic thickness readings. The minimum reading was 0.368 inches which is 53% over the minimum of 0.240 inches recommended by the UL-142 standard.

For tank evaluations, modifications and calculations, see certification reports by Mr. Lee F. Mount, PE, dated January 1995 and May 23, 1995 in Appendix TK-102-2.

For tank nozzle orientation and description, see Appendix TK-102-3.

For Tank T-102 supports evaluation, see calculations by Mr. Peter J. Bernes, SE, dated January 19, 1995 in Appendix TK-102-4.

Therefore, I certify that after visual inspection, the tank is structurally sound, properly supported and set. No evidence of cracks, bulging, corrosion pits or scales or weld defects were observed. Based on my inspection, the tank can be used for the intended purpose.

Very truly yours,

HOYER-SCHLESINGER-TURNER, INC.

Peter J. Bernes

Peter J. Bernes
Illinois #3659

STATE OF ILLINOIS
PETER J.
BERNES
3659
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11.30.01

APPENDIX TK-102-1

ULTRA SONIC THICKNESS TESTING
T-102

October 28, 1999

INTERNAL

TOP

East	South	West	North
.192	.192	.194	.192

SHELL

.300	.300	.304	.308
.306	.304	.304	.304
.292	.300	.304	.292

BOTTOM

.368	.372	.372	.372

CleanHarbors

ULTRASONIC THICKNESS TESTING - 12-17-97

TANK #102

EAST		SOUTH	WEST	NORTH
14	15	16	17	13
.234	.219	.236	.226	.245
3		6	9	12
.303		.297	.301	.302
2		5	8	11
.293		.324	.294	.299
1		4	7	10
.296		.288	.296	.290
18		19	20	21
.363		.367	.370	.361

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

23 May 1995

Mr. Alan F. Mount, Project Manager
Clean Harbors of Chicago, Inc.
11800 S. Stony Island Avenue
Chicago, Illinois 60617

Subject: CWM Tank Farm
Tank Agitator Mounting and Nozzle Details

Enclosure: 1) Design Calculations and Fabrication Details
(10 sheets, original issue date 14 March 1995)

Dear Alan,

Enclosure 1) is submitted herewith for your information and records. Sheet nos. 1, 5, 6 & 9 have been updated and revised where necessary to reflect your actual "as built" conditions.

Yours truly,

Lee F. Mount

Lee F. Mount

Reviewed by:

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-96

LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANK FARM
SHEET NO. COVER OF
CALCULATED BY L. F. MOUNT DATE 14 MAR '95
CHECKED BY REV. DATE 17 MAR. '95.
SCALE FINAL ISSUE TO REFLECT "AS BUILT" CONDITIONS 22 MAY '95

THE ENCLOSED CALCULATIONS AND FABRICATION DETAILS WERE CARRIED OUT IN SUPPORT OF CURRENT TANK UPGRADES PROPOSED FOR THE CLEAN HARBORS, CHICAGO STONY ISLAND FACILITY. AN OVERALL REVIEW AND ASSESSMENT OF THE STRUCTURAL INTEGRITY OF THESE EXISTING TANKS WAS COVERED IN A REPORT BY THE UNDERSIGNED DATED JAN. 1995. THIS REPORT ADDRESSES THE FITTING OF NEW TANK AGITATORS AS WELL AS ADDITIONAL NOZZLES.

CONTENTS

DESCRIPTION	SHEET NO.
SKETCH OF AGITATOR MOUNTING FLANGE (FOR TANKS 105, 106, 107	1
REFERENCES 109, 110, 112)	2
ESTIMATE OF STRESS DUE TO BENDING MOMENT @ FLANGE	2
ESTIMATE OF STRESS DUE TO TORQUE @ FLANGE	3
ESTIMATE OF STRESS DUE TO AGITATOR VERTICAL LOAD	3
CHECK OF LOADED TANK SUPPORT LEGS W/ AGITATOR VERT. LOAD	4
TYPICAL PROPOSED 4" NOZZLE INSTALLATIONS	5
BAFFLE PLATE DESIGN REQ'MTS.	6
CHECK TANK INTEGRITY FOR OPERATION WITH 1.0 PSIG VAPOR PRESS.	7-8
SKETCH OF MODIFIED AGITATOR MOUNTING FLANGE (FOR TANKS 103 + 104)	9
TABULAR SUMMARY OF AGITATOR SPECS. + TANK PROPERTIES	10

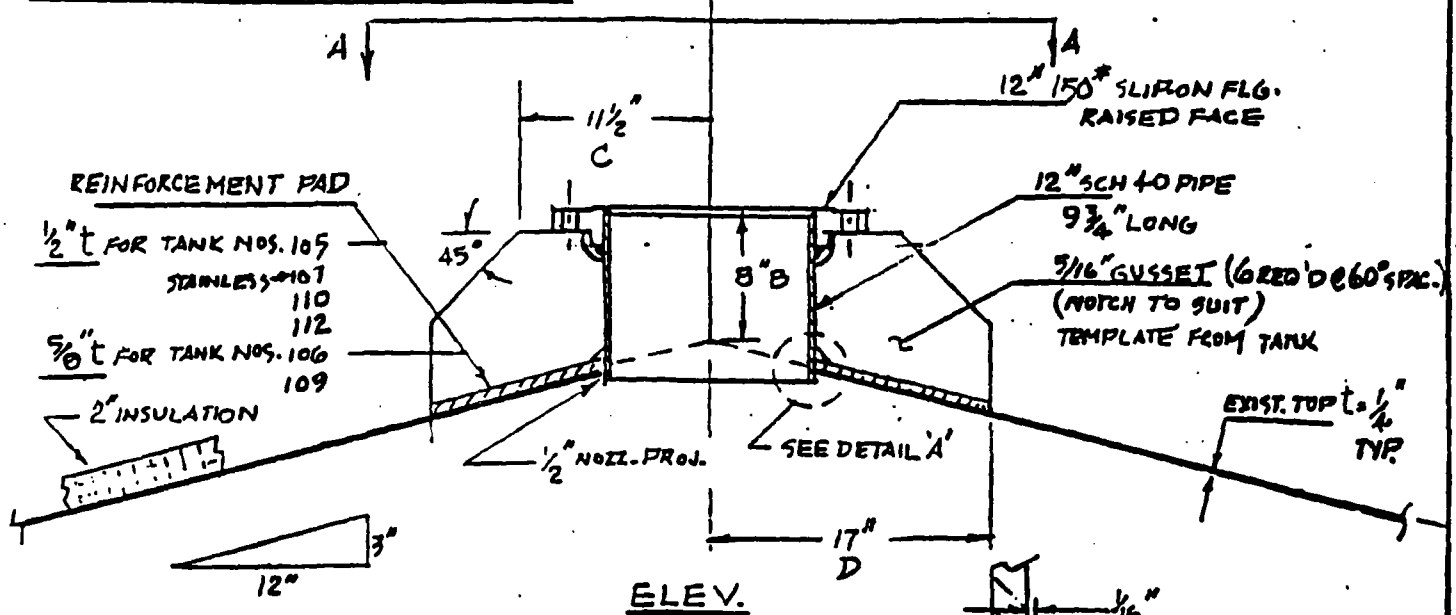
PREPARED BY Lee F. Mount
LEE F. MOUNT
14 MARCH 1995

COMMONWEALTH OF MASSACHUSETTS
LEE FORREST MOUNT
21193
REGISTERED
PROFESSIONAL ENGINEER

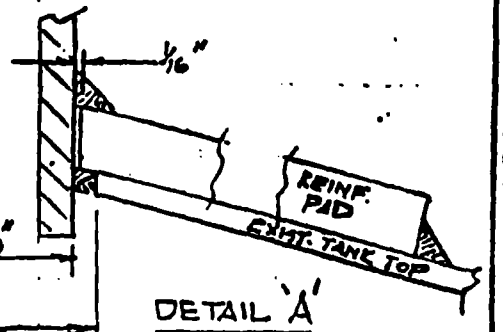
LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANK AGITATORS
SHEET NO. 1 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR.'95
REV. 15 MAR.'95..
CHECKED BY DATE
SCALE 1"=1'-0" & AS NOTED 22 MAY'95
"AS BUILT"

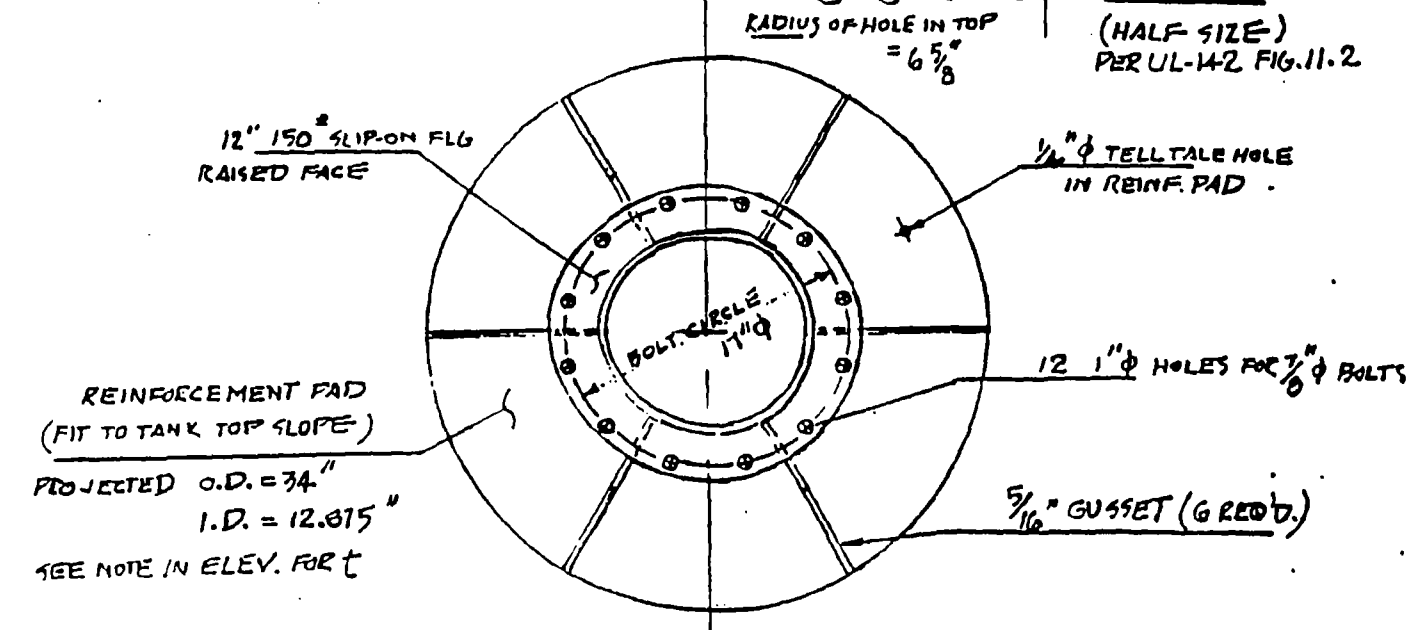
NEW MOUNTING FLANGE FOR TANK NOS. 105, 106, 107, 109, 110 & 112



ELEV.



DETAIL 'A'
(HALF SIZE)
PER UL-142 FIG. 11.2



PLAN A-A

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JOB CWM/CHI TANK AGITATOR & NOZZLE INSTALL
SHEET NO. 2 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. '95
CHECKED BY _____ DATE _____
SCALE _____

REFERENCES: 1) CHEMINEER AGITATOR DESIGN SYSTEM SPEC. SHEETS
2) UL-142, STEEL ABOVE GROUND TANKS
3) FORMULAS FOR STRESS & STRAIN, ROARK 4TH ED. 1965
4) API-650 WELDED STEEL TANKS FOR OIL STORAGE
5) CHEMINEER IOM MANUAL PG. 4-9 JUNE '93
6) ASME SECT VIII PRESSURE VESSEL CODE

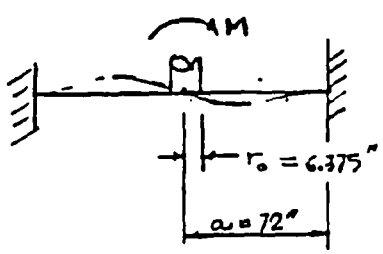
CHECK REINFORCED TANK TOP FOR AGITATOR LOADINGS

ASSUMPTIONS: LOADINGS - USE 15 HP TYPE C UNIT FOR MAX. BENDING MOMENT OF 5036 FT.-LBS & TORQUE OF 4274 FT.-LBS

- USE 5 HP TYPE B UNIT FOR MAX. VERTICAL LOAD OF SAY 3000 LBS

ESTIMATE STRESS DUE TO BENDING MOMENT

FROM REF 3) PG. 219, CASE 10 ASSUMES FLAT CIRCULAR PLT, EDGES FIXED, CENTRAL COUPLE



$$\text{MAX } S_r \text{ AT } r = r_o = \frac{3M}{4\pi t^2 r_o}\left[1 + \left(\frac{m+1}{m}\right)\log \frac{2(.45a - r_o)}{.45 k a}\right]$$

WHERE: $k = \dfrac{0.1a^2}{(r_o + .28a)^2} = \dfrac{0.1(72)^2}{[6.375 + .28(72)]^2}$

$= 0.736$

$M = 5036 \text{ FT-LBS} \times 12 = 60432 \text{ IN-LBS}$

$t = .25 + .625 \text{ (REINF. PAD)} = 0.875''$

m = RECIPROCAL OF POISSON'S RATIO

$= \dfrac{1}{.3} = 3.33$

$a = 72''$

$r_o = 6.375''$

$$\text{MAX } S_r = \frac{3(60432)}{4\pi(.875)^2(6.375)}\left[1 + 1.30 \log \frac{2[.45(72) - 6.375]}{.45(.736)(72)}\right] \quad (2.183)$$

$= 2956\,[1 + 1.3(.781)]$

$= 2956\,(2.02) = \boxed{5971 \text{ PSI}}$

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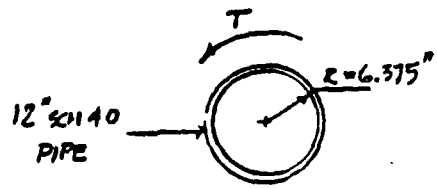
JOB CWM/CHI TANK AGITATORS
SHEET NO. 3 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. '95
CHECKED BY _____ DATE _____
SCALE _____

ESTIMATE SHEAR STRESS DUE TO TORQUE

$T = 4274 \text{ FT-LBS} \times 12 = 51288 \text{ IN-LBS}$

$\text{FORCE} = \frac{T}{r} = \frac{51288 \text{ IN-LBS}}{6.375''} = 8045 \text{ LBS}$



$\text{CIRCUM.} = 2\pi(r) = 40''$

$\therefore \text{LOAD}/'' \text{ OF CIRCUM.} = \frac{8045}{40} = 201 \text{ LBS}/''$

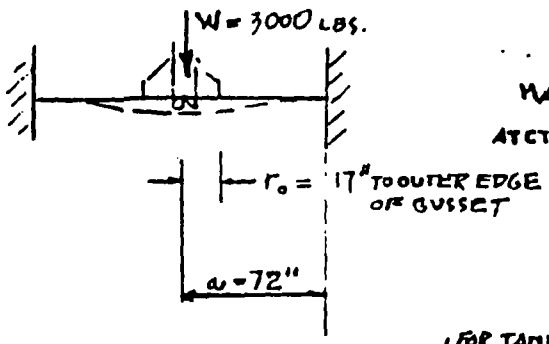
SAY TORQUE IS CARRIED BY 3/8" FILLET WELD @ REINF. PAD TO NOZZLE CONNECTION

ALLOWABLE WELD LOAD $= 11{,}200(.375) = \boxed{4200 \text{ LBS}/'' > 201 \text{ O.K.}}$

CONSERVATIVE IN THAT LOWER TANK TOP TO NOZZLE FULL PENETRATION WELD HAS NOT BEEN TAKEN INTO ACCOUNT.

ESTIMATE STRESS DUE TO VERTICAL LOAD

FROM REF. 3 / PG 218, CASE 7 ASSUMES FLAT CIRCULAR PLT., EDGES FIXED, UNIFORM LOAD OVER CONCENTRIC CIRCULAR AREA OF RADIUS r_o



$$\text{MAX } S_r \text{ AT CTR.} = \frac{3W}{2\pi m t^2}\left[(m+1)\log\frac{a}{r_o} + (m+1)\frac{r_o^2}{4a^2}\right]$$

WHERE: $W = 3000$ LBS
$t = .25 + .50$ (REINF PAD) $= 0.75''$ (FOR TANK No 112)
$m = 3.33$
$a = 72''$
$r_o = 17''$

$$\text{MAX } S_r = \frac{3(3000)}{2\pi(3.33)(.75)^2}\left[4.33\log 4.235 + 4.33(.0139)\right]$$

$$= 765\,(6.29 + .06)$$

$$= \boxed{4827 \text{ PSI}}$$

CONCLUDE: COMBINING STRESS DUE TO BENDING (5971) + STRESS DUE TO VERT. LOAD (4827) = 10,798 PSI
API 650 GIVES ALLOW STRESS OF 20,000 PSI FOR ASTM A285-C STEEL
THUS, THE STRESS DUE TO EXTERNAL LOADS IS ABT. 54% OF ALLOWABLE WHICH APPEARS TO BE REASONABLE

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(617) 749-5394

JOB CWM/CHI TANKS
SHEET NO. 4 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR 95
CHECKED BY _____ DATE _____
SCALE _____

CHECK TANK SUPPORT LEGS FOR AGITATOR VERT. LOAD

USE TANK NO 112 (LARGEST TANK + HEAVIEST AGITATOR)

ESTIMATED WEIGHT TO BE SUPPORTED BY 4 LEGS @ L=7.0' SIZE = W8x31

TANK STEEL

CONE TOP (1/4" RT.) LATERAL AREA = BASE CIRCUM x 1/2 SLANT HT.

$= \pi D \times \frac{6.18'}{2}$

$= \pi 12 \times 3.09 = 116.5$ sq ft $\times 10.2$ #/FT^2 = 1188 LBS.

SHELL (3/16" RT.) AREA = $\pi D H$

$= \pi 12 \times 22 = 829.4$ sq ft $\times 12.75$ #/FT^2 = 10575 LBS.

CONE BOTTOM (3/8" RT.) LATERAL AREA = BASE CIRCUM x 1/2 SLANT HT.

$= \pi D \times \frac{6.95}{2}$

$= \pi 12 \times 3.48 = 131.2$ sq ft $\times 15.7$ #/FT^2 = 2007 LBS.

AGITATOR WEIGHT ——————→ 3000 LBS

SUBTOTAL 16770 LBS

ADD 20% FOR MISC. PIPING, PLATFORMS INSULATION, ETC. ——————→ 3350 LBS

LIQUID CONTENTS @ S.G. = 1.5 CAP. = $\frac{20{,}000 \text{ GAL.}}{7.48 \text{ GAL/CU.FT}}$ = 2674 CU FT x 62.4 x 1.5 = 250,286 LBS

TOTAL ESTIMATED WT. TO BE SUPPORTED = 270,406 LBS.

USE 276 KIPS

∴ EACH LEG CARRIES $\frac{276}{4}$ = 69 KIPS

FROM AISC COL TABLE @ KL = 2(7) = 14 FOR W8x31 (A36 STL.)

READ ALLOWABLE LOAD = 137 KIPS > 69 KIPS

CONCLUDE: EXISTING COLUMN SUPPORT IS ADEQUATE FOR CONDITIONS

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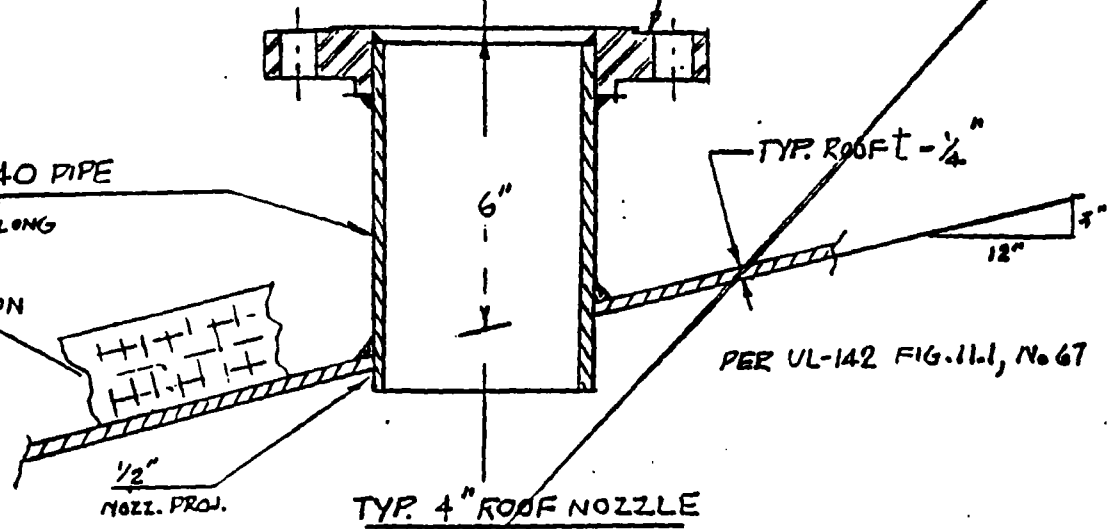
JOB CWM/CHI TANKS
SHEET NO. 5 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR.'95
REV. 15 MAR.95
CHECKED BY DATE
SCALE 3" = 1'-0" 22 MAY'95
"AS BUILT"

NOT APPLICABLE

4" NOZZLE INSTALLATIONS

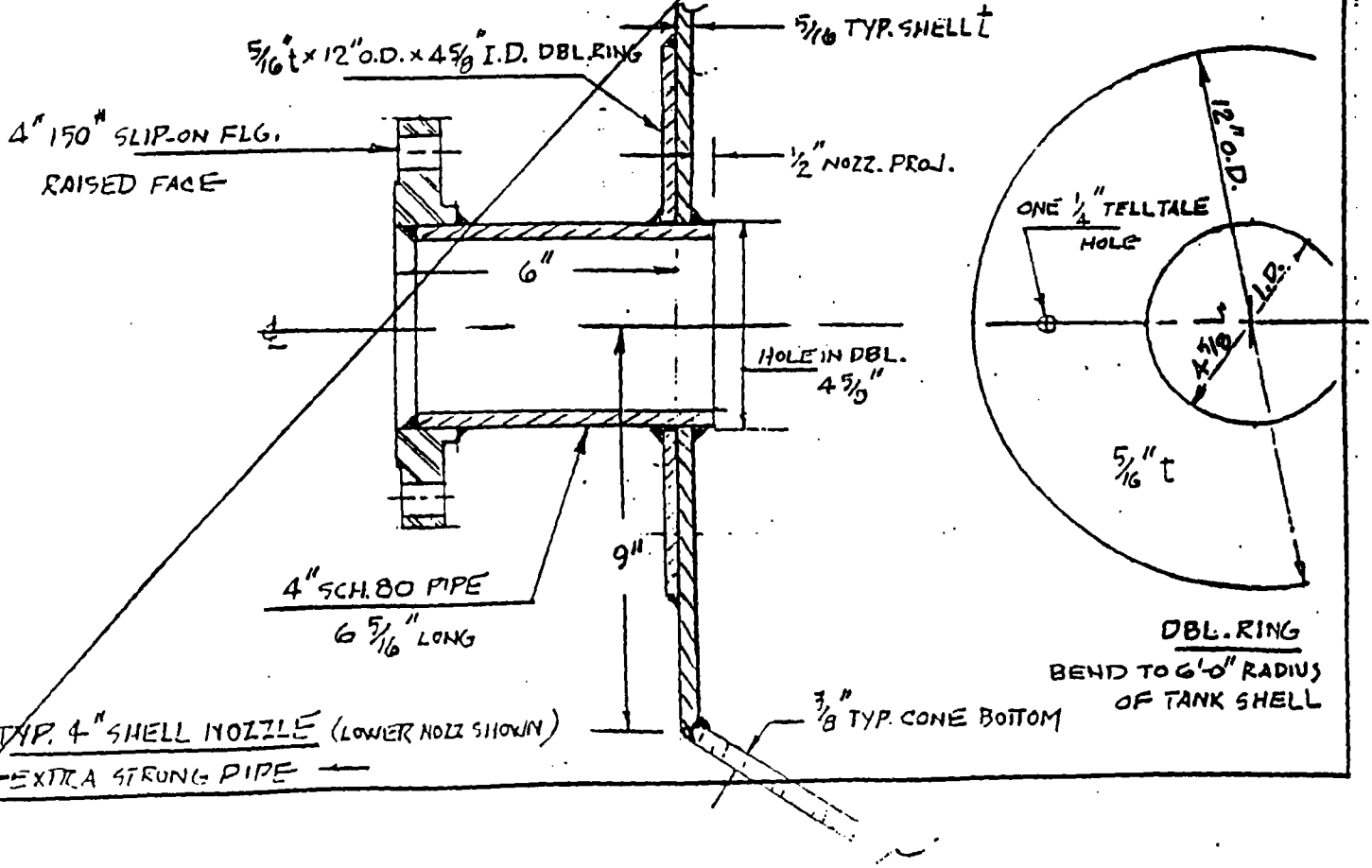
STAINLESS FOR TANK NOS. 101 & 107

CARBON STEEL OTHER TANKS



TYP. 4" ROOF NOZZLE

— STD. WT. PIPE —



TYP. 4" SHELL NOZZLE (LOWER NOZ SHOWN)

— EXTRA STRONG PIPE —

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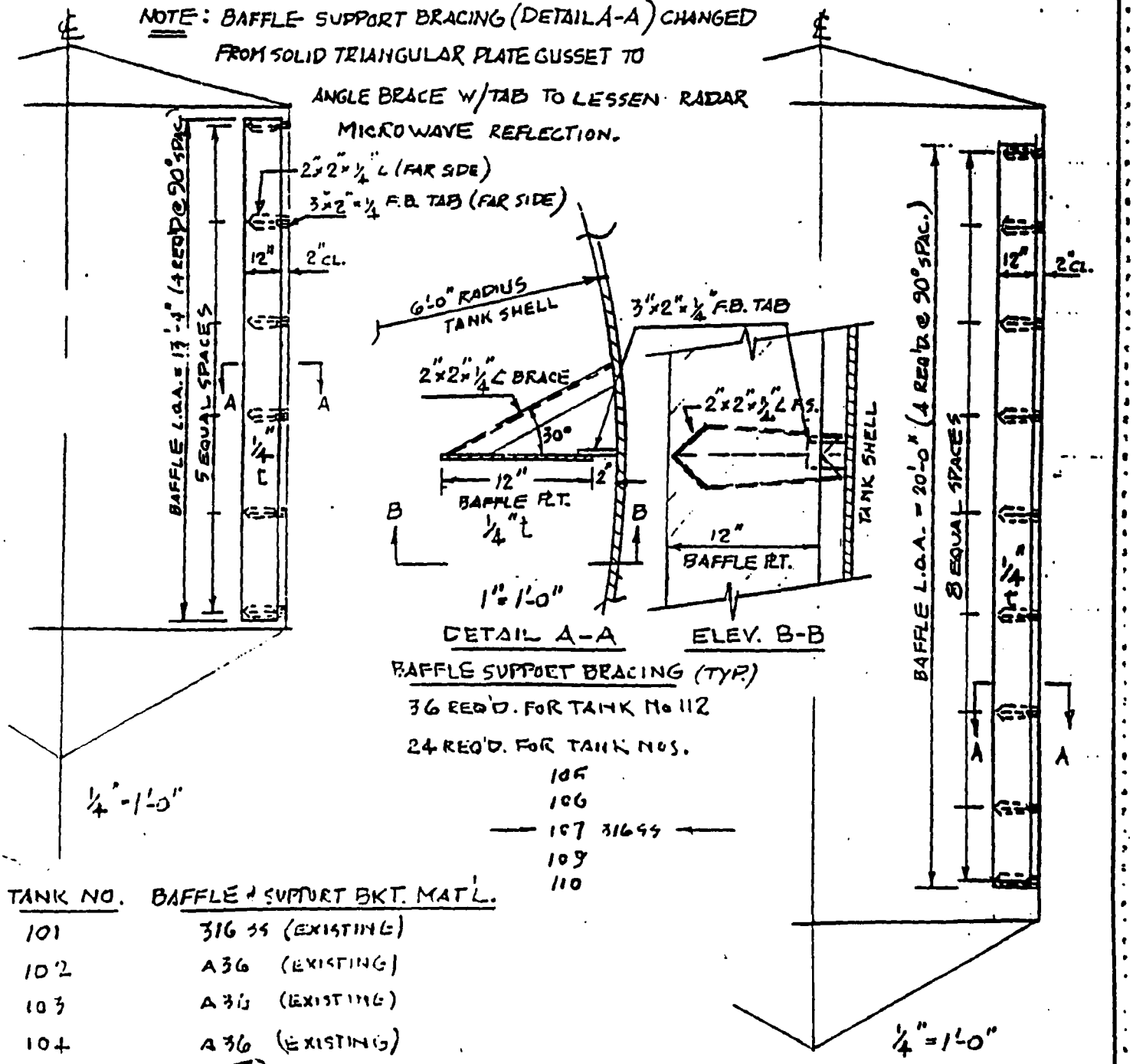
JOB CWM/CHI TANKS
SHEET NO. 6 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. '95
CHECKED BY REV. DATE 15 MAR. '95
SCALE AS NOTED "AS BUILT" 22 MAY '95

BAFFLE PLATE DESIGN (SIZES AS RECOMMENDED IN REF. 1)

NOTE: BAFFLE SUPPORT BRACING (DETAIL A-A) CHANGED FROM SOLID TRIANGULAR PLATE GUSSET TO ANGLE BRACE W/TAB TO LESSEN RADAR MICROWAVE REFLECTION.



BAFFLE SUPPORT BRACING (TYP.)
36 REQ'D. FOR TANK No 112
24 REQ'D. FOR TANK NOS.
105
106
107 316SS
109
110

TANK NO.	BAFFLE & SUPPORT BKT. MAT'L.	
101	316 SS	(EXISTING)
102	A36	(EXISTING)
103	A36	(EXISTING)
104	A36	(EXISTING)
(105)	(A36)	NEW
(106)	(A36)	NEW
(107)	(316 SS)	NEW
(109)	(A36)	NEW
(110)	(A36)	NEW

TANK No (112)
BAFFLE & SUPPORT BKTS.
A36 STEEL (NEW)

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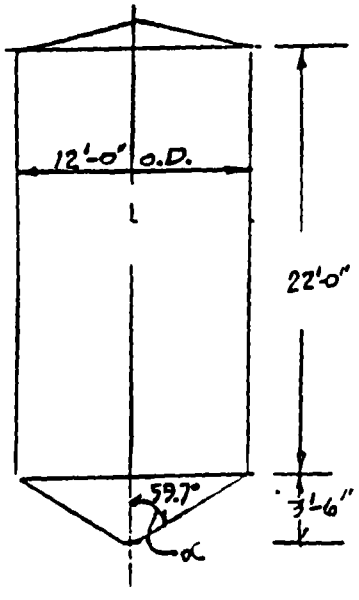
JOB CWM/CHI TANKS
SHEET NO. 7 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. 95
CHECKED BY DATE
SCALE

CHECK FOR TANK SERVICE OPERATION WITH 1.0 PSIG INTERNAL VAPOR PRESSURE (ABT. 24" WATER)

USE TANK NO 112 WHICH HAS GREATEST DEPTH

ASSUME S.G. @ 1.5



MAX PRESSURE @ CONE BOTTOM $= \frac{62.4 \times 1.5 \times 25.5'}{144} = 16.6$ PSI

PLUS VAPOR PRESSURE 1.0 PSI

17.6 PSI

USE 18 PSI = P

USE ASME SECT VIII - DIV 1, APPENDIX 1 TO DETERMINE MIN. REQ'D RT. t FOR SHELL & CONE BOTTOM

FOR CYLINDRICAL SHELL:

$$t = \frac{PR_o}{SE + 0.4P}$$

WHERE: $P = 18$ PSI

$R_o = \frac{12}{2}(12) = 72''$

$$t = \frac{18(72)}{(13800).7 + 0.4(18)}$$

$S = 13{,}800$ PSI FOR A 285-C STL.

$E = 0.7$

$t = 0.134'' + .0625'' = 0.197$ IN. (UL-142 WOULD REDUCE $t = 0.167$ IN)

CORR. ALLOW.

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $0.30'' > .197''$ O.K.

FOR CONE BOTTOM:

$$t = \frac{PD_o}{2\cos\alpha\,(SE + .4P)}$$

WHERE: $D_o = 144''$

$\alpha = 59.7°$

$$= \frac{18(144)}{2\cos 59.7°\,(13{,}800 \times .7 + .4 \times 18)}$$

$= 0.266'' + .0625'' = 0.329$ IN.

CORR ALLOW

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $.375'' > .329$ O.K.

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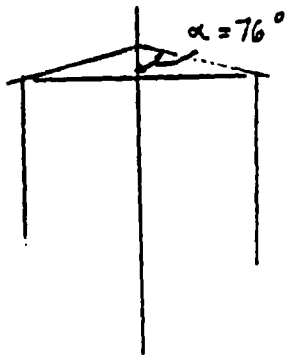
JOB CWM/CHI TANKS
SHEET NO. 8 OF 10
CALCULATED BY L.F. MOUNT DATE 16 MAR. 95
CHECKED BY DATE
SCALE

CHECK FOR 1.0 PSIG INTERNAL VAPOR PRESSURE (CON'D.)

FOR CONE TOP



FROM ASME SECT. VIII - DIV. 1

SOLVE FOR P:

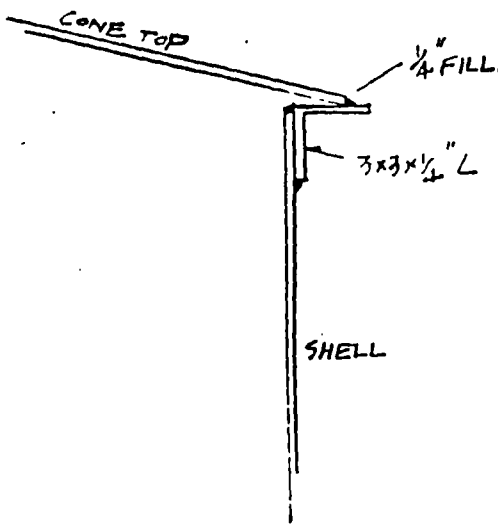
$$P = \frac{2SEt\cos\alpha}{D_o - 0.8t\cos\alpha}$$

WHERE S = 13,800 PSI
E = 0.7
D_o = 144 IN
α = 76°
t = USE .25 − 1/16" CORR ALL. = .1875"

$$P = \frac{2(13{,}800)(.7)(.1875)(.242)}{144 - [.8(.1875)(.242)]}$$

$$= \frac{876.65}{144} = \boxed{6 \text{ PSI} > 1.0 \quad \text{O.K.}}$$

CHECK ROOF TOP CONNECTION WELD DETAIL



EST. LATERAL SURFACE AREA CONE TOP SUBJECTED TO 1.0 PSI PRESSURE

DIA. ≈ 149" (ROOF OVERHANGS SHELL)

LATERAL AREA = BASE CIRCUM. × 1/2 PLANT HT

$$= \pi D \times \frac{76.2''}{2}$$

$$= \pi(149) \times 38.1 = 17{,}715 \text{ IN}^2$$

∴ LOAD TO ROOF = 17,715 IN² × 1 LB/IN² = 17,715 LBS

CIRCUM. OF 1/4" FILLET ATTACHMENT WELD = πD = π(149) = 467 IN

∴ LOAD/IN ON 1/4" FILLET WELD = $\frac{17715}{467}$ = 38 #/IN

VS

ALLOWABLE WELD LOAD OF 11,300 × .25 = 2825 #/IN O.K.

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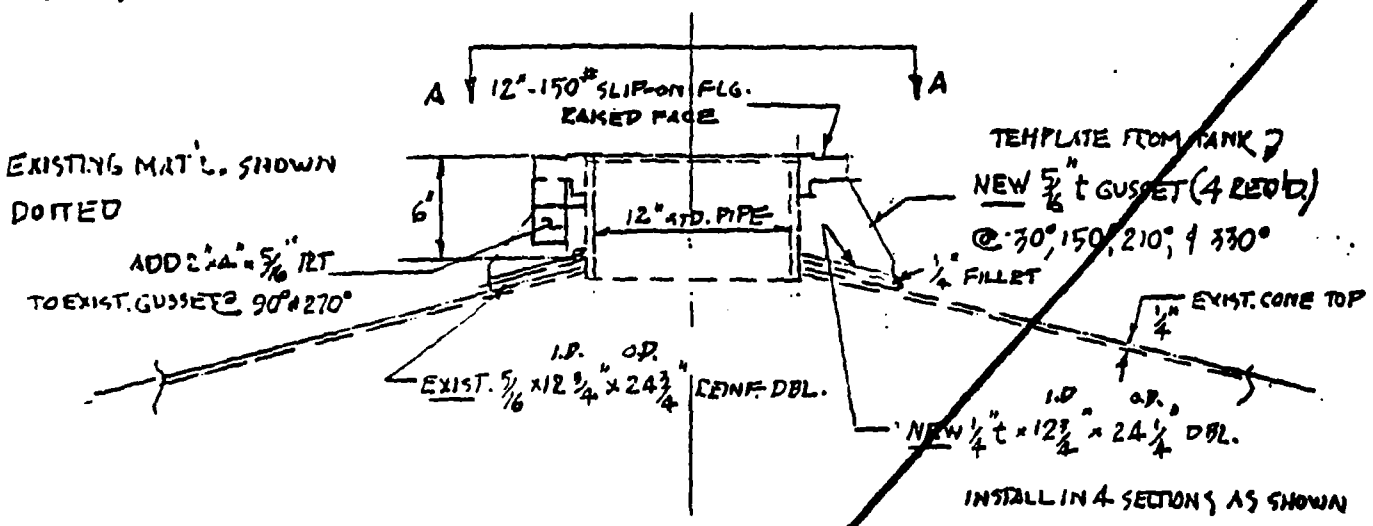
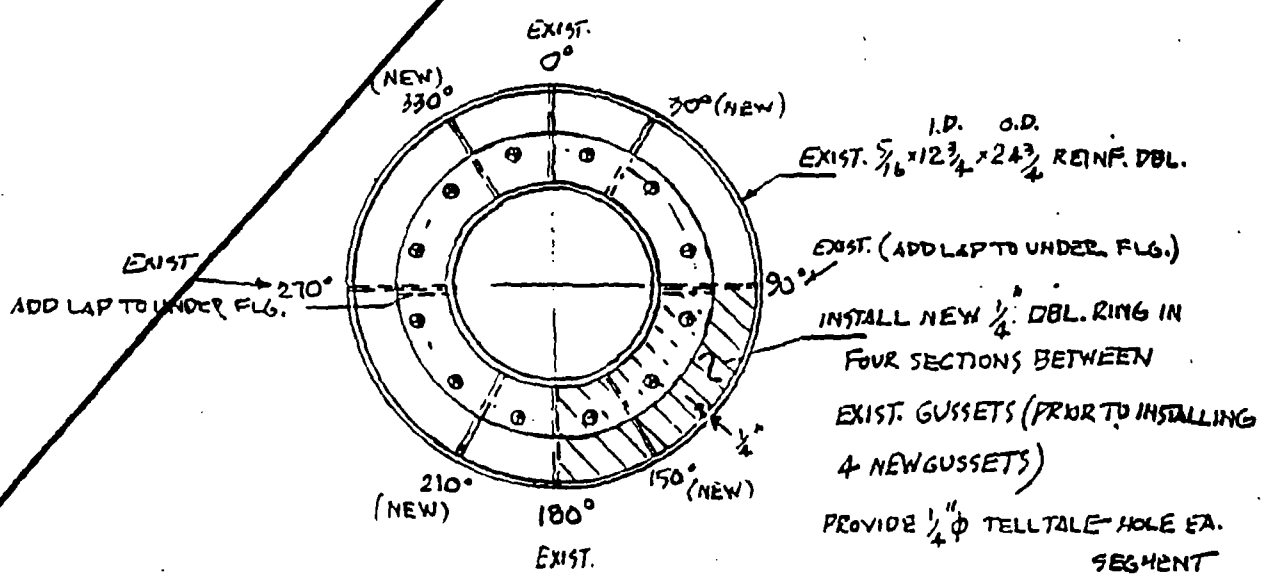
JOB CWM / CHI TANKS
SHEET NO. 9 OF 10
CALCULATED BY L.F. MOUNT DATE 16 MAR '95
CHECKED BY DATE
SCALE 1" = 1'-0" 22 MAY '95

NOT APPLICABLE "AS BUILT"

MODS. TO TANK 103 & 104 EXISTING AGITATOR MOUNTING; TO ACCOMMODATE NEW 7.5 HP UNITS



ELEV.



PLAN A-A

CWM/CHI TANK AGITATORS
L.F. MOUNT 10 MAR '95
REV. 15 MAR '95
SHT 10 OF 10

TANK I.D.	AGITATOR SPECS. (FROM REF. 1) TYPE	HP	RPM	SHAFT L IN.	SHAFT DIA. IN.	WT. LBS.	NOZZLE BEND MOM FT.-LBS	NOZZLE TORQUE FT.-LBS.	BAFFLE REQ'D.	CASE SIZE	TANK PROPERTIES TOP HEAD t"	MIN HEAD t" (TBL 3)	NOZZLE SIZE	REINF PAD DIMENS. B (TBL 2)	C	D FIG 3	
101 S.S.	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.313 S.S.		12" EXIST				
102	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.250		12" EXIST				
103	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.250	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5	17" 12.375	← (ACTUAL)
104	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.241	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5"	17" 12.375	← (ACTUAL) AS MODIFIED
105	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"	
106	C NEW	15	45	190.5	3.5	2745	5036 MAX.	4274 MAX.	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"	
107 S.S.	EXIST. FROM 103	3.0							YES (NEW)	2 DESIGN FOR 4	.250 S.S.	.500	12"	8"	11.5"	17"	
109	C NEW	15	45	190.5	3.5	2745	5036	4274	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"	
110	EXIST. FROM 104	3.0							YES (NEW)	2 DESIGN FOR 4	.230	.500	12"	8"	11.5"	17"	
112	B NEW	5	30	270.0	3.5	2872 MAX.	2898	2337	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"	

NO CHANGE

MODIFY (SHT. 9) MOUNTING

NEW MOUNTING (SHT. 1)

FROM ULTRASONIC TEST RESULTS

REINF. PAD t FROM REF. 5

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RECEIVED
JUN 20 1995
HOYER-SCHLESINGER-TURNER, INC.

19 June 1995

Marie Vanagas
Hoyer-Schlesinger-Turner, Inc.
300 West Adams Street
Chicago, ILL. 60606

Subject: Clean Harbors of Chicago, Inc.
CWM Tank Farm

Enclosure: 1) Review and Assessment of Structural Integrity of Existing Tanks; LFMount Report dated January 1995

Dear Ms Vanagas,

In response to Clean Harbors' request, enclosure 1) is herewith forwarded for your information and records.

Yours truly,

Lee F. Mount

Lee F. Mount

REVIEWED BY
Peter J. Bernes
PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3059
MY LICENSE EXPIRES ON 11.30.96

LEE F. MOUNT, P.E.
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CWM TANK FARM

Review and Assessment of Structural Integrity of Existing Tank Nos.

T - 101	T - 106
T - 102	T - 107
T - 103	T - 109
T - 104	T - 110
T - 105	T - 112

January 1995

Prepared For:

Clean Harbors of Chicago, Inc.

(In response to Illinois EPA comments)

INTRODUCTION

This report was prepared in response to the Illinois EPA's request for additional information on the structural condition of the existing hazardous waste storage and/or fuel tanks scheduled for reuse at your CWM Tank Farm.

The work scope involved a technical review of all available tank related documents furnished by Clean Harbors. Pertinent data was then summarized and tabulated for each tank on a "Existing Tank Status Form". The ultrasonic test measurements for thickness, shown on the status forms, were then analyzed in order to make estimates of corrosion rates and projected service life.

Reference documents consulted during the course of this study include:

* RCRA Tank Assessment - Tank Farm System, prepared for CWM Chemical Services Inc. by ALpha Consultants, Ltd. Jan. 1990

* Tank System Inspection, prepared for CWM Chemical Services Inc. by Sirrine Environmental Consultants Nov. 1991

* Straubing, Rubin & Kenes, Inc. Tank Design Drawings

* Imperial Steel Tank Co. Fabrication Drawings

* Supplemental ultrasonic thickness measurements taken on stainless steel Tank No. T-101 on 23 January '95 by MQS Inspection, Inc. (raw data)

TANK GENERAL DESCRIPTIONS AND HISTORY

The ten (10) existing tanks, numbered T-101 to T-107, T-109, T-110, & T-112, are 12 ft. dia. vertical, cone bottomed, leg supported, above ground, insulated tanks.

Tank T-112 has a nominal capacity of 20,000 gals. All other tanks are of 12,000 gal. capacity each.

Tank nos. T-101 and T-107 are of stainless steel construction. All others are of carbon steel.

The four (4) newer tank nos. T-101 to T-104, fabricated by Imperial Steel Tank Co., were placed in service during 1986. The remaining older six (6) tanks date from 1981.

Available records and fabrication drawings for tank nos. T-101 to T-104 indicate they were built to the Underwriters Laboratories, Inc. Standard UL-142 for steel above ground tanks and were to be labeled as such. The published UL-142 Standards "do not cover vertical tanks that are elevated by means of legs" and are not intended for liquids having a specific gravity exceeding that of water. In order to satisfy these exceptions, it was necessary for Imperial Steel to apply for Underwriters Lab review and inspection to obtain the UL Listing for these cone bottomed above ground steel tanks on legs.

The Imperial fabrication drawings list the following tank design parameters:

Design Pressure = hyrdostatic head due to contents

Design Temperature = 250° F

Specific Gravity = 1.5

Corrosion Allowance = 1/16 "

Although no fabrication drawings were found for the six (6) older tanks, the Straubing, Rubin & Kenes design plans indicate the same material thicknesses for the top, shell, and bottom as shown on the Imperial plans. Since these thicknesses have been further verified by ultrasonic test measurements, it seems reasonable to conclude that these older tanks were also built to the design standards of UL-142.

The most recent ultrasonic thickness measurements include those taken by Alpha Consultants in Aug. '89 and by MQS Inspection in Oct. '91 for the Serrine report.

Alpha Consultants conducted visual internal inspections on all tanks (except T-110, which was in service) in early Dec. '89 and an external site inspection on 3 Jan. '90. Serrine Environmental Consultants conducted a visual site inspection, including all tank externals, in Sept. '91.

SPECIFIC TANK DETAILS

For tabulation of existing tank detail design information and summary of latest ultrasonic thickness measurements, refer to the tank status form provided in Appendix A for each of the ten (10) tanks.

PROJECTED SERVICE LIFE

The following table summarizes results of calculations undertaken to establish corrosion rates, based on past service, in order to predict an expected service life for the eight (8) carbon steel tanks. For calculation details, refer to Appendix B.

Surface	Estimated Corrosion Rate	Estimated Retirement Thickness	% of "as built" Thickness Remaining at Retirement	Projected Life as of 1995
Tank Top T-110	2.5 Mils/yr	0.156"	62%	24 yrs.
Side Shell T-105&T-112	3.6 Mils/yr	0.188"	60%	21 yrs.
Cone Bottom T-102	3.0 Mils/yr	0.281"	71%	28 yrs.

NOTE:
The following assumptions were used in the development of this table:

Corrosion rates for the tank top and shell surfaces were arrived at by subtracting the lowest recorded minimum ultrasonic thickness reading to date from the "as built" thickness and then dividing by the tank age at time of thickness reading.

In arriving at an estimated corrosion rate for the bottom cone surface, it was found necessary to develop an adjusted "as built" thickness. This was required since the average recorded bottom thickness measurement for all tanks, and in most cases the minimum value also, exceeded the 0.375" thickness shown on the fabrication drawing. The "as built" thickness was therefore adjusted to 0.392" to more accurately reflect the ultrasonic readings which ten years later were giving averages and minimums greater than 0.375".

INSPECTION/TESTING PLAN PRIOR TO REUSE

In order to assess each tank's internal condition, material thickness, and integrity prior to being placed back in service, it is planned to do the following, once the tank has been found safe for man-entry:

* Conduct an initial visual inspection by a tank experienced technician in company with a registered professional engineer to determine general tank condition. A standard check list, similar to that used by Alpha Consultants for Tank T-109 and shown in Figure 1 will be used as a guide and for recording findings. Suspicious areas will be noted for a more rigorous inspection and scheduled for ultrasonic measurement if deemed necessary.

* Since these tanks are insulated, past ultrasonic readings taken from the tank exterior have been limited to those areas where a removable patch permits direct access to the plate surface beneath. Past surveys have included at each of 4 - 90° quadrants, 1 top point, 3 side points and 1 cone bottom point giving a total of 20 readings/tank. With the tank out of service and clean, it would seem desirable to take additional ultrasonic thickness measurements from within. The cone bottom and tank height will make this difficult and require a tank ladder or other means to reach the underside of the top plate.

* It is recommended that a minimum of 12 readings each be taken in a + pattern on the top and bottom surfaces. For the shell at mid-height, a girth sample of about 20 points around the circumference is desirable. Finally, a vertical row sample, top to bottom, of about 10 points at a location determined from the visual inspection to be most worthy of further exploration, should provide more than enough data to verify the existing surface thicknesses and to form a base for comparison with past and future thickness measurement readings. The ultrasonic test readings are to be taken by personnel qualified and certified as competent to use the test equipment. The test results are to be analyzed by a registered professional engineer experienced in steel tank design and construction.

FIGURE 1

ALPHA CONSULTANTS, Ltd.

CHECKLIST FOR VISUAL INSPECTION OF UNLINED VESSELS

OWNER CWM Chemical Services, Inc.-Chicago Incinerator
TEST SITE 11700 So. Stony Island Ave., Chicago, Il. 60617
DATE OF INSPECTION December 5, 1989
TIME OF INSPECTION 1525
SUPERVISORY ENGINEER Harris E. Dicker, P. E.
PHOTOGRAPHER/TECHNICIAN Robert A. Dicker
TECHNICIAN James L. Eggert

TANK NO. 109 (NO PCB IN TANK)
INTERIOR SHELL MATERIAL CS
CLADDING MATERIAL SST
INSULATION 2' FIBREGLASS SIDES & BOTTOM, 2" COL BLOCK TOP
EQUIPPED WITH MIXER NO

INITIAL ROOF INSPECTION FOR SAFETY

HAZARDS OF FALLING OBJECTS NONE
VISIBLE CORROSION NONE

MORE RIGOROUS INSPECTION OF ROOF & STRUCTURAL SUPPORTS

VISIBLE LOSS OF METAL THICKNESS NONE
VISIBLE CRACKS OR LEAKS AT WELDS NONE
VISIBLE CRACKS AT NOZZLE CONNECTIONS NONE
MALFUNCTIONING OF ROOF SEALS NONE
VISIBLE DETERIORATION OF WATER DRAIN SYSTEM NONE
CONDUCT HAMMER TESTING NO

TANK SHELL

VISIBLE CRACKS AT SEAMS NONE
VISIBLE CORROSION AT VAPOR SPACE/LIQUID LEVEL LINE NONE
VISIBLE CRACKING OF PLATE JOINTS NONE
VISIBLE CRACKING OF NOZZLE CONNECTION JOINTS NONE
VISIBLE LOSS OF METAL THICKNESS NONE

TANK BOTTOM

TYPE OF BOTTOM, SLOPED OR FLAT SLOPED
VISIBLE CORROSION PITS NONE
VISIBLE CRACKED SEAMS NONE
TYPE OF CONNECTION TO SIDEWALL, WELDED OR RIVETED WELDED
VISIBLE TIGHTNESS AT CONNECTION NONE
VISIBLE DEPRESSIONS IN BOTTOM AREAS AROUND OR UNDER ROOF OR PIPE SUPPORTS NONE
VISIBLE LOSS OF METAL THICKNESS NONE
VISIBLE UNEVENESS OF BOTTOM NONE
CONDUCT HAMMER TEST NO
VISIBLE BULGES, BLISTERING OR SPALLING NONE
WAS ULTRASONIC TESTING OF TANK WALLS, ETC. CONDUCTED YES

Source: OSWER Policy Directive No. 9483.00-1
Modified Version of Table 4-7, Page 4-35
"Permit Writer's Guidance for Hazardous Waste Tanks" U. S. EPA Contract 68-01-6515
(undated draft) pp 8-10.

SUMMARY DISCUSSION

Projected Service Life - The projected useful service life for the eight (8) carbon steel tanks is estimated to be on the order of 20 years from today.

- The projected service life for the two (2) stainless steel tanks (T-101 & T-107) is estimated to be more than 20 years as evidenced by the ultrasonic thickness readings which indicate little, if any significant material loss as of '91.

- These projected service life estimates are believed to be conservative in that minimum point readings, rather than average readings, were used to establish the corrosion rates. Furthermore, the projected service life calculations assume that corrosion has continued at the same rate during the past 3 years when the tanks have been out of service.

- These estimated rates can be expected to remain in effect so long as the future stored waste product corrosivity characteristics are compatible with and do not differ significantly from those products stored in the past. Also, the integrity of the external insulation cladding material must be maintained to prevent exterior corrosion from the weather.

- It is anticipated that these tanks, once returned to service, will be ultrasonically tested on an annual basis, at which time these estimated corrosion rates should be reviewed and modified if necessary to suit existing service conditions.

Type of Wastes Stored - The individual tank status forms, Appendix A, list the typical types of waste products stored in past service as well as those planned for future operations. Before any wastes are stored, the facility management is required to assess the compatibility of the waste with (1) the storage unit materials of construction and (2) the wastes being presently stored.

Conclusion - Based on a detailed technical review of the page 1 referenced documents, it is my opinion that the ten (10) existing tanks proposed for reuse at the CWM Tank Farm are structurally sound, free from leaks, and exhibit sufficient material thickness, as determined by ultrasonic measurements. They appear to meet applicable design guidance standards and the past visual inspection reports indicate them to be substantially free from corrosion. Therefore, it is my opinion that the existing reported condition and structural integrity of these storage tanks demonstrate suitability for continued service.

CERTIFICATION

"I certify, under penalty of law, that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately 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 possible fines and imprisonment"

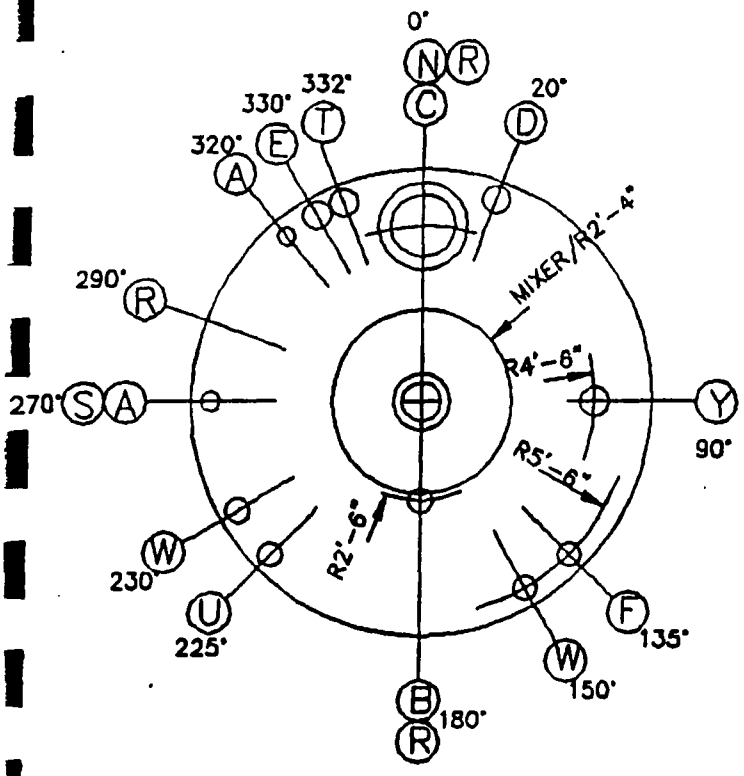
Registered Professional Engineer

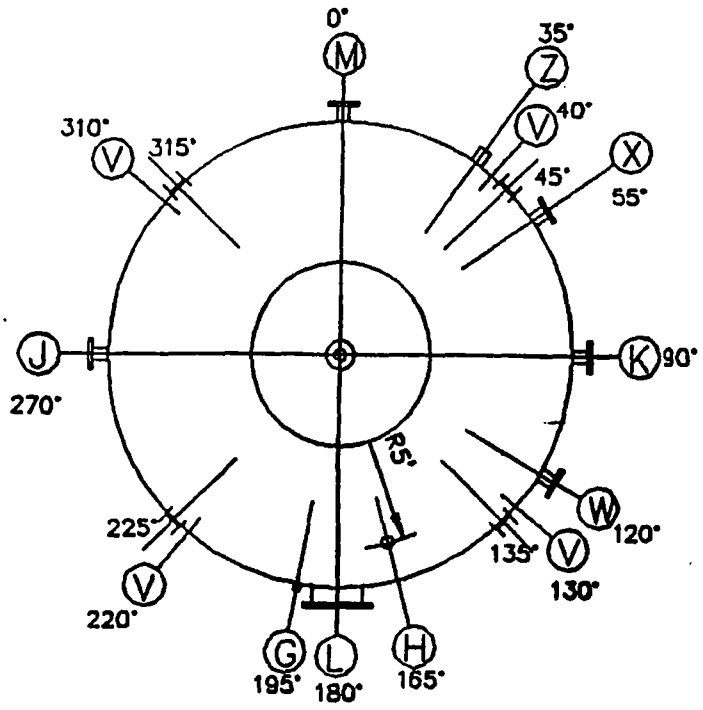
Name: Lee F. Mount

Signature: Lee F. Mount

Date: 24 January 1995

Massachusetts Registration No: 21193





TK-102

MARK	REQD.	SIZE	TYPE	ELEVATION	DESCRIPTION
A	2	2"	150# RFSO	ROOF	NITROGEN BLANKET
B	1	3"	150# RFSO	ROOF	COV - FA
C	1	20"	150#	ROOF	EMERGENCY VENT
D	1	4"	150# RFSO	ROOF	FILL
E	1	4"	150# RFSO	ROOF	HIGH LEVEL-LSH102
F	1	3"	150# RFSO	ROOF	SPARE
G	1	2"	3000# CPLG	12" F/CONE	SPARE
H	1	2"	3000# CPLG	CONE	SAMPLE
J	1	3"	150# RFSO	6" F/CONE	LOW LEVEL-LSL102
K	1	3"	150# RFSO	13" F/CONE	SPARE
L	1	24"	150#	12" F/CONE	MANWAY W/COVER
M	1	4"	150#FB-VALVE	CONE	DRAW-OFF
N	1	12"	150# RFSO	ROOF	MIXER MOUNT
R	AS SHWN		-	6'-3" F/ROOF	SUPPORT CLIP
S	AS SHWN		-	3'-9" F/ROOF	SUPPORT CLIP
T	1	4"	150# RFSO	ROOF	DPSL102 & DPSH102
U	1	3"	150# RFSO	ROOF	SPARE
V	4		-	SHELL	BAFFLE
W	2	3"	150# RFSO	ROOF	SPARE
W	1	3"	150# RFSO	6" F/CONE	SPARE
X*	2	4"	150# RFSO	9",6'-6" F/C	DRAW-OFF
Y*	1	4"	150# RFSO	ROOF	LEVEL MONITOR-LT102
Z*	2	2"	3000# CPLG	9",6'-6" F/C	SAMPLE

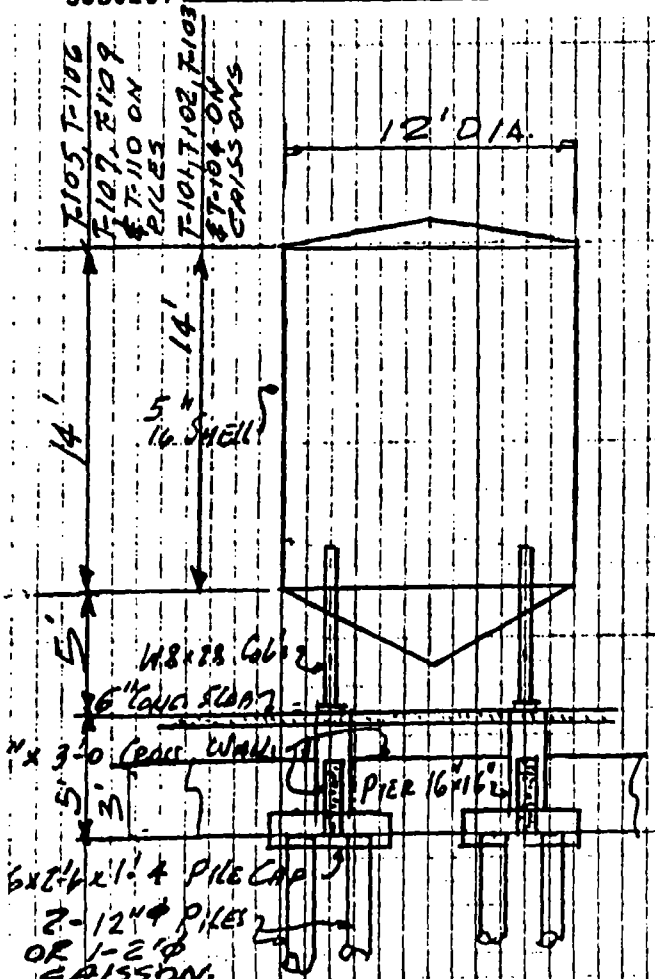
NOTE: * DESIGNATES NEW NOZZLE

HOYER-SCHLESINGER-TURNER, INC.

SHEET 2 OF 8
PROJECT NO. 17851
DATE 1.19.95
BY BERNES
CHK. C.K. 1.27.95

PROJECT CLEAN HARBORS - CHICAGO, IL

SUBJECT EXIST. TANK FARM SUPPORT COMPUTATIONS



SECTION "A-A"
SEE SH-1

TANKS T101, TRU T-107, T-109 & T-110

EMPTY TANK =
$= \pi(12 \times 14' + 12^2/4 + 6 \times \sqrt{13^2 \times 12^2}) \times 12.8 \times 1.15$
$= 11,985 + 4 \text{ LEGS} \times 7 \times 28 = 184$
TOTAL = 12,170#

PLUS NOZZLES, FLANGES AND SUPPORT:
= 7,830#

TOTAL EMPTY TANK = 12,170 + 7,830 =
= 20,000# ✓

LIQUID = 12,100 GAL × 8.33# × 1.5 =
= 151,298# ✓

TOTAL EMPTY + LIQUID =
= 20,000 + 151,298# = 171k

EACH LEG = 171/4 = 43k/LEG ✓

CONCRETE + SNOW

PILE CAP = 4.5' × 2.5 × 1.33 × .15	= 2.25k
PIER 1.33 × 1.33 × 5' × .15	= 1.33k
CROSS WALL 3' × .67' × 16' × .15	= 4.82k
FILL 4.5 × 2.5 × 3.5 × .10	= 3.94k
6" CONC. SLAB = 4.5 × 2.5 × .5 × .15	= .84k
SNOW $\pi R^2 \times 25^{\#}$	= 2.83k
	16.01k/LEG

TOTAL LOAD PER LEG ON PILES
= 43k + 16k = 59k

TWO 2-12"φ WOOD PILES = 20 TON CAP. EACH
= 2 × 40k = 80k > 59k O.K.

CAISSON CAP = $\pi \times R^2 \times 9^k = \pi \times 2.25^2 \times 9 = 143^k > 59^k$ O.K.

MECA ENGINEERING CORP. OF AMERICA

5539 Indianapolis Blvd. East Chicago, IN 46312 (219) 397-0100 FAX (219) 397-0164

December 19, 2002

James R. Laubsted
Facility Compliance Manager
CLEAN HARBORS SERVICES, INC.
11800 S Stony Island Avenue
Chicago, IL 60617

RE: Inspection Report
Tank T-104

MECA Job
No. 29-127

Dear Mr. Laubsted:

On December 16, 2002 I visually inspected the interior and exterior of Tank T-104.

Tank T-104 is located on the south side of the Flammable Storage Tank Farm (Unit 16), Previous visual internal inspections include October 28, 1999 and July 7, 1995. Hydrostatic testing was completed in July, 1995. From the time of the earliest inspection, the tank was used for storing Class I flammable hazardous waste fuels. Tank T-104 is located outdoors and has a dedicated concrete dike. The containment is coated with Protecto-Coat 900, 30 mils thick as manufactured by Dudick, Inc. This coating is compatible with the stored materials. The containment dike for T-104 and the remaining tanks within the tank farm were inspected August 30, 2002

Tank T-104 is a carbon steel vessel fabricated in 1986. Tank T-104 was empty at the time of inspection and was cleaned by Clean Harbors personnel. The tank is operated at ambient temperature and under 2" WC pressure from nitrogen blanketing. The tank is equipped with a condensing vent and is vented through a carbon bed.

Tank T-104 stores Class I flammable liquids including hazardous waste fuels. Maximum specific gravity of stored liquids is1.5 and PH may vary from 4 to 10. The tank is constructed from A-285 carbon steel. It is 12'-0" in diameter and 14'-0 high straight side with a cone bottom and top. The operating capacity is 12,000 gallons. Available records and fabrication drawings indicate this tank was fabricated to the UL-142 standard.

The tank is supported by steel legs on caissons. The steel legs are encased in concrete.

The internal and external visual inspection did not reveal any defects. The welds around nozzles and tank shell welds inspected from inside the tank were in good condition. There were not any visible defects on the interior of the tank.

It is not possible to inspect the entire exterior of the tank by visual inspection. The tank is insulated with 2' thick insulation with metal jacket. The insulation and jacketing was removed where the nozzles were added in 1995. At that time the welds could be inspected from the outside. In December, 2002 Calumet Testing Services performed NDE-ultrasonic thickness measurements from the interior of the tank and exterior shell measurements. Previous internal thickness measurements were taken. These ultrasonic thickness test results and prior results are listed in Appendix TK-104-1.

The top estimated as-built thickness was 0.250 inches. The four latest readings each show decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.212 inches which is 72% over the minimum of 0.123 inches recommended by the UL-142 standard.

The wall estimated as-built thickness was 0.313 inches. The twenty eight latest readings show little change in thickness compared to the 1999 ultrasonic thickness results. The minimum reading was 0.270 inches which is 162% of the minimum (0.167 inches) recommended by the UL-142 standard. A review of external readings from November 2000, December 2001 and December 2002 for a twelve locations shows an average decrease of 0.000 inches with maximum decrease of 0.010 inches.

The bottom estimated as-built thickness compared to the 1999 ultrasonic thickness readings. The minimum reading was 0.295 inches which is 123% of the minimum (0.24 inches) recommended by the UL-1142 standard. A review of external readings from November 2000 and December 2001 shows an average plant decrease with a maximum decrease of 0.014 inches.

For tank evaluations, modifications and calculations, see certification reports by Mr. Lee F. Mount, PE, dated January 1995 and May 23, 1995 in appendix TK-104-2.

For tank nozzle orientation and description, see Appendix TK-104-3.

For Tank T-104 supports evaluation, see calculations by Mr. Peter J. Bernes, SE, dated January 19, 1995 in Appendix TK-104-4.

Therefore, I certify that after visual inspection, the tank is structurally sound, properly supported and set. No evidence of cracks, bulging, corrosion pits or scales. No weld defects were observed. Based on my inspection, the tank can be used for the intended purpose.

Very truly your,

MECA Engineering Corp. of America

Kenneth D. Spaulding
Licensed Professional Engineer
Illinois License No. 62-44249, Expiration Date

KENNETH D. SPAULDING
62-44249
REGISTERED
PROFESSIONAL
ENGINEER
OF
STATE OF ILLINOIS

APPENDIX TK-104-1

Calumet Testing Services
1945 N. Griffith Blvd.
Griffith, Indiana 46319
(219) 923-9800 — (708) 474-5860

THICKNESS TESTING REPORT

CTS JOB # 3143

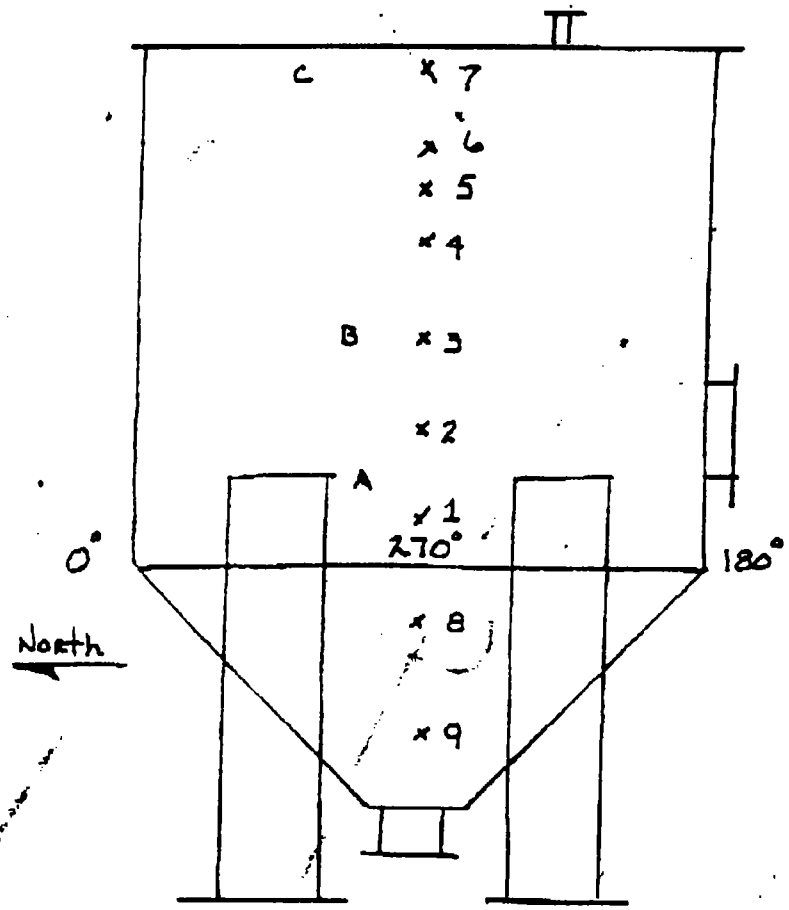
PAGE NO. 1 OF 2

Customer	Location	Surface Condition	Date
Clean Harbors, Inc.	Chgo, IL	As Rolled	12-13-2002

Meter Model, Serial No.	Couplant	Transducer Model, Serial No.
KrautKramer DM-2E	Grease	3/8" ϕ

This report is made with the limitations of ultrasonic testing equipment.
Errors will occur in reported thickness if the material contains internal discontinuities or the contact surface is rough.

Tank #104



Internal

	0	90	180	270	
1	.270"	.270"	.281"	.282"	
2	.277"	.290"	.290"	.282"	
3	.282"	.286"	.287"	.290"	
4	.290"	.295"	.283"	.290"	
5	.295"	.297"	.295"	.294"	
6	.300"	.304"	.290"	.300"	
7	.303"	.301"	.297"	.304"	
8	.296"	.300"	.295"	.310"	Bottom
9	.320"	.332"	.335"	.338"	

	0	90	180	270
A	.274"	.272"	.286"	.285"
B	.285"	.300"	.292"	.284"
C	.292"	.290"	.301"	.287"

External

Examiner Signature [signature] Level II Date 12-13-2002

Customer Review Signature [signature] Date

APPENDIX TX-104-1

ULTRA SONIC THICKNESS TESTING
T-104

October 28, 1999

INTERNAL

TOP

East	South	West	North
[illegible]	.218	.214	.230

SHELL

[illegible]	.284	.280	.300
[illegible]	.284	.288	.288
[illegible]	.292	.288	.282

BOTTOM

[illegible]	358	.353	.349

T104
External Ultrasonic Thickness Measurements

	Nov-00	01-Dec
Cone		
N	0.316	0.314
S	0.316	0.302
E	0.308	0.308
W	0.324	0.31
Shell		
Lower		
N	0.274	0.268
Shell	0.268	0.278
E	0.282	0.274
W	0.28	0.273
Middle		
N	0.272	0.274
S	0.28	0.28
E	0.274	0.27
W	0.272	0.262
Upper		
N	0.276	0.292
S	0.276	0.286
E	0.3	0.286
W	0.282	0.286
Top		
N	0.22	0.218
S	0.22	0.212
E	0.244	0.242
W	0.264	0.212

CLEAN HARBORS OF CHICAGO, INC.

CWM TANK FARM

EXISTING TANK STATUS FORM

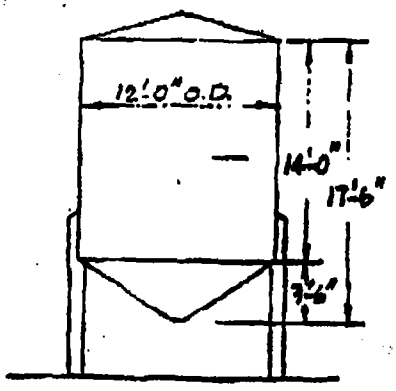
Tank No. T-104

Nominal Capacity 12,000 gals.

Mat'l. of Const. A-285-C STL.

Approx. Year of Build 1986

Designed Corrosion Allow. 1/16"



Stored Waste Characteristics:

	Past	Future
Specific Grav.	1.5 (design)	0.5 → 1.5
Class	NFPA CLASS 2	HAZARDOUS WASTE FUELS
	PCB / FUEL BLEND	(NFPA CLASS 1-3 LIQUIDS)

Material Thicknesses (Inches):

Surface	per UL-142 Std.	As Built	Ultrasonic Test Results			
			08/89 B		10/91 C	
		A	Avg.	Min.	Avg.	Min.
Top	0.123	0.250	0.247	0.246	0.241	0.238
Shell	0.167	0.313	0.311	0.306	0.308	0.298
Bottom	0.240	0.375	0.386	0.385	0.387	0.378

NOTES:
A. FROM IMPERIAL STEEL TANK CO. FABRICATION DWG. '86
B. FROM ALPHA CONSULTANTS JAN. '90 RPT.
C. FROM SIRRINE ENVIR. CONSULTANTS NOV. '91 RPT.

APPENDIX TK-104-2

1785

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

23 May 1995

Mr. Alan F. Mount, Project Manager
Clean Harbors of Chicago, Inc.
11800 S. Stony Island Avenue
Chicago, Illinois 60617

Subject: CWM Tank Farm
Tank Agitator Mounting and Nozzle Details

Enclosure: 1) Design Calculations and Fabrication Details
(10 sheets, original issue date 14 March 1995)

Dear Alan,

Enclosure 1) is submitted herewith for your information and records. Sheet nos. 1, 5, 6 & 9 have been updated and revised where necessary to reflect your actual "as built" conditions.

Yours truly,

Lee F. Mount

Lee F. Mount

Reviewed by:

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-96

LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANK FARM
SHEET NO. COVER OF
CALCULATED BY L. F. MOUNT DATE 14 MAR '95
CHECKED BY REV. DATE 17 MAR. '95.
SCALE FINAL ISSUE TO REFLECT "AS BUILT" CONDITIONS 22 MAY '95

THE ENCLOSED CALCULATIONS AND FABRICATION DETAILS WERE CARRIED OUT IN SUPPORT OF CURRENT TANK UPGRADES PROPOSED FOR THE CLEAN HARBORS, CHICAGO STONY ISLAND FACILITY. AN OVERALL REVIEW AND ASSESSMENT OF THE STRUCTURAL INTEGRITY OF THESE EXISTING TANKS WAS COVERED IN A REPORT BY THE UNDERSIGNED DATED JAN. 1995. THIS REPORT ADDRESSES THE FITTING OF NEW TANK AGITATORS AS WELL AS ADDITIONAL NOZZLES.

CONTENTS

DESCRIPTION	SHEET NO.
SKETCH OF AGITATOR MOUNTING FLANGE (FOR TANKS 105, 106, 107	1
REFERENCES 109, 110, 112)	2
ESTIMATE OF STRESS DUE TO BENDING MOMENT @ FLANGE	2
ESTIMATE OF STRESS DUE TO TORQUE @ FLANGE	3
ESTIMATE OF STRESS DUE TO AGITATOR VERTICAL LOAD	3
CHECK OF LOADED TANK SUPPORT LEGS W/ AGITATOR VERT. LOAD	4
TYPICAL PROPOSED 4" NOZZLE INSTALLATIONS	5
BAFFLE PLATE DESIGN REQ'MTS.	6
CHECK TANK INTEGRITY FOR OPERATION WITH 1.0 PSIG VAPOR PRESS.	7-8
SKETCH OF MODIFIED AGITATOR MOUNTING FLANGE (FOR TANKS 103 + 104)	9
TABULAR SUMMARY OF AGITATOR SPECS. + TANK PROPERTIES	10

PREPARED BY Lee F. Mount
LEE F. MOUNT
14 MARCH 1995

COMMONWEALTH OF MASSACHUSETTS
LEE FORREST MOUNT
21193
REGISTERED PROFESSIONAL ENGINEER

LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
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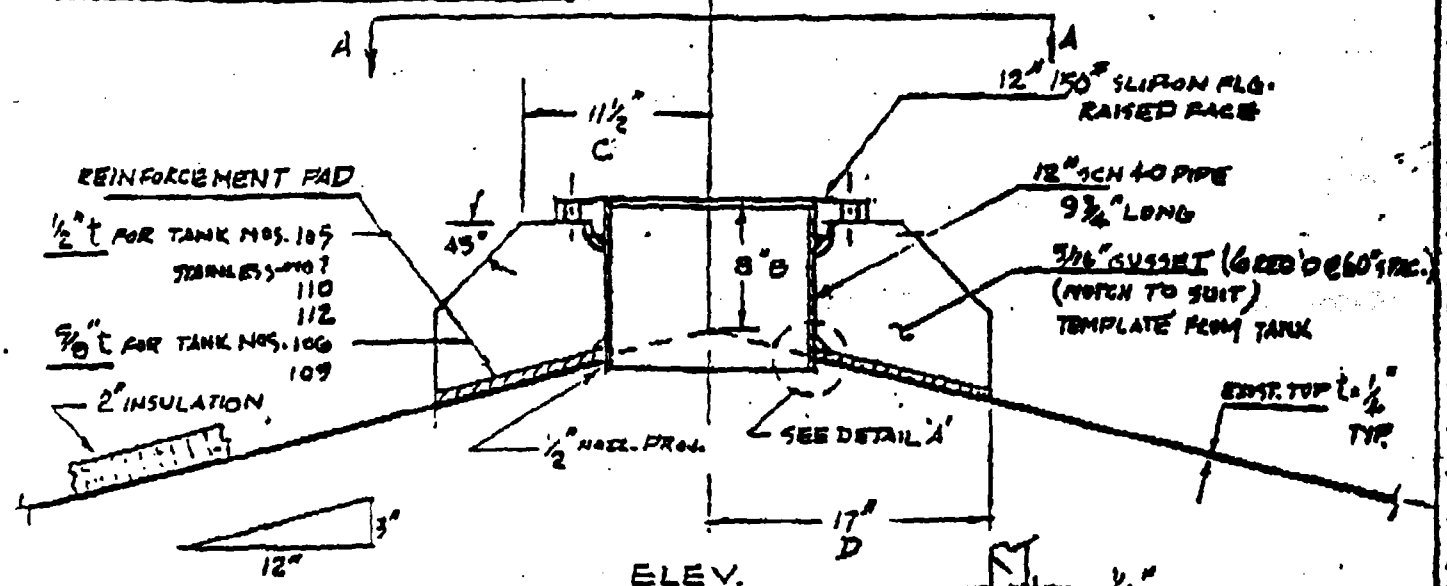
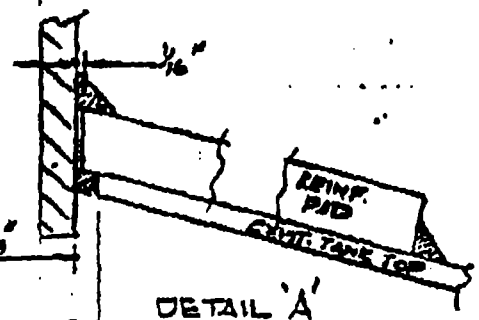
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANK AGITATORS
SHEET NO. 1 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR.'95
REV. 15 MAR.'95
CHECKED BY DATE
SCALE 1" = 1'-0" & AS NOTED 22 MAY '95
"AS BUILT"

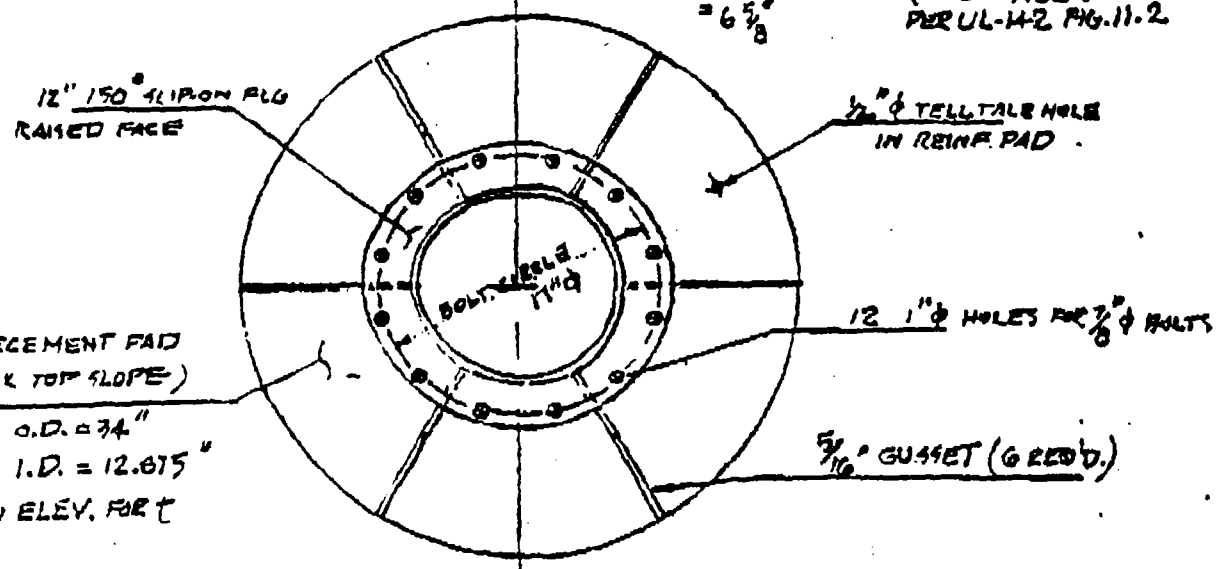
NEW MOUNTING FLANGE FOR TANK NOS. 105, 106, 107, 109, 110 & 112



ELEV.



DETAIL 'A'
(HALF SIZE)
PER UL-142 FIG. 11.2



PLAN A-A

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(617) 749-5394

JOB CWM/CHI TANK AGITATOR & NOZZLE INSTALL
SHEET NO. 2 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. '95
CHECKED BY DATE
SCALE

REFERENCES: 1) CHEMINEER AGITATOR DESIGN SYSTEM SPEC. SHEETS
2) UL-142, STEEL ABOVE GROUND TANKS
3) FORMULAS FOR STRESS & STRAIN, ROARK 4TH ED. 1965
4) API-650 WELDED STEEL TANKS FOR OIL STORAGE
5) CHEMINEER IOM MANUAL PG. 4-9 JUNE '93
6) ASME SECT VIII PRESSURE VESSEL CODE

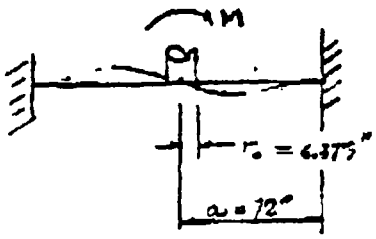
CHECK REINFORCED TANK TOP FOR AGITATOR LOADINGS

ASSUMPTIONS: LOADINGS - USE 15 HP TYPE C UNIT FOR MAX. BENDING MOMENT OF 5036 FT.-LBS & TORQUE OF 4274 FT.-LBS

- USE 5 HP TYPE B UNIT FOR MAX. VERTICAL LOAD OF SAY 3000 LBS

ESTIMATE STRESS DUE TO BENDING MOMENT

FROM REF 3) PG. 219, CASE 10 ANNULET FLAT CIRCULAR PLT, EDGES FIXED, CENTRAL COUPLE



$$\text{MAX } S_r \text{ AT } r = r_o = \frac{3M}{4\pi t^2 r_o}\left[1 + \left(\frac{m+1}{m}\right)\log \frac{2(.45a - r_o)}{.45 k a}\right]$$

WHERE: $k = \dfrac{0.1a^2}{(r_o + .28a)^2} = \dfrac{0.1(72)^2}{[6.375 + .28(72)]^2}$

$= 0.736$

$M = 5036 \text{ FT-LBS} \times 12 = 60432 \text{ IN-LBS}$

$t = .25 + .625 \text{ (REINF. PLT)} = 0.875''$

m = RECIPROCAL OF POISSON'S RATIO

$= \dfrac{1}{.3} = 3.33$

$a = 72''$

$r_o = 6.375''$

$$\text{MAX } S_r = \frac{3(60432)}{4\pi(.875)^2(6.375)}\left[1 + 1.30 \log \frac{2[.45(72) - 6.375]}{.45(.736)(72)}\right]$$

2.183

$= 2956\,[1 + 1.3(.781)]$

$= 2956\,(2.02) = \boxed{5971 \text{ PSI}}$

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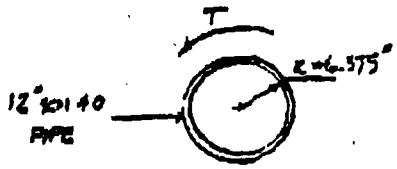
JOB: CWM/CH1 TANK AGITATORS
SHEET NO. 3 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. 95
CHECKED BY DATE
SCALE

ESTIMATE SHEAR STRESS DUE TO TORQUE

$T = 4274$ FT-LBS $\times 12 = 51288$ IN-LBS FORCE $= \frac{T}{r} = \frac{51288 \text{ IN-LBS}}{6.375''} = 8045$ LBS



CIRCUM. $= 2\pi(r) = 40''$

$\therefore$ LOAD/" OF CIRCUM. $= \frac{8045}{40} = 201$ LBS/IN

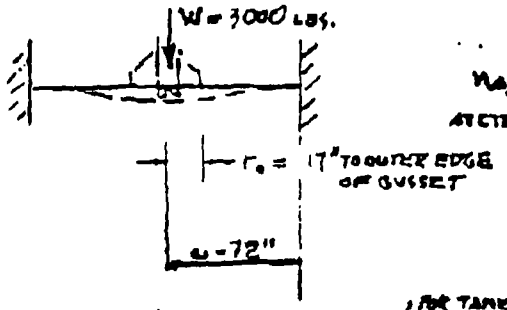
SAY TORQUE IS CARRIED BY 3/8" FILLET WELD @ REINF PAD TO NOZZLE CONNECTION

ALLOWABLE WELD LOAD $= 11{,}200(.375'') = \boxed{4200 \text{ LBS/IN} > 201 \text{ OK}}$

CONSERVATIVE IN THAT LOWER TANK TOP TO NOZZLE FULL PENETRATION WELD HAS NOT BEEN TAKEN INTO ACCOUNT.

ESTIMATE STRESS DUE TO VERTICAL LOAD

FROM REF. 3 / PG 218, CASE 7 ASSUMES FLAT CIRCULAR PLT., EDGES FIXED, UNIFORM LOAD OVER CONCENTRIC CIRCULAR AREA OF RADIUS r_o



$$\text{MAX } S_r = \frac{3W}{2\pi m t^2}\left[(m+1)\log\frac{a}{r_o} + (m+1)\frac{r_o^2}{4a^2}\right]$$
AT CTR.

WHERE: $W = 3000$ LBS
REINF PAD
$t = .25 + .50 = 0.75''$ FOR TANK No. 112
$m = 3.33$
$a = 72''$
$r_o = 17''$

$$\text{MAX } S_r = \frac{3(3000)}{2\pi(3.33)(.75)^2}\left[4.33\log 4.235 + 4.33(.0139)\right]$$

$= 765\,(6.25 + .06)$

$= \boxed{4827 \text{ PSI}}$

CONCLUDE: COMBINING STRESS DUE TO BENDING (5971) + STRESS DUE TO VERT. LOAD (4827) = 10,798 PSI
API 650 GIVES ALLOW STRESS OF 20,000 PSI FOR ASTM A285-C STEEL
THUS, THE STRESS DUE TO EXTERNAL LOADS IS ABT. 54% OF ALLOWABLE WHICH APPEARS TO BE REASONABLE

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Civil Engineer/Naval Architect
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HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANKS
SHEET NO. 4 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR 95
CHECKED BY DATE
SCALE

CHECK TANK SUPPORT LEGS FOR AGITATOR VERT. LOAD

USE TANK NO 112 (LARGEST TANK + HEAVIEST AGITATOR)

ESTIMATED WEIGHT TO BE SUPPORTED BY 4 LEGS @ L = 7.0' SIZE = W8x31

TANK STEEL

CONE TOP (1/4" RT.) LATERAL AREA = BASE CIRCUM x 1/2 SLANT HT.

$= \pi D \times \frac{6.18'}{2}$

$= \pi 12 \times 3.09 = 116.5$ sf $= 10.2$ #/ft² $= 1188$ LBS.

SHELL (3/16" RT.) AREA = $\pi D H$

$= \pi 12 \times 22 = 829.4$ sf $= 12.75$ #/ft² $= 10575$ LBS.

CONE BOTTOM (3/8" RT.) LATERAL AREA = BASE CIRCUM x 1/2 SLANT HT.

$= \pi D \times \frac{6.99}{2}$

$= \pi 12 \times 3.48 = 131.2$ sf $= 15.7$ #/ft² $= 2007$ LBS.

AGITATOR WEIGHT ——— 3000 LBS

SUBTOTAL 16770 LBS

ADD 20% FOR MISC. PIPING, PLATFORMS INSULATION, ETC. ——— 3350 LBS

LIQUID CONTENTS @ S.G. = 1.5 CAP. = 20,000 GAL. / 7.48 GAL/CU FT = 2674 CU FT x 62.4 x 1.5 = 250,286 LBS

TOTAL ESTIMATED WT. TO BE SUPPORTED = 270,406 LBS.

USE 276 KIPS

∴ EACH LEG CARRIES 276/4 = 69 KIPS

FROM AISC COL TABLE @ KL = 2(7) = 14 FOR W8x31 (A36 STL.)

READ ALLOWABLE LOAD = 137 KIPS > 69 KIPS

CONCLUDE: EXISTING COLUMN SUPPORT IS ADEQUATE FOR CONDITIONS

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Civil Engineer/Naval Architect
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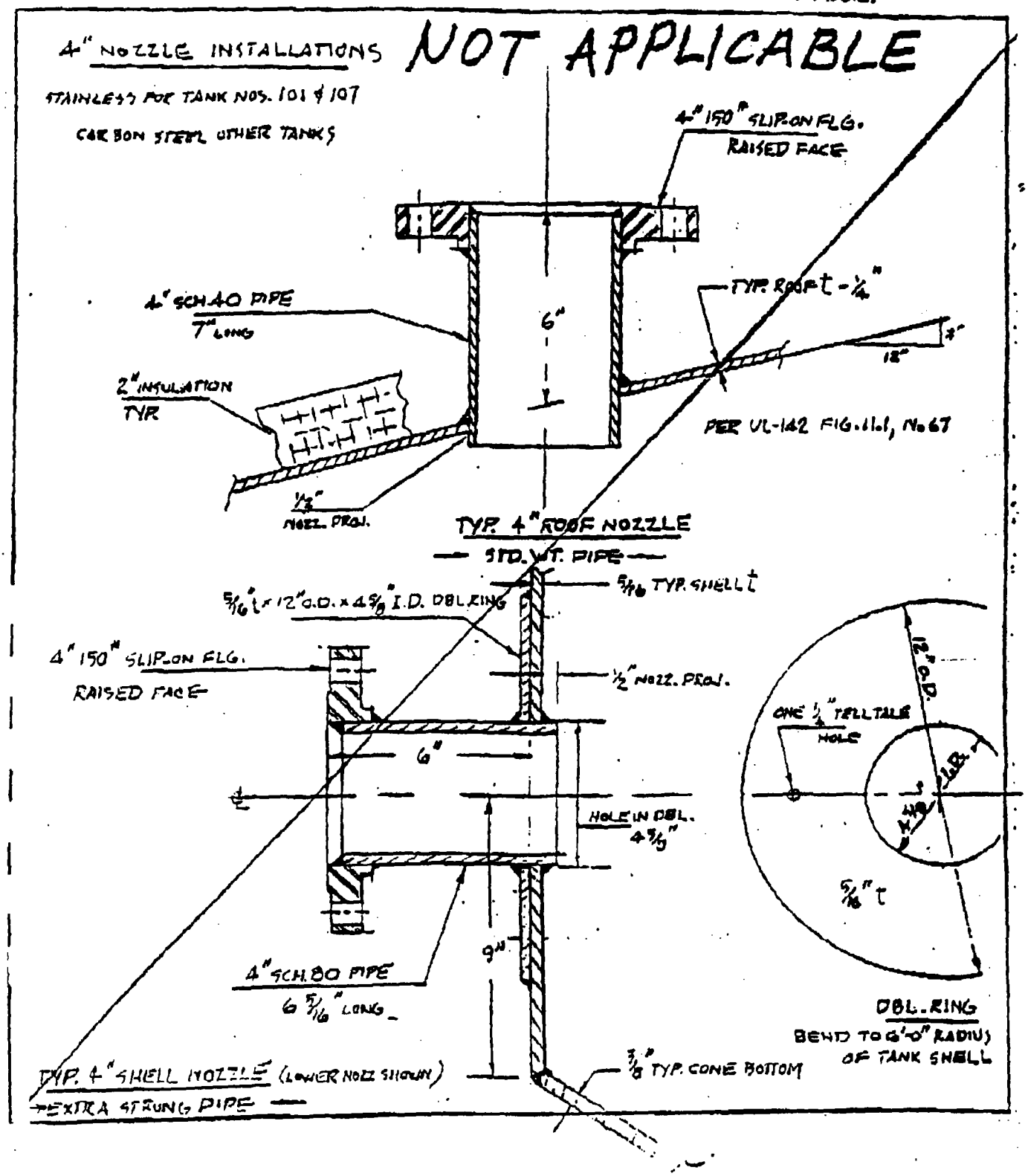
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB: CWM/CHI TANKS
SHEET NO. 3 OF 10
CALCULATED BY: L.F. MOUNT DATE: 14 MAR.'95
REV. 15 MAR.95
CHECKED BY: DATE:
SCALE: 3"=1'-0" 22 MAY'95
"AS BUILT"



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Civil Engineer/Naval Architect
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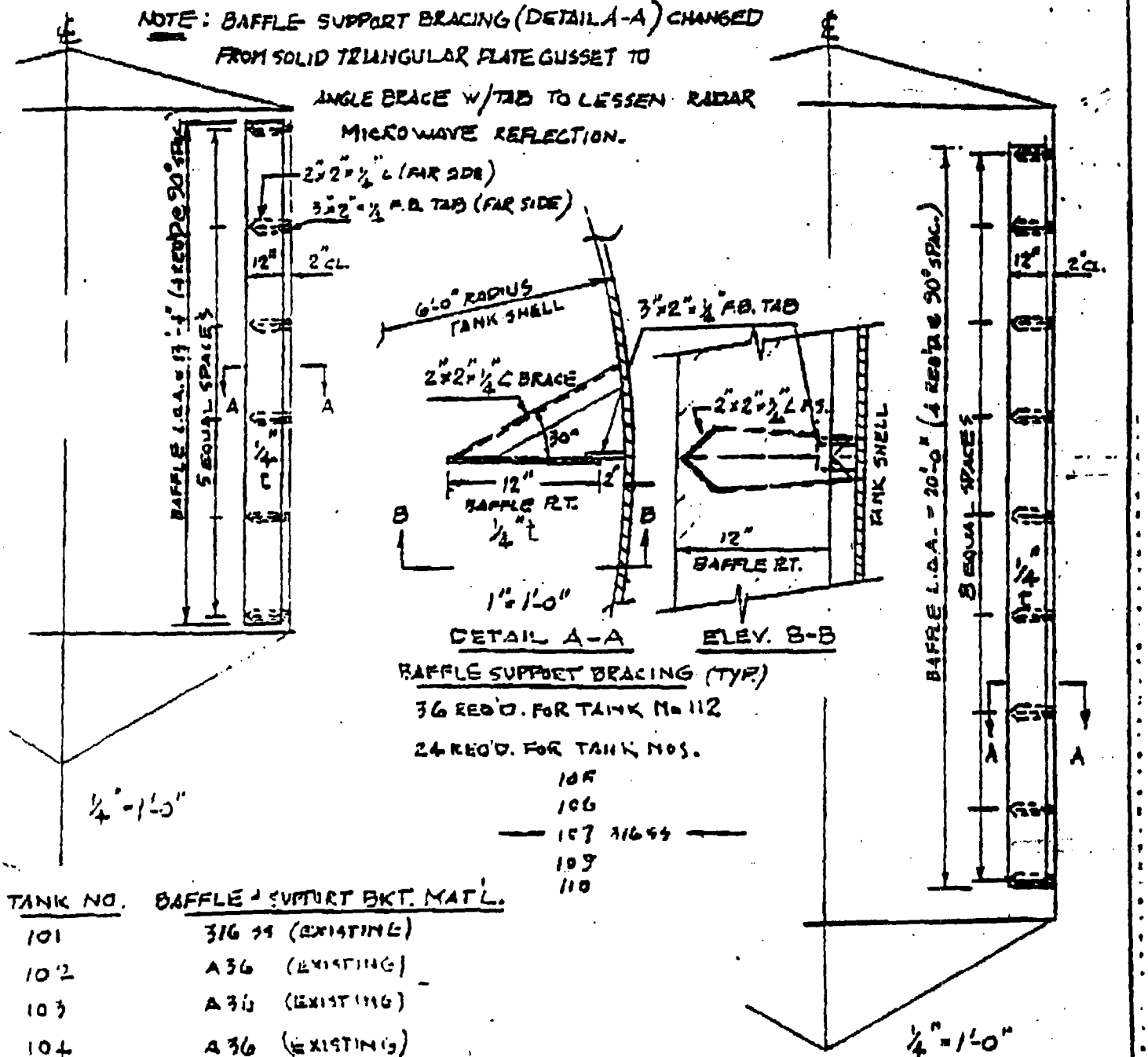
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANKS
SHEET NO. 6 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. '95
CHECKED BY REV. DATE 15 MAR. '95
SCALE AS NOTED "AS BUILT" 22 MAY '95

BAFFLE PLATE DESIGN (SIZES AS RECOMMENDED IN REF. 1)

NOTE: BAFFLE SUPPORT BRACING (DETAIL A-A) CHANGED FROM SOLID TRIANGULAR PLATE GUSSET TO ANGLE BRACE W/TAB TO LESSEN RADAR MICROWAVE REFLECTION.



BAFFLE SUPPORT BRACING (TYP.)
36 REQ'D. FOR TANK No 112
24 REQ'D. FOR TANK NOS.
106
107 316 SS
109
110

TANK NO.	BAFFLE & SUPPORT BKT. MAT'L.
101	316 SS (EXISTING)
102	A36 (EXISTING)
103	A36 (EXISTING)
104	A36 (EXISTING)
(105)	(A36) NEW
(106)	(A36) NEW
(107)	(316 SS) NEW
(109)	(A36) NEW
(110)	(A36) NEW

TANK No (112)
BAFFLE & SUPPORT BKTS.
A36 STEEL (NEW)

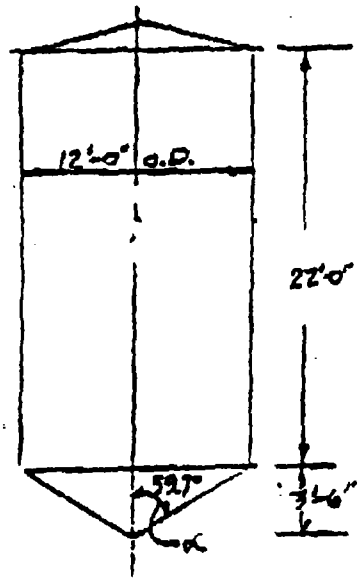
LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANKS
SHEET NO. 7 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. '95
CHECKED BY DATE
SCALE

CHECK FOR TANK SERVICE OPERATION WITH 1.0 PSIG INTERNAL VAPOR PRESSURE (ABT. 24" WATER)

USE TANK NO 112 WHICH HAS GREATEST DEPTH

ASSUME S.G. @ 1.5



MAX PRESSURE @ CONE BOTTOM $= \frac{62.4 \times 1.5 \times 25.5'}{144} = 16.6$ PSI

PLUS VAPOR PRESSURE 1.0 PSI

17.6 PSI

USE 18 PSI = P

USE ASME SECT VIII - DIV 1, APPENDIX 1 TO DETERMINE MIN. REQ'D PLT. t FOR SHELL & CONE BOTTOM

FOR CYLINDRICAL SHELL:

$$t = \frac{PR_o}{SE + 0.4P}$$

WHERE: $P = 18$ PSI

$R_o = \frac{12}{2}(12) = 72''$

$$t = \frac{18(72)}{(13800).7 + 0.4(18)}$$

$S = 13{,}800$ PSI FOR A285-C STL.

$E = 0.7$

$t = 0.134'' + .0625'' = 0.197$ IN. (UL-142 WOULD REQUIRE $t = 0.167$ IN.)

CORR. ALLOW.

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS 0.30" > .197" O.K.

FOR CONE BOTTOM:

$$t = \frac{PD_o}{2\cos\alpha(SE - .4P)}$$

WHERE: $D_o = 144''$

$\alpha = 59.7°$

$$= \frac{18(144)}{2\cos 59.7°(13{,}800 \times .7 - .4 \times 18)}$$

$= 0.266'' + .0625'' = 0.329$ IN.

CORR. ALLOW.

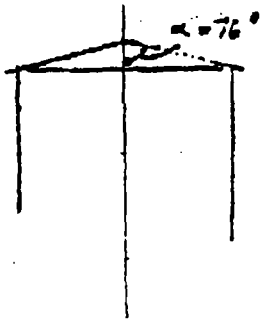
EXISTING AVG. t BASED ON ULTRASONIC TESTS IS .375" > .329 O.K.

LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB: CWM/CHI TANKS
SHEET NO. 8 OF 10
CALCULATED BY: L.F. MOUNT DATE: 16 MAR. 95
CHECKED BY: DATE:
SCALE:

CHECK FOR 1.0 PSIG INTERNAL VAPOR PRESSURE (CON'D.)

FOR CONE TOP



FROM ASME SECT VIII - DIV. 1

SOLVE FOR P:

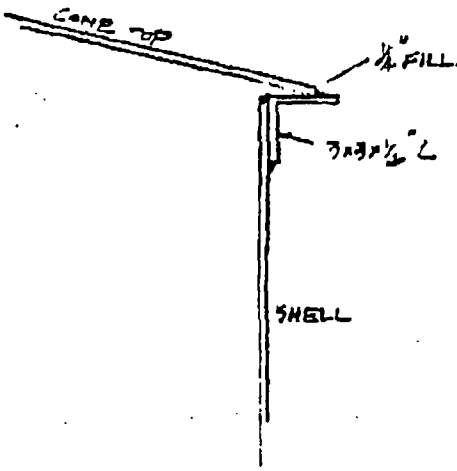
$$P = \frac{2SEt\cos\alpha}{D_o - 0.8t\cos\alpha}$$

WHERE S = 13,800 PSI
E = 0.7
D_o = 144 IN
α = 76°
t = USE .25 − 1/16" CORR. ALL. = .1875"

$$P = \frac{2(13{,}800)(.7)(.1875)(.242)}{144 - [.8(.1875)(.242)]}$$

$$= \frac{876.65}{144} = \boxed{6 \text{ PSI} > 1.0 \text{ O.K.}}$$

CHECK ROOF TOP CONNECTION WELD DETAIL



EST. LATERAL SURFACE AREA CONE TOP SUBJECTED TO 1.0 PSI PRESSURE

DIA. ≈ 143" (ROOF OVERHANGS SHELL)

LATERAL AREA = BASE CIRCUM. × 1/2 SLANT HT

$= \pi D \times \frac{76.2"}{2}$

$= \pi(143) \times 38.1 = 17{,}715 \text{ IN}^2$

∴ LOAD TO ROOF = 17,715 IN² × 1 LB/IN² = 17,715 LBS

CIRCUM. OF 1/4" FILLET ATTACHMENT WELD = πD = π(148) = 465 IN

∴ LOAD/IN ON 1/4" FILLET WELD = 17715/465 = 38 #/IN

VS

ALLOWABLE WELD LOAD = 11,200 × .25 = 2800 #/IN O.K.

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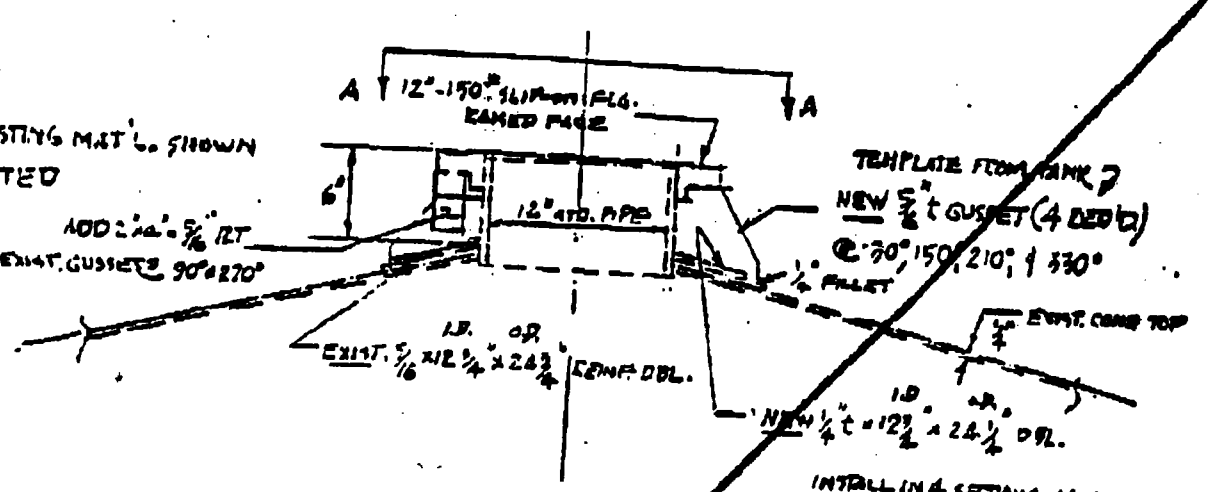
JOB CWM / CHI TANKS
SHEET NO. 9 OF 10
CALCULATED BY L. F. MOUNT DATE 16 MAR. '95
CHECKED BY DATE
SCALE 1" = 1'-0" 22 MAY '95

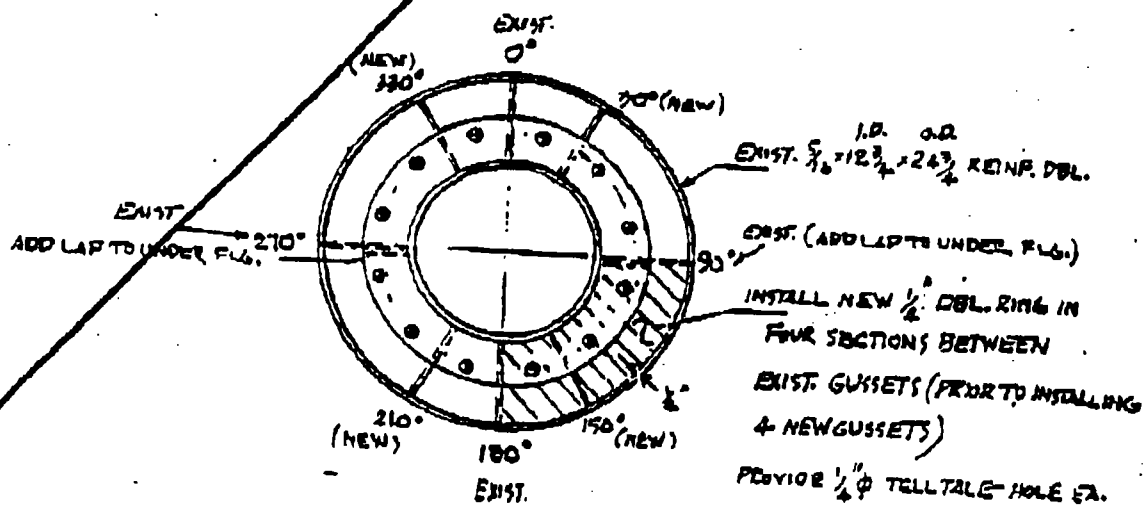
NOT APPLICABLE

"AS BUILT"

MODS. TO TANK 103 & 104 EXISTING AGITATOR MOUNTING; TO ACCOMMODATE NEW 7.5HP UNITS



ELEV.



PLAN A-A

CWM/CHI TANK AGITATORS
LE MOUNT REV. 15 DEC 93
SHT 10 OF 10

	TANK I.D.	AGITATOR SPECS. (FROM REF. 1)										TANK PROPERTIES					
		TYPE	HP	RPM	SHAFT L IN.	SHAFT DIA. IN.	WT. LBS.	NOZZLE BEND MOM FT.-LBS	NOZZLE TORQUE FT.-LBS	BAFFLE REQ'D.	CASE SIZE	TOP HEAD t"	MIN HEAD t" (TBL 3)	NOZZLE SIZE	BENCH PAD DIMENS. B (TBL 2)	C	D FIG 3
EXISTING AGITATED TANKS	101 S.S.	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST)	2	.313 S.S.		12" EXIST			
	102	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.250		12" EXIST			
	103	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST)	4	.250	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5	17" 12.375 ACTUAL
	104	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST)	4	.241	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5"	17" 12.375 ACTUAL
	105	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"
	106	C NEW	15	45	190.5	3.5	2745	5036 MAX.	4274 MAX.	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"
	107 S.S.	EXIST. FROM 103	3.0							YES (NEW)	2 DESIGN PER 4	.250 S.S.	.500	12"	8"	11.5"	17"
	109	C NEW	15	45	190.5	3.5	2745	5036	4274	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"
	110	EXIST. FROM 104	3.0							YES (NEW)	2 DESIGN PER 4	.250	.500	12"	8"	11.5"	17"
	112	B NEW	5	30	210.0	3.5	2872 MAX.	2898	2337	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"

NO CHANGE

MODIFY/SHIM MOUNTING (SHT 1)

NEW MOUNTING (SHT 1)

FROM ULTRASONIC TEST RESULTS

BENCH PAD t FROM REF. 5

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-8394

RECEIVED
JUN 20 1995
HOYER-SCHLESINGER-TURNER, INC

19 June 1995

Marie Vanagas
Hoyer-Schlesinger-Turner, Inc.
300 West Adams Street
Chicago, ILL. 60606

Subject: Clean Harbors of Chicago, Inc.
CWM Tank Farm

Enclosure: 1) Review and Assessment of Structural Integrity of Existing Tanks; LFMount Report dated January 1995

Dear Ms Vanagas,

In response to Clean Harbors' request, enclosure 1) is herewith forwarded for your information and records.

Yours truly,

Lee F. Mount

Lee F. Mount

REVIEWED BY
Peter J. Bernes
PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3059
MY LICENSE EXPIRES ON 11.30.96

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

CWM TANK FARM

Review and Assessment of Structural Integrity of Existing Tank Nos.

T - 101	T - 106
T - 102	T - 107
T - 103	T - 109
T - 104	T - 110
T - 105	T - 112

January 1995

Prepared For:

Clean Harbors of Chicago, Inc.

(In response to Illinois EPA comments)

INTRODUCTION

This report was prepared in response to the Illinois EPA's request for additional information on the structural condition of the existing hazardous waste storage and/or fuel tanks scheduled for reuse at your CWM Tank Farm.

The work scope involved a technical review of all available tank related documents furnished by Clean Harbors. Pertinent data was then summarized and tabulated for each tank on a "Existing Tank Status Form". The ultrasonic test measurements for thickness, shown on the status forms, were then analyzed in order to make estimates of corrosion rates and projected service life.

Reference documents consulted during the course of this study include:

* RCRA Tank Assessment - Tank Farm System, prepared for CWM Chemical Services Inc. by ALpha Consultants, Ltd. Jan. 1990
* Tank System Inspection, prepared for CWM Chemical Services Inc. by Sirrine Environmental Consultants Nov. 1991
* Straubing, Rubin & Kenes, Inc. Tank Design Drawings
* Imperial Steel Tank Co. Fabrication Drawings
* Supplemental ultrasonic thickness measurements taken on stainless steel Tank No. T-101 on 23 January '95 by MGS Inspection, Inc. (raw data)

TANK GENERAL DESCRIPTIONS AND HISTORY

The ten (10) existing tanks, numbered T-101 to T-107, T-109, T-110, & T-112, are 12 ft. dia. vertical, cone bottomed, leg supported, above ground, insulated tanks.

Tank T-112 has a nominal capacity of 20,000 gals. All other tanks are of 12,000 gal. capacity each.

Tank nos. T-101 and T-107 are of stainless steel construction. All others are of carbon steel.

The four (4) newer tank nos. T-101 to T-104, fabricated by Imperial Steel Tank Co., were placed in service during 1986. The remaining older six (6) tanks date from 1981.

Available records and fabrication drawings for tank nos. T-101 to T-104 indicate they were built to the Underwriters Laboratories, Inc. Standard UL-142 for steel above ground tanks and were to be labeled as such. The published UL-142 Standards "do not cover vertical tanks that are elevated by means of legs" and are not intended for liquids having a specific gravity exceeding that of water. In order to satisfy these exceptions, it was necessary for Imperial Steel to apply for Underwriters Lab review and inspection to obtain the UL Listing for these cone bottomed above ground steel tanks on legs.

The Imperial fabrication drawings list the following tank design parameters:

Design Pressure = hyrdostatic head due to contents

Design Temperature = 250° F

Specific Gravity = 1.5

Corrosion Allowance = 1/16 "

Although no fabrication drawings were found for the six (6) older tanks, the Straubing, Rubin & Kenes design plans indicate the same material thicknesses for the top, shell, and bottom as shown on the Imperial plans. Since these thicknesses have been further verified by ultrasonic test measurements, it seems reasonable to conclude that these older tanks were also built to the design standards of UL-142.

The most recent ultrasonic thickness measurements include those taken by Alpha Consultants in Aug. '89 and by MQS Inspection in Oct. '91 for the Serrine report.

Alpha Consultants conducted visual internal inspections on all tanks (except T-110, which was in service) in early Dec. '89 and an external site inspection on 3 Jan. '90. Serrine Environmental Consultants conducted a visual site inspection, including all tank externals, in Sept. '91.

SPECIFIC TANK DETAILS

For tabulation of existing tank detail design information and summary of latest ultrasonic thickness measurements, refer to the tank status form provided in Appendix A for each of the ten (10) tanks.

PROJECTED SERVICE LIFE

The following table summarizes results of calculations undertaken to establish corrosion rates, based on past service, in order to predict an expected service life for the eight (8) carbon steel tanks. For calculation details, refer to Appendix B.

Surface	Estimated Corrosion Rate	Estimated Retirement Thickness	% of "as built" Thickness Remaining at Retirement	Projected Life as of 1995
Tank Top T-110	2.5 Mils/yr	0.156"	62%	24 yrs.
Side Shell T-105&T-112	3.6 Mils/yr	0.188"	60%	21 yrs.
Cone Bottom T-102	3.0 Mils/yr	0.281"	71%	28 yrs.

NOTE:

The following assumptions were used in the development of this table:

Corrosion rates for the tank top and shell surfaces were arrived at by subtracting the lowest recorded minimum ultrasonic thickness reading to date from the "as built" thickness and then dividing by the tank age at time of thickness reading.

In arriving at an estimated corrosion rate for the bottom cone surface, it was found necessary to develop an adjusted "as built" thickness. This was required since the average recorded bottom thickness measurement for all tanks, and in most cases the minimum value also, exceeded the 0.375" thickness shown on the fabrication drawing. The "as built" thickness was therefore adjusted to 0.392" to more accurately reflect the ultrasonic readings which ten years later were giving averages and minimums greater than 0.375".

INSPECTION/TESTING PLAN PRIOR TO REUSE

In order to assess each tank's internal condition, material thickness, and integrity prior to being placed back in service, it is planned to do the following, once the tank has been found safe for man-entry:

* Conduct an initial visual inspection by a tank experienced technician in company with a registered professional engineer to determine general tank condition. A standard check list, similar to that used by Alpha Consultants for Tank T-109 and shown in Figure 1 will be used as a guide and for recording findings. Suspicious areas will be noted for a more rigorous inspection and scheduled for ultrasonic measurement if deemed necessary.

* Since these tanks are insulated, past ultrasonic readings taken from the tank exterior have been limited to those areas where a removable patch permits direct access to the plate surface beneath. Past surveys have included at each of 4 - 90° quadrants, 1 top point, 3 side points and 1 cone bottom point giving a total of 20 readings/tank. With the tank out of service and clean, it would seem desirable to take additional ultrasonic thickness measurements from within. The cone bottom and tank height will make this difficult and require a tank ladder or other means to reach the underside of the top plate.

* It is recommended that a minimum of 12 readings each be taken in a + pattern on the top and bottom surfaces. For the shell at mid-height, a girth sample of about 20 points around the circumference is desirable. Finally, a vertical row sample, top to bottom, of about 10 points at a location determined from the visual inspection to be most worthy of further exploration, should provide more than enough data to verify the existing surface thicknesses and to form a base for comparison with past and future thickness measurement readings. The ultrasonic test readings are to be taken by personnel qualified and certified as competent to use the test equipment. The test results are to be analyzed by a registered professional engineer experienced in steel tank design and construction.

FIGURE 1

ALPHA CONSULTANTS, Ltd.

CHECKLIST FOR VISUAL INSPECTION OF UNLINED VESSELS

OWNER CWM Chemical Services, Inc.-Chicago Incinerator
TEST SITE 11700 So. Stony Island Ave., Chicago, Il. 60617
DATE OF INSPECTION December 5, 1989
TIME OF INSPECTION 1825
SUPERVISORY ENGINEER Harris E. Dicker, P. E.
PHOTOGRAPHER/TECHNICIAN Robert A. Dicker
TECHNICIAN James L. Eggert

TANK NO. 109 (NO PCB IN TANK)
INTERIOR SHELL MATERIAL CS
CLADDING MATERIAL SST
INSULATION 2' FIBREGLASS SIDES & BOTTOM, 2" COL BLOCK TOP
EQUIPPED WITH MIXER NO

INITIAL ROOF INSPECTION FOR SAFETY

HAZARDS OF FALLING OBJECTS NONE
VISIBLE CORROSION NONE

MORE RIGOROUS INSPECTION OF ROOF & STRUCTURAL SUPPORTS

VISIBLE LOSS OF METAL THICKNESS NONE
VISIBLE CRACKS OR LEAKS AT WELDS NONE
VISIBLE CRACKS AT NOZZLE CONNECTIONS NONE
MALFUNCTIONING OF ROOF SEALS NONE
VISIBLE DETERIORATION OF WATER DRAIN SYSTEM NONE
CONDUCT HAMMER TESTING NO

TANK SHELL

VISIBLE CRACKS AT SEAMS NONE
VISIBLE CORROSION AT VAPOR SPACE/LIQUID LEVEL LINE NONE
VISIBLE CRACKING OF PLATE JOINTS NONE
VISIBLE CRACKING OF NOZZLE CONNECTION JOINTS NONE
VISIBLE LOSS OF METAL THICKNESS NONE

TANK BOTTOM

TYPE OF BOTTOM, SLOPED OR FLAT SLOPED
VISIBLE CORROSION PITS NONE
VISIBLE CRACKED SEAMS NONE
TYPE OF CONNECTION TO SIDEWALL, WELDED OR RIVETED WELDED
VISIBLE TIGHTNESS AT CONNECTION NONE
VISIBLE DEPRESSIONS IN BOTTOM AREAS AROUND OR UNDER ROOF OR PIPE SUPPORTS NONE
VISIBLE LOSS OF METAL THICKNESS NONE
VISIBLE UNEVENESS OF BOTTOM NONE
CONDUCT HAMMER TEST NO
VISIBLE BULGES, BLISTERING OR SPALLING NONE
WAS ULTRASONIC TESTING OF TANK WALLS, ETC. CONDUCTED YES

Source: OSWER Policy Directive No. 9483.00-1
Modified Version of Table 4-7, Page 4-35
"Permit Writer's Guidance for Hazardous Waste Tanks" U. S. EPA Contract 68-01-6515
(undated draft) pp 8-10.

SUMMARY DISCUSSION

Projected Service Life - The projected useful service life for the eight (8) carbon steel tanks is estimated to be on the order of 20 years from today.

- The projected service life for the two (2) stainless steel tanks (T-101 & T-107) is estimated to be more than 20 years as evidenced by the ultrasonic thickness readings which indicate little, if any significant material loss as of '91.

- These projected service life estimates are believed to be conservative in that minimum point readings, rather than average readings, were used to establish the corrosion rates. Furthermore, the projected service life calculations assume that corrosion has continued at the same rate during the past 3 years when the tanks have been out of service.

- These estimated rates can be expected to remain in effect so long as the future stored waste product corrosivity characteristics are compatible with and do not differ significantly from those products stored in the past. Also, the integrity of the external insulation cladding material must be maintained to prevent exterior corrosion from the weather.

- It is anticipated that these tanks, once returned to service, will be ultrasonically tested on an annual basis, at which time these estimated corrosion rates should be reviewed and modified if necessary to suit existing service conditions.

Type of Wastes Stored - The individual tank status forms, Appendix A, list the typical types of waste products stored in past service as well as those planned for future operations. Before any wastes are stored, the facility management is required to assess the compatibility of the waste with (1) the storage unit materials of construction and (2) the wastes being presently stored.

Conclusion - Based on a detailed technical review of the page 1 referenced documents, it is my opinion that the ten (10) existing tanks proposed for reuse at the CWM Tank Farm are structurally sound, free from leaks, and exhibit sufficient material thickness, as determined by ultrasonic measurements. They appear to meet applicable design guidance standards and the past visual inspection reports indicate them to be substantially free from corrosion. Therefore, it is my opinion that the existing reported condition and structural integrity of the storage tanks demonstrate suitability for continued service.

CERTIFICATION

"I certify, under penalty of law, that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately 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 possible fines and imprisonment"

Registered Professional Engineer

Name: Lee F. Mount

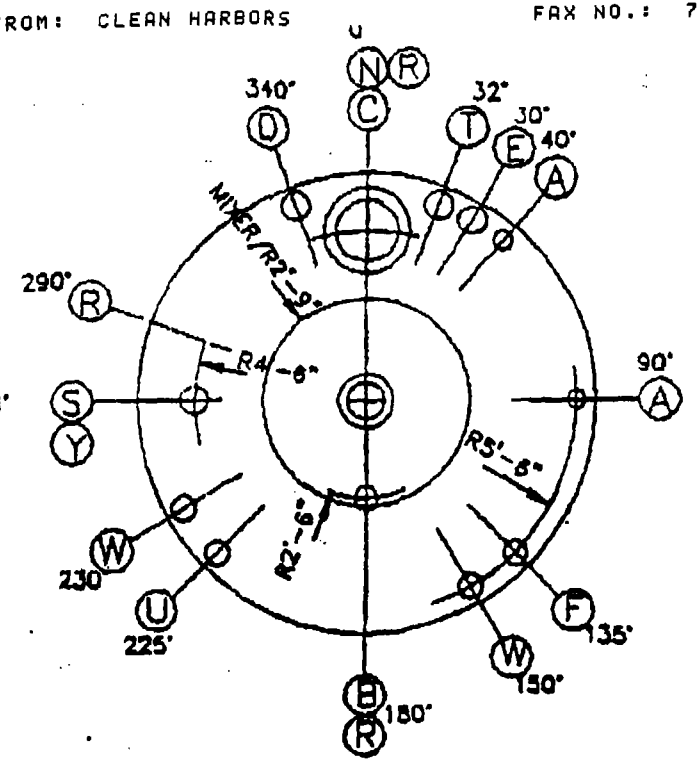
Signature: Lee F. Mount

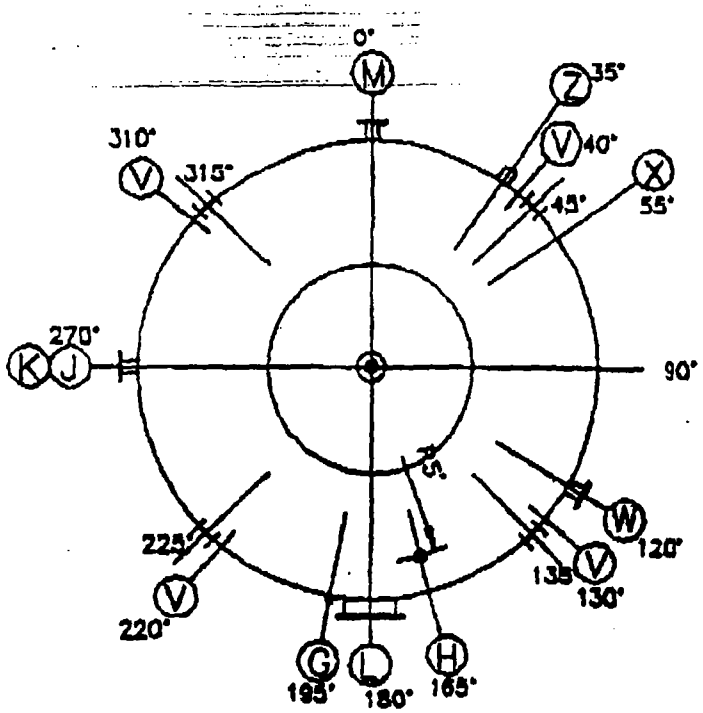
Date: 24 January 1995

Massachusetts Registration No: 21193

COMMONWEALTH OF MASSACHUSETTS
LEE FORREST MOUNT
21193
REGISTERED
PROFESSIONAL ENGINEER

APPENDIX TK-104-3





TK-104

MARK	REQD.	SIZE	TYPE	ELEVATION	DESCRIPTION
A	2	2"	150# RFSO	ROOF	NITROGEN BLANKET
B	1	3"	150# RFSO	ROOF	COV - FA
C	1	20"	150#	ROOF	EMERGENCY VENT
D	1	4"	150# RFSO	ROOF	FILL
E	1	4"	150# RFSO	ROOF	HIGH LEVEL-LSH104
F	1	3"	150# RFSO	ROOF	SPARE
G	1	2"	3000# CPLG	12" F/CONE	SPARE
H	1	2"	3000# CPLG	CONE	SAMPLE
J	1	3"	150# RFSO	6" F/CONE	LOW LEVEL-LSL104
K	1	3"	150# RFSO	13" F/CONE	SPARE
L	1	24"	150#	12" F/CONE	MANWAY W/COVER
M	1	4"	150#FB-VALVE	CONE	DRAW-OFF
N	1	12"	150# RFSO	ROOF	MIXER MOUNT
R	AS SHWN		-	6'-3" F/ROOF	SUPPORT CLIP
S	AS SHWN		-	3'-9" F/ROOF	SUPPORT CLIP
T	1	4"	150# RFSO	ROOF	DPSL104 & DPSH104
U	1	3"	150# RFSO	ROOF	SPARE
V	4		- -	SHELL	BAFFLE
W	2	3"	150# RFSO	ROOF	SPARE
W	1	3"	150# RFSO	6" F/CONE	SPARE
X*	2.	4"	150# RFSO	6",6'-6"	DRAW-OFF
Y*	1	4"	150# RFSO	ROOF	LEVEL MONITOR-LT104
Z*	2	2"	3000# CPLG	9",6'-6" F/C	SAMPLE

NOTE: - * DESIGNATES NEW NOZZLE
- REINFORCE EXISTING NOZZLE "N"

APPENDIX TK-104-4

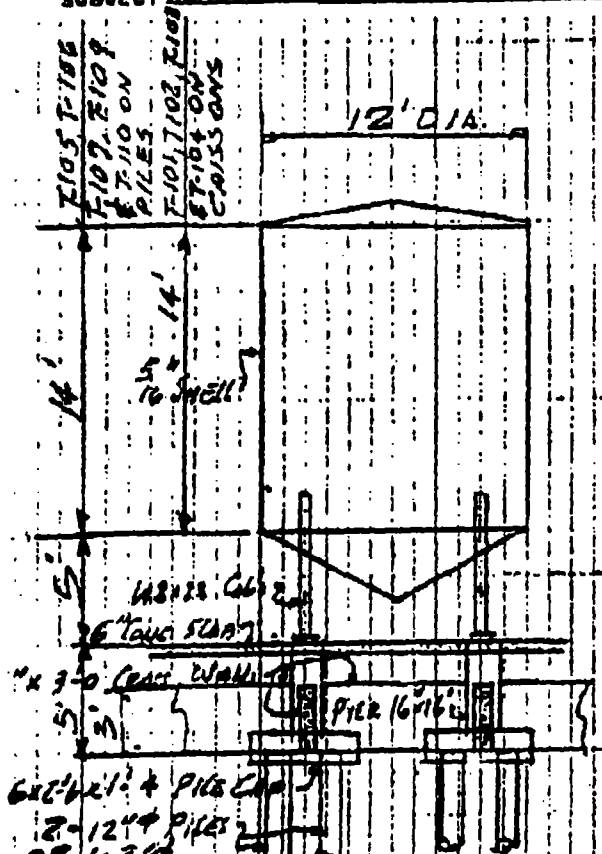
APPENDIX TK-104-4

HOYER-SCHLESINGER-TURNER, INC.

SHEET 2 OF 8
PROJECT NO. 17851
DATE 1.19.95
BY BERNES
CHK. C.K. 1.27.95

PROJECT CLEAN HARBORS - CHICAGO, IL

SUBJECT EXIST. TANK FARM SUPPORT COMPUTATIONS



SECTION "A-A"
SEE SM-1

TANKS T-101 TRU T-107, T-109 & T-110

EMPTY TANK =
$= \pi(12 \times 14' + 12^2/4 + 6 \times \sqrt{13^2 \times 12^2}) \times 12.8 \times 1.15$
$= 11.985 + 4 \text{ LEGS} \times 7 \times 28 = 184$
TOTAL = 12,170#

PLUS NOZZLES, FLANGES AND SUPPORTS
= 7,830#

TOTAL EMPTY TANK = 12,170 + 7,830 =
= 20,000#

LIQUID = 12,100 GAL × 8.33 × 1.5 =
= 151,298#

TOTAL EMPTY + LIQUID =
= 20,000 + 151,298 = 171k

EACH LEG = 171/4 = 43k/LEG

CONCRETE + SNOW

PILE CAP = 4.5 × 2.5 × 1.33 × .15	= 2.25k
PIER 1.33 × 1.33 × 5 × .15	= 1.33k
CROSS WALL 3' × .67 × 16 × .15	= 4.82k
FILL 4.5 × 2.5 × 3.5 × .10	= 3.94k
6" CONC. SLAB = 4.5 × 2.5 × .5 × .15	= .84k
SNOW $\pi R^2 \times 25^{\#}$	= 2.83k
	16.01 k/LEG

TOTAL LOAD PER LEG ON PILES
= 43k + 16k = 59k

TWO 2-12"ϕ WOOD PILES = 20 TON CAP. EACH
= 2 × 40k = 80k > 59k O.K.

CAISSON CAP = $\pi \times R^2 \times 9^k = \pi \times 2.25^2 \times 9 = 143^k > 59^k$ O.K.

H-S-T

HOYER-SCHLESINGER-TURNER,Inc.
ENGINEERS-ARCHITECTS
3074 University Ave.
Highland Park,IL 60035
Phone:847-461-0470 Fax:847-266-9829

December 10, 2000

Mr. James R. Laubsted
Facility Compliance Manager
CLEAN HARBORS SERVICES, INC.
11800 S. Stony Island Avenue
Chicago, IL 60617

RE: Inspection Report
Tank T-105

Dear Mr. Laubsted:

On November 28, 2000 I visually inspected the interior and exterior of Tank T-105.

Tank T-105 is located on the north side of the Flammable Storage Tank Farm (Unit 16). Previous visual inspections include July 7, 1995. Hydrostatic testing was completed in July, 1995. From the time of the earlier inspection, the tank was used for storing Class I flammable hazardous waste fuels. Tank T-105 is located outdoors and has a dedicated concrete dike. The containment is coated with Protecto-Coat 900, 30 mils thick as manufactured by Dudick, Inc. This coating is compatible with the stored materials. The containment dike for T-105 and the remaining tanks within the tank farm were inspected August 31, 2000.

Tank T-105 is a carbon steel vessel fabricated in 1981. Tank T-105 was empty at the time of inspection and was cleaned by Clean Harbors personnel. The tank is operated at ambient temperature and under 2" WC pressure from nitrogen blanketing. The tank is equipped with a conversation vent and is vented through a carbon bed.

Tank T-105 stores Class I flammable liquids including hazardous waste fuels. Maximum specific gravity of stored liquids is 1.5 and pH may vary from 4 to 10. The tank is constructed from carbon steel. It is 12'0" in diameter and 14"0" high straight side with a cone bottom and top. The operating capacity is 12,000 gallons. There is no record that this tank was built to the UL-142 standard. The assumption that the tank was built to this standard is based on a comparison with another tank which was fabricated to the UL 142 standard.

The tank is supported by steel legs on caissons. The steel legs are encased in concrete.

The internal and external visual inspection did not reveal any defects. The welds around nozzles and tank shell welds inspected from inside the tank were in good condition. The roof had areas with rust. The rust was sandblasted by Clean Harbors. There was no sign of pitting or other visible defects.

It is not possible to inspect the entire exterior of the tank by visual inspection. The tank is insulated with 2" thick insulation with metal jacket. The insulation and jacketing was removed where nozzles were added in 1995. At that time the welds could be inspected from the outside. The condition of the welds was good; there were no vertical defects.

Tank 105 had developed cracks to the agitator nozzle which have been repaired. Additional reinforcement has been added to the nozzle. The repair certification and details are included in Appendix TK-105-5.

In November, 2000 Clean Harbors performed NDE-ultrasonic thickness measurements from the interior of the tank. In October, 1999 external NDE-ultrasonic thickness measurements were taken. These ultrasonic thickness test results and prior results are listed in Appendix TK-105-1.

The top as-built thickness was 0.250 inches. The four latest readings each show decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.172 inches which is 40% over the minimum of 0.123 inches recommended by the UL-142 standard.

The wall as-built thickness was 0.313 inches. The twelve latest readings each show decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.218 inches which is 31% over the minimum of 0.167 inches recommended by the UL-142 standard.

The bottom as-built thickness was 0.375 inches. The four latest readings each show decreases in thickness compared to the 1991 ultrasonic thickness readings. The minimum reading was 0.338 inches which is 41% over the minimum of 0.240 inches recommended by the UL-142 standard.

For tank evaluations, modifications and calculations, see certification reports by Mr. Lee F. Mount, PE, dated January 1995 and May 23, 1995 in Appendix TK-105-2.

For tank nozzle orientation and description, see Appendix TK-105-3.

For Tank T-105 supports evaluation, see calculations by Mr. Peter J. Bernes, SE, dated January 19, 1995 in Appendix TK-105-4.

Therefore, I certify that after visual inspection, the tank is structurally sound, properly supported and set. No evidence of cracks, bulging, corrosion pits or scales or weld defects were observed. Based on my inspection, the tank can be used for the intended purpose.

Very truly yours,

HOYER-SCHLESINGER-TURNER, INC.

Peter J. Bernes

Peter J. Bernes
Illinois #3659

STATE OF ILLINOIS
PETER J.
BERNES
3659
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11.30.01

APPENDIX TK-105-1

ULTRA SONIC THICKNESS TESTING
T-105

November 28, 2000

INTERNAL

TOP

East	South	West	North
.172	.180	.180	.200

SHELL

.276	.276	.276	.266
.250	.248	.288	.250
.218	.228	.228	.220

BOTTOM

.340	.338	.340	.352

APPENDIX TK-105-1

ULTRA SONIC THICKNESS TESTING
T-105

October 21, 1999

EXTERNAL

TOP

East	South	West	North
.188	.212	.184	.176

SHELL

.272	.272	.276	.264
.266	.232	.264	.252
.220	.252	.220	.222

BOTTOM

.244	.320	.340	.352

ULTRA SONIC THICKNESS TESTING
T-105

October 17, 1998

TOP

East	South	West	North
#9 .214	#5 .240	#6 .201	#7 .225

SHELL

#12 .276	.263	#10 .271	#13 .288
#19 .261	#15 .261	#20 .271	#21 .261
#17 .219	#14 .238	#16 .233	#18 .237

BOTTOM

#4 .346	#3 .330	#2 .342	#1 .361

CleanHarbors

ULTRASONIC THICKNESS TESTING - 12-17-97

TANK #105

EAST	SOUTH	WEST	NORTH
9 .218	5 .228	6 .189	7 .188
13 .278	11 .285	10 .283	12 .290
19 .278	15 .272	20 .288	21 .270
17 .240	14 .256	16 .254	18 .258
4 .372	3 .341	2 .353	1 .374

CLEAN HARBORS OF CHICAGO, INC.

CWM TANK FARM

EXISTING TANK STATUS FORM

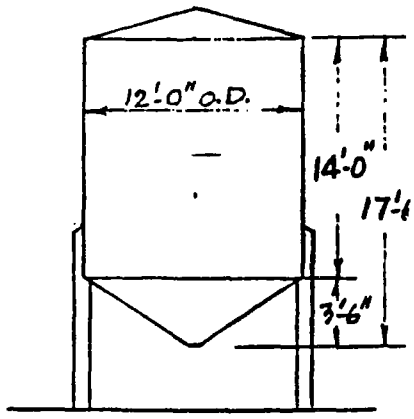
Tank No. T-105

Nominal Capacity 12,000 gals.

Mat'l. of Const. CARBON STEEL

Approx. Year of Build 1981

Designed Corrosion Allow. 1/16"



Stored Waste Characteristics:

	Past	Future
Specific Grav.	1.5 (design)	0.5 → 1.5
Class	NFPA CLASS 2 FUELS LEAN WATER	HAZARDOUS WASTE FUELS (NFPA CLASS 1-3 LIQUIDS)

Material Thicknesses (Inches):

Surface	per UL-142 Std.	As Built A	Ultrasonic Test Results 08/89 B Avg.	08/89 B Min.	10/91 C Avg.	10/91 C Min.
Top	0.123	0.250	0.250	0.238	0.254	0.250
Shell	0.167	0.313	0.305	0.303	0.299	0.277
Bottom	0.240	0.375	0.380	0.375	0.398	0.380

NOTES:

A. FROM STRAUBING, RUBIN & KENES DESIGN DWG. 1-Q-001

B. FROM ALPHA CONSULTANTS JAN. '90 RPT.

C. FROM SIRRINE ENVIR. CONSULTANTS NOV. '91 RPT.

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

23 May 1995

Mr. Alan F. Mount, Project Manager
Clean Harbors of Chicago, Inc.
11800 S. Stony Island Avenue
Chicago, Illinois 60617

Subject: CWM Tank Farm
Tank Agitator Mounting and Nozzle Details

Enclosure: 1) Design Calculations and Fabrication Details
(10 sheets, original issue date 14 March 1995)

Dear Alan,

Enclosure 1) is submitted herewith for your information and records. Sheet nos. 1, 5, 6 & 9 have been updated and revised where necessary to reflect your actual "as built" conditions.

Yours truly,

Lee F. Mount

Lee F. Mount

Reviewed by:

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-96

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JOB CWM/CHI TANK FARM
SHEET NO. COVER OF
CALCULATED BY L. F. MOUNT DATE 14 MAR '95
CHECKED BY REV. DATE 17 MAR. '95.
SCALE FINAL ISSUE TO REFLECT "AS BUILT" CONDITIONS 22 MAY '95

THE ENCLOSED CALCULATIONS AND FABRICATION DETAILS WERE CARRIED OUT IN SUPPORT OF CURRENT TANK UPGRADES PROPOSED FOR THE CLEAN HARBORS, CHICAGO STONY ISLAND FACILITY. AN OVERALL REVIEW AND ASSESSMENT OF THE STRUCTURAL INTEGRITY OF THESE EXISTING TANKS WAS COVERED IN A REPORT BY THE UNDERSIGNED DATED JAN. 1995. THIS REPORT ADDRESSES THE FITTING OF NEW TANK AGITATORS AS WELL AS ADDITIONAL NOZZLES.

CONTENTS

DESCRIPTION	SHEET NO.
SKETCH OF AGITATOR MOUNTING FLANGE (FOR TANKS 105, 106, 107	1
REFERENCES 109, 110, 112)	2
ESTIMATE OF STRESS DUE TO BENDING MOMENT @ FLANGE	2
ESTIMATE OF STRESS DUE TO TORQUE @ FLANGE	3
ESTIMATE OF STRESS DUE TO AGITATOR VERTICAL LOAD	3
CHECK OF LOADED TANK SUPPORT LEGS W/ AGITATOR VERT. LOAD	4
TYPICAL PROPOSED 4" NOZZLE INSTALLATIONS	5
BAFFLE PLATE DESIGN REQ'MTS.	6
CHECK TANK INTEGRITY FOR OPERATION WITH 1.0 PSIG VAPOR PRESS.	7-8
SKETCH OF MODIFIED AGITATOR MOUNTING FLANGE (FOR TANKS 103 + 104)	9
TABULAR SUMMARY OF AGITATOR SPECS. + TANK PROPERTIES	10

PREPARED BY Lee F. Mount
LEE F. MOUNT
14 MARCH 1995

COMMONWEALTH OF MASSACHUSETTS
LEE FORREST MOUNT
21193
REGISTERED
PROFESSIONAL ENGINEER

LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
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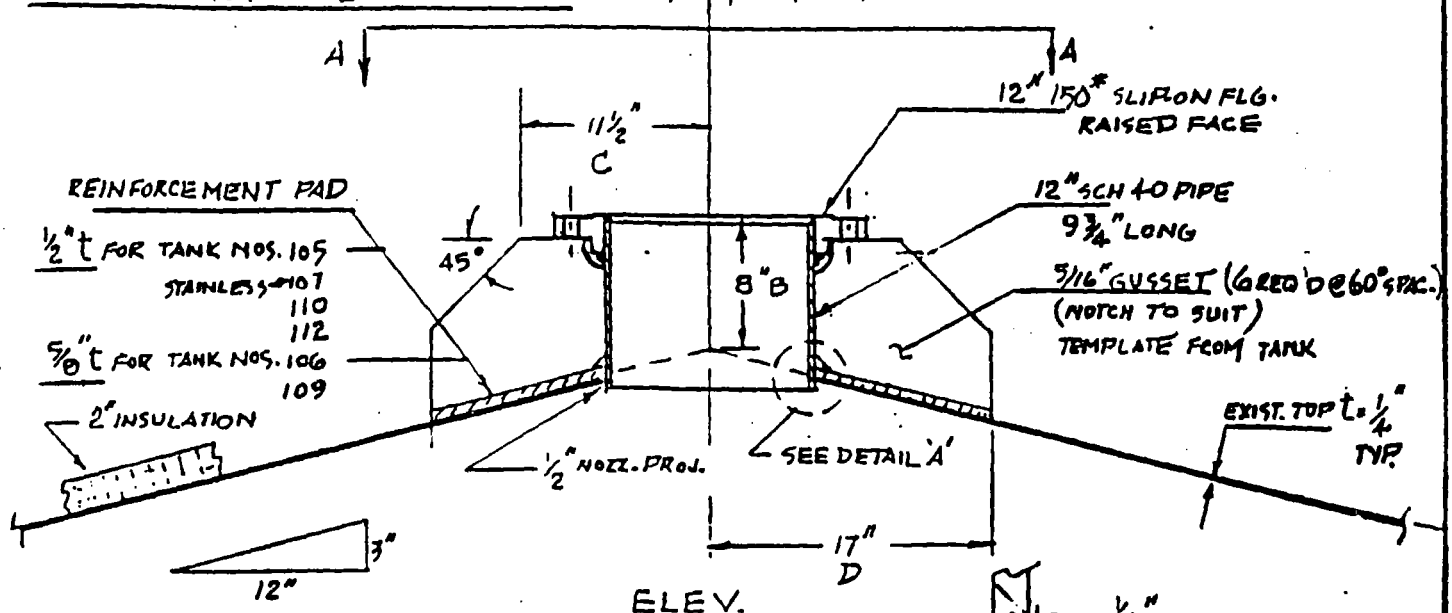
JOB CWM/CHI TANK AGITATORS
SHEET NO. 1 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR.'95
REV. 15 MAR.'95..
CHECKED BY DATE
SCALE 1"=1'-0" & AS NOTED 22 MAY'95
"AS BUILT"

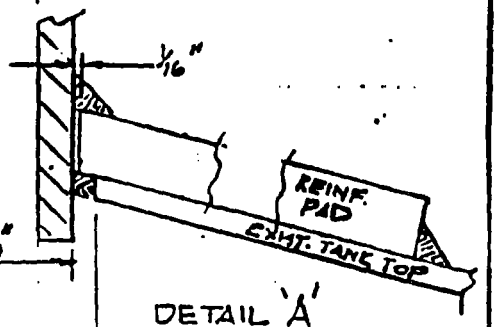
NEW MOUNTING FLANGE FOR TANK NOS. 105, 106, 107, 109, 110 & 112



ELEV.

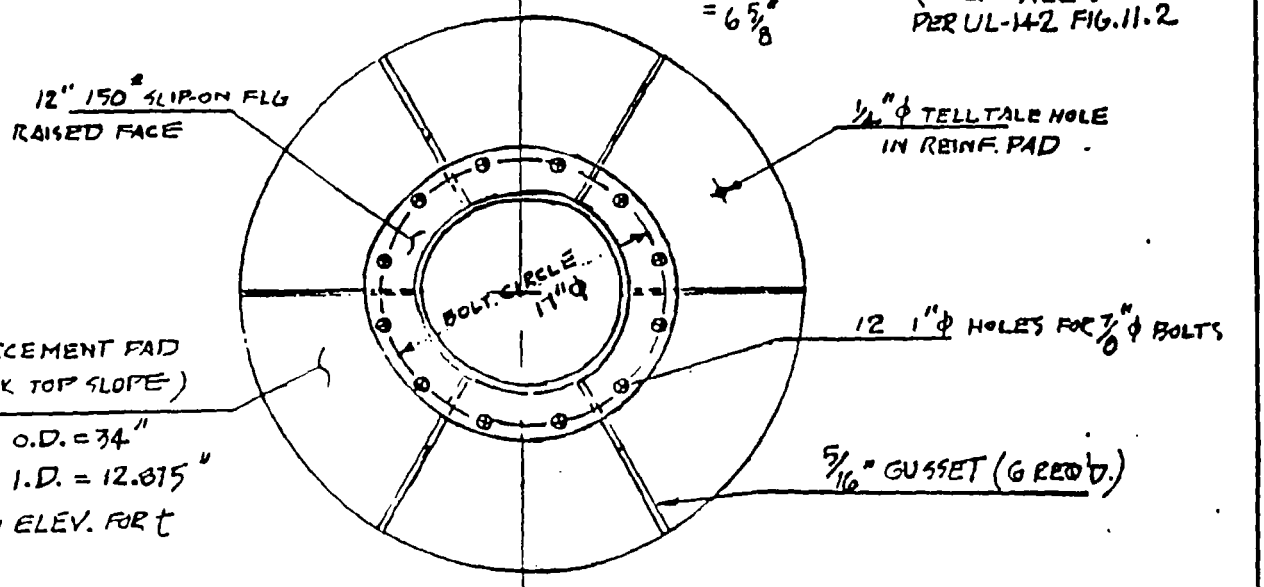
CONE TOP SLOPE SHOWN

(SOME TANKS HAVE 2"/12" SLOPE)



DETAIL 'A'

(HALF SIZE)
PER UL-142 FIG. 11.2



PLAN A-A

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REFERENCES: 1) CHEMINEER AGITATOR DESIGN SYSTEM SPEC. SHEETS
2) UL-142, STEEL ABOVE GROUND TANKS
3) FORMULAS FOR STRESS & STRAIN, ROARK 4TH ED. 1965
4) API-650 WELDED STEEL TANKS FOR OIL STORAGE
5) CHEMINEER IOM MANUAL PG. 4-9 JUNE '93
6) ASME SECT VIII PRESSURE VESSEL CODE

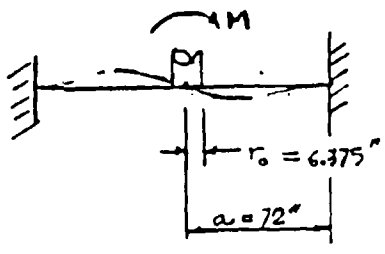
CHECK REINFORCED TANK TOP FOR AGITATOR LOADINGS

ASSUMPTIONS: LOADINGS - USE 15 HP TYPE C UNIT FOR MAX. BENDING MOMENT OF 5036 FT.-LBS & TORQUE OF 4274 FT.-LBS

- USE 5 HP TYPE B UNIT FOR MAX. VERTICAL LOAD OF SAY 3000 LBS

ESTIMATE STRESS DUE TO BENDING MOMENT

FROM REF 3) PG. 219, CASE 10 ASSUMES FLAT CIRCULAR PLT, EDGES FIXED, CENTRAL COUPLE



$$\text{Max } S_r \text{ at } r = r_o = \frac{3M}{4\pi t^2 r_o}\left[1 + \left(\frac{m+1}{m}\right)\log \frac{2(.45a - r_o)}{.45 k a}\right]$$

WHERE: $k = \dfrac{0.1a^2}{(r_o + .28a)^2} = \dfrac{0.1(72)^2}{[6.375 + .28(72)]^2}$

$= 0.736$

$M = 5036 \text{ FT-LBS} \times 12 = 60432 \text{ IN-LBS}$

$t = .25 + .625 \text{ (REINF. PAD)} = 0.875''$

m = RECIPROCAL OF POISSON'S RATIO

$= \dfrac{1}{.3} = 3.33$

$a = 72''$

$r_o = 6.375''$

$$\text{Max } S_r = \frac{3(60432)}{4\pi(.875)^2(6.375)}\left[1 + 1.30 \log \frac{2[.45(72) - 6.375]}{.45(.736)(72)}\right] \quad (2.183)$$

$= 2956\,[1 + 1.3(.781)]$

$= 2956\,(2.02) = \boxed{5971 \text{ PSI}}$

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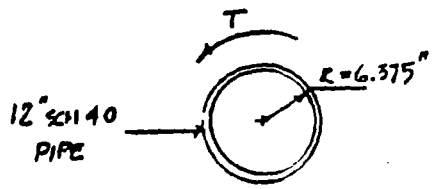
ESTIMATE SHEAR STRESS DUE TO TORQUE

$T = 4274 \text{ FT-LBS} \times 12 = 51288 \text{ IN-LBS}$

$\text{FORCE} = \frac{T}{r} = \frac{51288 \text{ IN-LBS}}{6.375''} = 8045 \text{ LBS}$



$\text{CIRCUM.} = 2\pi(r) = 40''$

$\therefore \text{LOAD}/''_{\text{OF CIRCUM.}} = \frac{8045}{40} = 201 \text{ LBS}/_{\text{IN}}$

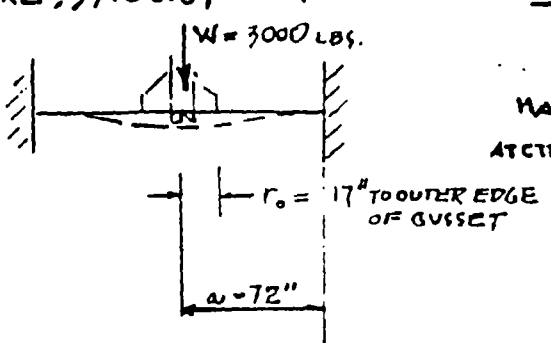
SAY TORQUE IS CARRIED BY 3/8" FILLET WELD @ REINF. PAD TO NOZZLE CONNECTION

ALLOWABLE WELD LOAD $= 11{,}200(.375) = \boxed{4200 \text{ LBS}/_{\text{IN}} > 201 \text{ O.K}}$

CONSERVATIVE IN THAT LOWER TANK TOP TO NOZZLE FULL PENETRATION WELD HAS NOT BEEN TAKEN INTO ACCOUNT.

ESTIMATE STRESS DUE TO VERTICAL LOAD

FROM REF. 3 / PG 218, CASE 7 ASSUMES FLAT CIRCULAR PLT., EDGES FIXED, UNIFORM LOAD OVER CONCENTRIC CIRCULAR AREA OF RADIUS r_o



$$\text{MAX } S_r \text{ AT } r_o = \frac{3W}{2\pi m t^2}\left[(m+1)\log\frac{a}{r_o} + (m+1)\frac{r_o^2}{4a^2}\right]$$

WHERE: $W = 3000$ LBS

$t = .25 + .50 = 0.75''$ (REINF PAD) (FOR TANK No 112)

$m = 3.33$

$a = 72''$

$r_o = 17''$

$$\text{MAX } S_r = \frac{3(3000)}{2\pi(3.33)(.75)^2}\left[4.33 \log 4.235 + 4.33(.0139)\right]$$

$$= 765\,(6.25 + .06)$$

$$= \boxed{4827 \text{ PSI}}$$

CONCLUDE: COMBINING STRESS DUE TO BENDING (5971) + STRESS DUE TO VERT. LOAD (4827) = 10,798 PSI

API 650 GIVES ALLOW STRESS OF 20,000 PSI FOR ASTM A285-C STEEL

THUS, THE STRESS DUE TO EXTERNAL LOADS IS ABT. 54% OF ALLOWABLE WHICH APPEARS TO BE REASONABLE

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JOB CWM/CHI TANKS
SHEET NO. 4 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR 95
CHECKED BY _____ DATE _____
SCALE _____

CHECK TANK SUPPORT LEGS FOR AGITATOR VERT. LOAD

USE TANK NO 112 (LARGEST TANK + HEAVIEST AGITATOR)

ESTIMATED WEIGHT TO BE SUPPORTED BY 4 LEGS @ L=7.0' SIZE = W8×31

TANK STEEL

CONE TOP (1/4" PLT.) LATERAL AREA = BASE CIRCUM × 1/2 SLANT HT.

$= \pi D \times \frac{6.18'}{2}$

$= \pi 12 \times 3.09 = 116.5$ □' × 10.2#/FT² = 1188 LBS.

SHELL (5/16" PLT.) AREA = $\pi D H$

$= \pi 12 \times 22 = 829.4$ □' × 12.75#/FT² = 10575 LBS.

CONE BOTTOM (3/8" PLT.) LATERAL AREA = BASE CIRCUM × 1/2 SLANT HT.

$= \pi D \times \frac{6.95}{2}$

$= \pi 12 \times 3.48 = 131.2$ □' × 15.7#/FT² = 2007 LBS.

AGITATOR WEIGHT ——————→ 3000 LBS

SUBTOTAL 16770 LBS

ADD 20% FOR MISC. PIPING, PLATFORMS INSULATION, ETC. ——————→ 3350 LBS

LIQUID CONTENTS @ S.G. = 1.5 CAP. = $\frac{20{,}000 \text{ GAL.}}{7.48 \text{ GAL/CU.FT}}$ = 2674 CU FT × 62.4 × 1.5 = 250,286 LBS

TOTAL ESTIMATED WT. TO BE SUPPORTED = 270,406 LBS.

USE 276 KIPS

∴ EACH LEG CARRIES 276/4 = 69 KIPS

FROM AISC COL TABLE @ KL = 2(7) = 14 FOR W8×31 (A36 STL.)

READ ALLOWABLE LOAD = $\boxed{137 \text{ KIPS} > 69 \text{ KIPS}}$

CONCLUDE: EXISTING COLUMN SUPPORT IS ADEQUATE FOR CONDITIONS

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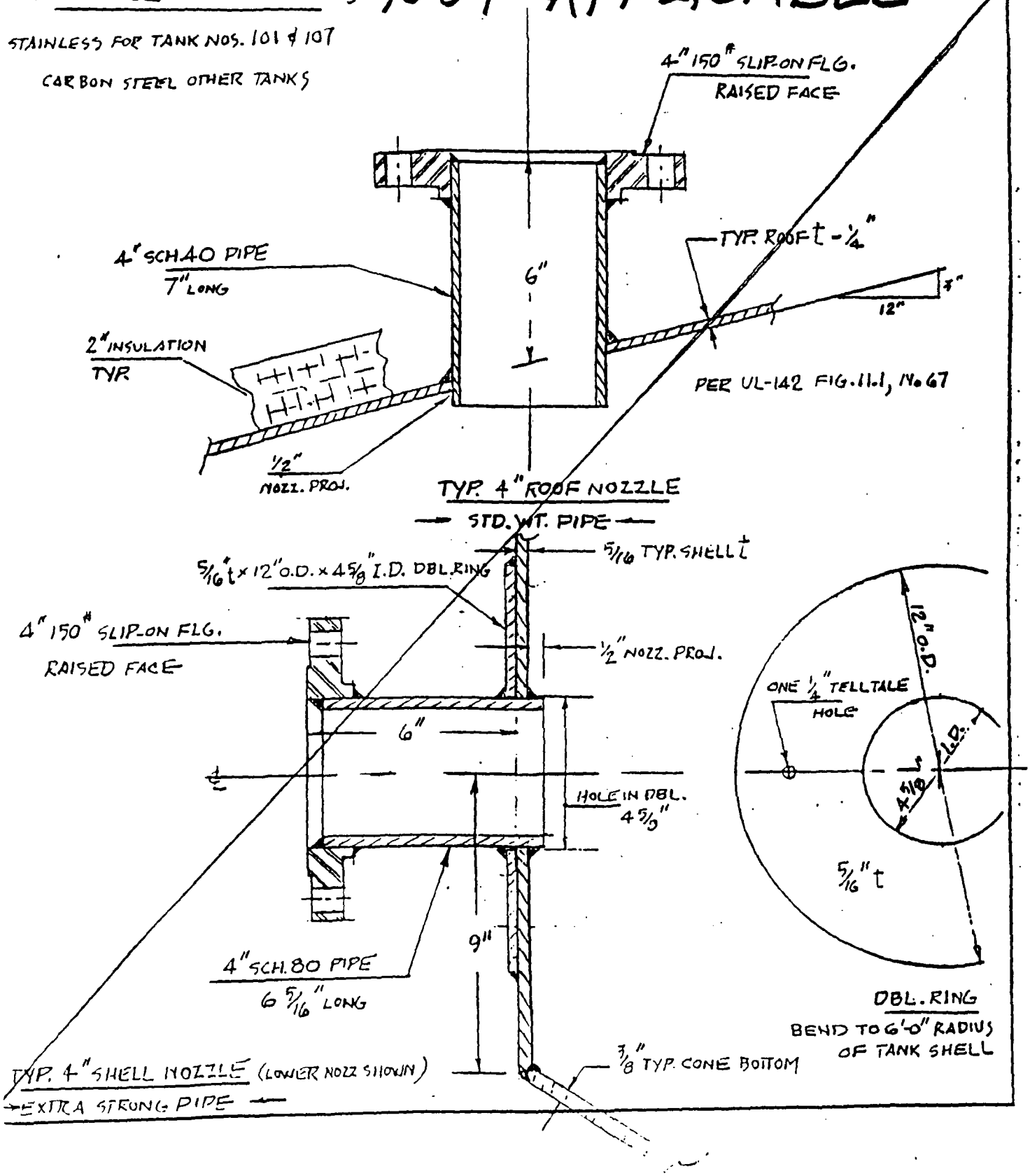
JOB CWM/CHI TANKS
SHEET NO. 5 OF 10
CALCULATED BY L. F. MOUNT DATE 14 MAR. '95
REV. 15 MAR. 95
CHECKED BY DATE
SCALE 3" = 1'-0" 22 MAY '95
"AS BUILT"

4" NOZZLE INSTALLATIONS NOT APPLICABLE

STAINLESS FOR TANK NOS. 101 & 107

CARBON STEEL OTHER TANKS



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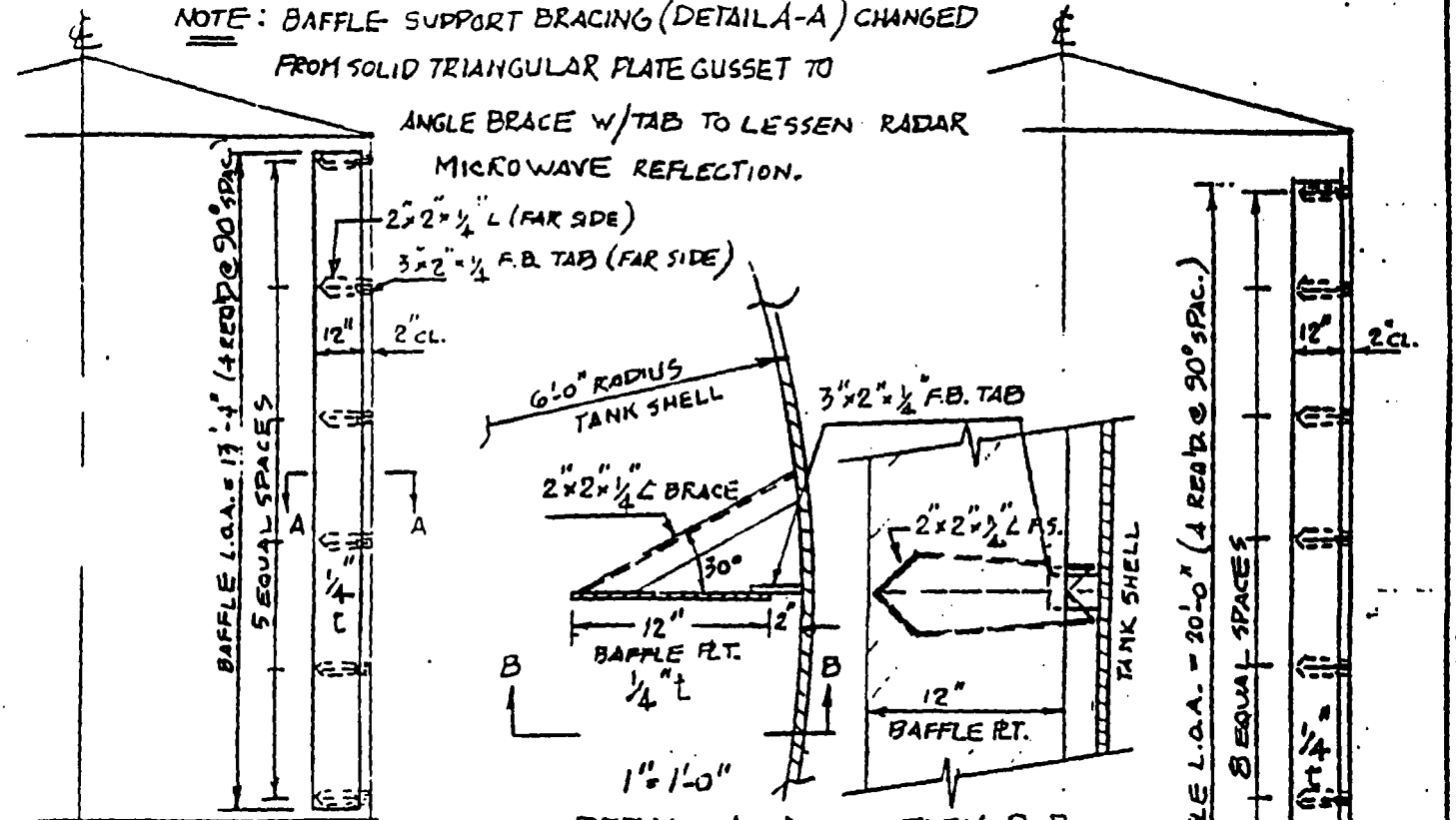
JOB CWM/CHI TANKS
SHEET NO. 6 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. '95
CHECKED BY REV. DATE 15 MAR. '95
SCALE AS NOTED "AS BUILT" 22 MAY '95

BAFFLE PLATE DESIGN (SIZES AS RECOMMENDED IN REF. 1)

NOTE: BAFFLE SUPPORT BRACING (DETAIL A-A) CHANGED FROM SOLID TRIANGULAR PLATE GUSSET TO ANGLE BRACE W/TAB TO LESSEN RADAR MICROWAVE REFLECTION.



BAFFLE SUPPORT BRACING (TYP.)
36 REQ'D. FOR TANK No 112
24 REQ'D. FOR TANK NOS.
105
106
107 316SS
109
110

TANK NO.	BAFFLE & SUPPORT BKT. MAT'L.	
101	316 SS	(EXISTING)
102	A36	(EXISTING)
103	A36	(EXISTING)
104	A36	(EXISTING)
(105)	(A36)	NEW
(106)	(A36)	NEW
(107)	(316 SS)	NEW
(108)	(A36)	NEW
(110)	(A36)	NEW

TANK No (112)
BAFFLE & SUPPORT BKTS.
A36 STEEL (NEW)

LEE F. MOUNT, P.E.
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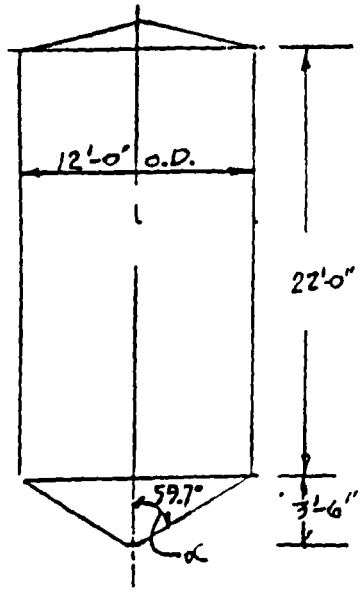
JOB CWM/CHI TANKS
SHEET NO. 7 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR '95
CHECKED BY _____ DATE _____
SCALE _____

CHECK FOR TANK SERVICE OPERATION WITH 1.0 PSIG INTERNAL VAPOR PRESSURE (APT. 24" WATER)

USE TANK NO 112 WHICH HAS GREATEST DEPTH

ASSUME S.G. @ 1.5



MAX PRESSURE @ CONE BOTTOM $= \frac{62.4 \times 1.5 \times 25.5'}{144} = 16.6$ PSI

PLUS VAPOR PRESSURE 1.0 PSI

17.6 PSI

USE 18 PSI = P

USE ASME SECT VIII - DIV 1, APPENDIX 1 TO DETERMINE MIN. REQ'D RT. t FOR SHELL & CONE BOTTOM

FOR CYLINDRICAL SHELL:

$t = \frac{PR_o}{SE + 0.4P}$ WHERE: $P = 18$ PSI

$R_o = \frac{12}{2}(12) = 72''$

$t = \frac{18(72)}{(13800).7 + 0.4(18)}$ $S = 13{,}800$ PSI FOR A285-C STL.

$E = 0.7$

$t = 0.134'' + .0625'' = 0.197$ IN. (UL-142 WOULD REDUCE $t = 0.167$ IN)
CORR. ALLOW.

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $\boxed{0.30'' > .197''}$ O.K.

FOR CONE BOTTOM:

$t = \frac{PD_o}{2\cos\alpha(SE + .4P)}$ WHERE: $D_o = 144''$

$\alpha = 59.7°$

$= \frac{18(144)}{2\cos 59.7°(13{,}800 \times .7 + .4 \times 18)}$

$= 0.266'' + .0625'' = 0.329$ IN.
CORR ALLOW

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $\boxed{.375'' > .329}$ O.K.

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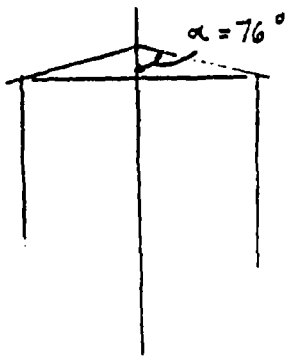
CHECK FOR 1.0 PSIG INTERNAL VAPOR PRESSURE (CON'D.)

FOR CONE TOP



FROM ASME SECT. VIII - DIV. 1

SOLVE FOR P:

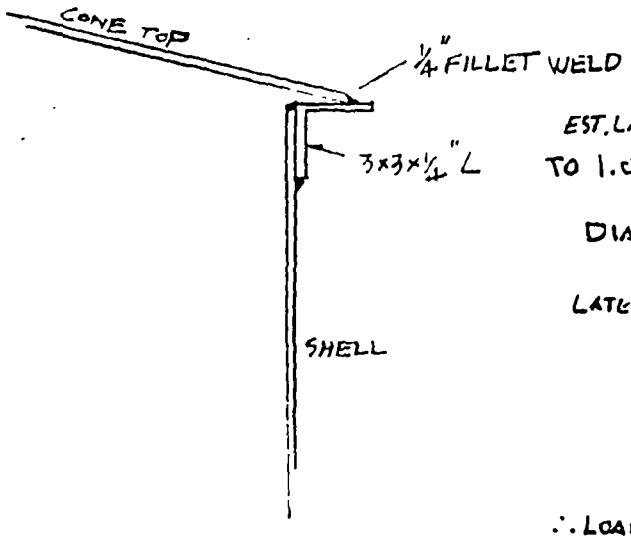
$$P = \frac{2SEt\cos\alpha}{D_o - 0.8t\cos\alpha}$$

WHERE S = 13,800 PSI
E = 0.7
D_o = 144 IN
α = 76°
t = USE .25 − 1/16" CORR ALL.
= .1875"

$$P = \frac{2(13{,}800)(.7)(.1875)(.242)}{144 - [.8(.1875)(.242)]}$$

$$= \frac{876.65}{144} = \boxed{6 \text{ PSI} > 1.0 \quad \text{O.K.}}$$

CHECK ROOF TOP CONNECTION WELD DETAIL



EST. LATERAL SURFACE AREA CONE TOP SUBJECTED TO 1.0 PSI PRESSURE

DIA. ≈ 148" (ROOF OVERHANGS SHELL)

LATERAL AREA = BASE CIRCUM. × 1/2 SLANT HT

$$= \pi D \times \frac{76.2''}{2}$$

$$= \pi(148) \times 38.1 = 17{,}715 \text{ IN}^2$$

∴ LOAD TO ROOF = 17,715 IN² × 1 LB/IN² = 17,715 LBS

CIRCUM. OF 1/4" FILLET ATTACHMENT WELD = πD = π(148) = 465 IN

∴ LOAD/IN ON 1/4" FILLET WELD = $\frac{17715}{465}$ = 38 #/"

VS

ALLOWABLE WELD LOAD OF 11,200 × .25 = 2800 #/" O.K.

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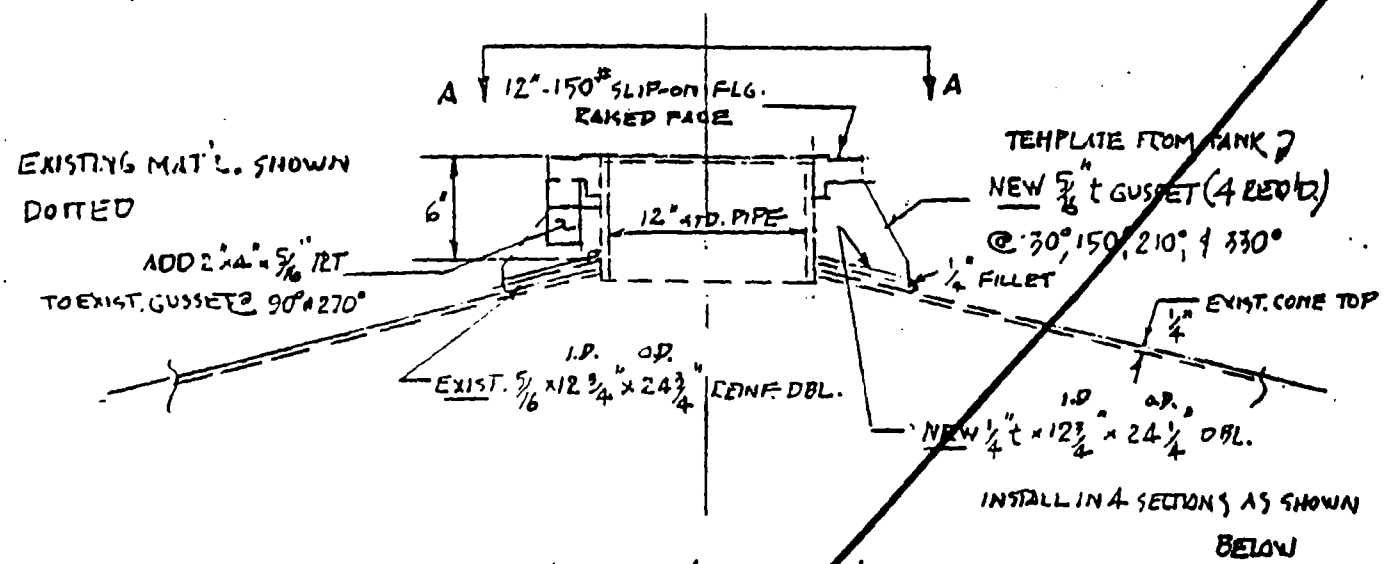
JOB CWM / CHI TANKS
SHEET NO. 9 OF 10
CALCULATED BY L. F. MOUNT DATE 16 MAR. '95
CHECKED BY DATE
SCALE 1" = 1'-0" 22 MAY '95

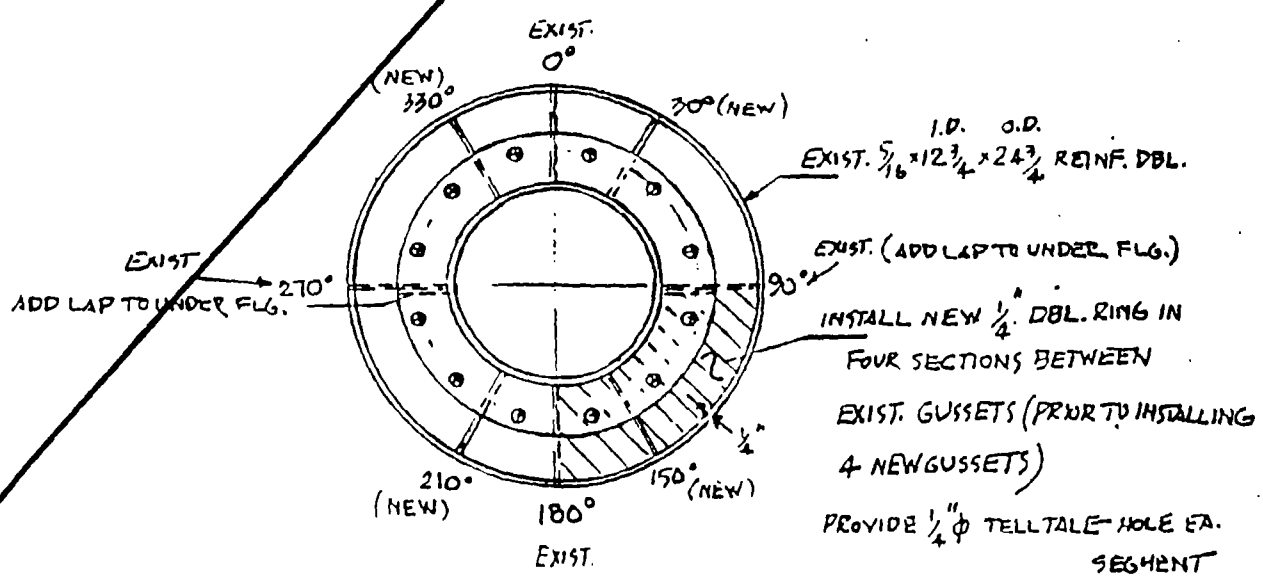
NOT APPLICABLE "AS BUILT"

MODS. TO TANK 103 & 104 EXISTING AGITATOR MOUNTING; TO ACCOMMODATE NEW 7.5 HP UNITS



INSTALL IN 4 SECTIONS AS SHOWN BELOW

ELEV.



FLAN A-A

TANK I.D.	AGITATOR SPECS. (FROM REF. 1)										TANK PROPERTIES					
	TYPE	HP	RPM	SHAFT L IN.	SHAFT DIA. IN.	WT. LBS.	NOZZLE BEND MOM FT.-LBS	NOZZLE TORQUE FT.-LBS.	BAFFLE REQ'D.	CASE SIZE	TOP HEAD t"	MIN HEAD t" (TBL 3)	NOZZLE SIZE	REINF. PAD DIMENS. B (TBL 2)	REINF. PAD DIMENS. C (TBL 2)	REINF. PAD DIMENS. D FIG 3
EXISTING AGITATED TANKS																
101 S.S.	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.313 S.S.		12" EXIST			
102	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.250		12" EXIST			
103	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.250	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5	17" 12.375 ← (ACTUAL)
104	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.241	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5"	17" 12.375 ← (ACTUAL)
105	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"
106	C NEW	15	45	190.5	3.5	2745	5036 MAX.	4274 MAX.	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"
107 S.S.	EXIST. FROM 103	3.0							YES (NEW)	2 DESIGN FOR A	.250 S.S.	.500	12"	8"	11.5"	17"
109	C NEW	15	45	190.5	3.5	2745	5036	4274	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"
110	EXIST. FROM 104	3.0							YES (NEW)	2 DESIGN FOR A	.230	.500	12"	8"	11.5"	17"
112	B NEW	5	30	270.0	3.5	2872 MAX.	2898	2337	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"

NO CHANGE

MODIFY (SHT. 9) MOUNTING

MOUNTING (SHT. 1)

FROM ULTRASONIC TEST RESULTS

REINF. PAD t FROM REF. 5

CWM/CHI TANK AGITATORS
LE MOUNT 10-MAR-1995
REV. 15 MAR 1995
SHT 10 OF 10

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

RECEIVED
JUN 20 1995
HOYER-SCHLESINGER-TURNER, INC.

19 June 1995

Marie Vanagas
Hoyer-Schlesinger-Turner, Inc.
300 West Adams Street
Chicago, ILL. 60606

Subject: Clean Harbors of Chicago, Inc.
CWM Tank Farm

Enclosure: 1) Review and Assessment of Structural Integrity of Existing Tanks; LFMount Report dated January 1995

Dear Ms Vanagas,

In response to Clean Harbors' request, enclosure 1) is herewith forwarded for your information and records.

Yours truly,

Lee F. Mount

Lee F. Mount

REVIEWED BY
Peter J. Bernes
PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-96

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

CWM TANK FARM

Review and Assessment of Structural Integrity of Existing Tank Nos.

T - 101	T - 106
T - 102	T - 107
T - 103	T - 109
T - 104	T - 110
T - 105	T - 112

January 1995

Prepared For:

Clean Harbors of Chicago, Inc.

(In response to Illinois EPA comments)

INTRODUCTION

This report was prepared in response to the Illinois EPA's request for additional information on the structural condition of the existing hazardous waste storage and/or fuel tanks scheduled for reuse at your CWM Tank Farm.

The work scope involved a technical review of all available tank related documents furnished by Clean Harbors. Pertinent data was then summarized and tabulated for each tank on a "Existing Tank Status Form". The ultrasonic test measurements for thickness, shown on the status forms, were then analyzed in order to make estimates of corrosion rates and projected service life.

Reference documents consulted during the course of this study include:

* RCRA Tank Assessment - Tank Farm System, prepared for CWM Chemical Services Inc. by ALpha Consultants, Ltd. Jan. 1990

* Tank System Inspection, prepared for CWM Chemical Services Inc. by Sirrine Environmental Consultants Nov. 1991

* Straubing, Rubin & Kenes, Inc. Tank Design Drawings

* Imperial Steel Tank Co. Fabrication Drawings

* Supplemental ultrasonic thickness measurements taken on stainless steel Tank No. T-101 on 23 January '95 by MQS Inspection, Inc. (raw data)

TANK GENERAL DESCRIPTIONS AND HISTORY

The ten (10) existing tanks, numbered T-101 to T-107, T-109, T-110, & T-112, are 12 ft. dia. vertical, cone bottomed, leg supported, above ground, insulated tanks.

Tank T-112 has a nominal capacity of 20,000 gals. All other tanks are of 12,000 gal. capacity each.

Tank nos. T-101 and T-107 are of stainless steel construction. All others are of carbon steel.

The four (4) newer tank nos. T-101 to T-104, fabricated by Imperial Steel Tank Co., were placed in service during 1986. The remaining older six (6) tanks date from 1981.

Available records and fabrication drawings for tank nos. T-101 to T-104 indicate they were built to the Underwriters Laboratories, Inc. Standard UL-142 for steel above ground tanks and were to be labeled as such. The published UL-142 Standards "do not cover vertical tanks that are elevated by means of legs" and are not intended for liquids having a specific gravity exceeding that of water. In order to satisfy these exceptions, it was necessary for Imperial Steel to apply for Underwriters Lab review and inspection to obtain the UL Listing for these cone bottomed above ground steel tanks on legs.

The Imperial fabrication drawings list the following tank design parameters:

Design Pressure = hyrdostatic head due to contents

Design Temperature = 250° F

Specific Gravity = 1.5

Corrosion Allowance = 1/16 "

Although no fabrication drawings were found for the six (6) older tanks, the Straubing, Rubin & Kenes design plans indicate the same material thicknesses for the top, shell, and bottom as shown on the Imperial plans. Since these thicknesses have been further verified by ultrasonic test measurements, it seems reasonable to conclude that these older tanks were also built to the design standards of UL-142.

The most recent ultrasonic thickness measurements include those taken by Alpha Consultants in Aug. '89 and by MQS Inspection in Oct. '91 for the Serrine report.

Alpha Consultants conducted visual internal inspections on all tanks (except T-110, which was in service) in early Dec. '89 and an external site inspection on 3 Jan. '90. Serrine Environmental Consultants conducted a visual site inspection, including all tank externals, in Sept. '91.

SPECIFIC TANK DETAILS

For tabulation of existing tank detail design information and summary of latest ultrasonic thickness measurements, refer to the tank status form provided in Appendix A for each of the ten (10) tanks.

PROJECTED SERVICE LIFE

The following table summarizes results of calculations undertaken to establish corrosion rates, based on past service, in order to predict an expected service life for the eight (8) carbon steel tanks. For calculation details, refer to Appendix B.

Surface	Estimated Corrosion Rate	Estimated Retirement Thickness	% of "as built" Thickness Remaining at Retirement	Projected Life as of 1995
Tank Top T-110	2.5 Mils/yr	0.156"	62%	24 yrs.
Side Shell T-105&T-112	3.6 Mils/yr	0.188"	60%	21 yrs.
Cone Bottom T-102	3.0 Mils/yr	0.281"	71%	28 yrs.

NOTE:
The following assumptions were used in the development of this table:

Corrosion rates for the tank top and shell surfaces were arrived at by subtracting the lowest recorded minimum ultrasonic thickness reading to date from the "as built" thickness and then dividing by the tank age at time of thickness reading.

In arriving at an estimated corrosion rate for the bottom cone surface, it was found necessary to develop an adjusted "as built" thickness. This was required since the average recorded bottom thickness measurement for all tanks, and in most cases the minimum value also, exceeded the 0.375" thickness shown on the fabrication drawing. The "as built" thickness was therefore adjusted to 0.392" to more accurately reflect the ultrasonic readings which ten years later were giving averages and minimums greater than 0.375".

INSPECTION/TESTING PLAN PRIOR TO REUSE

In order to assess each tank's internal condition, material thickness, and integrity prior to being placed back in service, it is planned to do the following, once the tank has been found safe for man-entry:

* Conduct an initial visual inspection by a tank experienced technician in company with a registered professional engineer to determine general tank condition. A standard check list, similar to that used by Alpha Consultants for Tank T-109 and shown in Figure 1 will be used as a guide and for recording findings. Suspicious areas will be noted for a more rigorous inspection and scheduled for ultrasonic measurement if deemed necessary.

* Since these tanks are insulated, past ultrasonic readings taken from the tank exterior have been limited to those areas where a removable patch permits direct access to the plate surface beneath. Past surveys have included at each of 4 - 90° quadrants, 1 top point, 3 side points and 1 cone bottom point giving a total of 20 readings/tank. With the tank out of service and clean, it would seem desirable to take additional ultrasonic thickness measurements from within. The cone bottom and tank height will make this difficult and require a tank ladder or other means to reach the underside of the top plate.

* It is recommended that a minimum of 12 readings each be taken in a + pattern on the top and bottom surfaces. For the shell at mid-height, a girth sample of about 20 points around the circumference is desirable. Finally, a vertical row sample, top to bottom, of about 10 points at a location determined from the visual inspection to be most worthy of further exploration, should provide more than enough data to verify the existing surface thicknesses and to form a base for comparison with past and future thickness measurement readings. The ultrasonic test readings are to be taken by personnel qualified and certified as competent to use the test equipment. The test results are to be analyzed by a registered professional engineer experienced in steel tank design and construction.

FIGURE 1

ALPHA CONSULTANTS, Ltd.

CHECKLIST FOR VISUAL INSPECTION OF UNLINED VESSELS

OWNER CWM Chemical Services, Inc.-Chicago Incinerator
TEST SITE 11700 So. Stony Island Ave., Chicago, Il. 60617
DATE OF INSPECTION December 5, 1989
TIME OF INSPECTION 1525
SUPERVISORY ENGINEER Harris E. Dicker, P. E.
PHOTOGRAPHER/TECHNICIAN Robert A. Dicker
TECHNICIAN James L. Eggert

TANK NO. 109 (NO PCB IN TANK)
INTERIOR SHELL MATERIAL CS
CLADDING MATERIAL SST
INSULATION 2' FIBREGLASS SIDES & BOTTOM, 2" COL BLOCK TOP
EQUIPPED WITH MIXER NO

INITIAL ROOF INSPECTION FOR SAFETY

- HAZARDS OF FALLING OBJECTS NONE
- VISIBLE CORROSION NONE

MORE RIGOROUS INSPECTION OF ROOF & STRUCTURAL SUPPORTS

- VISIBLE LOSS OF METAL THICKNESS NONE
- VISIBLE CRACKS OR LEAKS AT WELDS NONE
- VISIBLE CRACKS AT NOZZLE CONNECTIONS NONE
- MALFUNCTIONING OF ROOF SEALS NONE
- VISIBLE DETERIORATION OF WATER DRAIN SYSTEM NONE
- CONDUCT HAMMER TESTING NO

TANK SHELL

- VISIBLE CRACKS AT SEAMS NONE
- VISIBLE CORROSION AT VAPOR SPACE/LIQUID LEVEL LINE NONE
- VISIBLE CRACKING OF PLATE JOINTS NONE
- VISIBLE CRACKING OF NOZZLE CONNECTION JOINTS NONE
- VISIBLE LOSS OF METAL THICKNESS NONE

TANK BOTTOM

- TYPE OF BOTTOM, SLOPED OR FLAT SLOPED
- VISIBLE CORROSION PITS NONE
- VISIBLE CRACKED SEAMS NONE
- TYPE OF CONNECTION TO SIDEWALL, WELDED OR RIVETED WELDED
- VISIBLE TIGHTNESS AT CONNECTION NONE
- VISIBLE DEPRESSIONS IN BOTTOM AREAS AROUND OR UNDER ROOF OR PIPE SUPPORTS NONE
- VISIBLE LOSS OF METAL THICKNESS NONE
- VISIBLE UNEVENESS OF BOTTOM NONE
- CONDUCT HAMMER TEST NO
- VISIBLE BULGES, BLISTERING OR SPALLING NONE
- WAS ULTRASONIC TESTING OF TANK WALLS, ETC. CONDUCTED YES

Source: OSWER Policy Directive No. 9483.00-1
Modified Version of Table 4-7, Page 4-35
"Permit Writer's Guidance for Hazardous Waste Tanks" U. S. EPA Contract 68-01-6515
(undated draft) pp 8-10.

SUMMARY DISCUSSION

Projected Service Life - The projected useful service life for the eight (8) carbon steel tanks is estimated to be on the order of 20 years from today.

- The projected service life for the two (2) stainless steel tanks (T-101 & T-107) is estimated to be more than 20 years as evidenced by the ultrasonic thickness readings which indicate little, if any significant material loss as of '91.

- These projected service life estimates are believed to be conservative in that minimum point readings, rather than average readings, were used to establish the corrosion rates. Furthermore, the projected service life calculations assume that corrosion has continued at the same rate during the past 3 years when the tanks have been out of service.

- These estimated rates can be expected to remain in effect so long as the future stored waste product corrosivity characteristics are compatible with and do not differ significantly from those products stored in the past. Also, the integrity of the external insulation cladding material must be maintained to prevent exterior corrosion from the weather.

- It is anticipated that these tanks, once returned to service, will be ultrasonically tested on an annual basis, at which time these estimated corrosion rates should be reviewed and modified if necessary to suit existing service conditions.

Type of Wastes Stored - The individual tank status forms, Appendix A, list the typical types of waste products stored in past service as well as those planned for future operations. Before any wastes are stored, the facility management is required to assess the compatibility of the waste with (1) the storage unit materials of construction and (2) the wastes being presently stored.

Conclusion - Based on a detailed technical review of the page 1 referenced documents, it is my opinion that the ten (10) existing tanks proposed for reuse at the CWM Tank Farm are structurally sound, free from leaks, and exhibit sufficient material thickness, as determined by ultrasonic measurements. They appear to meet applicable design guidance standards and the past visual inspection reports indicate them to be substantially free from corrosion. Therefore, it is my opinion that the existing reported condition and structural integrity of these storage tanks demonstrate suitability for continued service.

CERTIFICATION

"I certify, under penalty of law, that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately 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 possible fines and imprisonment"

Registered Professional Engineer

Name: Lee F. Mount

Signature: Lee F. Mount

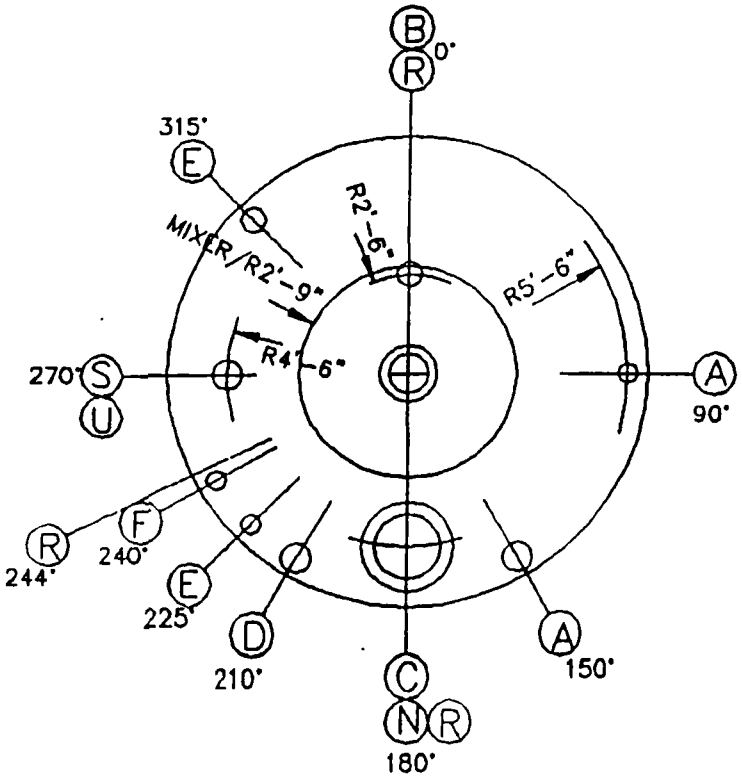
Date: 24-January 1995

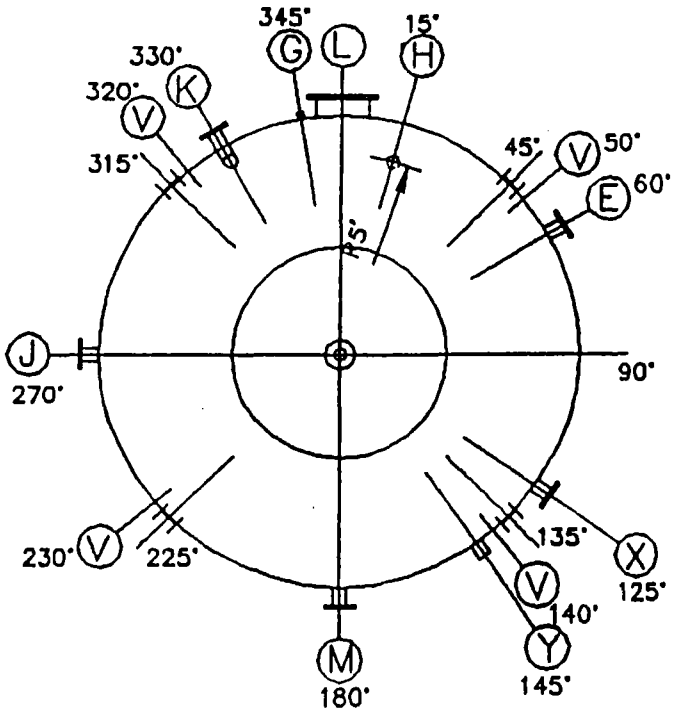
Massachusetts Registration No: 21193

Appendix TK-105-3

MARK	REQD.	SIZE	TYPE	ELEVATION	DESCRIPTION
A	2	2"	150# RFSO	ROOF	NITROGEN BLANKET
B*	1	3"	150# RFSO	ROOF	COV – FA
C	1	20"	150#	ROOF	EMERGENCY VENT
D	1	4"	150# RFSO	ROOF	FILL
E(225)	1	3"	150# RFSO	ROOF	HIGH LEVEL–LSH105
E(315)	1	3"	150# RFSO	ROOF	SPARE
F	1	3"	150# RFSO	ROOF	DPSL105 & DPSH105
G	1	2"	3000# CPLG	12" F/CONE	SPARE
H	1	2"	3000# CPLG	CONE	SAMPLE
J	1	3"	150# RFSO	6" F/CONE	LOW LEVEL–LSL105
K	1	3"	150# RFSO	13" F/CONE	SPARE
L	1	24"	150#	12" F/CONE	MANWAY W/COVER
M	1	4"	150#FB–VALVE	CONE	DRAW–OFF
N*	1	12"	150# RFSO	ROOF	MIXER MOUNT
R	AS SHWN		–	6'–3" F/ROOF	SUPPORT CLIP
S	AS SHWN		–	3'–9" F/ROOF	SUPPORT CLIP
E	1	3"	150# RFSO	6" F/CONE	SPARE
U*	1	4"	150# RFSO	ROOF	LEVEL MONITOR–LT105
V*	4		–	SHELL	BAFFLE
X*	2	4"	150# RFSO	9",6'–6" F/C	DRAW–OFF
Y*	2	2"	3000# CPLG	9",6'–6" F/C	SAMPLE

NOTE: * DESIGNATES NEW NOZZLE





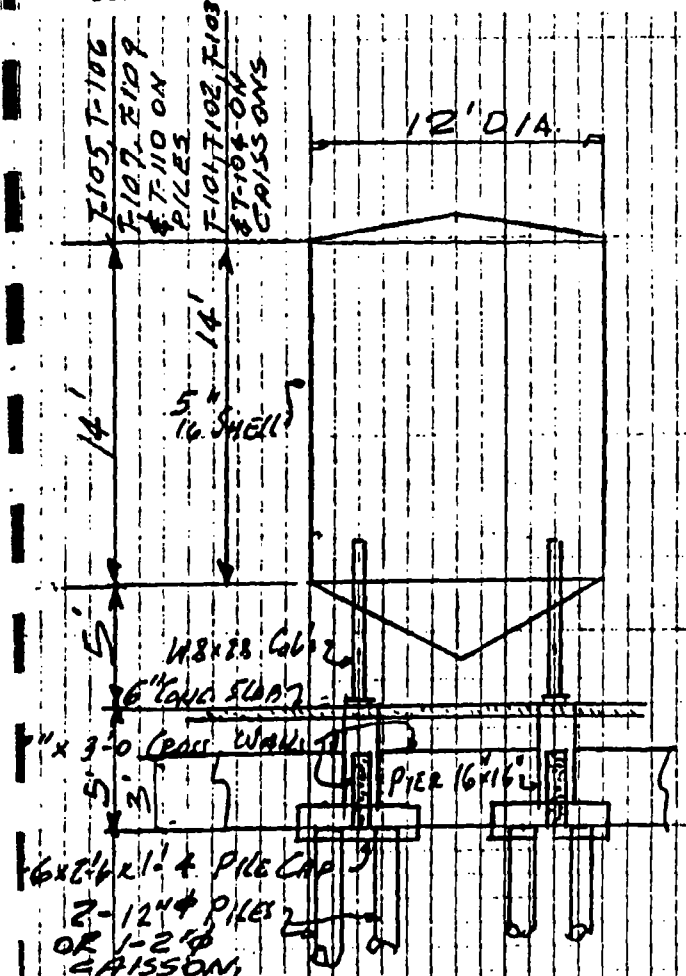
TK–105

HOYER-SCHLESINGER-TURNER, INC.

SHEET 2 OF 8
PROJECT NO. 17851
DATE 1.19.95
BY BERNES
CHK. C.K. 1.27.95

PROJECT CLEAN HARBORS - CHICAGO, IL

SUBJECT EXIST. TANK FARM SUPPORT COMPUTATIONS



SECTION "A-A"

SEE SH-1

TANKS T-101 THRU T-107, T-109 & T-110

EMPTY TANK =

$= \pi(12 \times 14' + 12^2/4 + 6 \times \sqrt{7.3^2 \times 12^2}) \times 12.8 \times 1.05$

$= 11,985 + 4 \text{ LEGS} \times 7 \times 28 = 184$

TOTAL = 12,170#

PLUS NOZZLES, FLANGES AND SUPPORT =

= 7,830#

TOTAL EMPTY TANK = 12,170 + 7,830 =

= 20,000# ✓

LIQUID = 12,100 GAL × 8.35# × 1.5 =

= 151,298# ✓

TOTAL EMPTY + LIQUID =

= 20,000 + 151,298# = 171K

EACH LEG = 171/4 = 43K/LEG ✓

CONCRETE + SNOW

PILE CAP = 4.5' × 2.5 × 1.33 × .15	= 2.25K
PIER 1.33 × 1.33 × 5' × .15	= 1.33K
CROSS WALL 3' × .67' × 16 × .15	= 4.82K
FILL 4.5 × 2.5 × 3.5 × .10	= 3.94K
6" CONC. SLAB = 4.5 × 2.5 × .5 × .15	= .84K
SNOW π12² × 25#	= 2.83K
	16.01K/LEG

TOTAL LOAD PER LEG ON PILES

= 43K + 16K = 59K

TWO 2-12"ϕ WOOD PILES = 20 TON CAP. EACH

= 2 × 40K = 80K > 59K O.K.

CAISSON CAP. = $\pi \times R^2 \times 9^K = \pi \times 2.25^2 \times 9 = 143^K > 59^K$ O.K.

H-S-T

HOYER-SCHLESINGER-TURNER,Inc.
ENGINEERS-ARCHITECTS
3074 University Ave.
Highland Park,IL 60035
Phone:847-461-0470 Fax:847-266-9829

December 6, 2000

Mr. Mark A. Schollenberger, P.E.
Illinois Environmental Protection Agency
Bureau of Land - Permit Section
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Re: Certification of Repairs Inspection Report
Tanks 105 and 106
Clean Harbors Services, Inc.
ILD000608471

Dear Mr. Schollenberger:

On November 28, 2000 I visually inspected Tanks 105 and 106. Both tanks had developed cracks to the agitator nozzles which had been repaired. Additional reinforcement has also been added to the nozzles. I find that the repairs are satisfactory and the repairs to Tanks 105 and 106 are capable of handling hazardous wastes without release for the intended life of the tanks.

Very truly yours,

Hoyer-Schlesinger-Turner, Inc.

Peter J. Bernes

Peter J. Bernes
Illinois #3659

STATE OF ILLINOIS
PETER J.
BERNES
3659
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 12.6.00

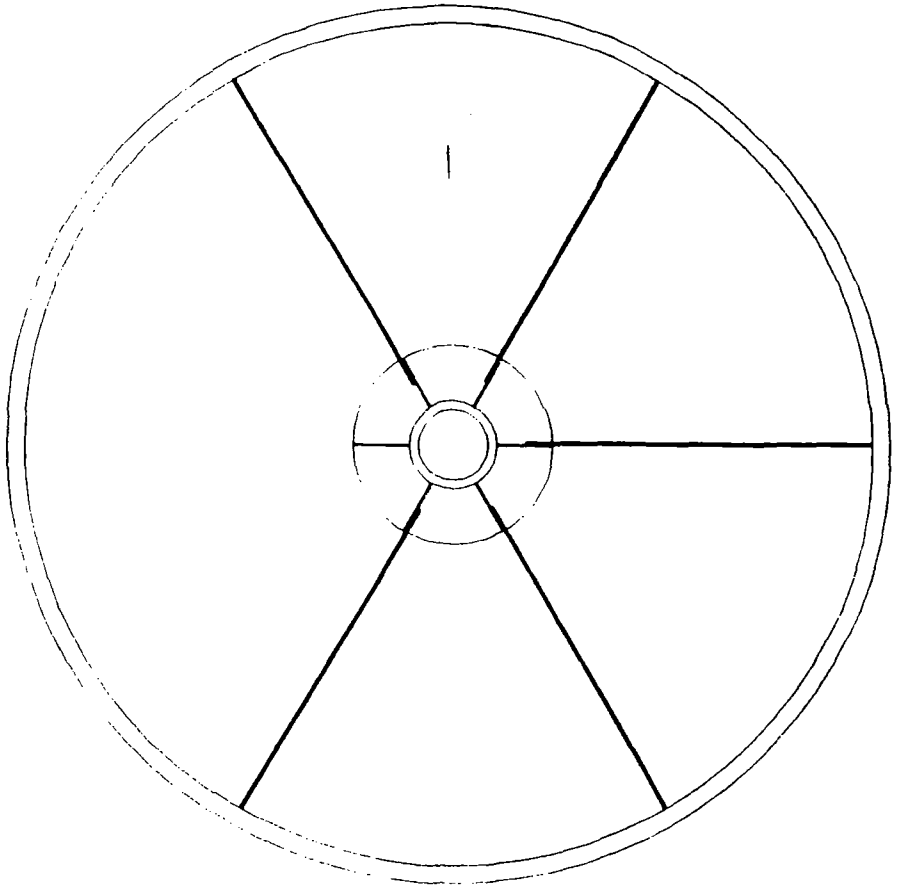
I hereby certify that I, the undersigned am a Professional Engineer, licensed to practice in the State of Illinois. I have reviewed the Certification of Repairs Inspection Report for Tanks 105 and 106 for Clean Harbors Services, Inc.

I certify under penalty of law that this document was 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.

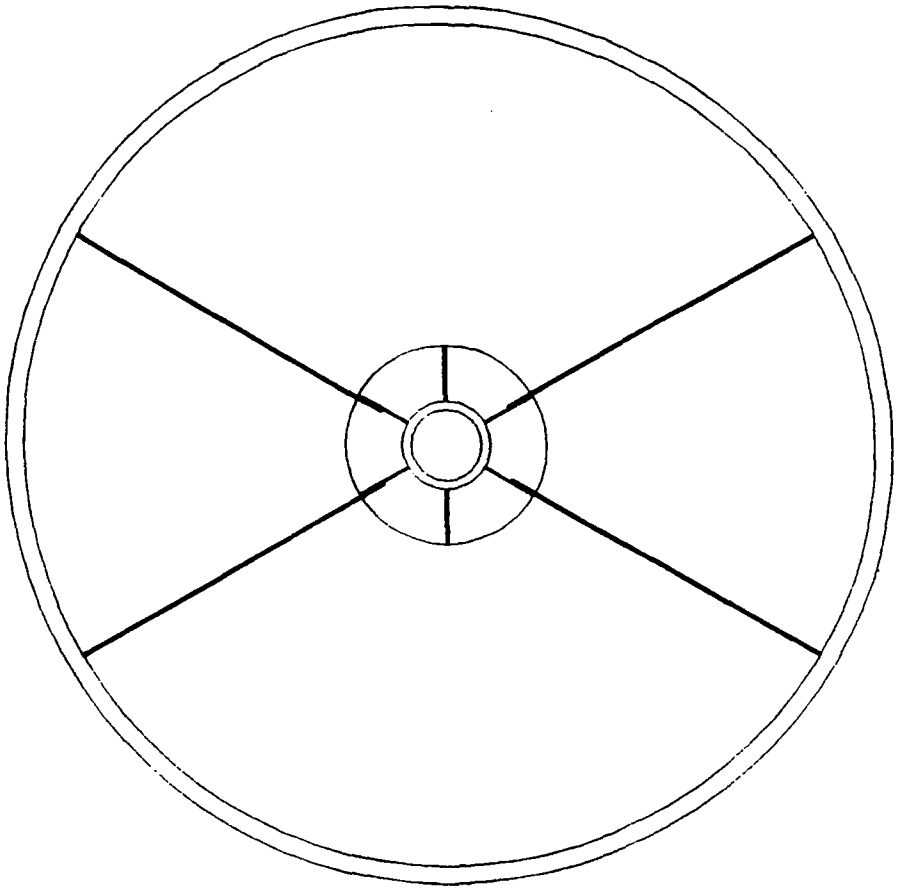
Engineer Seal

Signature of Registered P.E.

(Expires 11 30 01)

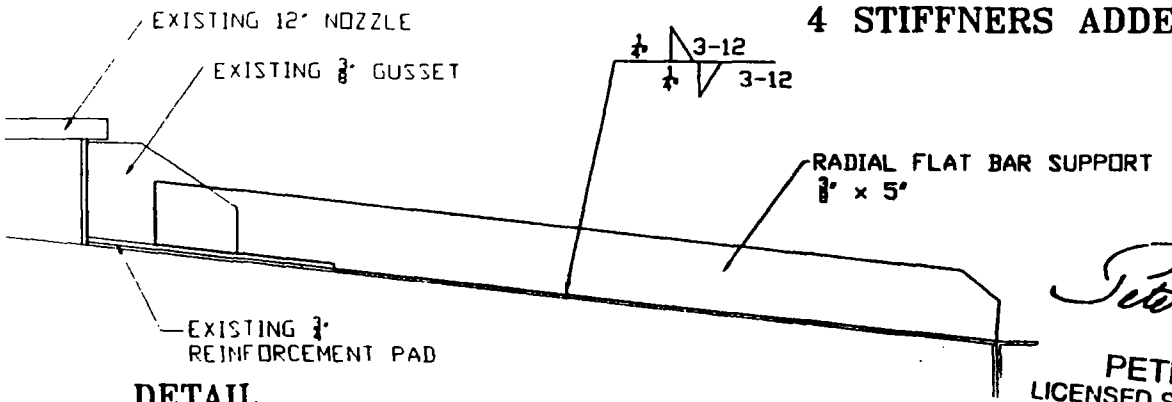


TANK 106
5 STIFFNERS ADDED



TANK 105
4 STIFFNERS ADDED

STATE OF ILLINOIS
PETER J. BERNES
3659
LICENSED STRUCTURAL ENGINEER



DETAIL

TYPICAL AT EACH RADIAL SUPPORT

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 12.6.00

MECA ENGINEERING CORP. OF AMERICA

5539 Indianapolis Blvd. East Chicago, IN 46312 (219) 397-0100 FAX (219) 397-0164

December 19, 2002

Mr. James R. Laubsted
Facility Compliance Manager
CLEAN HARBORS SERVICES, INC.
11800 S Stony Island Avenue
Chicago, IL 60617

RE: Inspection Report
Tank T-106

MECA Job
No. 29-157

Dear Mr. Laubsted:

On December 16, 2002 I visually inspected the interior and exterior of Tank T-106.

Tank T-106 is located on the south side of the Flammable Storage Tank Farm (Unit 16), Previous visual internal inspections include October 23, 1998, February 27, 1997 and July 7, 1995. Hydrostatic testing was completed in July, 1995. From the time of the earliest inspection, the tank was used for storing Class I flammable hazardous waste fuels. Tank T-106 is located outdoors and has a dedicated concrete dike. The containment is coated with Protecto-Coat 900, 30 mils thick as manufactured by Dudick, Inc. This coating is compatible with the stored materials. The containment dike for T-106 and the remaining tanks within the tank farm were inspected August 30, 2002.

Tank T-106 is a carbon steel vessel fabricated in 1981. Tank T-106 was empty at the time of inspection and was cleaned by Clean Harbors personnel. The tank is operated at ambient temperature and under 2" WC pressure from nitrogen blanketing. The tank is equipped with a condensing vent and is vented through a carbon bed.

Tank T-106 stores Class I flammable liquids including hazardous waste fuels. Maximum specific gravity of stored liquids is 1.5 and PH may vary from 4 to 10.The tank is constructed from carbon steel. It is 12'-0" in diameter and 14' high straight side with a cone bottom and top. There is no record that this tank was built to the UL-142 standard. The assumption that the tank was built to this standard is based on a comparison with another tank which was fabricated to the UL-142 standard.

The tank is supported by steel legs on caissons. The steel legs are encased in concrete.

The internal and external visual inspection did reveal a three foot portion of the weld seam in the bottom cone section that has a poor weld. It appears the final pass as left out in error at the time of fabrication. No other defects were seen The welds around nozzles and other tank shell welds inspected from inside the the tank were in good condition. There were not any other visible defects on the interior of the tank. Clean Harbors will clean/grind out the weld and put one or two passes over the existing weld.

It is not possible to inspect the entire exterior of the tank by visual inspection. The tank is insulated with 2" thick insulation with metal jacket. The insulation and jacketing was removed when the nozzles were added in 1995. At that time the welds could be inspected from the outside. The condition of the welds were good; there were no vertical defects.

Tank 106 had developed cracks to the agitator nozzle in 2000. Additional re-inforcement was added to the nozzle at that time. The repair certification and details are included in Appendix TK-106-5.

In December, 2002 Calumet Testing Services performed NDT-ultrasonic thickness measurements from the interior of the tank and exterior shell measurements. Previous internal thickness measurements were taken in November, 2000. In December, 2001, November, 2000 and October, 1999 external NDE ultrasonic thickness test results and prior results are listed in Appendix TK-106-1.

The top estimated as-built thickness was 0.250 inches. The four latest readings each show decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.206 inches which is 167% of the minimum (0.123 inches) recommended by the UL-142 standard.

The wall estimated as-built thickness was 0.313 inches. The twenty-eight latest readings show little change in average thickness compared to the 2000 ultrasonic thickness results. The minimum reading was 0.220 inches which is 132% over the minimum of 0.167 inches recommended by the UL-142 standard.
A review of external readings from October, 1999, November 2000, December 2001 and December 2002 for twelve locations shows an average decrease of 0.007 inches with a maximum decrease of 0.025 inches.

The bottom estimated as-built thickness was 0.375 inches. The four latest readings show decreases in thickness compared to the 2000 ultrasonic thickness readings. The minimum reading was 0.301 inches which is 125% of the minimum recommended by the UL-142 standard. The average reading of four readings was 0.305. A review of external readings from October 1999 and December 2001 shows an average minor decrease with a maximum decrease of 0.018 inches.

For tank evaluations, modifications and calculations, see certification reports by Mr. Lee F. Mount, PE. dated January, 1995 and May 23, 1995 in Appendix TK-106-2.

For tank nozzle orientation and description, see Appendix TK-106-3.

For Tank T-106 supports evaluation, see calculations by Mr. Peter J. Bernes, SE, dated January 19, 1995 in Appendix TK-106-4.

Therefore, I certify that after visual inspection, the tank is structurally sound, properly supported and set. No evidence of cracks, bulging, corrosion pits or scales. The poor weld should be corrected before use. No other weld defects were observed. Based on my inspection, the tank can be used for the intended purpose.

Very truly your,

MECA Engineering Corp. of America

Kenneth D. Spaulding
Licensed Professional Engineer
Illinois License No. 62-44249, Expiration Date

KENNETH D. SPAULDING
62-44249
REGISTERED
PROFESSIONAL
ENGINEER
OF
STATE OF ILLINOIS

Marie Vanagas
Hoyer-Schlesinger-Turner, Inc.
300 West Adams Street
Chicago, ILL. 60606

Subject: Clean Harbors of Chicago, Inc.
CWM Tank Farm

Enclosure: 1) Review and Assessment of Structural Integrity of Existing Tanks; LFMount Report dated January 1995

Dear Ms Vanagas,

In response to Clean Harbors' request, enclosure 1) is herewith forwarded for your information and records.

Yours truly,

Lee F. Mount

Lee F. Mount

REVIEWED BY
Peter J. Bernes
PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3059
MY LICENSE EXPIRES ON 11.30.96

APPENDIX TK-106-1

APPENDIX TK-106-1

ULTRA SONIC THICKNESS TESTING
T-106

November 28, 2000

INTERNAL

TOP

East	South	West	North
.196	.220	.200	.200

SHELL

.266	.280	.236	.234
.248	.248	.252	.250
[illegible]	.264	.266	.266

BOTTOM

.344	.336	.332	.334

Calumet Testing Services
1945 N. Griffith Blvd.
Griffith, Indiana 46319
(219) 923-9800 — (708) 474-5860

THICKNESS TESTING REPORT

CTS JOB # 3143

PAGE NO. 2 OF 2

Customer	Location	Surface Condition	Date
Clean Harbors, Inc.	Chgo, IL	As Rolled	12-13-2002

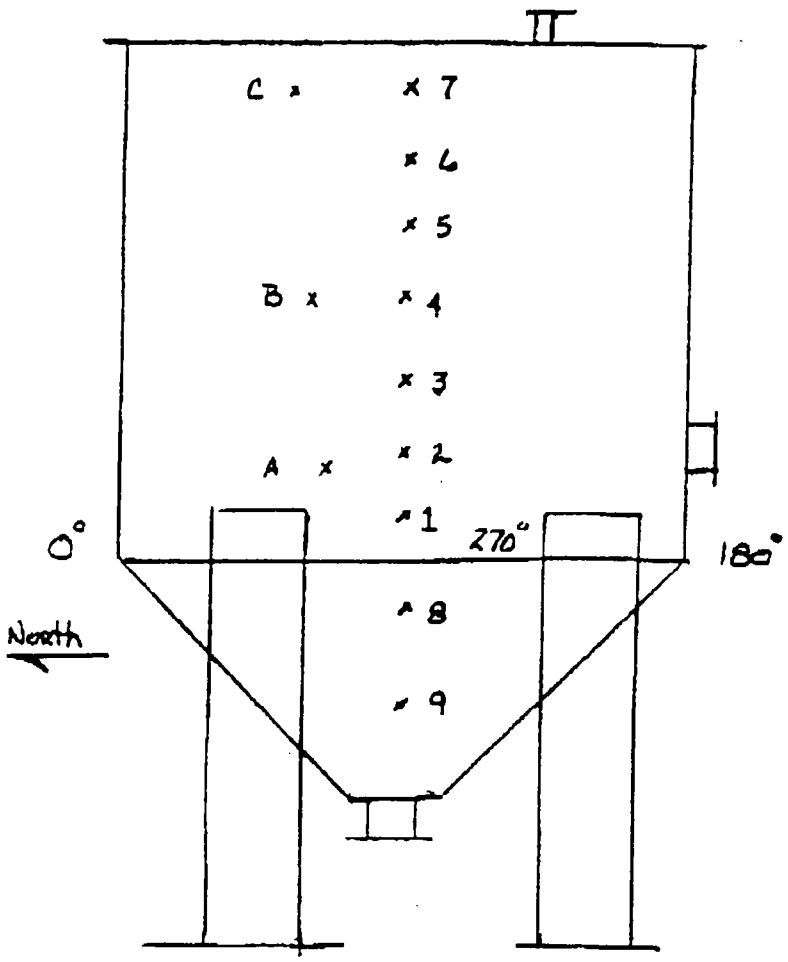
Meter Model, Serial No.	Couplant	Transducer Model, Serial No.
Krautkramer DM-2E	Grease	3/8" ϕ

This report is made with the limitations of ultrasonic testing equipment.
Errors will occur in reported thickness if the material contains internal discontinuities or the contact surface is rough.

Tank #106

Internal

	0	90	180	270	
1	.250"	.220"	.256"	.235"	
2	.262"	.234"	.244"	.251"	
3	.249"	.252"	.238"	.243"	
4	.248"	.250"	.236"	.251"	
5	.256"	.265"	.249"	.263"	
6	.268"	.260"	.264"	.265"	
7	.264"	.259"	.260"	.273"	
8	.325"	.240"	.242"	.251"	Bottom
9	.354"	.258"	.357"	.336"	



	0	90	180	270
A	.234"	.244"	.242"	.251"
B	.251"	.248"	.261"	.265"
C	.268"	.273"	.264"	.270"

External

Examiner [signature] II 12-13-2002
Signature Level Date

Customer Review [signature]
Signature Date

APPENDIX TK-106-1

ULTRA SONIC THICKNESS TESTING
T-106

October 21, 1999

EXTERNAL

[illegible]	South	West	North
[illegible]	.184	.194	.162
SHELL			
[illegible]	.280	.276	.276
[illegible]	.246	.260	.276
[illegible]	.248	.252	.244
BOTTOM			
[illegible]	.356	.344	.346

T106
External Ultrasonic Thickness Measurements

	Nov-00	01-Dec
Cone		
N	0.334	0.334
S	0.336	0.342
E	0.334	0.326
W	0.332	0.326
Shell		
Lower		
N	0.234	0.231
S	0.234	0.238
E	0.24	0.248
W	0.236	0.242
Middle		
N	0.25	0.248
S	0.248	0.242
E	0.248	0.25
W	0.252	0.25
Upper		
N	0.266	0.294
S	0.264	0.294
E	0.266	0.292
W	0.266	0.278
Top		
N	0.2	0.206
S	0.22	0.216
E	0.190	0.206
W	0.2	0.212

CLEAN HARBORS OF CHICAGO, INC.

CWM TANK FARM

EXISTING TANK STATUS FORM

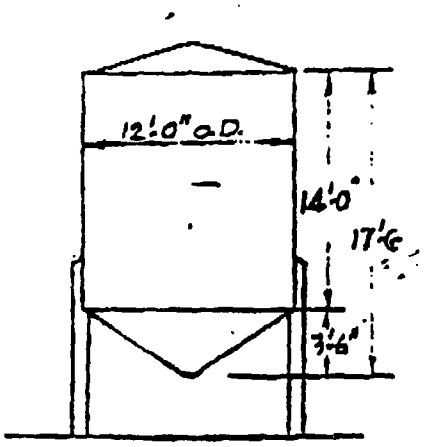
Tank No. T-106

Nominal Capacity 12,000 gals.

Mat'l. of Const. CARBON STEEL

Approx. Year of Build 1981

Designed Corrosion Allow. 1/16"



Stored Waste Characteristics:

	Past	Future
Specific Grav.	1.5 (design)	0.5 → 1.5
Class	NFPA CLASS 2	HAZARDOUS WASTE FUELS
	LEAN WATER	(NFPA CLASS 1-3 LIQUIDS)

Material Thicknesses (Inches):

Surface	per UL-142 Std.	As Built A	Ultrasonic Test Results 08/89 B Avg.	08/89 B Min.	10/91 C Avg.	10/91 C Min.
Top	0.123	0.250	0.250	0.247	0.252	0.250
Shell	0.167	0.313	0.304	0.301	0.295	0.278
Bottom	0.240	0.375	0.381	0.378	0.394	0.387

NOTES:

A. FROM STRAUBING, RUBIN & KENES DESIGN DWG. 1-Q-002

B. FROM ALPHA CONSULTANTS JAN. '90 RPT.

C. FROM SIRRINE ENVIR. CONSULTANTS NOV '91 RPT.

APPENDIX TK-106-2

1785

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

23 May 1995

Mr. Alan F. Mount, Project Manager
Clean Harbors of Chicago, Inc.
11800 S. Stony Island Avenue
Chicago, Illinois 60617

Subject: CWM Tank Farm
Tank Agitator Mounting and Nozzle Details

Enclosure: 1) Design Calculations and Fabrication Details
(10 sheets, original issue date 14 March 1996)

Dear Alan,

Enclosure 1) is submitted herewith for your information and records. Sheet nos. 1, 5, 6 & 9 have been updated and revised where necessary to reflect your actual "as built" conditions.

Yours truly,

Lee F. Mount

Lee F. Mount

Reviewed by:

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-96

LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANK FARM
SHEET NO. COVER OF
CALCULATED BY L.F. MOUNT DATE 14 MAR '95
CHECKED BY REV. DATE 17 MAR. '95.
SCALE FINAL ISSUE TO REFLECT "AS BUILT" CONDITIONS 22 MAY '95

THE ENCLOSED CALCULATIONS AND FABRICATION DETAILS WERE CARRIED OUT IN SUPPORT OF CURRENT TANK UPGRADES PROPOSED FOR THE CLEAN HARBORS, CHICAGO STONY ISLAND FACILITY. AN OVERALL REVIEW AND ASSESSMENT OF THE STRUCTURAL INTEGRITY OF THESE EXISTING TANKS WAS COVERED IN A REPORT BY THE UNDERSIGNED DATED JAN. 1995. THIS REPORT ADDRESSES THE FITTING OF NEW TANK AGITATORS AS WELL AS ADDITIONAL NOZZLES.

CONTENTS

DESCRIPTION	SHEET NO.
SKETCH OF AGITATOR MOUNTING FLANGE (FOR TANKS 105, 106, 107	1
REFERENCES 109, 110, 112)	2
ESTIMATE OF STRESS DUE TO BENDING MOMENT @ FLANGE	2
ESTIMATE OF STRESS DUE TO TORQUE @ FLANGE	3
ESTIMATE OF STRESS DUE TO AGITATOR VERTICAL LOAD	3
CHECK OF LOADED TANK SUPPORT LEGS W/AGITATOR VERT. LOAD	4
TYPICAL PROPOSED 4" NOZZLE INSTALLATIONS	5
BAFFLE PLATE DESIGN REQ'MTS.	6
CHECK TANK INTEGRITY FOR OPERATION WITH 1.0 PSIG VAPOR PRESS.	7-8
SKETCH OF MODIFIED AGITATOR MOUNTING FLANGE (FOR TANKS 103 + 104)	9
TABULAR SUMMARY OF AGITATOR SPECS. + TANK PROPERTIES	10

PREPARED BY Lee F. Mount
LEE F. MOUNT
14 MARCH 1995

COMMONWEALTH OF MASSACHUSETTS
LEE FORREST MOUNT
21193
REGISTERED
PROFESSIONAL ENGINEER

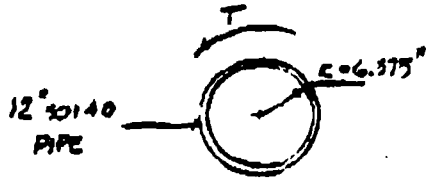
LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/GHI TANK AGITATORS
SHEET NO. 3 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR 95
CHECKED BY DATE
SCALE

ESTIMATE SHEAR STRESS DUE TO TORQUE

$T = 4274$ FT-LBS $\times 12 = 51288$ IN-LBS

$\text{FORCE} = \frac{T}{r} = \frac{51288 \text{ IN-LBS}}{6.375''} = 8045$ LBS



$\text{CIRCUM.} = 2\pi(r) = 40''$

$\therefore \text{LOAD}/'' \text{ OF CIRCUM.} = \frac{8045}{40} = 201$ LBS/IN

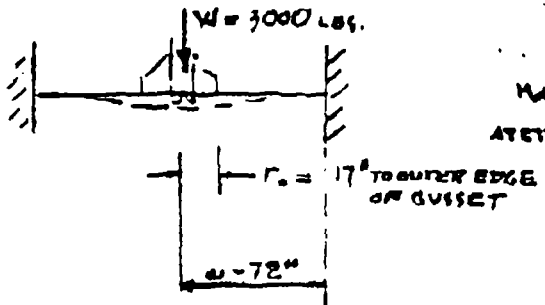
SAY TORQUE IS CARRIED BY 3/8" FILLET WELD @ REINF. PAD TO NOZZLE CONNECTION

ALLOWABLE WELD LOAD = 11,200(.375) = **4200 LBS/IN > 201 OK**

CONSERVATIVE IN THAT LOWER TANK TOP TO NOZZLE FULL PENETRATION WELD HAS NOT BEEN TAKEN INTO ACCOUNT.

ESTIMATE STRESS DUE TO VERTICAL LOAD

FROM REF. 3 / PG 218, CASE 7 ASSUMES FLAT CIRCULAR PLT., EDGES FIXED, UNIFORM LOAD OVER CONCENTRIC CIRCULAR AREA OF RADIUS r_o



$$\text{MAX } S_r \text{ AT } r_o = \frac{3W}{2\pi m t^2}\left[(m+1)\log\frac{a}{r_o} - (m+1)\frac{r_o^2}{4a^2}\right]$$

WHERE: W = 3000 LBS
t = .25 + .50 (REINF PAD) = 0.75" (FOR TANK No 112)
m = 3.33
a = 72"
r_o = 17"

$$\text{MAX } S_r = \frac{3(3000)}{2\pi(3.33)(.75)^2}\left[4.33\log 4.235 - 4.33(.0149)\right]$$

$= 765\,(6.29 - .06)$

$= \boxed{4827 \text{ PSI}}$

CONCLUDE: COMBINING STRESS DUE TO BENDING (5971) + STRESS DUE TO VERT. LOAD (4827) = 10,798 PSI

API 650 GIVES ALLOW STRESS OF 20,000 PSI FOR ASTM A285-C STEEL

THUS, THE STRESS DUE TO EXTERNAL LOADS IS APPT. 54% OF ALLOWABLE WHICH APPEARS TO BE REASONABLE

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JOB CWM/CHI TANK AGITATOR & NOZZLE INSTALL
SHEET NO. 2 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. '95
CHECKED BY DATE
SCALE

REFERENCES: 1) CHEMINEER AGITATOR DESIGN SYSTEM SPEC. SHEETS
2) UL-142, STEEL ABOVE GROUND TANKS
3) FORMULAS FOR STRESS & STRAIN, ROARK 4TH ED. 1965
4) API-650 WELDED STEEL TANKS FOR OIL STORAGE
5) CHEMINEER IOM MANUAL PG. 4-9 JUNE '93
6) ASME SECT VIII PRESSURE VESSEL CODE

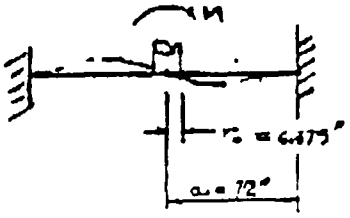
CHECK REINFORCED TANK TOP FOR AGITATOR LOADINGS

ASSUMPTIONS: LOADINGS - USE 15 HP TYPE C UNIT FOR MAX. BENDING MOMENT OF 5036 FT-LBS & TORQUE OF 4274 FT-LBS

- USE 5 HP TYPE B UNIT FOR MAX. VERTICAL LOAD OF SAY 3000 LBS

ESTIMATE STRESS DUE TO BENDING MOMENT

FROM REF 3) PG. 219, CASE 10 MOMENT FLAT CIRCULAR PLT, EDGES FIXED, CENTRAL COUPLE



$$\text{MAX } S_r \text{ AT } r = r_o = \frac{3M}{4\pi t^2 r_o}\left[1 + \left(\frac{m+1}{m}\right)\log\frac{2(.45a - r_o)}{.45ka}\right]$$

WHERE: $k = \frac{0.1a^2}{(r_o + .28a)^2} = \frac{0.1(72)^2}{[6.375 + .28(72)]^2}$

$= 0.736$

$M = 5036 \text{ FT-LBS} \times 12 = 60432 \text{ IN-LBS}$

$t = .25 + .625 = 0.875''$ (REINF PAD)

m = RECIPROCAL OF POISSON'S RATIO $= \frac{1}{.3} = 3.33$

$a = 72''$

$r_o = 6.375''$

$$\text{MAX } S_r = \frac{3(60432)}{4\pi(.875)^2(6.375)}\left[1 + 1.30\log\frac{2[.45(72) - 6.375]}{.45(.736)(72)}\right]$$

(2.183)

$= 2956\,[1 + 1.3(.781)]$

$= 2956\,(2.02) = \boxed{5971 \text{ PSI}}$

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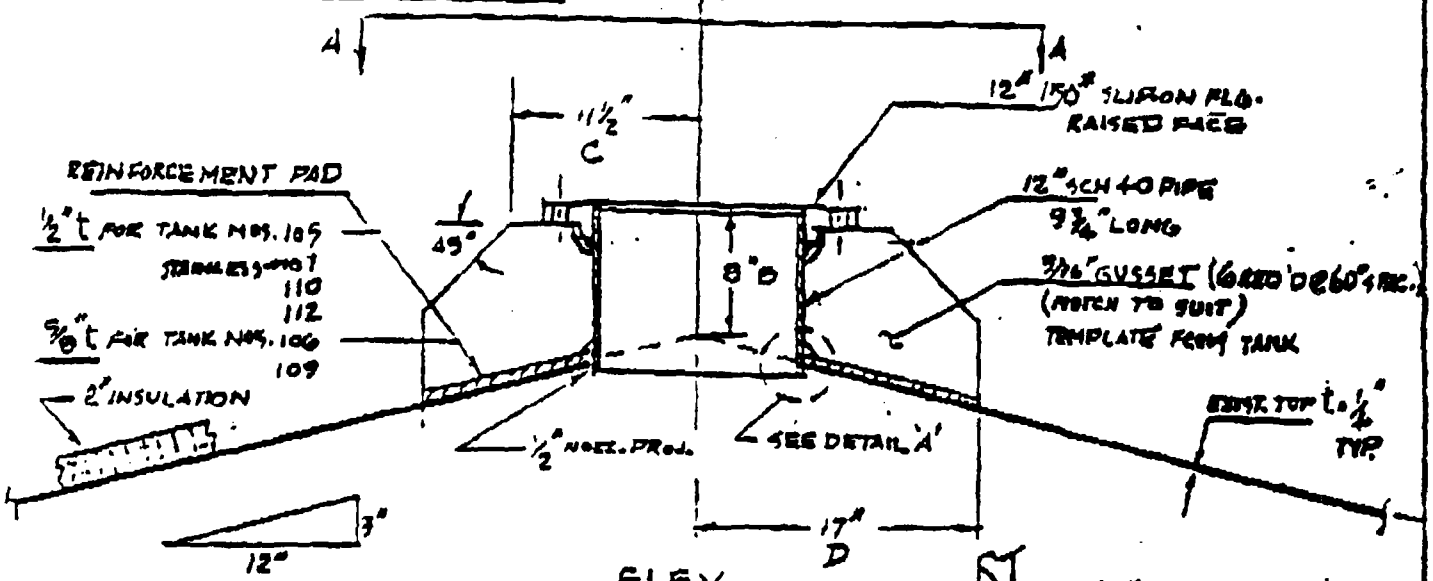
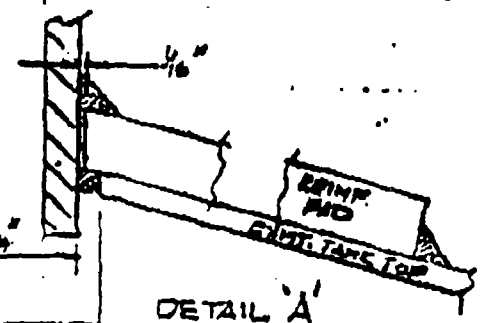
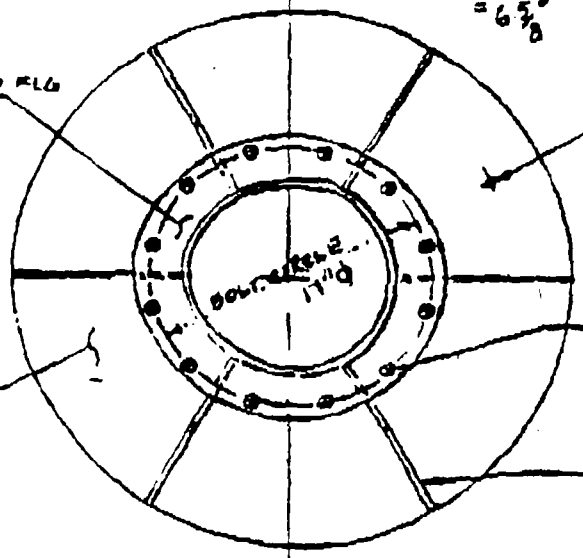
JOB CWM/CHI TANK AGITATORS
SHEET NO. 1 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. '95
CHECKED BY REV. DATE 17 MAR. '95
SCALE 1" = 1'-0" & AS NOTED 22 MAY '95
"AS BUILT"

NEW MOUNTING FLANGE FOR TANK NOS. 105, 106, 107, 109, 110 & 112





DETAIL 'A'
(HALF SIZE)
PER UL-142 FIG. 11.2



REINFORCEMENT PAD
(FIT TO TANK TOP SLOPE)
PROJECTED O.D. = 34"
I.D. = 12.875"
SEE NOTE IN ELEV. FOR t

PLAN A-A

FROM: CLEAN HARBORS FAX NO.: 7736466381

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Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANKS
SHEET NO. 4 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR 95
CHECKED BY DATE
SCALE

CHECK TANK SUPPORT LEGS FOR AGITATOR VERT. LOAD

USE TANK NO 112 (LARGEST TANK + HEAVIEST AGITATOR)

ESTIMATED WEIGHT TO BE SUPPORTED BY 4 LEGS @ L=7.0' SIZE = W8x31

TANK STEEL

CONE TOP (1/4" RT.) LATERAL AREA = BASE CIRCUM x 1/2 SLANT HT.

$= \pi D \times \frac{6.18'}{2}$

$= \pi 12 \times 3.09 = 116.5 \text{ ft}^2 \times 10.2 \text{ \#/ft}^2 = 1188$ LBS.

SHELL (3/16" RT.) AREA = $\pi D H$

$= \pi 12 \times 22 = 829.4 \text{ ft}^2 \times 12.75 \text{ \#/ft}^2 = 10575$ LBS.

CONE BOTTOM (3/8" RT.) LATERAL AREA = BASE CIRCUM x 1/2 SLANT HT.

$= \pi D \times \frac{6.99}{2}$

$= \pi 12 \times 3.48 = 131.2 \text{ ft}^2 \times 15.7 \text{ \#/ft}^2 = 2007$ LBS.

AGITATOR WEIGHT ——— 3000 LBS

SUBTOTAL 16770 LBS

ADD 20% FOR MISC. PIPING, PLATFORMS INSULATION, ETC. ——— 3350 LBS

LIQUID CONTENTS @ S.G. = 1.5 CAP. = $\frac{20{,}000 \text{ GAL.}}{7.48 \text{ GAL/CU FT}}$ = 2674 CU FT x 62.4 x 1.5 = 250,286 LBS

TOTAL ESTIMATED WT. TO BE SUPPORTED = 270,406 LBS.

USE 276 KIPS

∴ EACH LEG CARRIES $\frac{276}{4}$ = 69 KIPS

FROM AISC COL TABLE @ KL = 2(7) = 14 FOR W8x31 (A36 STL)

SEAD ALLOWABLE LOAD = 137 KIPS > 69 KIPS

CONCLUDE: EXISTING COLUMN SUPPORT IS ADEQUATE FOR CONDITIONS

FROM: CLEAN HARBORS FAX NO.: 7736466381

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Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

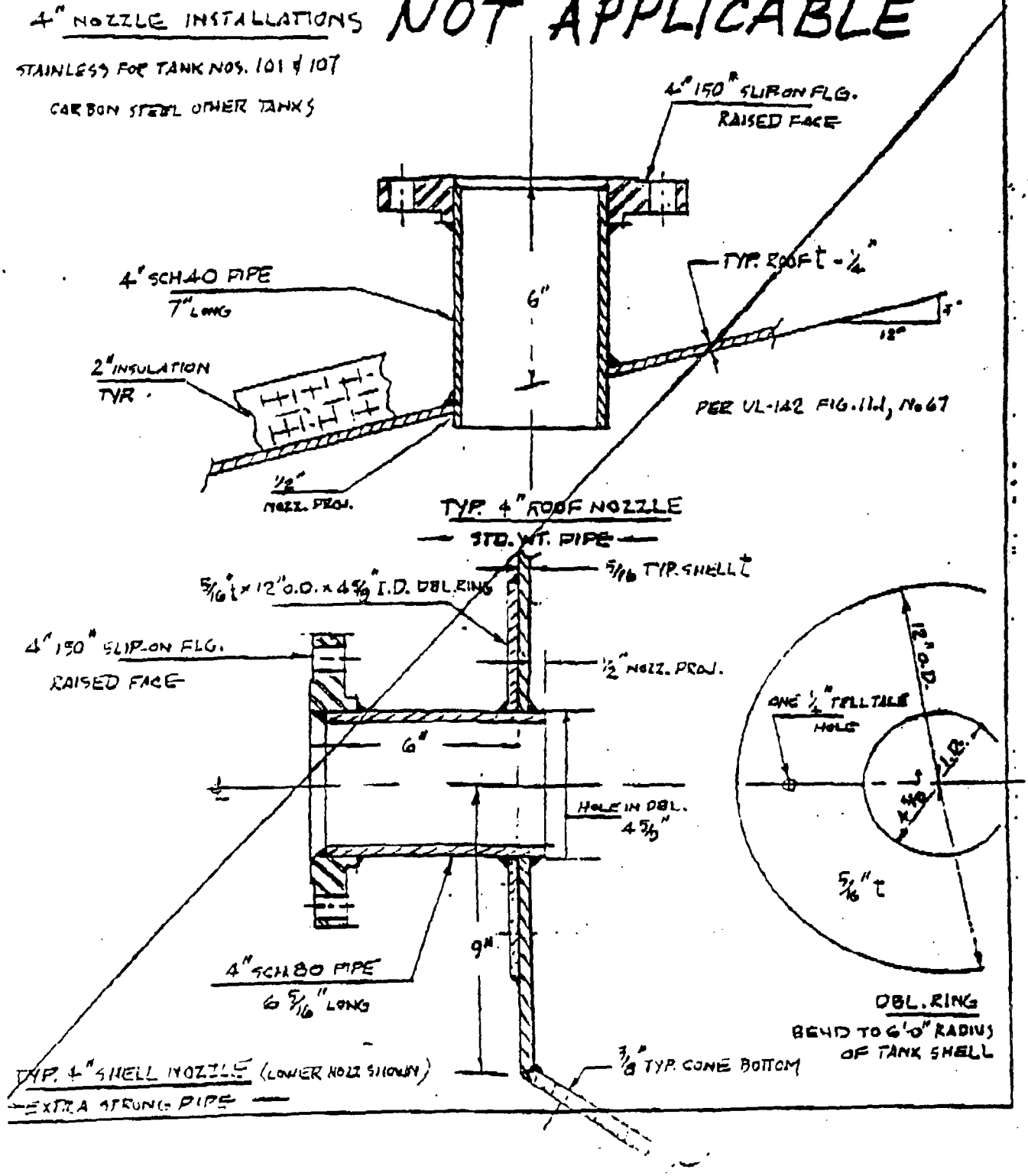
JOB CWM/CHI TANKS
SHEET NO. 9 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR.'95
REV. 15 MAR.95
CHECKED BY DATE
SCALE 3" = 1'-0" 22 MAY'95
"AS BUILT"

NOT APPLICABLE

4" NOZZLE INSTALLATIONS

STAINLESS FOR TANK NOS. 101 & 107

CARBON STEEL OTHER TANKS



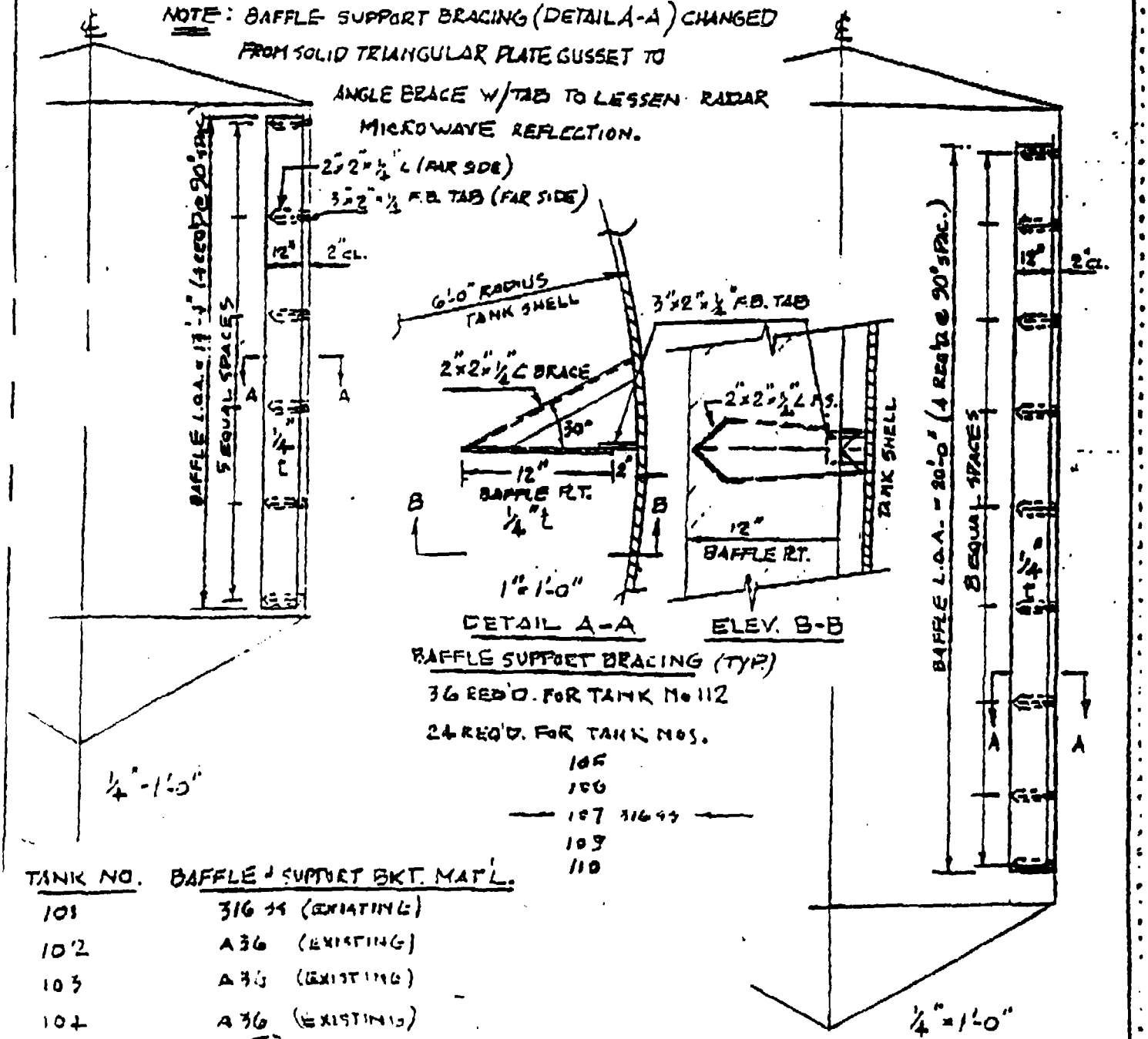
FROM: CLEAN HARBORS FAX NO.: 7736466381

LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB: CWM/CHI TANKS
SHEET NO. 6 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR '95
CHECKED BY DATE REV. 15 MAR '95
SCALE: AS NOTED "AS BUILT" 22 MAY '95

BAFFLE PLATE DESIGN (SIZES AS RECOMMENDED IN REF. 1)

NOTE: BAFFLE SUPPORT BRACING (DETAIL A-A) CHANGED FROM SOLID TRIANGULAR PLATE GUSSET TO ANGLE BRACE W/TAB TO LESSEN RADAR MICROWAVE REFLECTION.



BAFFLE SUPPORT BRACING (TYP.)
36 REQ'D. FOR TANK No 112
24 REQ'D. FOR TANK NOS.
105
106
107 316 SS
109
110

TANK NO.	BAFFLE & SUPPORT BKT. MAT'L.
101	316 SS (EXISTING)
102	A36 (EXISTING)
103	A36 (EXISTING)
104	A36 (EXISTING)
(105)	(A36) NEW
(106)	(A36) NEW
(107)	(316 SS) NEW
(109)	(A36) NEW
~~(110)~~	~~(A36)~~ NEW

TANK No (112)
BAFFLE & SUPPORT BKTS.
A36 STEEL (NEW)

FROM: CLEAN HARBORS FAX NO.: 7736466381

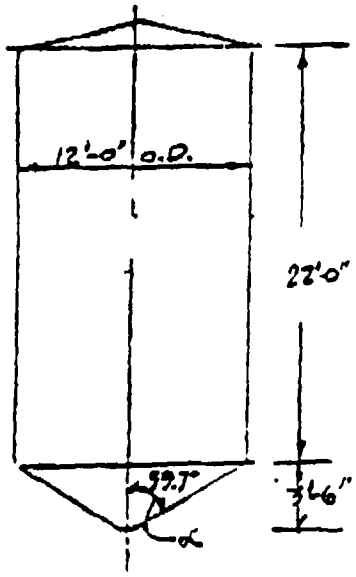
LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANKS
SHEET NO. 7 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. '95
CHECKED BY DATE
SCALE

CHECK FOR TANK SERVICE OPERATION WITH 1.0 PSIG INTERNAL VAPOR PRESSURE (ABT. 24" WATER)

USE TANK NO 112 WHICH HAS GREATEST DEPTH

ASSUME S.G. @ 1.5



MAX PRESSURE @ CONE BOTTOM = $\frac{62.4 \times 1.5 \times 25.5'}{144}$ = 16.6 PSI

PLUS VAPOR PRESSURE 1.0 PSI

17.6 PSI

USE 18 PSI = P

USE ASME SECT VIII - DIV 1, APPENDIX 1 TO DETERMINE MIN. REQ'D PLT. t FOR SHELL & CONE BOTTOM

FOR CYLINDRICAL SHELL:

$t = \frac{PR_o}{SE + 0.4P}$ WHERE: P = 18 PSI

$R_o = \frac{12}{2}(12) = 72''$

$t = \frac{18(72)}{(13800).7 + 0.4(18)}$ S = 13,800 PSI FOR A 285-C STL.

E = 0.7

$t = 0.134'' + .0625''$ (CORR. ALLOW.) $= 0.197$ IN. (UL-142 WOULD REDUCE t = 0.167 IN.)

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS 0.30" > .197" O.K.

FOR CONE BOTTOM:

$t = \frac{PD_o}{2\cos\alpha(SE + .4P)}$ WHERE: $D_o = 144''$, $\alpha = 59.7°$

$= \frac{18(144)}{2\cos 59.7°(13{,}800 \times .7 + .4 \times 18)}$

$= 0.266'' + .0625''$ (CORR. ALLOW) $= 0.329$ IN.

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS .375" > .329 O.K.

LEE F. MOUNT, P.E.
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2 Bay View Avenue
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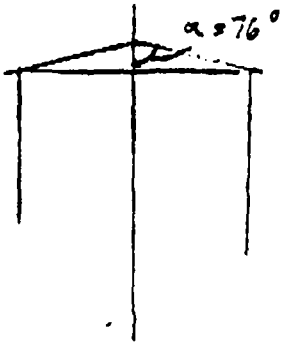
(617) 749-5394

JOB CKM/CHI TANKS
SHEET NO. 8 OF 10
CALCULATED BY L.F. MOUNT DATE 16 MAR. 95
CHECKED BY DATE
SCALE

CHECK FOR 1.0 PSIG INTERNAL VAPOR PRESSURE (CON'D.)

FOR CONE TOP



FROM ASME SECT. VIII - DIV. 1

SOLVE FOR P:

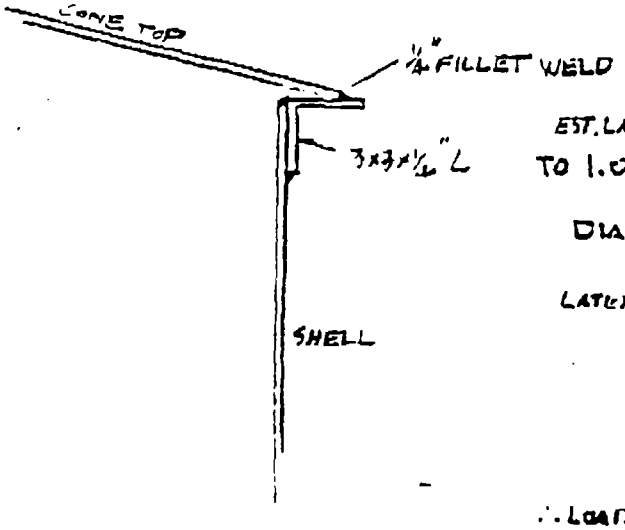
$$P = \frac{2SEt\cos\alpha}{D_o - 0.8t\cos\alpha}$$

WHERE S = 13,800 PSI
E = 0.7
D_o = 144 IN
α = 76°
t = USE .25 - 1/16" CORR ALL. = .1875"

$$P = \frac{2(13{,}800)(.7)(.1875)(.242)}{144 - [.8(.1875)(.242)]}$$

$$= \frac{876.65}{144} = \boxed{6 \text{ PSI} > 1.0 \quad \text{O.K.}}$$

CHECK ROOF TOP CONNECTION WELD DETAIL



EST. LATERAL SURFACE AREA CONE TOP SUBJECTED TO 1.0 PSI PRESSURE

DIA. ≈ 148" (ROOF OVERHANGS SHELL)

LATERAL AREA = BASE CIRCUM. × 1/2 PLANT HT

$$= \pi D \times \frac{76.2''}{2}$$

$$= \pi(148) \times 38.1 = 17{,}715 \text{ IN}^2$$

∴ LOAD TO ROOF = 17,715 IN² × 1 LB/IN² = 17,715 LBS

CIRCUM. OF 1/4" FILLET ATTACHMENT WELD = πD = π(148) = 465 IN

∴ LOAD/IN ON 1/4" FILLET WELD = 17715/465 = 38 #/IN

VS

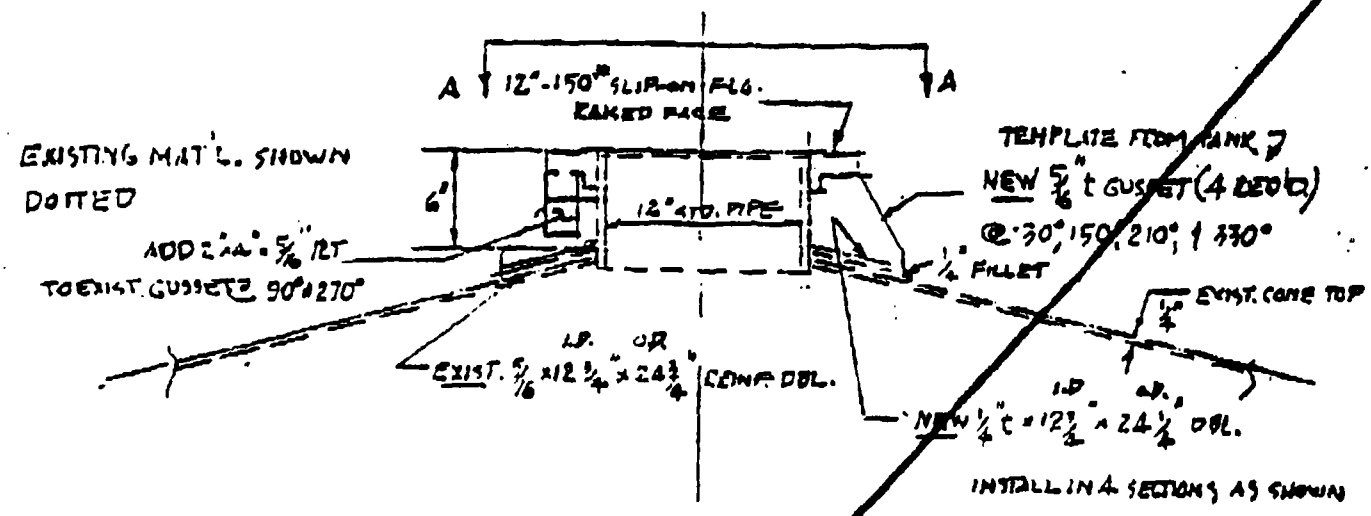
ALLOWABLE WELD LOAD = 11,200 × .25 = 2800 #/IN O.K.

LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

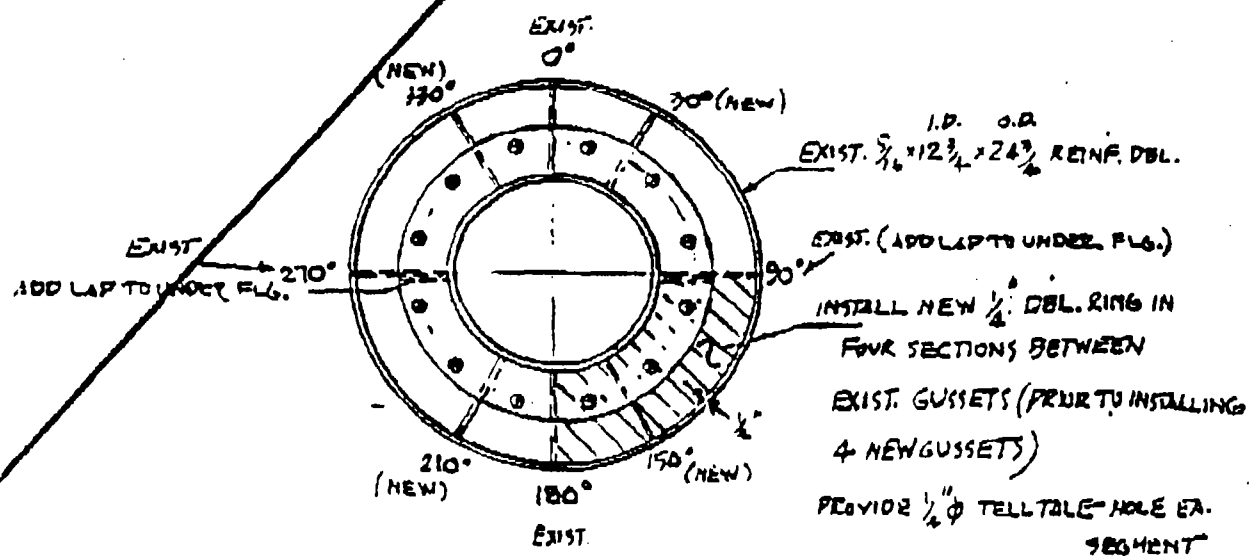
JOB CWM/CHI TANKS
SHEET NO. 9 OF 10
CALCULATED BY L.F. MOUNT DATE 16 MAR '95
CHECKED BY DATE
SCALE 1" = 1'-0" 22 MAY '95

NOT APPLICABLE "AS BUILT"

MODS. TO TANK 103 & 110 EXISTING AGITATOR MOUNTING; TO ACCOMMODATE NEW 7.5 HP UNITS



ELEV.



PLAN A-A

CWM/CHI TANK AGITATORS

	TANK I.D.	AGITATOR SPECS. (FROM REF. 1) TYPE	HP	RPM	SHAFT L IN.	SHAFT DIA. IN.	WT. LBS.	NOZZLE BEND MOM FT-LBS	NOZZLE TORQUE FT-LBS	BAFFLE REQ'D.	CASE SIZE	TANK PROPERTIES TOP HEAD t"	MIN HEAD t" (TBL 3)	NOZZLE SIZE	REINF PAD DIMENS. B (TB 2)	C	D FIG 3	
EXISTING AGITATED TANKS	101 S.S.	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST)	2	.313 S.S.		12" EXIST				
	102	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.250		12" EXIST				
	103	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST)	4	.250	.500 .3125	12" EXIST.	8" 6"	11.5" 9.5	17" 12.375	ACTUAL
	104	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST)	4	.241	.500 .3625	12" EXIST.	8" 6"	11.5" 9.5	17" 12.375	ACTUAL
	105	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"	
	106	C NEW	15	45	190.5	3.5	2745	5036 MAX.	4274 MAX.	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"	
	107 S.S.	EXIST. FROM 102	3.0							YES (NEW)	2 DESIGN REQ'D	.250 S.S.	.500	12"	8"	11.5"	17"	
	109	C NEW	15	45	190.5	3.5	2745	5036	4274	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"	
	110	EXIST. FROM 104	3.0							YES (NEW)	2 DESIGN REQ'D	.250	.500	12"	8"	11.5"	17"	
	112	B NEW	5	30	270.0	3.5	2812 MAX.	2898	12337	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"	

NO CHANGE

MODIFY (SIZE) EXISTING (SHT 1)

NEW

FROM ULTRASONIC TEST RESULTS

REINF. PAD t FROM REF. 5

SHT 10 of 10

REV. 15 DEC 95

TANK MOUNT

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

RECEIVED
JUN 20 1995
HOVER-SCHLESINGER-TURNER, INC.

18 June 1995

INTRODUCTION

This report was prepared in response to the Illinois EPA's request for additional information on the structural condition of the existing hazardous waste storage and/or fuel tanks scheduled for reuse at your CWM Tank Farm.

The work scope involved a technical review of all available tank related documents furnished by Clean Harbors. Pertinent data was then summarized and tabulated for each tank on a "Existing Tank Status Form". The ultrasonic test measurements for thickness, shown on the status forms, were then analyzed in order to make estimates of corrosion rates and projected service life.

Reference documents consulted during the course of this study include:

* RCRA Tank Assessment - Tank Farm System, prepared for CWM Chemical Services Inc. by ALpha Consultants, Ltd. Jan. 1990

* Tank System Inspection, prepared for CWM Chemical Services Inc. by Sirrine Environmental Consultants Nov. 1991

* Straubing, Rubin & Kenes, Inc. Tank Design Drawings

* Imperial Steel Tank Co. Fabrication Drawings

* Supplemental ultrasonic thickness measurements taken on stainless steel Tank No. T-101 on 23 January '95 by MOS Inspection, Inc. (raw data)

TANK GENERAL DESCRIPTIONS AND HISTORY

The ten (10) existing tanks, numbered T-101 to T-107, T-109, T-110, & T-112, are 12 ft. dia. vertical, cone bottomed, leg supported, above ground, insulated tanks.

Tank T-112 has a nominal capacity of 20,000 gals. All other tanks are of 12,000 gal. capacity each.

Tank nos. T-101 and T-107 are of stainless steel construction. All others are of carbon steel.

The four (4) newer tank nos. T-101 to T-104, fabricated by Imperial Steel Tank Co., were placed in service during 1986. The remaining older six (6) tanks date from 1981.

Available records and fabrication drawings for tank nos. T-101 to T-104 indicate they were built to the Underwriters Laboratories, Inc. Standard UL-142 for steel above ground tanks and were to be labeled as such. The published UL-142 Standards "do not cover vertical tanks that are elevated by means of legs" and are not intended for liquids having a specific gravity exceeding that of water. In order to satisfy these exceptions, it was necessary for Imperial Steel to apply for Underwriters Lab review and inspection to obtain the UL Listing for these cone bottomed above ground steel tanks on legs.

The Imperial fabrication drawings list the following tank design parameters:

Design Pressure = hyrdostatic head due to contents

Design Temperature = 250° F

Specific Gravity = 1.5

Corrosion Allowance = 1/16 "

Although no fabrication drawings were found for the six (6) older tanks, the Straubing, Rubin & Kenes design plans indicate the same material thicknesses for the top, shell, and bottom as shown on the Imperial plans. Since these thicknesses have been further verified by ultrasonic test measurements, it seems reasonable to conclude that these older tanks were also built to the design standards of UL-142.

The most recent ultrasonic thickness measurements include those taken by Alpha Consultants in Aug. '89 and by MQS Inspection in Oct. '91 for the Serrine report.

Alpha Consultants conducted visual internal inspections on all tanks (except T-110, which was in service) in early Dec. '89 and an external site inspection on 3 Jan. '90. Serrine Environmental Consultants conducted a visual site inspection, including all tank externals, in Sept. '91.

SPECIFIC TANK DETAILS

For tabulation of existing tank detail design information and summary of lateest ultrasonic thickness measurements, refer to the tank status form provided in Appendix A for each of the ten (10) tanks.

PROJECTED SERVICE LIFE

The following table summarizes results of calculations undertaken to establish corrosion rates, based on past service, in order to predict an expected service life for the eight (8) carbon steel tanks. For calculation details, refer to Appendix B.

Surface	Estimated Corrosion Rate	Estimated Retirement Thickness	% of "as built" Thickness Remaining at Retirement	Projected Life as of 1995
Tank Top T-110	2.5 Mils/yr	0.156"	52%	24 yrs.
Side Shell T-105&T-112	3.6 Mils/yr	0.188"	60%	21 yrs.
Cone Bottom T-102	3.0 Mils/yr	0.291"	71%	28 yrs.

NOTE:
The following assumptions were used in the development of this table:

Corrosion rates for the tank top and shell surfaces were arrived at by subtracting the lowest recorded minimum ultrasonic thickness reading to date from the "as built" thickness and then dividing by the tank age at time of thickness reading.

In arriving at an estimated corrosion rate for the bottom cone surface, it was found necessary to develop an adjusted "as built" thickness. This was required since the average recorded bottom thickness measurement for all tanks, and in most cases the minimum value also, exceeded the 0.375" thickness shown on the fabrication drawing. The "as built" thickness was therefore adjusted to 0.392" to more accurately reflect the ultrasonic readings which ten years later were giving averages and minimums greater than 0.375".

INSPECTION/TESTING PLAN PRIOR TO REUSE

In order to assess each tank's internal condition, material thickness, and integrity prior to being placed back in service, it is planned to do the following, once the tank has been found safe for man-entry:

* Conduct an initial visual inspection by a tank experienced technician in company with a registered professional engineer to determine general tank condition. A standard check list, similar to that used by Alpha Consultants for Tank T-107 and shown in Figure 1 will be used as a guide and for recording findings. Suspicious areas will be noted for a more rigorous inspection and scheduled for ultrasonic measurement if deemed necessary.

* Since these tanks are insulated, past ultrasonic readings taken from the tank exterior have been limited to those areas where a removable patch permits direct access to the plate surface beneath. Past surveys have included at each of 4 - 90° quadrants, 1 top point, 3 side points and 1 cone bottom point giving a total of 20 readings/tank. With the tank out of service and clean, it would seem desirable to take additional ultrasonic thickness measurements from within. The cone bottom and tank height will make this difficult and require a tank ladder or other means to reach the underside of the top plate.

* It is recommended that a minimum of 12 readings each be taken in a + pattern on the top and bottom surfaces. For the shell at mid-height, a girth sample of about 20 points around the circumference is desirable. Finally, a vertical row sample, top to bottom, of about 10 points at a location determined from the visual inspection to be most worthy of further exploration, should provide more than enough data to verify the existing surface thicknesses and to form a base for comparison with past and future thickness measurement readings. The ultrasonic test readings are to be taken by personnel qualified and certified as competent to use the test equipment. The test results are to be analyzed by a registered professional engineer experienced in steel tank design and construction.

FIGURE 1

ALPHA CONSULTANTS, Ltd.

CHECKLIST FOR VISUAL INSPECTION OF UNLINED VESSELS

OWNER CWM Chemical Services, Inc.-Chicago Incinerator
TEST SITE 11700 So. Stony Island Ave., Chicago, Il. 60617
DATE OF INSPECTION December 5, 1989
TIME OF INSPECTION 1825
SUPERVISORY ENGINEER Harris E. Dicker, P. E.
PHOTOGRAPHER/TECHNICIAN Robert A. Dicker
TECHNICIAN James L. Eggert

TANK NO. 109 (NO PCB IN TANK)
INTERIOR SHELL MATERIAL CS
CLADDING MATERIAL SST
INSULATION 2" FIBREGLASS SIDES & BOTTOM, 2" COL BLOCK TOP
EQUIPPED WITH MIXER NO

INITIAL ROOF INSPECTION FOR SAFETY

HAZARDS OF FALLING OBJECTS NONE
VISIBLE CORROSION NONE

MORE RIGOROUS INSPECTION OF ROOF & STRUCTURAL SUPPORTS

VISIBLE LOSS OF METAL THICKNESS NONE
VISIBLE CRACKS OR LEAKS AT WELDS NONE
VISIBLE CRACKS AT NOZZLE CONNECTIONS NONE
MALFUNCTIONING OF ROOF SEALS NONE
VISIBLE DETERIORATION OF WATER DRAIN SYSTEM NONE
CONDUCT HAMMER TESTING NO

TANK SHELL

VISIBLE CRACKS AT SEAMS NONE
VISIBLE CORROSION AT VAPOR SPACE/LIQUID LEVEL LINE NONE
VISIBLE CRACKING OF PLATE JOINTS NONE
VISIBLE CRACKING OF NOZZLE CONNECTION JOINTS NONE
VISIBLE LOSS OF METAL THICKNESS NONE

TANK BOTTOM

TYPE OF BOTTOM, SLOPED OR FLAT SLOPED
VISIBLE CORROSION PITS NONE
VISIBLE CRACKED SEAMS NONE
TYPE OF CONNECTION TO SIDEWALL, WELDED OR RIVETED WELDED
VISIBLE TIGHTNESS AT CONNECTION NONE
VISIBLE DEPRESSIONS IN BOTTOM AREAS AROUND OR UNDER ROOF OR PIPE SUPPORTS NONE
VISIBLE LOSS OF METAL THICKNESS NONE
VISIBLE UNEVENESS OF BOTTOM NONE
CONDUCT HAMMER TEST NO
VISIBLE BULGES, BLISTERING OR SPALLING NONE
WAS ULTRASONIC TESTING OF TANK WALLS, ETC. CONDUCTED YES

Source: OSWER Policy Directive No. 9483.00-1
Modified Version of Table 4-7, Page 4-35
"Permit Writer's Guidance for Hazardous Waste Tanks" U. S. EPA Contract 68-01-6515
(undated draft) pp 8-10.

SUMMARY DISCUSSION

Projected Service Life - The projected useful service life for the eight (8) carbon steel tanks is estimated to be on the order of 20 years from today.

- The projected service life for the two (2) stainless steel tanks (T-101 & T-107) is estimated to be more than 20 years as evidenced by the ultrasonic thickness readings which indicate little, if any significant material loss as of '91.

- These projected service life estimates are believed to be conservative in that minimum point readings, rather than average readings, were used to establish the corrosion rates. Furthermore, the projected service life calculations assume that corrosion has continued at the same rate during the past 3 years when the tanks have been out of service.

- These estimated rates can be expected to remain in effect so long as the future stored waste product corrosivity characteristics are compatible with and do not differ significantly from those products stored in the past. Also, the integrity of the external insulation cladding material must be maintained to prevent exterior corrosion from the weather.

- It is anticipated that these tanks, once returned to service, will be ultrasonically tested on an annual basis, at which time these estimated corrosion rates should be reviewed and modified if necessary to suit existing service conditions.

Type of Wastes Stored - The individual tank status forms, Appendix A, list the typical types of waste products stored in past service as well as those planned for future operations. Before any wastes are stored, the facility management is required to assess the compatibility of the waste with (1) the storage unit materials of construction and (2) the wastes being presently stored.

Conclusion - Based on a detailed technical review of the page 1 referenced documents, it is my opinion that the ten (10) existing tanks proposed for reuse at the CMM Tank Farm are structurally sound, free from leaks, and exhibit sufficient material thickness, as determined by ultrasonic measurements. They appear to meet applicable design guidance standards and the past visual inspection reports indicate them to be substantially free from corrosion. Therefore, it is my opinion that the existing reported condition and structural integrity of these storage tanks demonstrate suitability for continued service.

CERTIFICATION

"I certify, under penalty of law, that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately 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 possible fines and imprisonment"

Registered Professional Engineer

Name: Lee F. Mount

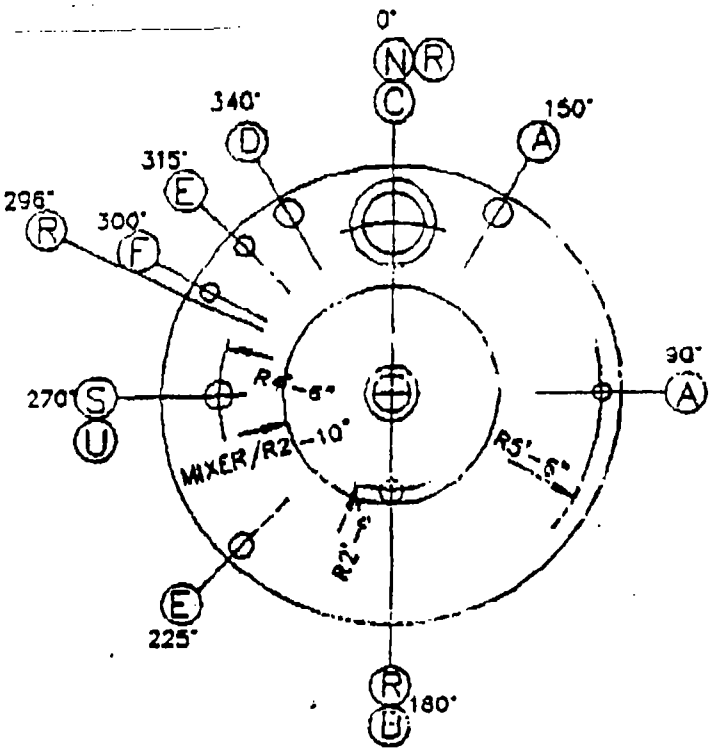
Signature: Lee F. Mount

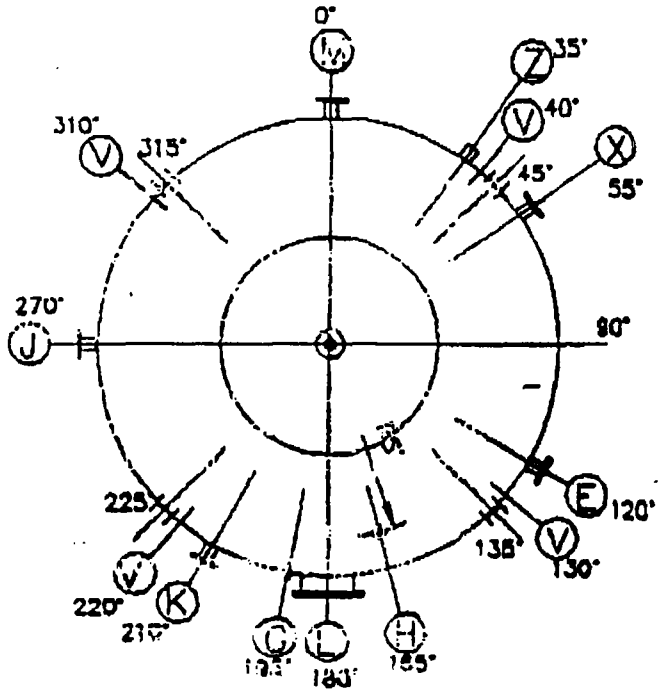
Date: 24 January 1995

Massachusetts Registration No: 21193

COMMONWEALTH OF MASSACHUSETTS
LEE FORREST MOUNT
21193
REGISTERED
PROFESSIONAL ENGINEER

APPENDIX TR-106-3





TK-106

MARK	REQD.	SIZE	TYPE	ELEVATION	DESCRIPTION
A	2	2"	150# RFSO	ROOF	NITROGEN BLANKET
B*	1	3"	150# RFSO	ROOF	COV – FA
C	1	20"	150#	ROOF	EMERGENCY VENT
D	1	4"	150# RFSO	ROOF	FILL
E(315)	1	3"	150# RFSO	ROOF	HIGH LEVEL–LSH106
E(225)	1	3"	150# RFSO	ROOF	SPARE
F	1	3"	150# RFSO	ROOF	DPSL106 & DPSH106
G	1	2"	3000# CPLG	12" F/CONE	SPARE
H	1	2"	3000# CPLG	CONE	SAMPLE
J	1	3"	150# RFSO	6" F/CONE	LOW LEVEL–LSL106
K	1	3"	150# RFSO	13" F/CONE	SPARE
L	1	24"	150#	12" F/CONE	MANWAY W/COVER
M	1	4"	150#FB–VALVE	CONE	DRAW–OFF
N*	1	12"	150# RFSO	ROOF	MIXER MOUNT
R	AS SHWN		–	8'–3" F/ROOF	SUPPORT CLIP
S	AS SHWN		–	3'–9" F/ROOF	SUPPORT CLIP
E	1	3"	150# RFSO	6" F/CONE	SPARE
U*	1	4"	150# RFSO	ROOF	LEVEL MONITOR–LT106
V*	4		–	SHELL	BAFFLE
X*	2	4"	150# RFSO	9",6'–6" F/C	DRAW–OFF
Z*	2	2"	3000# CPLG	9",6'–6" F/C	SAMPLE

NOTE: * DESIGNATES NEW NOZZLE

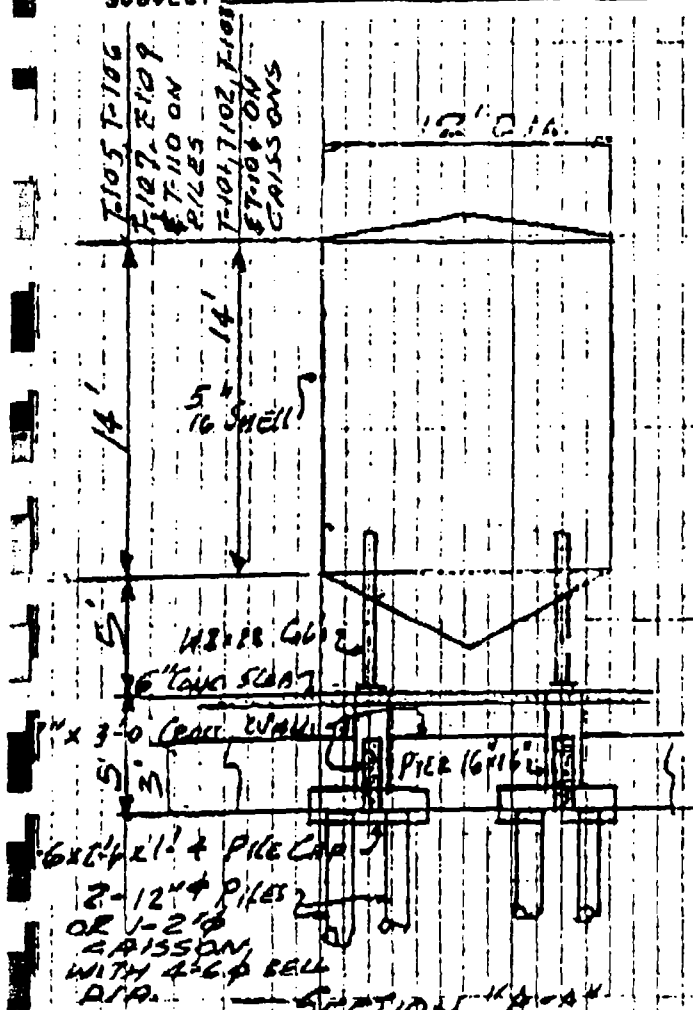
APPENDIX TK-100-4

HOYER-SCHLESINGER-TURNER, INC.

SHEET 2 OF 8
PROJECT NO. 17851
DATE 1.19.95
BY BERNES
CHK. C.K. 1.27.95

PROJECT CLEAN HARBORS - CHICAGO, IL

SUBJECT EXIST. TANK FARM SUPPORT COMPUTATIONS



SECTION "A-A"
SEE SH-1

TANKS T-101 TRU T-107, T-109 & T-110

EMPTY TANK =
$= \pi(12 \times 14' + 12^2/4 + 6 \times \sqrt{3^2 \times 12^2}) \times 12.8 \times 1.05$
$= 11,985 + 4 \text{ LEGS} \times 7 \times 28 = 184$
TOTAL = 12,170#

PLUS NOZZLES, FLANGES AND SUPPORTS
= 7,830#

TOTAL EMPTY TANK = 12,170 + 7,830 =
= 20,000#

LIQUID = 12,100 GAL × 8.33L × 1.5 =
= 151,298#

TOTAL EMPTY + LIQUID =
= 20,000 + 151,298# = 171K

EACH LEG = 171/4 = 43K/LEG

CONCRETE + SNOW

PILE CAP = 4.5 × 2.5 × 1.33 × .15	= 2.25K
PIER 1.33 × 1.33 × 5 × .15	= 1.33K
CROSS WALLS 3 × .67 × 16 × .15	= 4.82K
FILL 4.5 × 2.5 × 3.5 × .10	= 3.94K
6" CONC SLAB = 4.5 × 2.5 × .5 × .15	= .84K
SNOW $\pi R^2 \times 25^{\#}$	= 2.83K
	16.01 K/LEG

TOTAL LOAD PER LEG ON PILES
= 43K + 16K = 59K

TWO 2-12"φ WOOD PILES = 20 TON CAP. EACH
= 2 × 40K = 80K > 59K O.K.

CAISSON CAP = $\pi \times R^2 \times 9^K = \pi \times 2.25^2 \times 9 = 143^K > 59^K$ O.K.

APPENDIX TK-106-5

H·S·T

HOYER-SCHLESINGER-TURNER,Inc.
ENGINEERS-ARCHITECTS
3074 University Ave.
Highland Park,IL 60035
Phone:847-461-0470 Fax:847-266-9829

December 6, 2000

Mr. Mark A. Schollenberger, P.E.
Illinois Environmental Protection Agency
Bureau of Land - Permit Section
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Re: Certification of Repairs Inspection Report
Tanks 105 and 106
Clean Harbors Services, Inc.
ILD000608471

Dear Mr. Schollenberger:

On November 28, 2000 I visually inspected Tanks 105 and 106. Both tanks had developed cracks to the agitator nozzles which had been repaired. Additional reinforcement has also been added to the nozzles. I find that the repairs are satisfactory and the repairs to Tanks 105 and 106 are capable of handling hazardous wastes without release for the intended life of the tanks.

Very truly yours

Hoyer-Schlesinger-Turner, Inc.

Peter J. Bernes

Peter J. Bernes
Illinois #3959

STATE OF ILLINOIS
PETER J. BERNES
3959
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3959
MY LICENSE EXPIRES ON 12.6.00

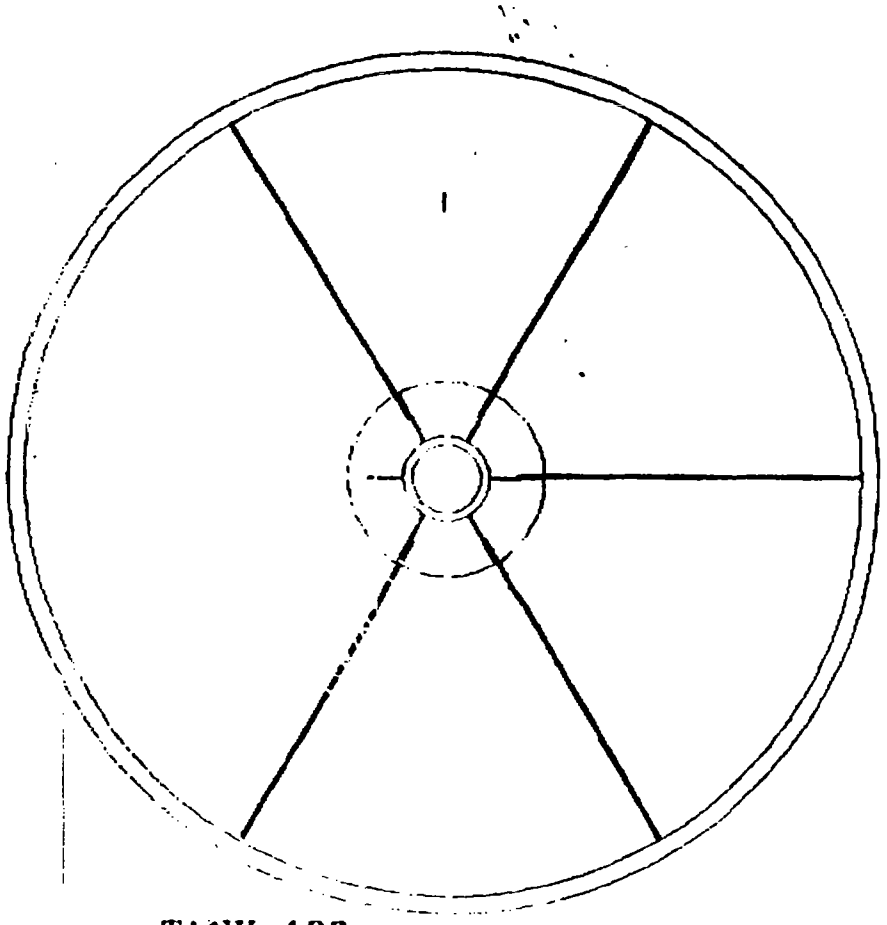
I hereby certify that I, the undersigned am a Professional Engineer, licensed to practice in the State of Illinois. I have reviewed the Certification of Repairs Inspection Report for Tanks 105 and 106 for Clean Harbors Services, Inc.

I certify under penalty of law that this document was 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.

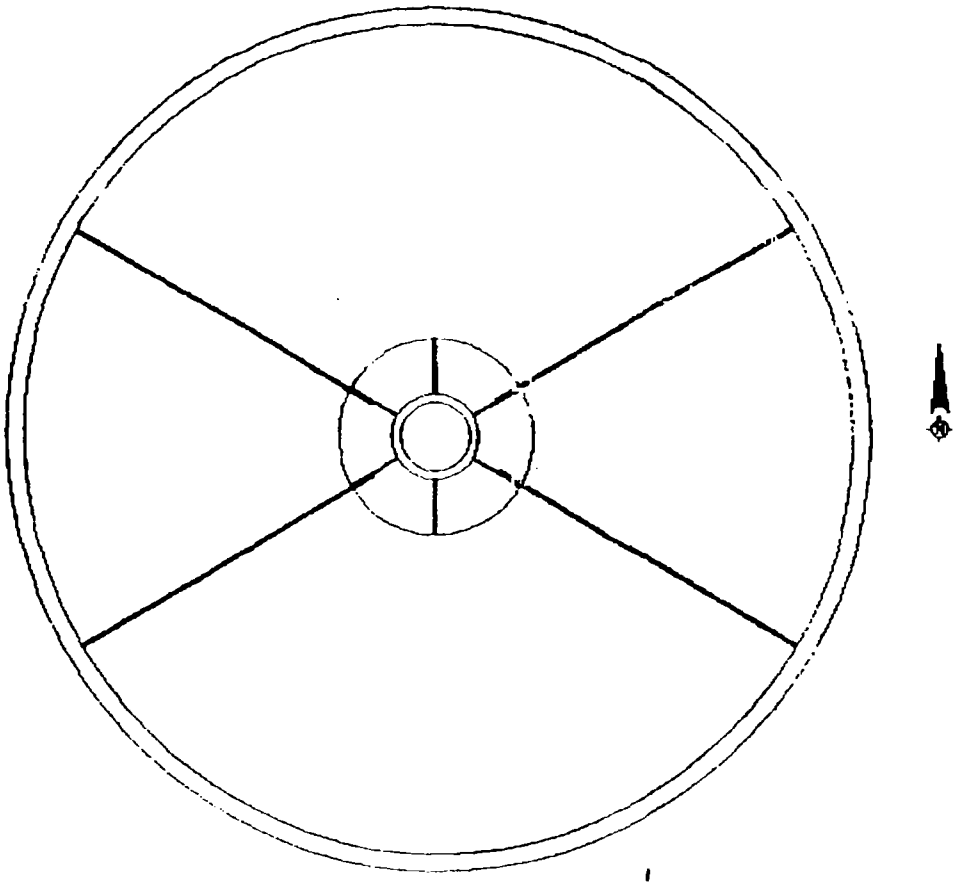
Engineer Seal

Signature of Registered P.E.

(Expires 11 30 01)

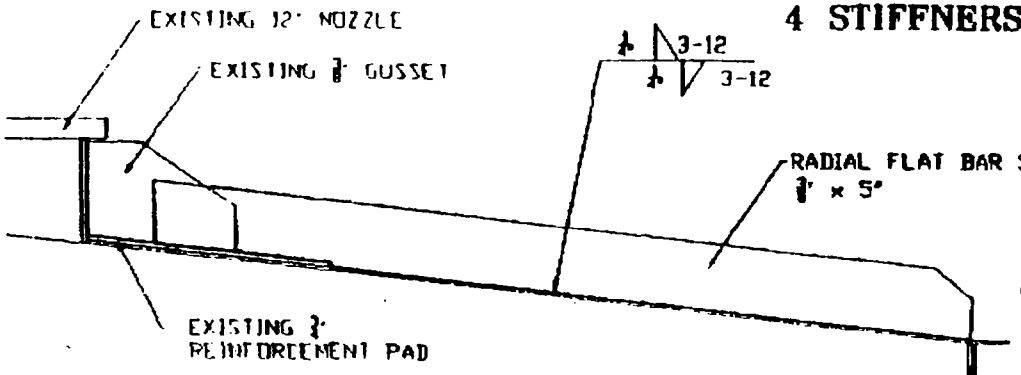


TANK 106
5 STIFFNERS ADDED



TANK 105
4 STIFFNERS ADDED

STATE OF ILLINOIS
PETER J. BERNES
3659
LICENSED STRUCTURAL ENGINEER



DETAIL

TYPICAL AT EACH RADIAL SUPPORT

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO 3659
MY LICENSE EXPIRES ON 12.6.00

H-S-T

HOYER-SCHLESINGER-TURNER,Inc.
ENGINEERS-ARCHITECTS
3074 University Ave.
Highland Park,IL 60035
Phone:847-461-0470 Fax:847-266-9829

July 27, 2000

Mr. James R. Laubsted
Facility Compliance Manager
CLEAN HARBORS SERVICES, INC.
11800 S. Stony Island Avenue
Chicago, IL 60617

RE: Inspection Report
Tank T-107

Dear Mr. Laubsted:

On June 23, 2000 I visually inspected the interior and exterior of Tank T-107.

Tank T-107 is located on the north side of the Flammable Storage Tank Farm (Unit 16). Previous visual inspections include July 10, 1995. Hydrostatic testing was completed in July, 1995. From the time of the earlier inspection, the tank was used for storing corrosive flammable hazardous wastes. Tank T-107 is located outdoors and has a dedicated concrete dike. The containment is coated with Protecto-Coat 900, 30 mils thick as manufactured by Dudick, Inc. This coating is compatible with the stored materials. The containment dike for T-107 and the remaining tanks within the tank farm were inspected August 31, 1999.

Tank T-107 is a stainless steel vessel fabricated in 1981. Tank T-107 was empty at the time of inspection and was cleaned by Clean Harbors personnel. The tank is operated at ambient temperature and under 2" WC pressure from nitrogen blanketing. The tank is equipped with a conversation vent and is vented through a carbon bed.

Tank T-107 stores corrosive flammable liquids Class I. Maximum specific gravity of stored liquids is 1.5 and pH may vary from 1 to 10. The tank is constructed from stainless steel. It is 12'0" in diameter and 14"0" high straight side with a cone bottom and top. The operating capacity is 12,000 gallons. There is no record that this tank was built to UL-142 standard. The assumption that the tank was built to this standard is based on a comparison with another tank which was fabricated to the UL-142 standard.

The tank is supported by steel legs on caissons. The steel legs are encased in concrete.

The internal and external visual inspection did not reveal any defects. The welds around nozzles and tank shell welds inspected from inside the tank were in good condition. The interior top plate did not show signs of rust. There were no other visible defects.

It is not possible to inspect the entire exterior of the tank by visual inspection. The tank is insulated with 2" thick insulation with metal jacket.

In June, 2000 Clean Harbors performed NDE-ultrasonic thickness measurements from the interior of the tank. In October, 1999 external NDE-ultrasonic thickness measurements were taken. These ultrasonic thickness test results and prior results are listed in Appendix TK-107-1.

The top as-built thickness was 0.250 inches. The four latest readings each show minor decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.268 inches which is 212% over the minimum of 0.086 inches recommended by the UL-142 standard.

The wall as-built thickness was 0.313 inches. The twelve latest readings each show minor decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.318 inches which is 177% over the minimum of 0.115 inches recommended by the UL-142 standard.

The bottom as-built thickness was 0.375 inches. The four latest readings are vey close in thickness to the as built thickness. The minimum reading was 0.396 inches which is 151% over the minimum of 0.158 inches recommended by the UL-142 standard.

For tank evaluations, modifications and calculations, see certification reports by Mr. Lee F. Mount, PE, dated January 1995 and May 23, 1995 in Appendix TK-107-2.

For tank nozzle orientation and description, see Appendix TK-107-3.

For Tank T-107 supports evaluation, see calculations by Mr. Peter J. Bernes, SE, dated January 19, 1995 in Appendix TK-107-4.

Therefore, I certify that after visual inspection, the tank is structurally sound, properly supported and set. No evidence of cracks, bulging, corrosion pits or scales or weld defects were observed. Based on my inspection, the tank can be used for the intended purpose.

Very truly yours,

HOYER-SCHLESINGER-TURNER, INC.

Peter J. Bernes

Peter J. Bernes
Illinois #3659

STATE OF ILLINOIS
PETER J.
BERNES
3659
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11.30.01

APPENDIX TK-107-1

ULTRA SONIC THICKNESS TESTING
T-107

June 23, 2000

INTERNAL

TOP

East	South	West	North
.276	.268	.272	.272

SHELL

.364	.360	.364	.362
.324	.324	.324	.320
.332	.324	.318	.324

BOTTOM

.402	.404	.396	.404

ULTRA SONIC THICKNESS TESTING
T-107

October 12, 1999

EXTERNAL

TOP

East	South	West	North
.276	.268	.272	.272

SHELL

.334	.372	.380	.334
.332	.328	.328	.336
.332	.324	.320	.332

BOTTOM

.404	.404	.396	.408

ULTRA SONIC THICKNESS TESTING
T-107

October 17, 1998

TOP

East	South	West	North
#20 .270	#17 .267	#18 .266	#19 .271

SHELL

#13 .327	#16 .365	#15 .390	#14 .331
#12 .331	#7 .321	#9 .315	#11 .323
#5 .319	#6 .315	#8 .310	#10 .319

BOTTOM

#2 .393	#3 .394	#4 .386	#1 .389

CleanHarbors

ULTRASONIC THICKNESS TESTING - 12-17-97

TANK #107

EAST	SOUTH	WEST	NORTH
20 .267	17 .261	18 .272	19 .260

NORTHEAST	SOUTHEAST		
13 .323	16 .358	15 .367	14 .321
12 .317	7 .313	9 .311	11 .319
5 .320	6 .310	8 .306	10 .318
2 .386	3 .388	4 .386	1 .390

CLEAN HARBORS OF CHICAGO, INC.

CWM TANK FARM

EXISTING TANK STATUS FORM

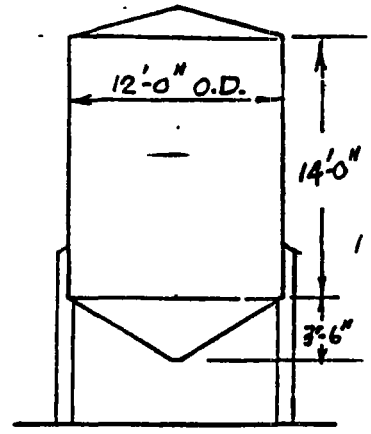
Tank No. T-107

Nominal Capacity 12,000 gals.

Mat'l. of Const. 316 Stainless

Approx. Year of Build

Designed Corrosion Allow. 1/16"



Stored Waste Characteristics:

	Past	Future
Specific Grav.	1.5 (design)	0.5 → 1.5
Class	NFPA CLASS 2 - AQUEOUS	ACIDIC WATERS, LEAN WATERS,
	RACA FUEL	AND/OR HAZARDOUS WASTE FUELS (NFPA CLASS 1-3 LIQUIDS)

Material Thicknesses (Inches):

Surface	per UL-142 Std.	As Built A	Ultrasonic Test Results 08/89 B Avg.	08/89 B Min.	10/91 C Avg.	10/91 C Min.
Top	0.086	0.250	0.261	0.252	0.270	0.265
Shell	0.115	0.313	0.322	0.316	0.341	0.318
Bottom	0.158	0.375	0.386	0.386	0.402	0.398

NOTES:

A. FROM STRAUBING, RUBIN, & KENES DESIGN DWG. 1-Q-003

B. FROM ALPHA CONSULTANTS JAN. '90 RPT.

C. FROM SIRRINE ENVIR. CONSULTANTS NOV. '91 RPT.

LEE F. MOUNT, P.E.

CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

23 May 1995

Mr. Alan F. Mount, Project Manager
Clean Harbors of Chicago, Inc.
11800 S. Stony Island Avenue
Chicago, Illinois 60617

Subject: CWM Tank Farm
Tank Agitator Mounting and Nozzle Details

Enclosure: 1) Design Calculations and Fabrication Details
(10 sheets, original issue date 14 March 1995)

Dear Alan,

Enclosure 1) is submitted herewith for your information and records. Sheet nos. 1, 5, 6 & 9 have been updated and revised where necessary to reflect your actual "as built" conditions.

Yours truly,

Lee F. Mount

Lee F. Mount

Reviewed by:

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-96

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JOB CWM/CHI TANK FARM
SHEET NO. COVER OF
CALCULATED BY L. F. MOUNT DATE 14 MAR '95
REV. 17 MAR. '95.
CHECKED BY DATE
SCALE FINAL ISSUE TO REFLECT 22 MAY '95
"AS BUILT" CONDITIONS

THE ENCLOSED CALCULATIONS AND FABRICATION DETAILS WERE CARRIED OUT IN SUPPORT OF CURRENT TANK UPGRADES PROPOSED FOR THE CLEAN HARBORS, CHICAGO STONY ISLAND FACILITY. AN OVERALL REVIEW AND ASSESSMENT OF THE STRUCTURAL INTEGRITY OF THESE EXISTING TANKS WAS COVERED IN A REPORT BY THE UNDERSIGNED DATED JAN. 1995. THIS REPORT ADDRESSES THE FITTING OF NEW TANK AGITATORS AS WELL AS ADDITIONAL NOZZLES.

CONTENTS

DESCRIPTION	SHEET NO.
SKETCH OF AGITATOR MOUNTING FLANGE (FOR TANKS 105, 106, 107	1
REFERENCES 109, 110, 112)	2
ESTIMATE OF STRESS DUE TO BENDING MOMENT @ FLANGE	2
ESTIMATE OF STRESS DUE TO TORQUE @ FLANGE	3
ESTIMATE OF STRESS DUE TO AGITATOR VERTICAL LOAD	3
CHECK OF LOADED TANK SUPPORT LEGS W/ AGITATOR VERT. LOAD	4
TYPICAL PROPOSED 4" NOZZLE INSTALLATIONS	5
BAFFLE PLATE DESIGN REQ'MTS.	6
CHECK TANK INTEGRITY FOR OPERATION WITH 1.0 PSIG VAPOR PRESS.	7-8
SKETCH OF MODIFIED AGITATOR MOUNTING FLANGE (FOR TANKS 103 & 104)	9
TABULAR SUMMARY OF AGITATOR SPECS. & TANK PROPERTIES	10

PREPARED BY Lee F. Mount
LEE F. MOUNT
14 MARCH 1995

COMMONWEALTH OF MASSACHUSETTS
LEE FORREST MOUNT
21193
REGISTERED
PROFESSIONAL ENGINEER

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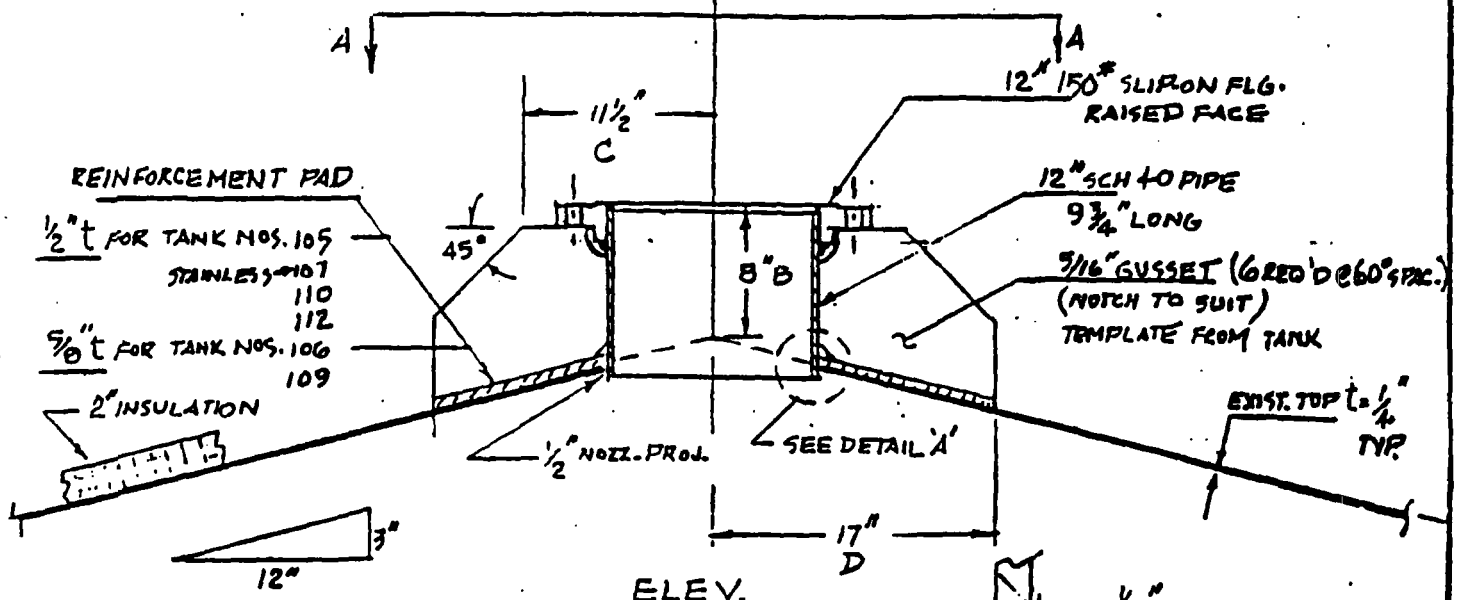
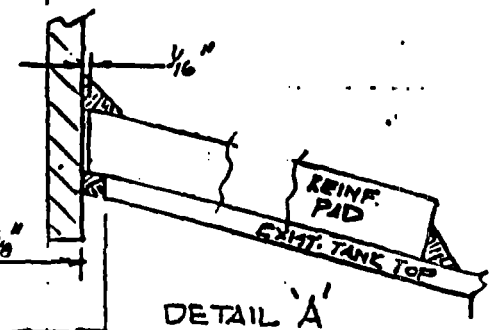
JOB CWM/CHI TANK AGITATORS
SHEET NO. 1 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR.'95
REV. 15 MAR.'95
CHECKED BY DATE
SCALE 1" = 1'-0" & AS NOTED 22 MAY'95
"AS BUILT"

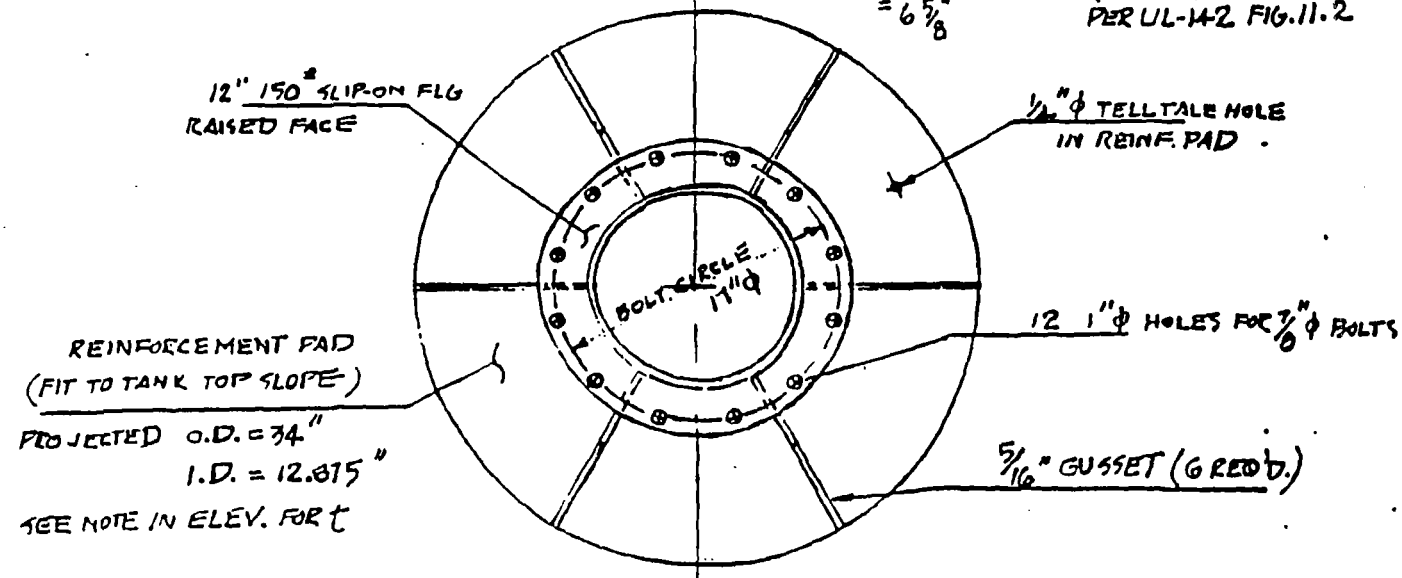
NEW MOUNTING FLANGE FOR TANK NOS. 105, 106, 107, 109, 110 & 112



ELEV.



DETAIL 'A'
(HALF SIZE)
PER UL-142 FIG. 11.2



PLAN A-A

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JOB CWM/CHI TANK AGITATOR & NOZZLE INSTALL
SHEET NO. 2 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. '95
CHECKED BY _____ DATE _____
SCALE _____

REFERENCES: 1) CHEMINEER AGITATOR DESIGN SYSTEM SPEC. SHEETS
2) UL-142, STEEL ABOVE GROUND TANKS
3) FORMULAS FOR STRESS & STRAIN, ROARK 4TH ED. 1965
4) API-650 WELDED STEEL TANKS FOR OIL STORAGE
5) CHEMINEER IOM MANUAL PG. 4-9 JUNE '93
6) ASME SECT VIII PRESSURE VESSEL CODE

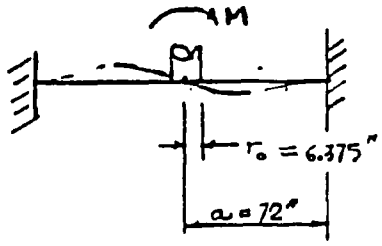
CHECK REINFORCED TANK TOP FOR AGITATOR LOADINGS

ASSUMPTIONS: LOADINGS - USE 15 HP TYPE C UNIT FOR MAX. BENDING MOMENT OF 5036 FT.-LBS & TORQUE OF 4274 FT.-LBS

- USE 5 HP TYPE B UNIT FOR MAX. VERTICAL LOAD OF SAY 3000 LBS

ESTIMATE STRESS DUE TO BENDING MOMENT

FROM REF 3) PG. 219, CASE 10 ASSUMES FLAT CIRCULAR PLT, EDGES FIXED, CENTRAL COUPLE



$$\text{MAX } S_r \text{ AT } r = r_o = \frac{3M}{4\pi t^2 r_o}\left[1 + \left(\frac{m+1}{m}\right)\log \frac{2(.45a - r_o)}{.45 k a}\right]$$

WHERE: $k = \dfrac{0.1a^2}{(r_o + .28a)^2} = \dfrac{0.1(72)^2}{[6.375 + .28(72)]^2}$

$= 0.736$

$M = 5036 \text{ FT-LBS} \times 12 = 60432 \text{ IN-LBS}$

$t = .25 + .625 = 0.875''$ (REINF. PAD)

m = RECIPROCAL OF POISSON'S RATIO

$= \dfrac{1}{.3} = 3.33$

$a = 72''$

$r_o = 6.375''$

$$\text{MAX } S_r = \frac{3(60432)}{4\pi(.875)^2(6.375)}\left[1 + 1.30 \log \frac{2[.45(72) - 6.375]}{.45(.736)(72)}\right]$$

(2.183)

$= 2956\,[1 + 1.3(.781)]$

$= 2956\,(2.02) = \boxed{5971 \text{ PSI}}$

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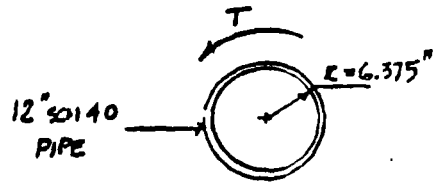
ESTIMATE SHEAR STRESS DUE TO TORQUE

$T = 4274$ FT-LBS $\times 12 = 51288$ IN-LBS

FORCE $= \frac{T}{r} = \frac{51288 \text{ IN-LBS}}{6.375''} = 8045$ LBS



CIRCUM. $= 2\pi(r) = 40''$

$\therefore$ LOAD/" OF CIRCUM. $= \frac{8045}{40} = 201$ LBS/IN

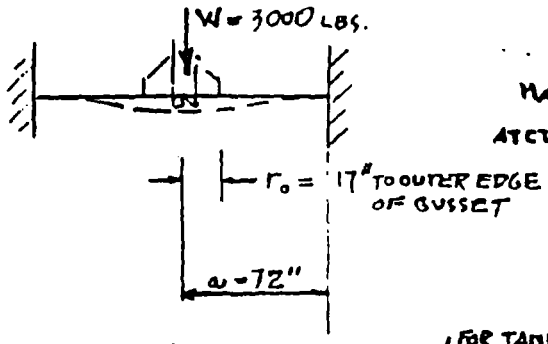
SAY TORQUE IS CARRIED BY 3/8" FILLET WELD @ REINF. PAD TO NOZZLE CONNECTION

ALLOWABLE WELD LOAD $= 11{,}200(.375'') = \boxed{4200 \text{ LBS/IN} > 201 \text{ OK}}$

CONSERVATIVE IN THAT LOWER TANK TOP TO NOZZLE FULL PENETRATION WELD HAS NOT BEEN TAKEN INTO ACCOUNT.

ESTIMATE STRESS DUE TO VERTICAL LOAD

FROM REF. 3 / PG 218, CASE 7 ASSUMES FLAT CIRCULAR PLT., EDGES FIXED, UNIFORM LOAD OVER CONCENTRIC CIRCULAR AREA OF RADIUS r_o



$$\text{MAX } S_r \text{ AT } r_o = \frac{3W}{2\pi m t^2}\left[(m+1)\log\frac{a}{r_o} + (m+1)\frac{r_o^2}{4a^2}\right]$$

WHERE: $W = 3000$ LBS

$t = .25 + .50$ (REINF PAD) $= 0.75''$ FOR TANK No 112

$m = 3.33$

$a = 72''$

$r_o = 17''$

$$\text{MAX } S_r = \frac{3(3000)}{2\pi(3.33)(.75)^2}\left[4.33\log 4.235 + 4.33(.0139)\right]$$

$$= 765\,(6.25 + .06)$$

$$= \boxed{4827 \text{ PSI}}$$

CONCLUDE: COMBINING STRESS DUE TO BENDING (5971) + STRESS DUE TO VERT. LOAD (4827) = 10,798 PSI

API 650 GIVES ALLOW STRESS OF 20,000 PSI FOR ASTM A285-C STEEL

THUS, THE STRESS DUE TO EXTERNAL LOADS IS APPT. 54% OF ALLOWABLE WHICH APPEARS TO BE REASONABLE

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JOB CWM/CHI TANKS
SHEET NO. 4 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR '95
CHECKED BY _____ DATE _____
SCALE _____

CHECK TANK SUPPORT LEGS FOR AGITATOR VERT. LOAD

USE TANK NO 112 (LARGEST TANK + HEAVIEST AGITATOR)

ESTIMATED WEIGHT TO BE SUPPORTED BY 4 LEGS @ L=7.0' SIZE = W8×31

TANK STEEL

CONE TOP (1/4" RT.) LATERAL AREA = BASE CIRCUM × 1/2 SLANT HT.

$= \pi D \times \frac{6.18'}{2}$

$= \pi 12 \times 3.09 = 116.5 \text{ ft}^2 \times 10.2 \text{ \#/ft}^2 = 1188$ LBS.

SHELL (5/16" RT.) AREA = $\pi D H$

$= \pi 12 \times 22 = 829.4 \text{ ft}^2 \times 12.75 \text{ \#/ft}^2 = 10575$ LBS.

CONE BOTTOM (3/8" RT.) LATERAL AREA = BASE CIRCUM × 1/2 SLANT HT.

$= \pi D \times \frac{6.95}{2}$

$= \pi 12 \times 3.48 = 131.2 \text{ ft}^2 \times 15.7 \text{ \#/ft}^2 = 2007$ LBS.

AGITATOR WEIGHT → 3000 LBS

SUBTOTAL 16770 LBS

ADD 20% FOR MISC. PIPING, PLATFORMS INSULATION, ETC. → 3350 LBS

LIQUID CONTENTS @ S.G. = 1.5 CAP. = $\frac{20{,}000 \text{ GAL.}}{7.48 \text{ GAL/CU.FT}}$ = 2674 CU FT × 62.4 × 1.5 = 250,286 LBS

TOTAL ESTIMATED WT. TO BE SUPPORTED = 270,406 LBS.

USE 276 KIPS

∴ EACH LEG CARRIES $\frac{276}{4}$ = 69 KIPS

FROM AISC COL TABLE @ KL = 2(7) = 14 FOR W8×31 (A36 ST.)

READ ALLOWABLE LOAD = 137 KIPS > 69 KIPS

CONCLUDE: EXISTING COLUMN SUPPORT IS ADEQUATE FOR CONDITIONS

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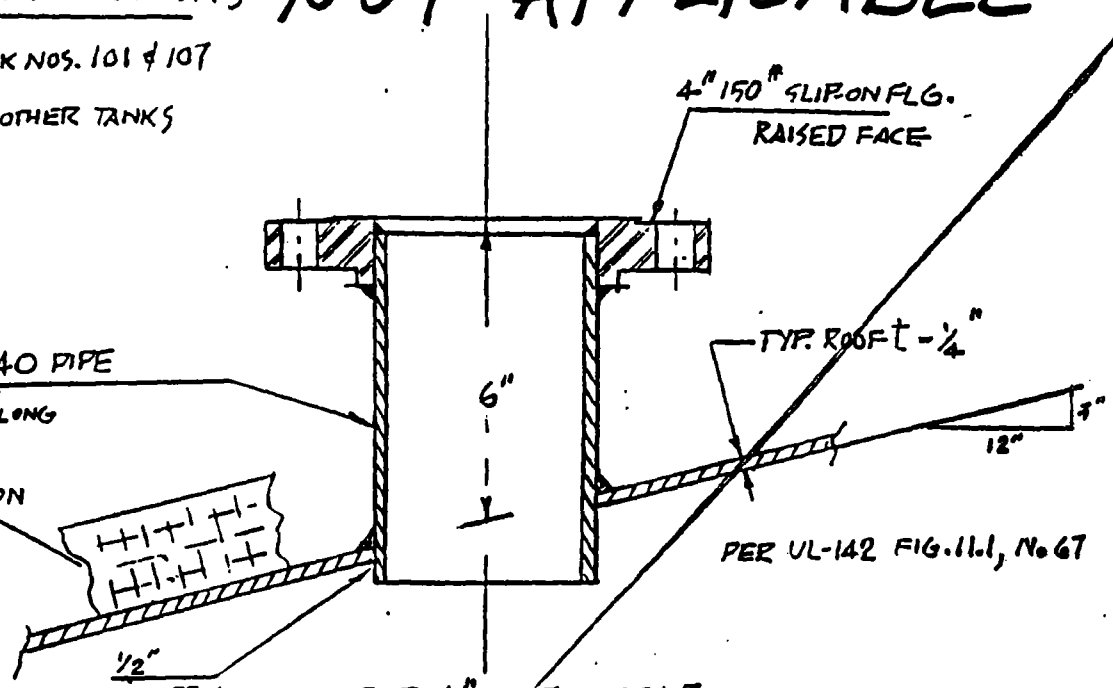
JOB CWM/CHI TANKS
SHEET NO. 5 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR.'95
REV. 15 MAR.95
CHECKED BY DATE
SCALE 3" = 1'-0" 22 MAY'95
"AS BUILT"

NOT APPLICABLE

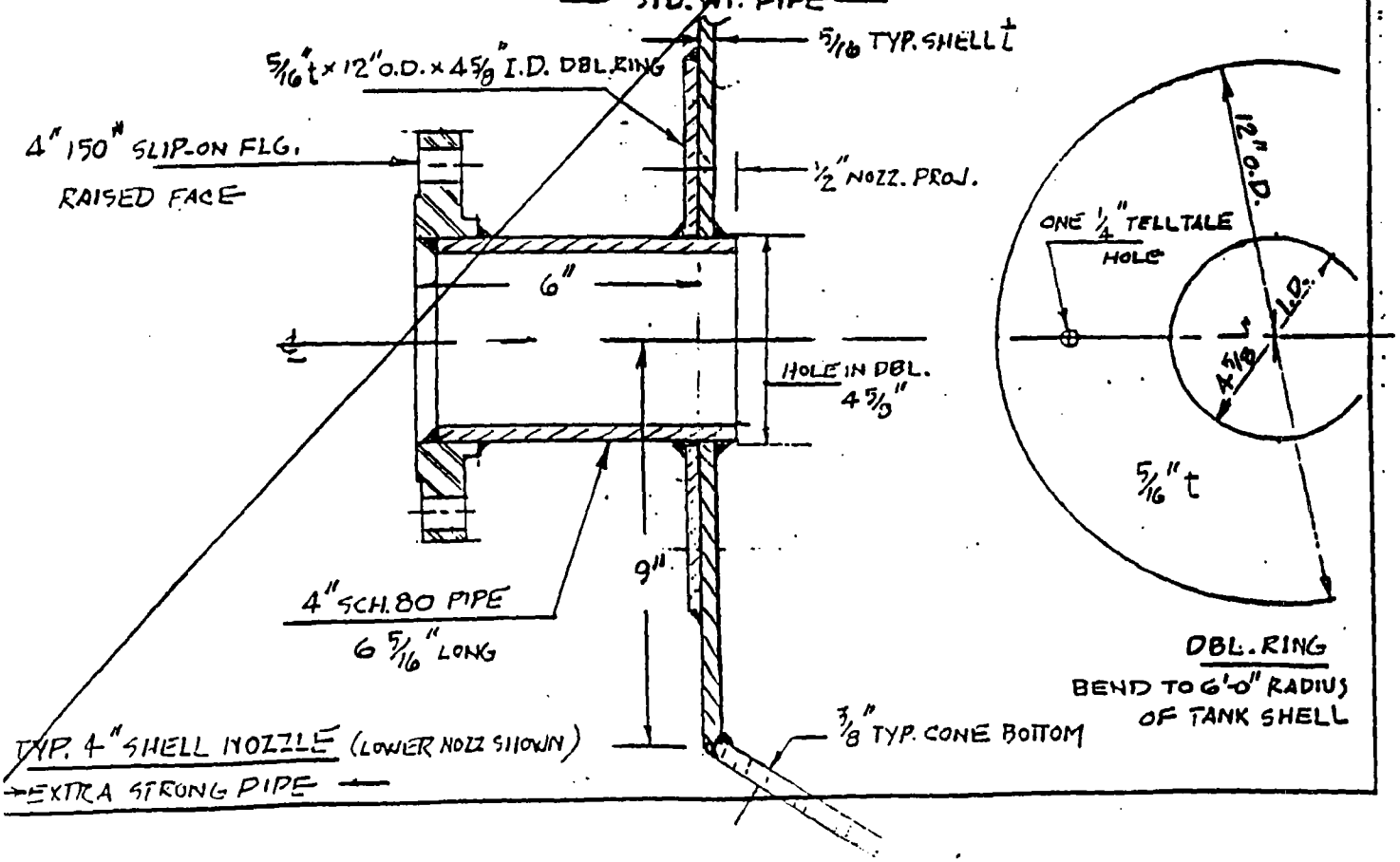
4" NOZZLE INSTALLATIONS

STAINLESS FOR TANK NOS. 101 & 107

CARBON STEEL OTHER TANKS



TYP. 4" ROOF NOZZLE



TYP. 4" SHELL NOZZLE (LOWER NOZZ SHOWN)
EXTRA STRONG PIPE

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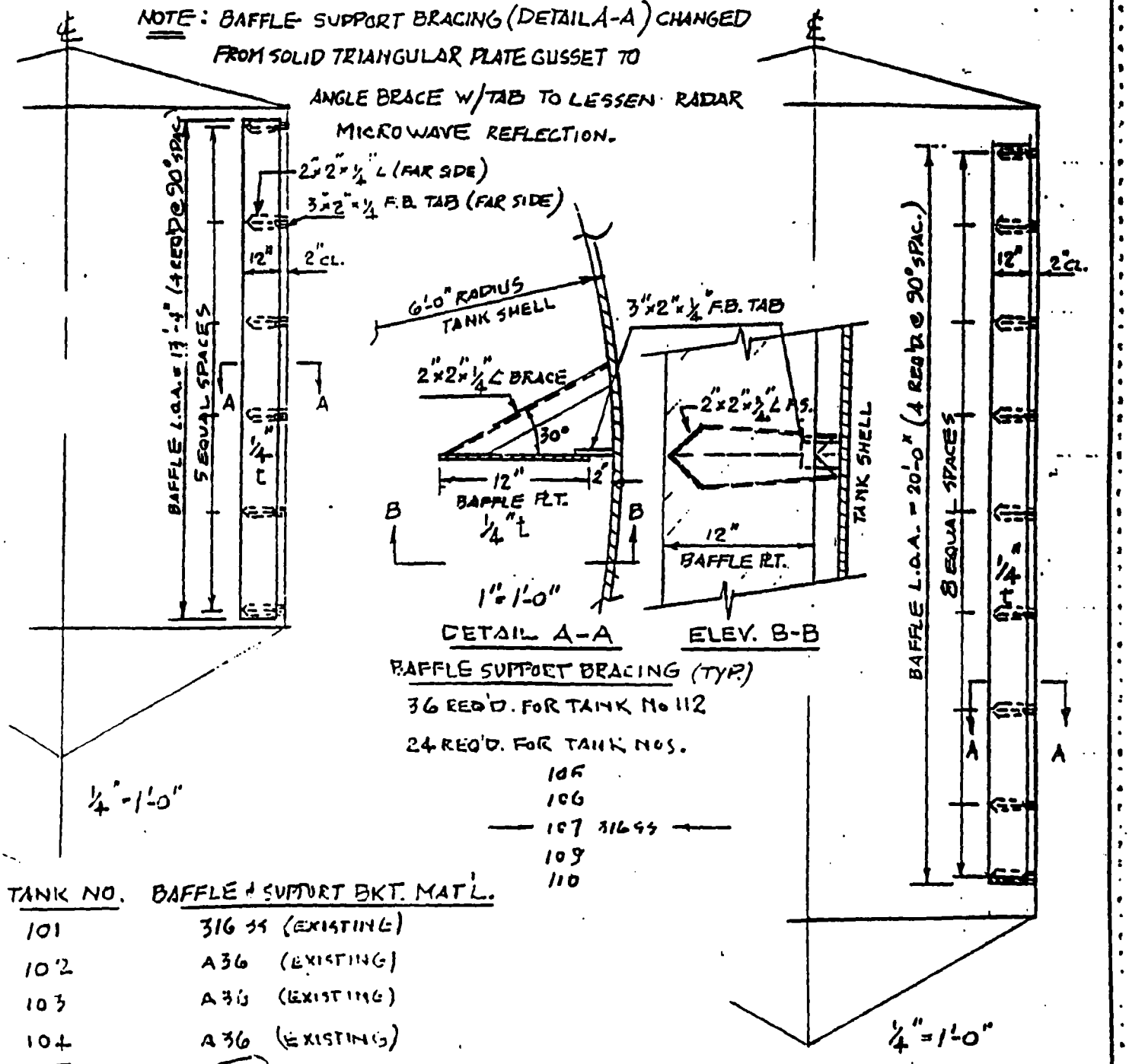
JOB C.W.M./CHI TANKS
SHEET NO. 6 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. '95
REV. 15 MAR. '95
CHECKED BY DATE
SCALE AS NOTED "AS BUILT" 22 MAY '95

BAFFLE PLATE DESIGN (SIZES AS RECOMMENDED IN REF. 1)

NOTE: BAFFLE SUPPORT BRACING (DETAIL A-A) CHANGED FROM SOLID TRIANGULAR PLATE GUSSET TO ANGLE BRACE W/TAB TO LESSEN RADAR MICROWAVE REFLECTION.



BAFFLE SUPPORT BRACING (TYP.)
36 REQ'D. FOR TANK No 112
24 REQ'D. FOR TANK NOS.
106
106
107 316 SS
109
110

TANK NO.	BAFFLE & SUPPORT BKT. MAT'L.	
101	316 SS	(EXISTING)
102	A36	(EXISTING)
103	A36	(EXISTING)
104	A36	(EXISTING)
(105)	(A36)	NEW
(106)	(A36)	NEW
(107)	(316 SS)	NEW
(109)	(A36)	NEW
(110)	(A36)	NEW

TANK NO. (112)
BAFFLE & SUPPORT BKTS.
A36 STEEL (NEW)

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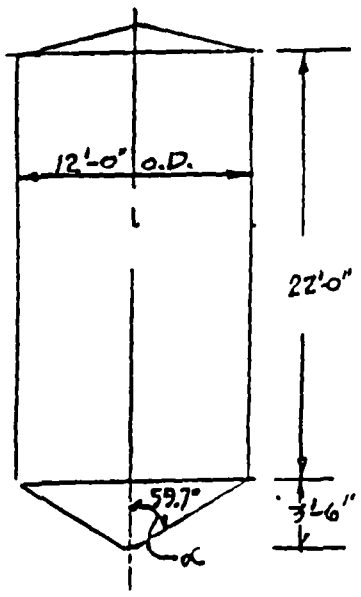
JOB CWM/CHI TANKS
SHEET NO. 7 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. 95
CHECKED BY _____ DATE _____
SCALE _____

CHECK FOR TANK SERVICE OPERATION WITH 1.0 PSIG INTERNAL VAPOR PRESSURE (4FT. 24" WATER)

USE TANK NO 112 WHICH HAS GREATEST DEPTH

ASSUME S.G. @ 1.5



MAX PRESSURE @ CONE BOTTOM $= \frac{62.4 \times 1.5 \times 25.5'}{144} = 16.6$ PSI

PLUS VAPOR PRESSURE 1.0 PSI

17.6 PSI

USE 18 PSI = P

USE ASME SECT VIII - DIV 1, APPENDIX 1 TO DETERMINE MIN. REQ'D PLT. t FOR SHELL & CONE BOTTOM

FOR CYLINDRICAL SHELL:

$$t = \frac{PR_o}{SE + 0.4P}$$

WHERE: $P = 18$ PSI

$R_o = \frac{12}{2}(12) = 72''$

$$t = \frac{18(72)}{(13800).7 + 0.4(18)}$$

$S = 13{,}800$ PSI FOR A285-C STL.

$E = 0.7$

$t = 0.134'' + .0625'' = 0.197$ IN. (UL-142 WOULD REDUCE $t = 0.167$ IN)
CORR. ALLOW.

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $\boxed{0.30'' > .197''}$ O.K.

FOR CONE BOTTOM:

$$t = \frac{PD_o}{2\cos\alpha\,(SE + .4P)}$$

WHERE: $D_o = 144''$

$\alpha = 59.7°$

$$= \frac{18(144)}{2\cos 59.7°\,(13{,}800 \times .7 + .4 \times 18)}$$

$= 0.266'' + .0625'' = 0.329$ IN.
CORR. ALLOW

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $\boxed{.375'' > .329}$ O.K.

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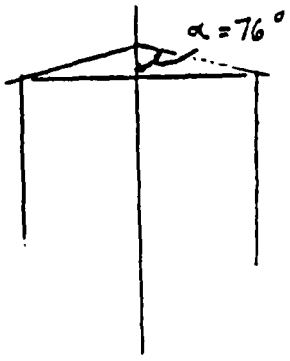
JOB CWM/CHI TANKS
SHEET NO. 8 OF 10
CALCULATED BY L.F. MOUNT DATE 16 MAR. 95
CHECKED BY _____ DATE _____
SCALE _____

CHECK FOR 1.0 PSIG INTERNAL VAPOR PRESSURE (CON'D.)

FOR CONE TOP



FROM ASME SECT. VIII - DIV. 1

SOLVE FOR P:

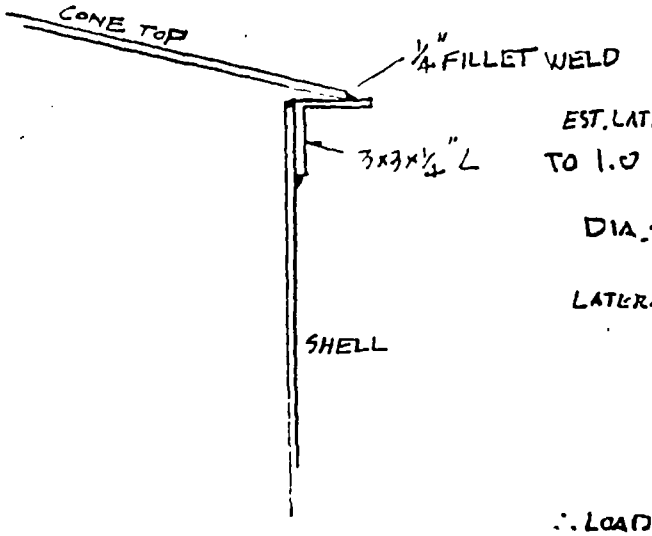
$$P = \frac{2SEt\cos\alpha}{D_o - 0.8t\cos\alpha}$$

WHERE S = 13,800 PSI
E = 0.7
D_o = 144 IN
α = 76°
t = USE .25 − 1/16" CORR ALL. = .1875"

$$P = \frac{2(13{,}800)(.7)(.1875)(.242)}{144 - [.8(.1875)(.242)]}$$

$$= \frac{876.65}{144} = \boxed{6 \text{ PSI} > 1.0 \quad \text{O.K.}}$$

CHECK ROOF TOP CONNECTION WELD DETAIL



EST. LATERAL SURFACE AREA CONE TOP SUBJECTED TO 1.0 PSI PRESSURE

DIA. ≈ 148" (ROOF OVERHANGS SHELL)

LATERAL AREA = BASE CIRCUM. × 1/2 SLANT HT

$$= \pi D \times \frac{76.2''}{2}$$

$$= \pi(148) \times 38.1 = 17{,}715 \text{ IN}^2$$

∴ LOAD TO ROOF = 17,715 IN² × 1 LB/IN² = 17,715 LBS

CIRCUM. OF 1/4" FILLET ATTACHMENT WELD = πD = π(148) = 465 IN

∴ LOAD/IN ON 1/4" FILLET WELD = 17715/465 = 38 #/IN — O.K.

VS

ALLOWABLE WELD LOAD = 11,200 × .25 = 2800 #/IN

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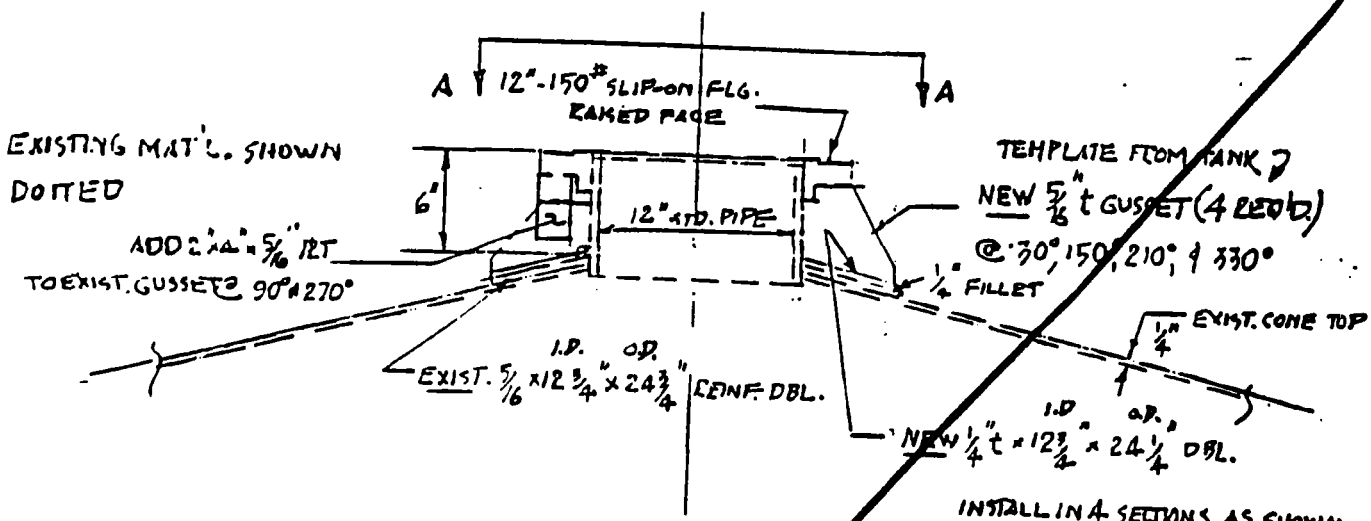
JOB CWM/CHI TANKS
SHEET NO. 9 OF 10
CALCULATED BY L.F. MOUNT DATE 16 MAR. '95
CHECKED BY DATE
SCALE 1" = 1'-0" 22 MAY '95

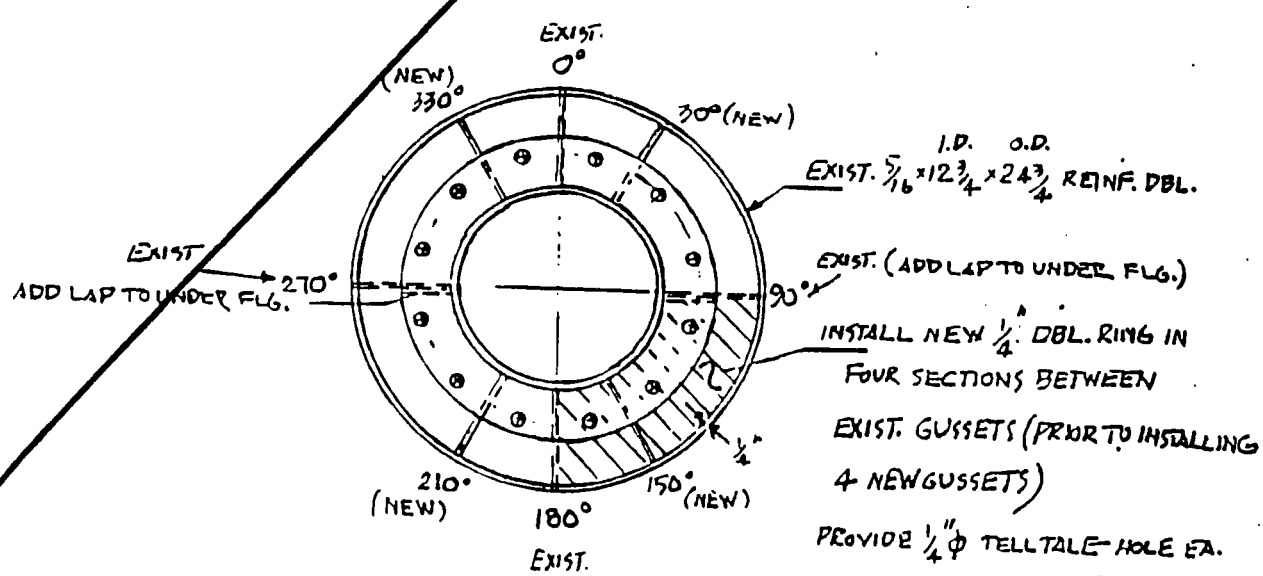
NOT APPLICABLE "AS BUILT"

MODS. TO TANK 103 & 101 EXISTING AGITATOR MOUNTING; TO ACCOMMODATE NEW 7.5HP UNITS



INSTALL IN 4 SECTIONS AS SHOWN BELOW

ELEV.



PLAN A-A

TANK I.D.	AGITATOR SPECS. (FROM REF. 1)										TANK PROPERTIES						
	TYPE	HP	RPM	SHAFT		WT.	NOZZLE		BAFFLE REQ'D.	CASE SIZE	TOP HEAD t"	MIN HEAD t" (TBL 3)	NOZZLE SIZE	REINF PAD DIMENS.			
				L IN.	DIA. IN.	LBS.	BEND MOM FT.-LBS	TORQUE FT.-LBS.						B (TB	C 2)	D FIG 3	
101 S.S.	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.313 S.S.		12" EXIST				
102	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.250		12" EXIST				
103	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.250	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5	17" 12.375	(ACTUAL)
104	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.241	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5"	17" 12.375	(ACTUAL)
105	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"	
106	C NEW	15	45	190.5	3.5	2745	5036 MAX.	4274 MAX.	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"	
107 S.S.	EXIST. FROM 103	3.0							YES (NEW)	2 DESIGN FOR 4	.250 S.S.	.500	12"	8"	11.5"	17"	
109	C NEW	15	45	190.5	3.5	2745	5036	4274	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"	
110	EXIST. FROM 104	3.0							YES (NEW)	2 DESIGN FOR 4	.230	.500	12"	8"	11.5"	17"	
112	B NEW	5	30	270.0	3.5	2872 MAX.	2898	2337	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"	

NO CHANGE

MODIFY (SHT. 9) MOUNTING

MOUNTING (SHT. 1)

NEW

FROM ULTRASONIC TEST RESULTS

REINF. PAD t FROM REF. 5

CWM/CHI TANK AGITATORS
LE MOUNT 10 MAR 1995
REV. 15 MAR 1995
SHT 10 OF 10

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

RECEIVED
JUN 20 1995
HOYER-SCHLESINGER-TURNER, INC.

19 June 1995

Marie Vanagas
Hoyer-Schlesinger-Turner, Inc.
300 West Adams Street
Chicago, ILL. 60606

Subject: Clean Harbors of Chicago, Inc.
CWM Tank Farm

Enclosure: 1) Review and Assessment of Structural Integrity of Existing Tanks; LFMount Report dated January 1995

Dear Ms Vanagas,

In response to Clean Harbors' request, enclosure 1) is herewith forwarded for your information and records.

Yours truly,

Lee F. Mount

Lee F. Mount

REVIEWED BY
Peter J. Bernes
PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3059
MY LICENSE EXPIRES ON 11-30-96

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

CWM TANK FARM

Review and Assessment of Structural Integrity of Existing Tank Nos.

T - 101	T - 106
T - 102	T - 107
T - 103	T - 109
T - 104	T - 110
T - 105	T - 112

January 1995

Prepared For:

Clean Harbors of Chicago, Inc.

(In response to Illinois EPA comments)

INTRODUCTION

This report was prepared in response to the Illinois EPA's request for additional information on the structural condition of the existing hazardous waste storage and/or fuel tanks scheduled for reuse at your CWM Tank Farm.

The work scope involved a technical review of all available tank related documents furnished by Clean Harbors. Pertinent data was then summarized and tabulated for each tank on a "Existing Tank Status Form". The ultrasonic test measurements for thickness, shown on the status forms, were then analyzed in order to make estimates of corrosion rates and projected service life.

Reference documents consulted during the course of this study include:

* RCRA Tank Assessment - Tank Farm System, prepared for CWM Chemical Services Inc. by ALpha Consultants, Ltd. Jan. 1990

* Tank System Inspection, prepared for CWM Chemical Services Inc. by Sirrine Environmental Consultants Nov. 1991

* Straubing, Rubin & Kenes, Inc. Tank Design Drawings

* Imperial Steel Tank Co. Fabrication Drawings

* Supplemental ultrasonic thickness measurements taken on stainless steel Tank No. T-101 on 23 January '95 by MQS Inspection, Inc. (raw data)

TANK GENERAL DESCRIPTIONS AND HISTORY

The ten (10) existing tanks, numbered T-101 to T-107, T-109, T-110, & T-112, are 12 ft. dia. vertical, cone bottomed, leg supported, above ground, insulated tanks.

Tank T-112 has a nominal capacity of 20,000 gals. All other tanks are of 12,000 gal. capacity each.

Tank nos. T-101 and T-107 are of stainless steel construction. All others are of carbon steel.

The four (4) newer tank nos. T-101 to T-104, fabricated by Imperial Steel Tank Co., were placed in service during 1986. The remaining older six (6) tanks date from 1981.

Available records and fabrication drawings for tank nos. T-101 to T-104 indicate they were built to the Underwriters Laboratories, Inc. Standard UL-142 for steel above ground tanks and were to be labeled as such. The published UL-142 Standards "do not cover vertical tanks that are elevated by means of legs" and are not intended for liquids having a specific gravity exceeding that of water. In order to satisfy these exceptions, it was necessary for Imperial Steel to apply for Underwriters Lab review and inspection to obtain the UL Listing for these cone bottomed above ground steel tanks on legs.

The Imperial fabrication drawings list the following tank design parameters:

Design Pressure = hyrdostatic head due to contents

Design Temperature = 250° F

Specific Gravity = 1.5

Corrosion Allowance = 1/16 "

Although no fabrication drawings were found for the six (6) older tanks, the Straubing, Rubin & Kenes design plans indicate the same material thicknesses for the top, shell, and bottom as shown on the Imperial plans. Since these thicknesses have been further verified by ultrasonic test measurements, it seems reasonable to conclude that these older tanks were also built to the design standards of UL-142.

The most recent ultrasonic thickness measurements include those taken by Alpha Consultants in Aug. '89 and by MQS Inspection in Oct. '91 for the Serrine report.

Alpha Consultants conducted visual internal inspections on all tanks (except T-110, which was in service) in early Dec. '89 and an external site inspection on 3 Jan. '90. Serrine Environmental Consultants conducted a visual site inspection, including all tank externals, in Sept. '91.

SPECIFIC TANK DETAILS

For tabulation of existing tank detail design information and summary of latest ultrasonic thickness measurements, refer to the tank status form provided in Appendix A for each of the ten (10) tanks.

PROJECTED SERVICE LIFE

The following table summarizes results of calculations undertaken to establish corrosion rates, based on past service, in order to predict an expected service life for the eight (8) carbon steel tanks. For calculation details, refer to Appendix B.

Surface	Estimated Corrosion Rate	Estimated Retirement Thickness	% of "as built" Thickness Remaining at Retirement	Projected Life as of 1995
Tank Top T-110	2.5 Mils/yr	0.156"	62%	24 yrs.
Side Shell T-105&T-112	3.6 Mils/yr	0.188"	60%	21 yrs.
Cone Bottom T-102	3.0 Mils/yr	0.281"	71%	28 yrs.

NOTE:
The following assumptions were used in the development of this table:

Corrosion rates for the tank top and shell surfaces were arrived at by subtracting the lowest recorded minimum ultrasonic thickness reading to date from the "as built" thickness and then dividing by the tank age at time of thickness reading.

In arriving at an estimated corrosion rate for the bottom cone surface, it was found necessary to develop an adjusted "as built" thickness. This was required since the average recorded bottom thickness measurement for all tanks, and in most cases the minimum value also, exceeded the 0.375" thickness shown on the fabrication drawing. The "as built" thickness was therefore adjusted to 0.392" to more accurately reflect the ultrasonic readings which ten years later were giving averages and minimums greater than 0.375".

INSPECTION/TESTING PLAN PRIOR TO REUSE

In order to assess each tank's internal condition, material thickness, and integrity prior to being placed back in service, it is planned to do the following, once the tank has been found safe for man-entry:

* Conduct an initial visual inspection by a tank experienced technician in company with a registered professional engineer to determine general tank condition. A standard check list, similar to that used by Alpha Consultants for Tank T-109 and shown in Figure 1 will be used as a guide and for recording findings. Suspicious areas will be noted for a more rigorous inspection and scheduled for ultrasonic measurement if deemed necessary.

* Since these tanks are insulated, past ultrasonic readings taken from the tank exterior have been limited to those areas where a removable patch permits direct access to the plate surface beneath. Past surveys have included at each of 4 - 90° quadrants, 1 top point, 3 side points and 1 cone bottom point giving a total of 20 readings/tank. With the tank out of service and clean, it would seem desirable to take additional ultrasonic thickness measurements from within. The cone bottom and tank height will make this difficult and require a tank ladder or other means to reach the underside of the top plate.

* It is recommended that a minimum of 12 readings each be taken in a + pattern on the top and bottom surfaces. For the shell at mid-height, a girth sample of about 20 points around the circumference is desirable. Finally, a vertical row sample, top to bottom, of about 10 points at a location determined from the visual inspection to be most worthy of further exploration, should provide more than enough data to verify the existing surface thicknesses and to form a base for comparison with past and future thickness measurement readings. The ultrasonic test readings are to be taken by personnel qualified and certified as competent to use the test equipment. The test results are to be analyzed by a registered professional engineer experienced in steel tank design and construction.

FIGURE 1

ALPHA CONSULTANTS, Ltd.

CHECKLIST FOR VISUAL INSPECTION OF UNLINED VESSELS

OWNER CWM Chemical Services, Inc.-Chicago Incinerator
TEST SITE 11700 So. Stony Island Ave., Chicago, Il. 60617
DATE OF INSPECTION December 5, 1989
TIME OF INSPECTION 1525
SUPERVISORY ENGINEER Harris E. Dicker, P. E.
PHOTOGRAPHER/TECHNICIAN Robert A. Dicker
TECHNICIAN James L. Eggert

TANK NO. 109 (NO PCB IN TANK)
INTERIOR SHELL MATERIAL CS
CLADDING MATERIAL SST
INSULATION 2' FIBREGLASS SIDES & BOTTOM, 2" COL BLOCK TOP
EQUIPPED WITH MIXER NO

INITIAL ROOF INSPECTION FOR SAFETY

- HAZARDS OF FALLING OBJECTS NONE
- VISIBLE CORROSION NONE

MORE RIGOROUS INSPECTION OF ROOF & STRUCTURAL SUPPORTS

- VISIBLE LOSS OF METAL THICKNESS NONE
- VISIBLE CRACKS OR LEAKS AT WELDS NONE
- VISIBLE CRACKS AT NOZZLE CONNECTIONS NONE
- MALFUNCTIONING OF ROOF SEALS NONE
- VISIBLE DETERIORATION OF WATER DRAIN SYSTEM NONE
- CONDUCT HAMMER TESTING NO

TANK SHELL

- VISIBLE CRACKS AT SEAMS NONE
- VISIBLE CORROSION AT VAPOR SPACE/LIQUID LEVEL LINE NONE
- VISIBLE CRACKING OF PLATE JOINTS NONE
- VISIBLE CRACKING OF NOZZLE CONNECTION JOINTS NONE
- VISIBLE LOSS OF METAL THICKNESS NONE

TANK BOTTOM

- TYPE OF BOTTOM, SLOPED OR FLAT SLOPED
- VISIBLE CORROSION PITS NONE
- VISIBLE CRACKED SEAMS NONE
- TYPE OF CONNECTION TO SIDEWALL, WELDED OR RIVETED WELDED
- VISIBLE TIGHTNESS AT CONNECTION NONE
- VISIBLE DEPRESSIONS IN BOTTOM AREAS AROUND OR UNDER ROOF OR PIPE SUPPORTS NONE
- VISIBLE LOSS OF METAL THICKNESS NONE
- VISIBLE UNEVENESS OF BOTTOM NONE
- CONDUCT HAMMER TEST NO
- VISIBLE BULGES, BLISTERING OR SPALLING NONE
- WAS ULTRASONIC TESTING OF TANK WALLS, ETC. CONDUCTED YES

Source: OSWER Policy Directive No. 9483.00-1
Modified Version of Table 4-7, Page 4-35
"Permit Writer's Guidance for Hazardous Waste Tanks" U. S. EPA Contract 68-01-6515 (undated draft) pp 8-10.

SUMMARY DISCUSSION

Projected Service Life - The projected useful service life for the eight (8) carbon steel tanks is estimated to be on the order of 20 years from today.

- The projected service life for the two (2) stainless steel tanks (T-101 & T-107) is estimated to be more than 20 years as evidenced by the ultrasonic thickness readings which indicate little, if any significant material loss as of '91.

- These projected service life estimates are believed to be conservative in that minimum point readings, rather than average readings, were used to establish the corrosion rates. Furthermore, the projected service life calculations assume that corrosion has continued at the same rate during the past 3 years when the tanks have been out of service.

- These estimated rates can be expected to remain in effect so long as the future stored waste product corrosivity characteristics are compatible with and do not differ significantly from those products stored in the past. Also, the integrity of the external insulation cladding material must be maintained to prevent exterior corrosion from the weather.

- It is anticipated that these tanks, once returned to service, will be ultrasonically tested on an annual basis, at which time these estimated corrosion rates should be reviewed and modified if necessary to suit existing service conditions.

Type of Wastes Stored - The individual tank status forms, Appendix A, list the typical types of waste products stored in past service as well as those planned for future operations. Before any wastes are stored, the facility management is required to assess the compatibility of the waste with (1) the storage unit materials of construction and (2) the wastes being presently stored.

Conclusion - Based on a detailed technical review of the page 1 referenced documents, it is my opinion that the ten (10) existing tanks proposed for reuse at the CWM Tank Farm are structurally sound, free from leaks, and exhibit sufficient material thickness, as determined by ultrasonic measurements. They appear to meet applicable design guidance standards and the past visual inspection reports indicate them to be substantially free from corrosion. Therefore, it is my opinion that the existing reported condition and structural integrity of these storage tanks demonstrate suitability for continued service.

CERTIFICATION

"I certify, under penalty of law, that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately 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 possible fines and imprisonment"

Registered Professional Engineer

Name: Lee F. Mount

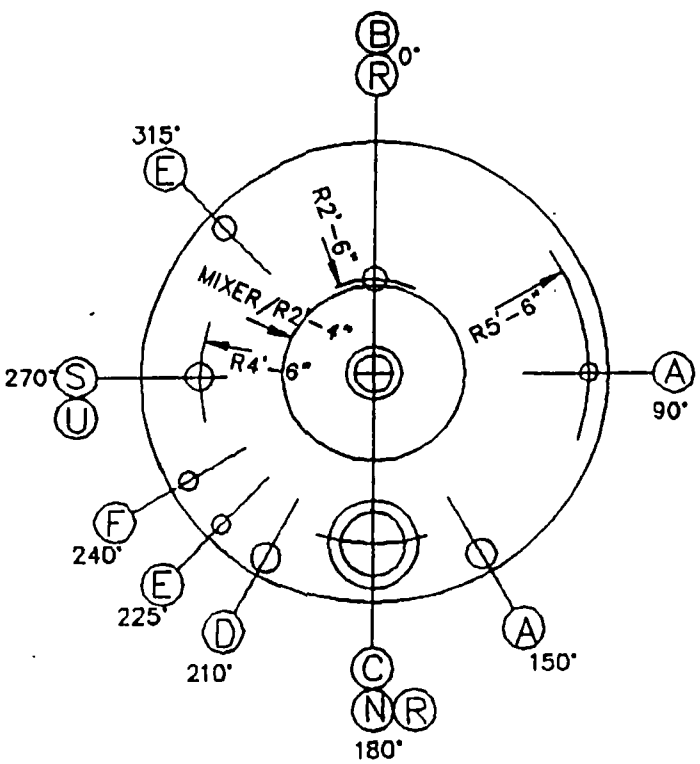
Signature: Lee F. Mount

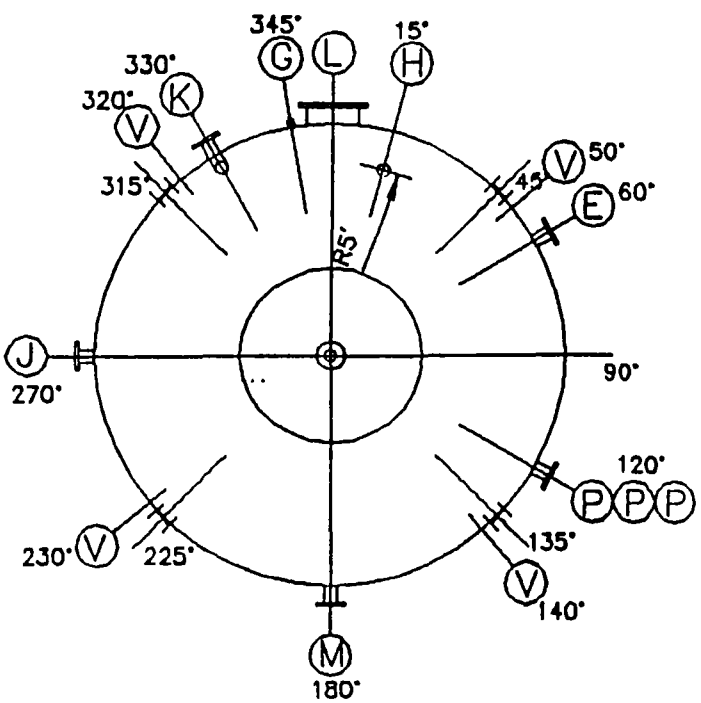
Date: 24 January 1995

Massachusetts Registration No: 21193

MARK	REQD.	SIZE	TYPE	ELEVATION	DESCRIPTION
A	2	2"	150# RFSO	ROOF	NITROGEN BLANKET
B*	1	3"	150# RFSO	ROOF	COV – FA
C	1	20"	150#	ROOF	EMERGENCY VENT
D	1	4"	150# RFSO	ROOF	FILL
E(225)	1	3"	150# RFSO	ROOF	HIGH LEVEL–LSH107
E(315)	1	3"	150# RFSO	ROOF	SPARE
F	1	3"	150# RFSO	ROOF	DPSL107 & DPSH107
G	1	2"	3000# CPLG	12" F/CONE	SPARE
H	1	2"	3000# CPLG	CONE	SAMPLE
J	1	3"	150# RFSO	6" F/CONE	LOW LEVEL–LSL107
K	1	3"	150# RFSO	13" F/CONE	SPARE
L	1	24"	150#	12" F/CONE	MANWAY W/COVER
M	1	4"	150#FB–VALVE	CONE	DRAW–OFF
N*	1	12"	150# RFSO	ROOF	MIXER MOUNT
P	3	3"	150# RFSO	6",3'–6",6'–6"	DRAW–OFF
R	AS SHWN		–	6'–3" F/ROOF	SUPPORT CLIP
S	AS SHWN		–	3'–9" F/ROOF	SUPPORT CLIP
E	1	3"	150# RFSO	6" F/CONE	SPARE
U*	1	4"	150# RFSO	ROOF	LEVEL MONITOR–LT107
V*	4		–	SHELL	BAFFLE

NOTE: * DESIGNATES NEW NOZZLE





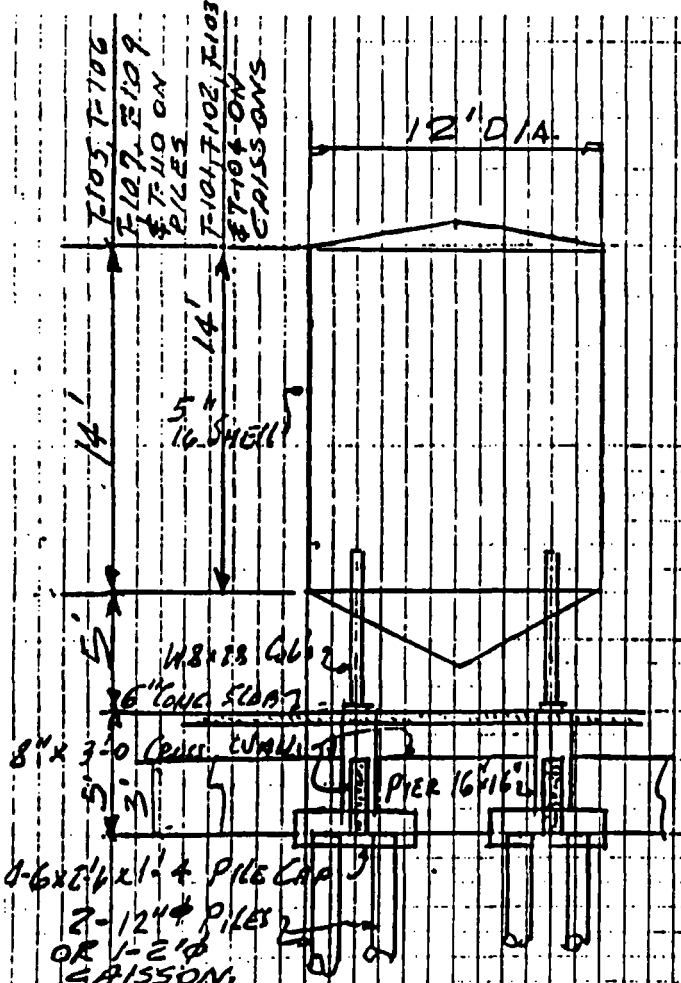
TK–107

HOYER-SCHLESINGER-TURNER, INC.

SHEET 2 OF 8
PROJECT NO. 17851
DATE 1.19.95
BY BERNES
CHK. C.K. 1.27.95

PROJECT CLEAN HARBORS - CHICAGO, IL

SUBJECT EXIST. TANK FARM SUPPORT COMPUTATIONS



SECTION "A-A"
SEE SH-1

TANKS T-101 THRU T-107, T-109 & T-110

EMPTY TANK =
$= \pi(12 \times 14' + 12^2/4 + 6^2 + \sqrt{12 \times 12^2}) \times 12.8 \times 1.15$
$= 11,985 + 4 \text{ LEGS} \times 7 \times 28 = 188$
TOTAL = 12,170#

PLUS NOZZLES, FLANGES AND SUPPORTS:
= 7,830#

TOTAL EMPTY TANK = 12,170 + 7,830 =
= 20,000#

LIQUID = 12,100 GAL × 2.332 × 1.5 =
= 151,298#

TOTAL EMPTY + LIQUID =
= 20,000# + 151,298# = 171k

EACH LEG = 171/4 = 43k/LEG

CONCRETE + SNOW

PILE CAP = 4.5' × 2.5 × 1.33 × .15 = 2.25k
PIER 1.33 × 1.33 × 5 × .15 = 1.33k
CROSSWALL 3' × .67' × 16 × .15 = 4.82k
FILL 4.5 × 2.5 × 3.5 × .10 = 3.94k
6" CONC. SLAB 4.5 × 2.5 × .5 × .15 = .84k
SNOW π12² × 25# = 2.83k

16.01 k/L

TOTAL LOAD PER LEG ON PILES
= 43k + 16k = 59k

TWO 2-12" ϕ WOOD PILES = 20 TON CAP. EACH
= 2 × 40k = 80k > 59k OK

CAISSON CAP = π × R² × 9k = π × 2.25² × 9 = 143k > 59k o.

H-S-T

HOYER-SCHLESINGER-TURNER,Inc.
ENGINEERS-ARCHITECTS
3074 University Ave.
Highland Park,IL 60035
Phone:847-461-0470 Fax:847-266-9829

July 20, 1999

Mr. James R. Laubsted
Facility Compliance Manager
CLEAN HARBORS SERVICES, INC.
11800 S. Stony Island Avenue
Chicago, IL 60617

RE: Inspection Report
Tank T-109

Dear Mr. Laubsted:

On July 9, 1999 I visually inspected the interior and exterior of Tank T-109.

Tank T-109 is located on the north side of the Flammable Storage Tank Farm (Unit 16). Previous visual inspections include July 7, 1995. Hydrostatic testing was completed in July, 1995. From the time of the earlier inspection, the tank was used for storing Class I flammable hazardous waste fuels. Tank T-109 is located outdoors and has a dedicated concrete dike. The containment is coated with Protecto-Coat 900, 30 mils thick as manufactured by Dudick, Inc. This coating is compatible with the stored materials. The containment dike for T-109 and the remaining tanks within the tank farm were inspected August 31, 1998.

Tank T-109 is a carbon steel vessel fabricated in 1981. Tank T-109 was empty at the time of inspection and was cleaned by Clean Harbors personnel. The tank is operated at ambient temperature and under 2" WC pressure from nitrogen blanketing. The tank is equipped with a conversation vent and is vented through a carbon bed.

Tank T-109 stores Class I flammable liquids including hazardous waste fuels. Maximum specific gravity of stored liquids is 1.5 and pH may vary from 4 to 10. The tank is constructed from carbon steel. It is 12'0" in diameter and 14"0" high straight side with a cone bottom and top. The operating capacity is 12,000 gallons. There is no record that this tank was built to the UL-142 standard. The assumption that the tank was built to this standard is based on a comparison with another tank which was fabricated to the UL-142 standard.

The tank is supported by steel legs on caissons. The steel legs are encased in concrete.

The internal and external visual inspection did not reveal any defects. The welds around nozzles and tank shell welds inspected from inside the tank were in good condition. The roof had areas with rust. The rust was sandblasted by Clean Harbors. There was no sign of pitting or other visible defects.

It is not possible to inspect the entire exterior of the tank by visual inspection. The tank is insulated with 2" thick insulation with metal jacket. The insulation and jacketing was removed where nozzles were added in 1995. At that time the welds could be inspected from the outside. The condition of the welds was good; there were no vertical defects.

In July, 1999 Clean Harbors performed NDE-ultrasonic thickness measurements from the interior of the tank. In March, 1999 external NDE-ultrasonic thickness measurements were taken. These ultrasonic thickness test results and prior results are listed in Appendix TK-109-1.

The top as-built thickness was 0.250 inches. The eight latest readings each show decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.228 inches which is 85% over the minimum of 0.123 inches recommended by the UL-142 standard.

The wall as-built thickness was 0.313 inches. The sixteen latest readings each show decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.218 inches which is 31% over the minimum of 0.167 inches recommended by the UL-142 standard. A review of external readings from August 1996 through March 1999 for eleven locations shows an average decrease of 0.042 inches with a maximum decrease of 0.078 inches.

The bottom as-built thickness was 0.375 inches. The eight latest readings each show marked decreases in thickness compared to the 1991 ultrasonic thickness readings. The minimum reading was 0.268 inches which is 12% over the minimum of 0.240 inches recommended by the UL-142 standard. A review of external readings from August 1996 through March 1999 for four locations shows an average decrease of 0.105 inches with a maximum decrease of 0.119 inches. Eighty-five percent of the average decrease occurred between December 1997 and October 1998. The external readings from March 1999 are approximately equal or higher than the readings from October

1998. The eight internal readings from July 1999 average 7% higher than the four internal readings from March 1999 with only one of the eight readings lower than the external readings.

Because the decreases in thickness were concentrated from December 1997 to October 1998, Clean Harbors should attempt to determine wastes stored in TK-109 during that period which could have caused the decrease. Although the decreases have slowed substantially, future readings should be closely monitored.

For tank evaluations, modifications and calculations, see certification reports by Mr. Lee F. Mount, PE, dated January 1995 and May 23, 1995 in Appendix TK-109-2.

For tank nozzle orientation and description, see Appendix TK-109-3.

For Tank T-109 supports evaluation, see calculations by Mr. Peter J. Bernes, SE, dated January 19, 1995 in Appendix TK-109-4.

Therefore, I certify that after visual inspection, the tank is structurally sound, properly supported and set. No evidence of cracks, bulging, corrosion pits or scales or weld defects were observed. Based on my inspection, the tank can be used for the intended purpose.

Very truly yours,

HOYER-SCHLESINGER-TURNER, INC.

Peter J. Bernes

Peter J. Bernes
Illinois #3659

STATE OF ILLINOIS
PETER J.
BERNES
3659
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11.30.99

APPENDIX TK-109-1

ULTRA SONIC THICKNESS TESTING
T-109

July 7, 1999

INTERNAL

TOP

East	South	West	North
.252	.234	.296	.296
.230	.292	.228	.240

SHELL

.232	.218	.238	.246
.256	.248	.224	.252
.289	.296	.284	.288
.300	.294	.296	.299

BOTTOM

.294	.288	.268	.286
.336	.368	.308	.304

Calumet Testing Services, Inc.
1945 N. Griffith Blvd.
Griffith, Indiana 46319
(219) 923-9800 — (708) 474-5860

THICKNESS TESTING REPORT

CTS JOB # 6503

PAGE NO. 1 OF 1

Customer	Location	Surface Condition	Date
CLEAN HARBORS	CHIC.	AS PAINTED	3-1-99

Meter Model, Serial No.	Couplant	Transducer Model, Serial No.
DM 2E	GREASE	1/4"

This report is made with the limitations of ultrasonic testing equipment.
Errors will occur in reported thickness if the material contains internal discontinuities or the contact surface is rough.

TANK 109

LOCATION	THICKNESS READINGS
#1	.249"
#2	.253"
#3	.247"
#4	.252"
#5	.271"
#6	.277"
#7	.280"
#8	.255"
#9	.222"
#10	.279"
#11	.288"
#12	.288"
#13	N/A
#14	.225
#15	.239"
#16	.283"
#17	.288"
#18	.284"
#19	.288"
#20	.285"

Examiner KOBLE (Signature) II (Level) 3-1-99 (Date) Customer Review _____ (Signature) _____ (Date)

ULTRA SONIC THICKNESS TESTING
T-109

October 17, 1998

TOP

East	South	West	North
#2 .236	#1 .229	#4 .237	#3 .239

SHELL

#12 .297	#5 .290	#6 .295	#11 .299
#10 .269	#7 .292	#16 .282	#13 .284
#9 .222	#8 .238	#15 .238	#14 .228

BOTTOM

#20 .256	#19 .289	#18 .289	#17 .284

CleanHarbors

ULTRASONIC THICKNESS TESTING - 12-17-97

TANK #109

EAST	SOUTH	WEST	NORTH
2 .218	1 .227	4 .247	3 .257
12 .296	5 .296	6 .299	11 .298
10 .281	7 .298	16 .292	13 .291
9 .282	8 .290	15 .285	14 .282
20 .348	19 .399	18 .387	17 .375

ULTRA SONIC THICKNESS TESTING
T109

August 8, 1996

TOP

East	South	West	North
#2 .247	#1 .249	#4 .263	#3 .249

SHELL

#12 .300	#5 .301	#6 .308	#11 .302
#10 .307	#7 .315	#16 .303	#13 .300
#9 .293	#8 .332	#15 .304	#14 .303

BOTTOM

#20 .370	#19 .402	#18 .403	#17 .389

CLEAN HARBORS OF CHICAGO, INC.

CWM TANK FARM

EXISTING TANK STATUS FORM

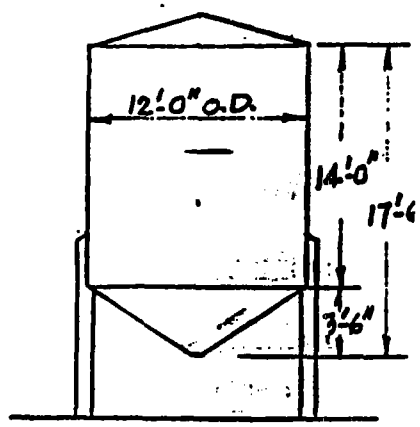
Tank No. T-109

Nominal Capacity 12,000 gals.

Mat'l. of Const. CARBON STEEL

Approx. Year of Build 1981

Designed Corrosion Allow. 1/16"



Stored Waste Characteristics:

	Past	Future
Specific Grav.	1.5 (design)	0.5 → 1.5
Class	FUEL OIL (HEATED)	HAZARDOUS WASTE FUELS (NFPA CLASS 1-3 LIQUIDS)

Material Thicknesses (Inches):

Surface	per UL-142 Std.	As Built	Ultrasonic Test Results			
			08/89 B		10/91 C	
		A	Avg.	Min.	Avg.	Min.
Top	0.123	0.250	0.254	0.249	0.255	0.246
Shell	0.167	0.313	0.315	0.305	0.318	0.307
Bottom	0.240	0.375	0.385	0.384	0.414	0.397

NOTES:

A. FROM STRAUBING, RUBIN & KENES DESIGN DWG. 1-Q-005

B. FROM ALPHA CONSULTANTS JAN. '90 RPT.

C. FROM SIRRINE ENVIR. CONSULTANTS NOV. '91 RPT.

16 BRUTENSKE A 1

1785

LEE F. MOUNT, P.E.
CIVIL ENGINEER
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(617) 749-5394

23 May 1995

Mr. Alan F. Mount, Project Manager
Clean Harbors of Chicago, Inc.
11800 S. Stony Island Avenue
Chicago, Illinois 60617

Subject: CWM Tank Farm
Tank Agitator Mounting and Nozzle Details

Enclosure: 1) Design Calculations and Fabrication Details
(10 sheets, original issue date 14 March 1995)

Dear Alan,

Enclosure 1) is submitted herewith for your information and records. Sheet nos. 1, 5, 6 & 9 have been updated and revised where necessary to reflect your actual "as built" conditions.

Yours truly,

Lee F. Mount

Lee F. Mount

Reviewed by:

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-96

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JOB CWM/CHI TANK FARM
SHEET NO. COVER OF
CALCULATED BY L. F. MOUNT DATE 14 MAR '95
REV. 17 MAR. '95.
CHECKED BY DATE
SCALE FINAL ISSUE TO REFLECT 22 MAY '95
"AS BUILT" CONDITIONS

THE ENCLOSED CALCULATIONS AND FABRICATION DETAILS WERE CARRIED OUT IN SUPPORT OF CURRENT TANK UPGRADES PROPOSED FOR THE CLEAN HARBORS, CHICAGO STONY ISLAND FACILITY. AN OVERALL REVIEW AND ASSESSMENT OF THE STRUCTURAL INTEGRITY OF THESE EXISTING TANKS WAS COVERED IN A REPORT BY THE UNDERSIGNED DATED JAN. 1995. THIS REPORT ADDRESSES THE FITTING OF NEW TANK AGITATORS AS WELL AS ADDITIONAL NOZZLES.

CONTENTS

DESCRIPTION	SHEET NO.
SKETCH OF AGITATOR MOUNTING FLANGE (FOR TANKS 105, 106, 107	1
REFERENCES 109, 110, 112)	2
ESTIMATE OF STRESS DUE TO BENDING MOMENT @ FLANGE	2
ESTIMATE OF STRESS DUE TO TORQUE @ FLANGE	3
ESTIMATE OF STRESS DUE TO AGITATOR VERTICAL LOAD	3
CHECK OF LOADED TANK SUPPORT LEGS W/ AGITATOR VERT. LOAD	4
TYPICAL PROPOSED 4" NOZZLE INSTALLATIONS	5
BAFFLE PLATE DESIGN REQ'MTS.	6
CHECK TANK INTEGRITY FOR OPERATION WITH 1.0 PSIG VAPOR PRESS.	7-8
SKETCH OF MODIFIED AGITATOR MOUNTING FLANGE (FOR TANKS 103 + 104)	9
TABULAR SUMMARY OF AGITATOR SPECS. + TANK PROPERTIES	10

PREPARED BY Lee F. Mount
LEE F. MOUNT
14 MARCH 1995

COMMONWEALTH OF MASSACHUSETTS
LEE FORREST MOUNT
21193
REGISTERED
PROFESSIONAL ENGINEER

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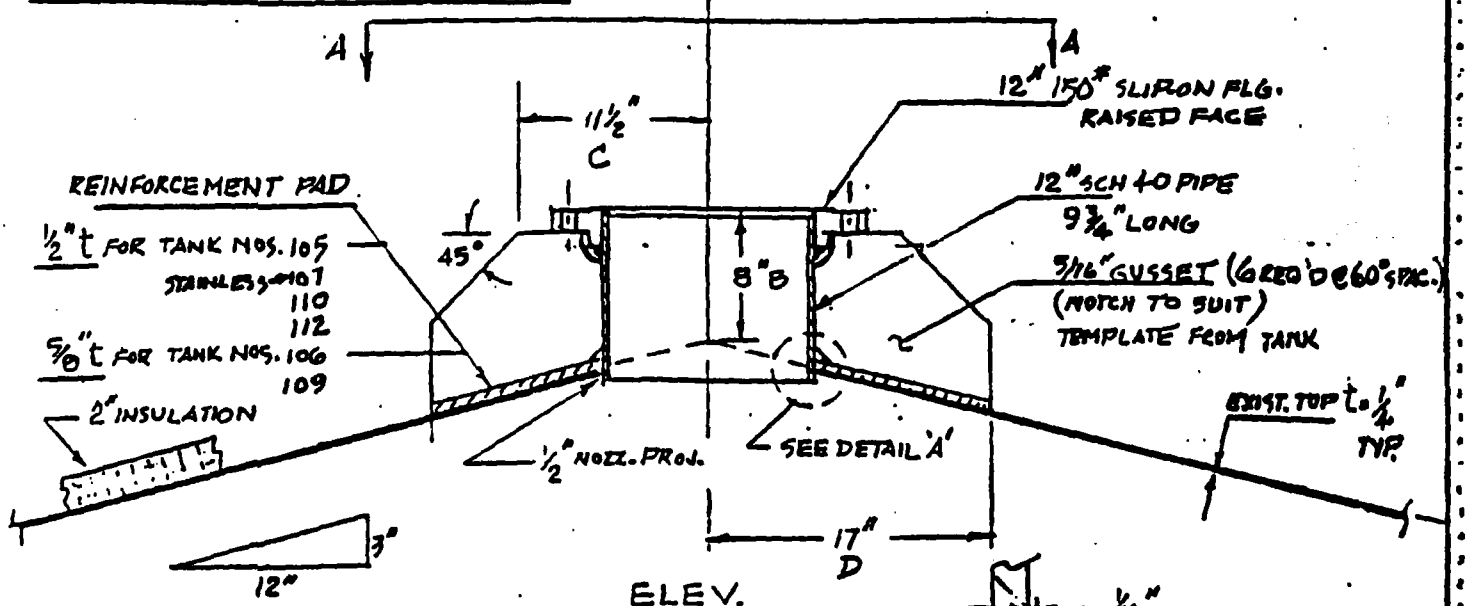
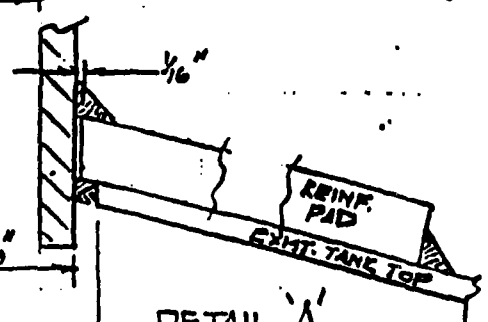
JOB CWM/CHI TANK AGITATORS
SHEET NO. 1 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR.'95
REV. 15 MAR.'95
CHECKED BY DATE
SCALE 1" = 1'-0" & AS NOTED 22 MAY'95
"AS BUILT"

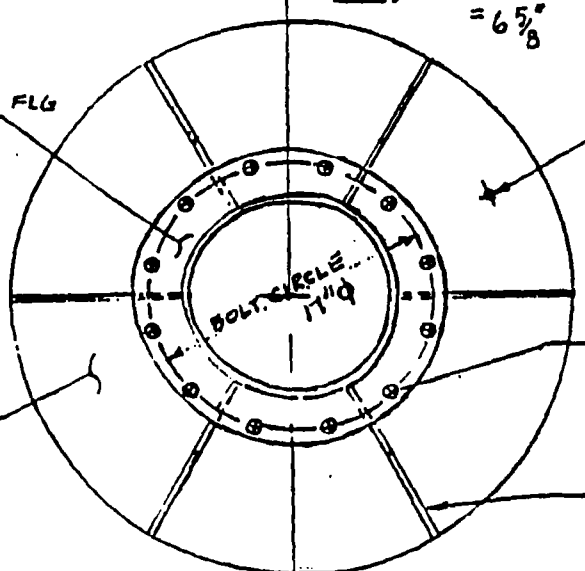
NEW MOUNTING FLANGE FOR TANK NOS. 105, 106, 107, 109, 110 & 112



ELEV.



DETAIL 'A'
(HALF SIZE)
PER UL-142 FIG. 11.2



PLAN A-A

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JOB CWM/CHI TANK AGITATOR & NOZZLE INSTALL
SHEET NO. 2 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. '95
CHECKED BY _____ DATE _____
SCALE _____

REFERENCES: 1) CHEMINEER AGITATOR DESIGN SYSTEM SPEC. SHEETS
2) UL-142, STEEL ABOVE GROUND TANKS
3) FORMULAS FOR STRESS & STRAIN, ROARK 4TH ED. 1965
4) API-650 WELDED STEEL TANKS FOR OIL STORAGE
5) CHEMINEER IOM MANUAL PG. 4-9 JUNE '93
6) ASME SECT VIII PRESSURE VESSEL CODE

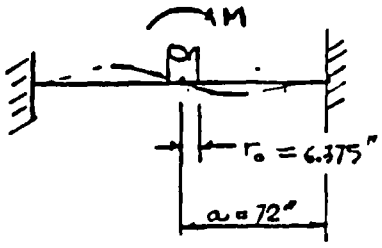
CHECK REINFORCED TANK TOP FOR AGITATOR LOADINGS

ASSUMPTIONS: LOADINGS - USE 15 HP TYPE C UNIT FOR MAX. BENDING MOMENT OF 5036 FT.-LBS & TORQUE OF 4274 FT.-LBS

- USE 5 HP TYPE B UNIT FOR MAX. VERTICAL LOAD OF SAY 3000 LBS

ESTIMATE STRESS DUE TO BENDING MOMENT

FROM REF 3) PG. 219, CASE 10 ASSUMES FLAT CIRCULAR PLT, EDGES FIXED, CENTRAL COUPLE



$$\text{Max } S_r \text{ at } r = r_o = \frac{3M}{4\pi t^2 r_o}\left[1 + \left(\frac{m+1}{m}\right)\log \frac{2(.45a - r_o)}{.45 k a}\right]$$

WHERE: $k = \dfrac{0.1a^2}{(r_o + .28a)^2} = \dfrac{0.1(72)^2}{[6.375 + .28(72)]^2}$

$= 0.736$

$M = 5036 \text{ FT-LBS} \times 12 = 60432 \text{ IN-LBS}$

$t = .25 + .625 \text{ (REINF. PAD)} = 0.875''$

m = RECIPROCAL OF POISSON'S RATIO

$= \dfrac{1}{.3} = 3.33$

$a = 72''$

$r_o = 6.375''$

$$\text{Max } S_r = \frac{3(60432)}{4\pi(.875)^2(6.375)}\left[1 + 1.30 \log \frac{2[.45(72) - 6.375]}{.45(.736)(72)}\right] \quad (2.183)$$

$= 2956\,[1 + 1.3(.781)]$

$= 2956\,(2.02) = \boxed{5971 \text{ PSI}}$

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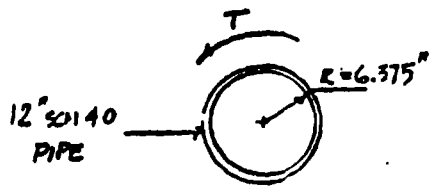
JOB CWM/CHI TANK AGITATORS
SHEET NO. 3 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. '95
CHECKED BY _____ DATE _____
SCALE _____

ESTIMATE SHEAR STRESS DUE TO TORQUE

$T = 4274$ FT-LBS $\times 12 = 51288$ IN-LBS

FORCE $= \frac{T}{r} = \frac{51288 \text{ IN-LBS}}{6.375''} = 8045$ LBS



CIRCUM. $= 2\pi(r) = 40''$

$\therefore$ LOAD/" OF CIRCUM. $= \frac{8045}{40} = 201$ LBS/IN

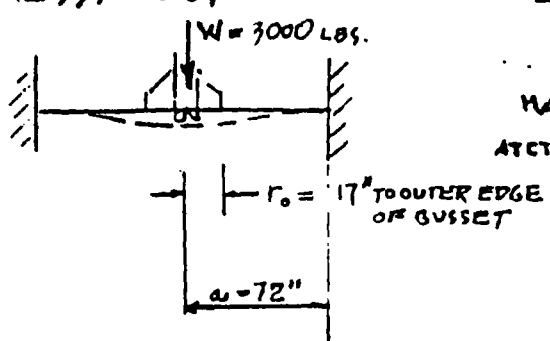
SAY TORQUE IS CARRIED BY 3/8" FILLET WELD @ REINF. PAD TO NOZZLE CONNECTION

ALLOWABLE WELD LOAD $= 11{,}200(.375) = \boxed{4200 \text{ LBS/IN} > 201 \text{ OK}}$

CONSERVATIVE IN THAT LOWER TANK TOP TO NOZZLE FULL PENETRATION WELD HAS NOT BEEN TAKEN INTO ACCOUNT.

ESTIMATE STRESS DUE TO VERTICAL LOAD

FROM REF. 3) PG 218, CASE 7 ASSUMES FLAT CIRCULAR PLT., EDGES FIXED, UNIFORM LOAD OVER CONCENTRIC CIRCULAR AREA OF RADIUS r_o



$$\text{MAX } S_r \text{ AT } r_o = \frac{3W}{2\pi m t^2}\left[(m+1)\log\frac{a}{r_o} + (m+1)\frac{r_o^2}{4a^2}\right]$$

WHERE: $W = 3000$ LBS

$t = .25 + .50$ (REINF PAD) $= 0.75''$ FOR TANK No 112

$m = 3.33$

$a = 72''$

$r_o = 17''$

$$\text{MAX } S_r = \frac{3(3000)}{2\pi(3.33)(.75)^2}\left[4.33\log 4.235 + 4.33(.0139)\right]$$

$$= 765\,(6.25 + .06)$$

$$= \boxed{4827 \text{ PSI}}$$

CONCLUDE: COMBINING STRESS DUE TO BENDING (5771) + STRESS DUE TO VERT. LOAD (4827) = 10,598 PSI

API 650 GIVES ALLOW STRESS OF 20,000 PSI FOR ASTM A285-C STEEL

THUS, THE STRESS DUE TO EXTERNAL LOADS IS APT. 54% OF ALLOWABLE WHICH APPEARS TO BE REASONABLE

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JOB CWM/CHI TANKS
SHEET NO. 4 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR '95
CHECKED BY DATE
SCALE

CHECK TANK SUPPORT LEGS FOR AGITATOR VERT. LOAD

USE TANK NO 112 (LARGEST TANK + HEAVIEST AGITATOR)

ESTIMATED WEIGHT TO BE SUPPORTED BY 4 LEGS @ L=7.0' SIZE = W8×31

TANK STEEL

CONE TOP (1/4" RT.) LATERAL AREA = BASE CIRCUM × 1/2 SLANT HT.

$= \pi D \times \frac{6.18'}{2}$

$= \pi 12 \times 3.09 = 116.5$ □' × 10.2#/FT² = 1188 LBS.

SHELL (5/16" RT.) AREA = $\pi D H$

$= \pi 12 \times 22 = 829.4$ □' × 12.75#/FT² = 10575 LBS.

CONE BOTTOM (3/8" RT.) LATERAL AREA = BASE CIRCUM × 1/2 SLANT HT.

$= \pi D \times \frac{6.95}{2}$

$= \pi 12 \times 3.48 = 131.2$ □' × 15.7#/FT² = 2007 LBS.

AGITATOR WEIGHT → 3000 LBS

SUBTOTAL 16770 LBS

ADD 20% FOR MISC. PIPING, PLATFORMS INSULATION, ETC. → 3350 LBS

LIQUID CONTENTS @ S.G. = 1.5 CAP. = $\frac{20{,}000 \text{ GAL.}}{7.48 \text{ GAL/CU.FT}}$ = 2674 CU FT × 62.4 × 1.5 = 250,286 LBS

TOTAL ESTIMATED WT. TO BE SUPPORTED = 270,406 LBS.

USE 276 KIPS

∴ EACH LEG CARRIES 276/4 = 69 KIPS

FROM AISC COL TABLE @ KL = 2(7) = 14 FOR W8×31 (A36 STL.)

READ ALLOWABLE LOAD = 137 KIPS > 69 KIPS

CONCLUDE: EXISTING COLUMN SUPPORT IS ADEQUATE FOR CONDITIONS

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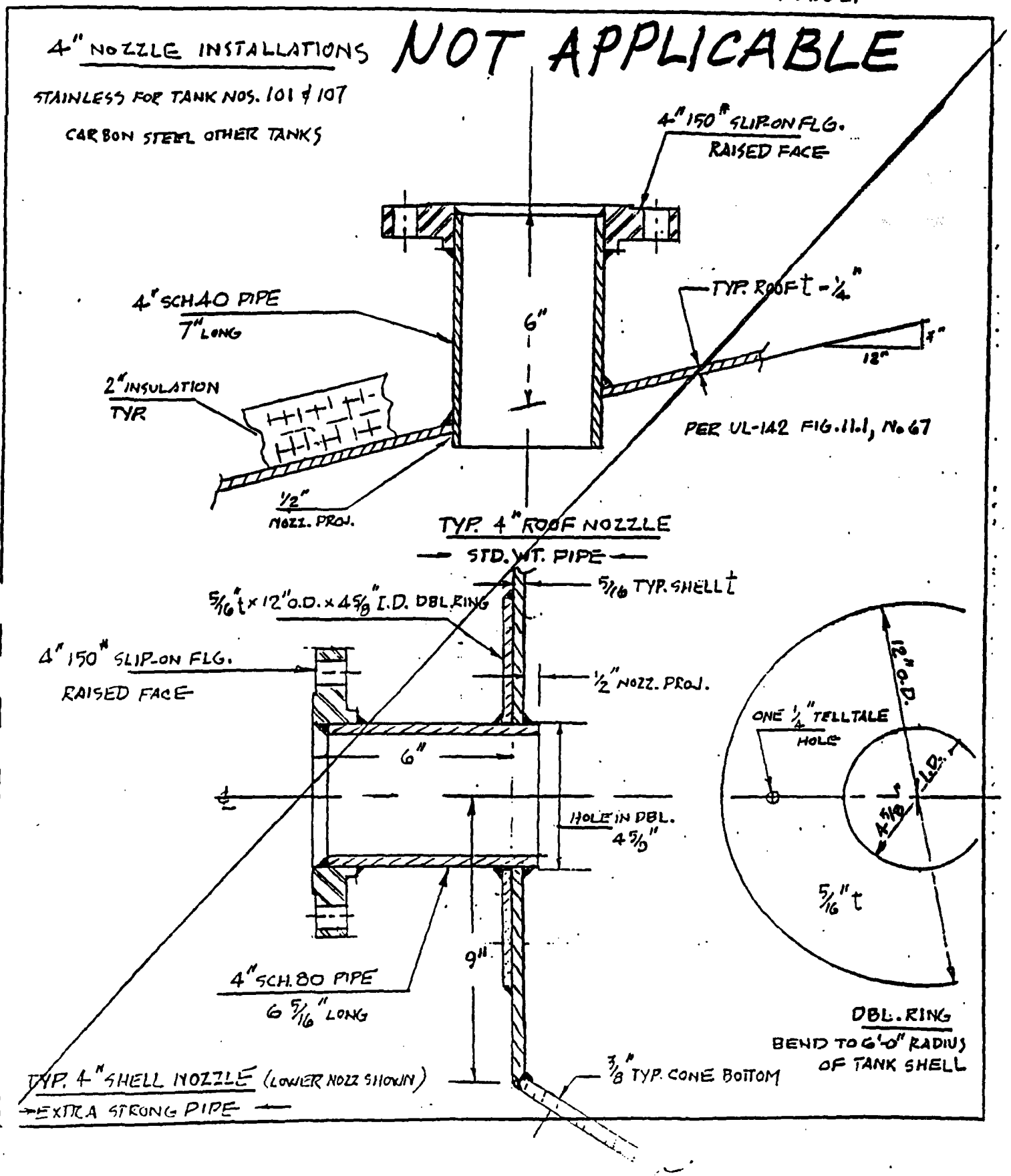
JOB CWM/CHI TANKS
SHEET NO. 5 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR.'95
REV. 15 MAR.95
CHECKED BY DATE
SCALE 3" = 1'-0" 22 MAY'95
"AS BUILT"



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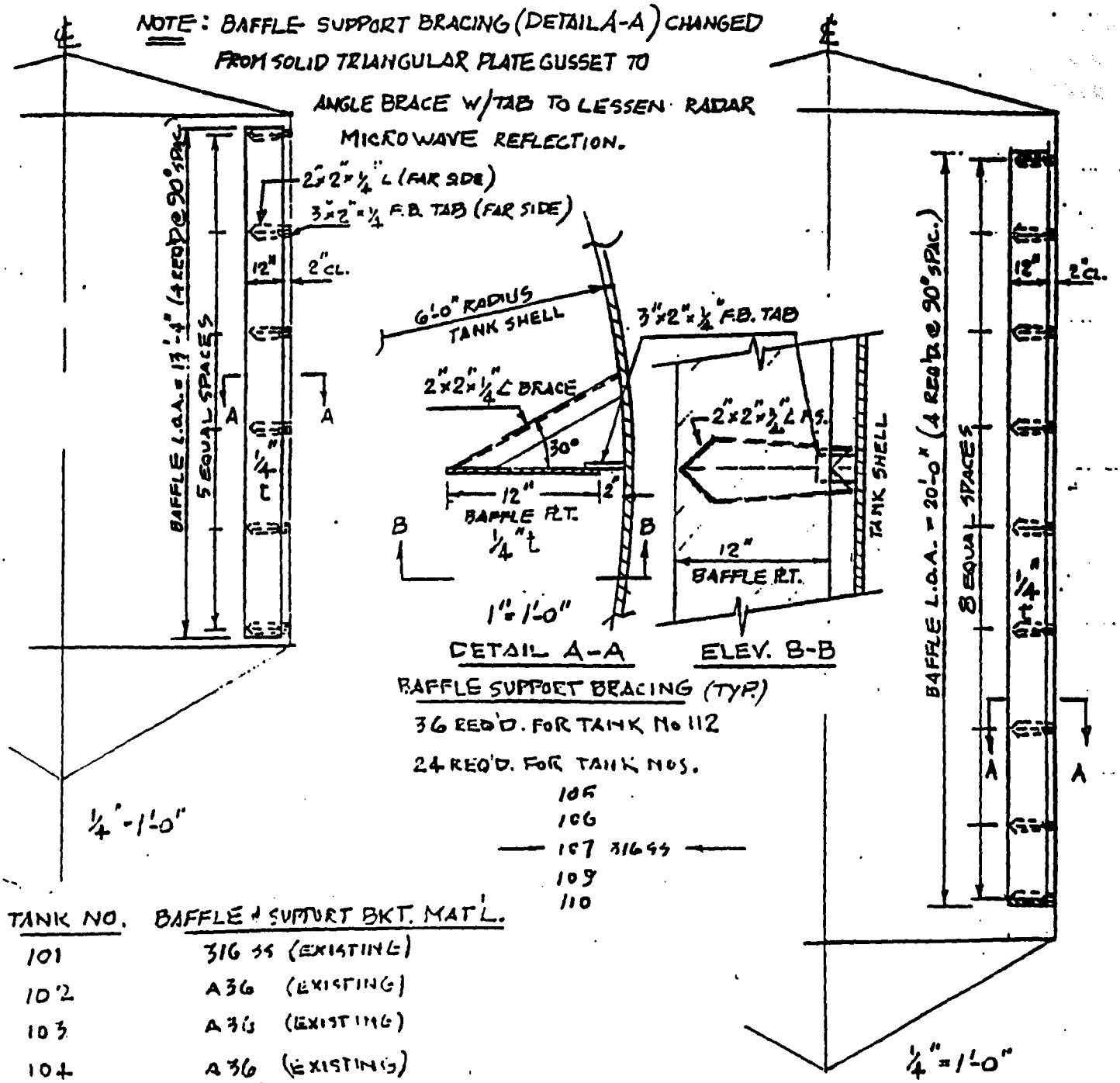
JOB C.WM/CHI TANKS
SHEET NO. 6 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. '95
CHECKED BY DATE REV. 15 MAR. '95 --
SCALE AS NOTED "AS BUILT" 22 MAY '95

BAFFLE PLATE DESIGN (SIZES AS RECOMMENDED IN REF. 1)

NOTE: BAFFLE SUPPORT BRACING (DETAIL A-A) CHANGED FROM SOLID TRIANGULAR PLATE GUSSET TO ANGLE BRACE W/TAB TO LESSEN RADAR MICROWAVE REFLECTION.



BAFFLE SUPPORT BRACING (TYP.)
36 REQ'D. FOR TANK No 112
24 REQ'D. FOR TANK NOS.
105
106
107 316SS
109
110

TANK NO.	BAFFLE & SUPPORT BKT. MAT'L.
101	316 SS (EXISTING)
102	A36 (EXISTING)
103	A36 (EXISTING)
104	A36 (EXISTING)
(105)	(A36) NEW
(106)	(A36) NEW
(107)	(316 SS) NEW
(109)	(A36) NEW
(110)	(A36) NEW

TANK No (112)
BAFFLE & SUPPORT BKTS.
A36 STEEL (NEW)

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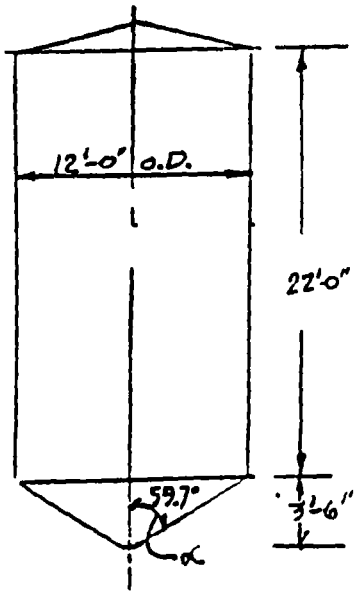
JOB CWM/CHI TANKS
SHEET NO. 7 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR '95
CHECKED BY _____ DATE _____
SCALE _____

CHECK FOR TANK SERVICE OPERATION WITH 1.0 PSIG INTERNAL VAPOR PRESSURE (APPT. 24" WATER)

USE TANK NO 112 WHICH HAS GREATEST DEPTH

ASSUME S.G. @ 1.5



MAX PRESSURE @ CONE BOTTOM $= \frac{62.4 \times 1.5 \times 25.5'}{144} = 16.6$ PSI

PLUS VAPOR PRESSURE 1.0 PSI

17.6 PSI

USE 18 PSI = P

USE ASME SECT VIII - DIV 1, APPENDIX 1 TO DETERMINE MIN. REQ'D PLT. t FOR SHELL & CONE BOTTOM

FOR CYLINDRICAL SHELL:

$$t = \frac{PR_o}{SE + 0.4P}$$

WHERE: $P = 18$ PSI

$R_o = \frac{12}{2}(12) = 72''$

$$t = \frac{18(72)}{(13800).7 + 0.4(18)}$$

$S = 13{,}800$ PSI FOR A285-C STL.

$E = 0.7$

$t = 0.134'' + .0625'' = 0.197$ IN. (UL-142 WOULD REDUCE $t = 0.167$ IN)

CORR. ALLOW.

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $0.30'' > .197''$ O.K.

FOR CONE BOTTOM:

$$t = \frac{PD_o}{2\cos\alpha\,(SE + .4P)}$$

WHERE: $D_o = 144''$

$\alpha = 59.7°$

$$= \frac{18(144)}{2\cos 59.7°\,(13{,}800 \times .7 + .4 \times 18)}$$

$= 0.266'' + .0625'' = 0.329$ IN.

CORR ALLOW

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $.375'' > .329$ O.K.

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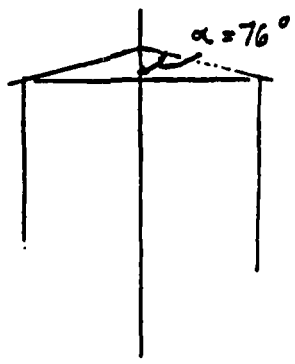
CHECK FOR 1.0 PSIG INTERNAL VAPOR PRESSURE (CON'D.)

FOR CONE TOP



FROM ASME SECT. VIII - DIV. 1

SOLVE FOR P:

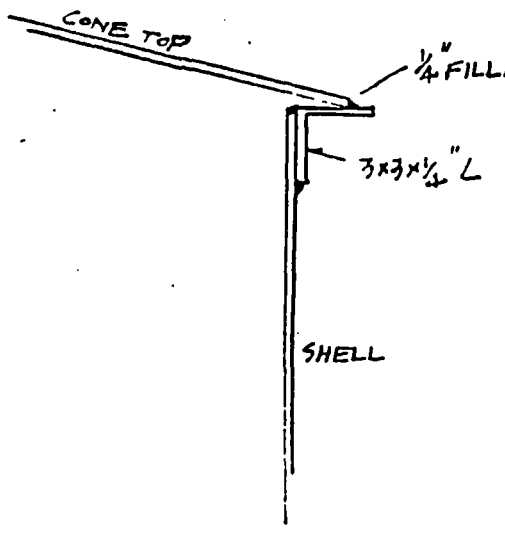
$$P = \frac{2SEt\cos\alpha}{D_o - 0.8t\cos\alpha}$$

WHERE S = 13,800 PSI
E = 0.7
D_o = 144 IN
α = 76°
t = USE .25 − 1/16" CORR ALL.
= .1875"

$$P = \frac{2(13{,}800)(.7)(.1875)(.242)}{144 - [.8(.1875)(.242)]}$$

$$= \frac{876.65}{144} = \boxed{6 \text{ PSI} > 1.0 \quad \text{O.K.}}$$

CHECK ROOF TOP CONNECTION WELD DETAIL



EST. LATERAL SURFACE AREA CONE TOP SUBJECTED TO 1.0 PSI PRESSURE

DIA. ≈ 148" (ROOF OVERHANGS SHELL)

LATERAL AREA = BASE CIRCUM. × 1/2 SLANT HT

$$= \pi D \times \frac{76.2''}{2}$$

$$= \pi(148) \times 38.1 = 17{,}715 \text{ IN}^2$$

∴ LOAD TO ROOF = 17,715 IN² × 1 LB/IN² = 17,715 LBS

CIRCUM. OF 1/4" FILLET ATTACHMENT WELD = πD = π(148) = 465 IN

∴ LOAD/IN ON 1/4" FILLET WELD = $\frac{17715}{465}$ = 38 #/IN

VS

ALLOWABLE WELD LOAD OF 11,200 × .25 = 2800 #/IN O.K.

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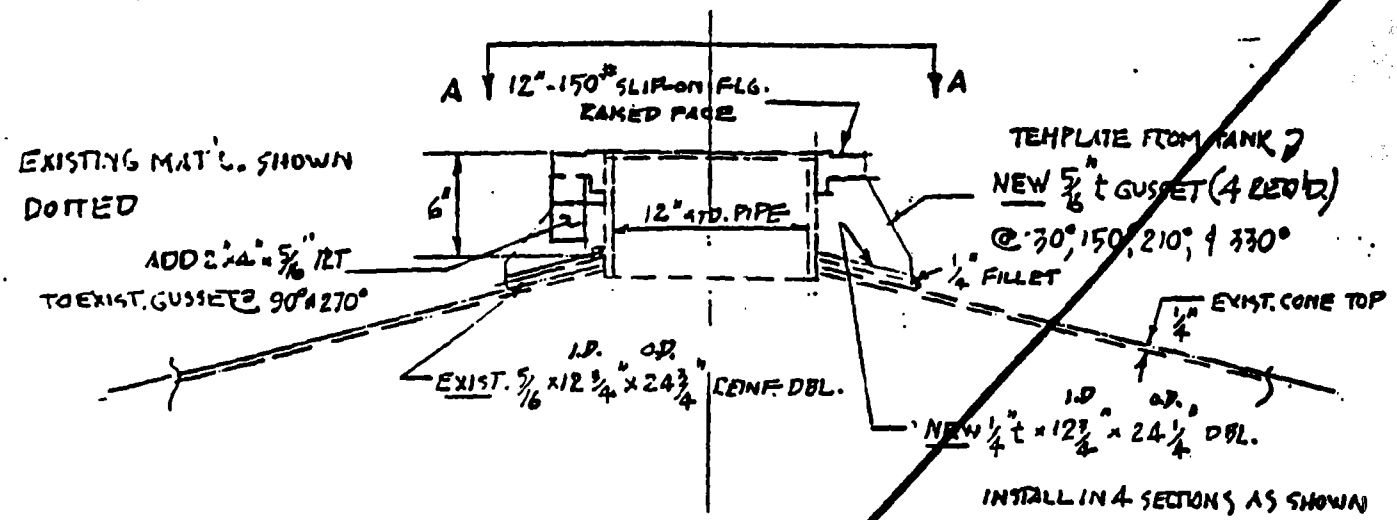
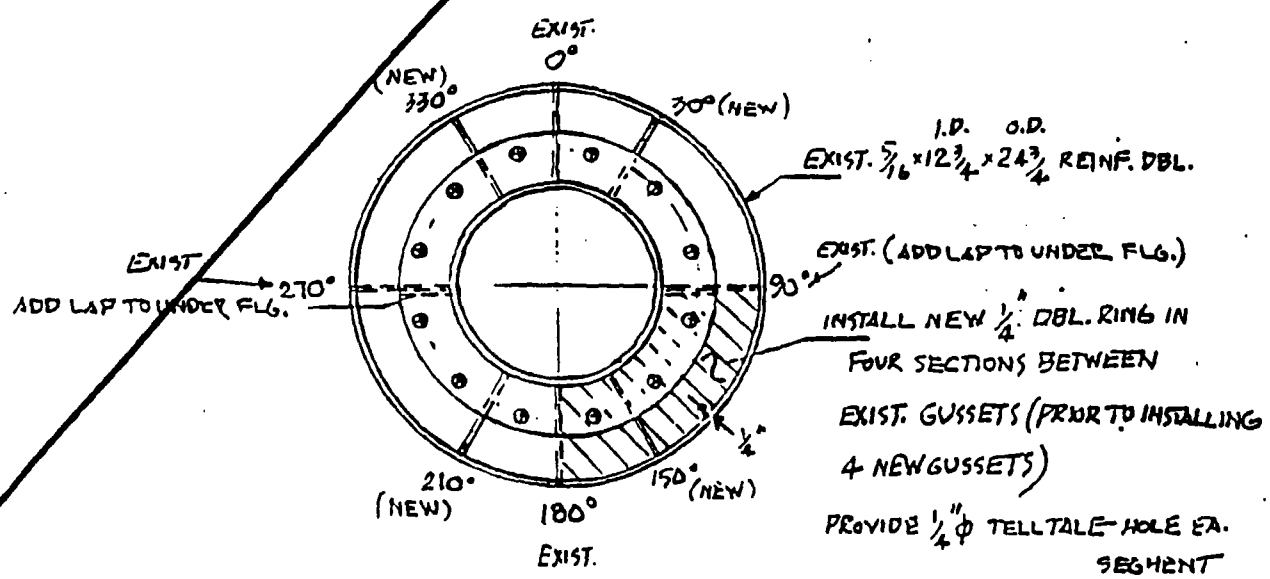
JOB CWM / CHI TANKS
SHEET NO. 9 OF 10
CALCULATED BY L.F. MOUNT DATE 16 MAR '95
CHECKED BY DATE
SCALE 1" = 1'-0" 22 MAY '95

NOT APPLICABLE "AS BUILT"

MODS. TO TANK 103 & 104 EXISTING AGITATOR MOUNTING; TO ACCOMMODATE NEW 7.5 HP UNITS



ELEV.



PLAN A-A

CWM/CHI TANK AGITATORS
L.F. MOUNT 10 MAR '95
REV. 15 MAR '95
SHT 10 OF 10

TANK I.D.	AGITATOR SPECS. (FROM REF. 1) TYPE	HP	RPM	SHAFT L IN.	SHAFT DIA. IN.	WT. LBS.	NOZZLE BEND MOM FT.-LBS.	NOZZLE TORQUE FT.-LBS.	BAFFLE REQ'D.	CASE SIZE	TANK PROPERTIES TOP HEAD t"	MIN HEAD t" (TBL 3)	NOZZLE SIZE	REINF PAD DIMENS. B (TBL 2)	C	D FIG 3	
101 S.S.	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.313 S.S.		12" EXIST				
102	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.250		12" EXIST				
103	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.250	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5	17" 12.375	(ACTUAL)
104	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.241	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5"	17" 12.375	AS MODIFIED (ACTUAL)
105	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"	
106	C NEW	15	45	190.5	3.5	2745	5036 MAX.	4274 MAX.	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"	
107 S.S.	EXIST. FROM 103	3.0							YES (NEW)	2 DESIGN FOR 4	.250 S.S.	.500	12"	8"	11.5"	17"	
109	C NEW	15	45	190.5	3.5	2745	5036	4274	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"	
110	EXIST. FROM 104	3.0							YES (NEW)	2 DESIGN FOR 4	.230	.500	12"	8"	11.5"	17"	
112	B NEW	5	30	270.0	3.5	2872 MAX.	2898	2337	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"	

NO CHANGE

MODIFY (SHT. 9) MOUNTING

NEW MOUNTING (SHT. 1)

FROM ULTRASONIC TEST RESULTS

REINF. PAD t FROM REF. 5

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

RECEIVED
JUN 20 1995
HOYER-SCHLESINGER-TURNER, INC.

19 June 1995

Marie Vanagas
Hoyer-Schlesinger-Turner, Inc.
300 West Adams Street
Chicago, ILL. 60606

Subject: Clean Harbors of Chicago, Inc.
CWM Tank Farm

Enclosure: 1) Review and Assessment of Structural Integrity of Existing Tanks; LFMount Report dated January 1995

Dear Ms Vanagas,

In response to Clean Harbors' request, enclosure 1) is herewith forwarded for your information and records.

Yours truly,

Lee F. Mount

Lee F. Mount

REVIEWED BY
Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3059
MY LICENSE EXPIRES ON 11-30-96

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

CWM TANK FARM

Review and Assessment of Structural Integrity of Existing Tank Nos.

T - 101	T - 106
T - 102	T - 107
T - 103	T - 109
T - 104	T - 110
T - 105	T - 112

January 1995

Prepared For:

Clean Harbors of Chicago, Inc.

(In response to Illinois EPA comments)

INTRODUCTION

This report was prepared in response to the Illinois EPA's request for additional information on the structural condition of the existing hazardous waste storage and/or fuel tanks scheduled for reuse at your CWM Tank Farm.

The work scope involved a technical review of all available tank related documents furnished by Clean Harbors. Pertinent data was then summarized and tabulated for each tank on a "Existing Tank Status Form". The ultrasonic test measurements for thickness, shown on the status forms, were then analyzed in order to make estimates of corrosion rates and projected service life.

Reference documents consulted during the course of this study include:

* RCRA Tank Assessment - Tank Farm System, prepared for CWM Chemical Services Inc. by ALpha Consultants, Ltd. Jan. 1990

* Tank System Inspection, prepared for CWM Chemical Services Inc. by Sirrine Environmental Consultants Nov. 1991

* Straubing, Rubin & Kenes, Inc. Tank Design Drawings

* Imperial Steel Tank Co. Fabrication Drawings

* Supplemental ultrasonic thickness measurements taken on stainless steel Tank No. T-101 on 23 January '95 by MQS Inspection, Inc. (raw data)

TANK GENERAL DESCRIPTIONS AND HISTORY

The ten (10) existing tanks, numbered T-101 to T-107, T-109, T-110, & T-112, are 12 ft. dia. vertical, cone bottomed, leg supported, above ground, insulated tanks.

Tank T-112 has a nominal capacity of 20,000 gals. All other tanks are of 12,000 gal. capacity each.

Tank nos. T-101 and T-107 are of stainless steel construction. All others are of carbon steel.

The four (4) newer tank nos. T-101 to T-104, fabricated by Imperial Steel Tank Co., were placed in service during 1986. The remaining older six (6) tanks date from 1981.

Available records and fabrication drawings for tank nos. T-101 to T-104 indicate they were built to the Underwriters Laboratories, Inc. Standard UL-142 for steel above ground tanks and were to be labeled as such. The published UL-142 Standards "do not cover vertical tanks that are elevated by means of legs" and are not intended for liquids having a specific gravity exceeding that of water. In order to satisfy these exceptions, it was necessary for Imperial Steel to apply for Underwriters Lab review and inspection to obtain the UL Listing for these cone bottomed above ground steel tanks on legs.

The Imperial fabrication drawings list the following tank design parameters:

Design Pressure = hyrdostatic head due to contents

Design Temperature = 250° F

Specific Gravity = 1.5

Corrosion Allowance = 1/16 "

Although no fabrication drawings were found for the six (6) older tanks, the Straubing, Rubin & Kenes design plans indicate the same material thicknesses for the top, shell, and bottom as shown on the Imperial plans. Since these thicknesses have been further verified by ultrasonic test measurements, it seems reasonable to conclude that these older tanks were also built to the design standards of UL-142.

The most recent ultrasonic thickness measurements include those taken by Alpha Consultants in Aug. '89 and by MQS Inspection in Oct. '91 for the Serrine report.

Alpha Consultants conducted visual internal inspections on all tanks (except T-110, which was in service) in early Dec. '89 and an external site inspection on 3 Jan. '90. Serrine Environmental Consultants conducted a visual site inspection, including all tank externals, in Sept. '91.

SPECIFIC TANK DETAILS

For tabulation of existing tank detail design information and summary of latest ultrasonic thickness measurements, refer to the tank status form provided in Appendix A for each of the ten (10) tanks.

PROJECTED SERVICE LIFE

The following table summarizes results of calculations undertaken to establish corrosion rates, based on past service, in order to predict an expected service life for the eight (8) carbon steel tanks. For calculation details, refer to Appendix B.

Surface	Estimated Corrosion Rate	Estimated Retirement Thickness	% of "as built" Thickness Remaining at Retirement	Projected Life as of 1995
Tank Top T-110	2.5 Mils/yr	0.156"	62%	24 yrs.
Side Shell T-105&T-112	3.6 Mils/yr	0.188"	60%	21 yrs.
Cone Bottom T-102	3.0 Mils/yr	0.281"	71%	28 yrs.

NOTE:

The following assumptions were used in the development of this table:

Corrosion rates for the tank top and shell surfaces were arrived at by subtracting the lowest recorded minimum ultrasonic thickness reading to date from the "as built" thickness and then dividing by the tank age at time of thickness reading.

In arriving at an estimated corrosion rate for the bottom cone surface, it was found necessary to develop an adjusted "as built" thickness. This was required since the average recorded bottom thickness measurement for all tanks, and in most cases the minimum value also, exceeded the 0.375" thickness shown on the fabrication drawing. The "as built" thickness was therefore adjusted to 0.392" to more accurately reflect the ultrasonic readings which ten years later were giving averages and minimums greater than 0.375".

INSPECTION/TESTING PLAN PRIOR TO REUSE

In order to assess each tank's internal condition, material thickness, and integrity prior to being placed back in service, it is planned to do the following, once the tank has been found safe for man-entry:

* Conduct an initial visual inspection by a tank experienced technician in company with a registered professional engineer to determine general tank condition. A standard check list, similar to that used by Alpha Consultants for Tank T-109 and shown in Figure 1 will be used as a guide and for recording findings. Suspicious areas will be noted for a more rigorous inspection and scheduled for ultrasonic measurement if deemed necessary.

* Since these tanks are insulated, past ultrasonic readings taken from the tank exterior have been limited to those areas where a removable patch permits direct access to the plate surface beneath. Past surveys have included at each of 4 - 90° quadrants, 1 top point, 3 side points and 1 cone bottom point giving a total of 20 readings/tank. With the tank out of service and clean, it would seem desirable to take additional ultrasonic thickness measurements from within. The cone bottom and tank height will make this difficult and require a tank ladder or other means to reach the underside of the top plate.

* It is recommended that a minimum of 12 readings each be taken in a + pattern on the top and bottom surfaces. For the shell at mid-height, a girth sample of about 20 points around the circumference is desirable. Finally, a vertical row sample, top to bottom, of about 10 points at a location determined from the visual inspection to be most worthy of further exploration, should provide more than enough data to verify the existing surface thicknesses and to form a base for comparison with past and future thickness measurement readings. The ultrasonic test readings are to be taken by personnel qualified and certified as competent to use the test equipment. The test results are to be analyzed by a registered professional engineer experienced in steel tank design and construction.

FIGURE 1

ALPHA CONSULTANTS, Ltd.

CHECKLIST FOR VISUAL INSPECTION OF UNLINED VESSELS

OWNER CWM Chemical Services, Inc.-Chicago Incinerator
TEST SITE 11700 So. Stony Island Ave., Chicago, Il. 60617
DATE OF INSPECTION December 5, 1989
TIME OF INSPECTION 1525
SUPERVISORY ENGINEER Harris E. Dicker, P. E.
PHOTOGRAPHER/TECHNICIAN Robert A. Dicker
TECHNICIAN James L. Eggert

TANK NO. 109 (NO PCB IN TANK)
INTERIOR SHELL MATERIAL CS
CLADDING MATERIAL SST
INSULATION 2' FIBREGLASS SIDES & BOTTOM, 2" COL BLOCK TOP
EQUIPPED WITH MIXER NO

INITIAL ROOF INSPECTION FOR SAFETY

HAZARDS OF FALLING OBJECTS NONE
VISIBLE CORROSION NONE

MORE RIGOROUS INSPECTION OF ROOF & STRUCTURAL SUPPORTS

VISIBLE LOSS OF METAL THICKNESS NONE
VISIBLE CRACKS OR LEAKS AT WELDS NONE
VISIBLE CRACKS AT NOZZLE CONNECTIONS NONE
MALFUNCTIONING OF ROOF SEALS NONE
VISIBLE DETERIORATION OF WATER DRAIN SYSTEM NONE
CONDUCT HAMMER TESTING NO

TANK SHELL

VISIBLE CRACKS AT SEAMS NONE
VISIBLE CORROSION AT VAPOR SPACE/LIQUID LEVEL LINE NONE
VISIBLE CRACKING OF PLATE JOINTS NONE
VISIBLE CRACKING OF NOZZLE CONNECTION JOINTS NONE
VISIBLE LOSS OF METAL THICKNESS NONE

TANK BOTTOM

TYPE OF BOTTOM, SLOPED OR FLAT SLOPED
VISIBLE CORROSION PITS NONE
VISIBLE CRACKED SEAMS NONE
TYPE OF CONNECTION TO SIDEWALL, WELDED OR RIVETED WELDED
VISIBLE TIGHTNESS AT CONNECTION NONE
VISIBLE DEPRESSIONS IN BOTTOM AREAS AROUND OR UNDER ROOF OR PIPE SUPPORTS NONE
VISIBLE LOSS OF METAL THICKNESS NONE
VISIBLE UNEVENESS OF BOTTOM NONE
CONDUCT HAMMER TEST NO
VISIBLE BULGES, BLISTERING OR SPALLING NONE
WAS ULTRASONIC TESTING OF TANK WALLS, ETC. CONDUCTED YES

Source: OSWER Policy Directive No. 9483.00-1
Modified Version of Table 4-7, Page 4-35
"Permit Writer's Guidance for Hazardous Waste Tanks" U. S. EPA Contract 68-01-6515
(undated draft) pp 8-10.

SUMMARY DISCUSSION

Projected Service Life - The projected useful service life for the eight (8) carbon steel tanks is estimated to be on the order of 20 years from today.

- The projected service life for the two (2) stainless steel tanks (T-101 & T-107) is estimated to be more than 20 years as evidenced by the ultrasonic thickness readings which indicate little, if any significant material loss as of '91.

- These projected service life estimates are believed to be conservative in that minimum point readings, rather than average readings, were used to establish the corrosion rates. Furthermore, the projected service life calculations assume that corrosion has continued at the same rate during the past 3 years when the tanks have been out of service.

- These estimated rates can be expected to remain in effect so long as the future stored waste product corrosivity characteristics are compatible with and do not differ significantly from those products stored in the past. Also, the integrity of the external insulation cladding material must be maintained to prevent exterior corrosion from the weather.

- It is anticipated that these tanks, once returned to service, will be ultrasonically tested on an annual basis, at which time these estimated corrosion rates should be reviewed and modified if necessary to suit existing service conditions.

Type of Wastes Stored - The individual tank status forms, Appendix A, list the typical types of waste products stored in past service as well as those planned for future operations. Before any wastes are stored, the facility management is required to assess the compatibility of the waste with (1) the storage unit materials of construction and (2) the wastes being presently stored.

Conclusion - Based on a detailed technical review of the page 1 referenced documents, it is my opinion that the ten (10) existing tanks proposed for reuse at the CWM Tank Farm are structurally sound, free from leaks, and exhibit sufficient material thickness, as determined by ultrasonic measurements. They appear to meet applicable design guidance standards and the past visual inspection reports indicate them to be substantially free from corrosion. Therefore, it is my opinion that the existing reported condition and structural integrity of these storage tanks demonstrate suitability for continued service.

CERTIFICATION

"I certify, under penalty of law, that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately 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 possible fines and imprisonment"

Registered Professional Engineer

Name: Lee F. Mount

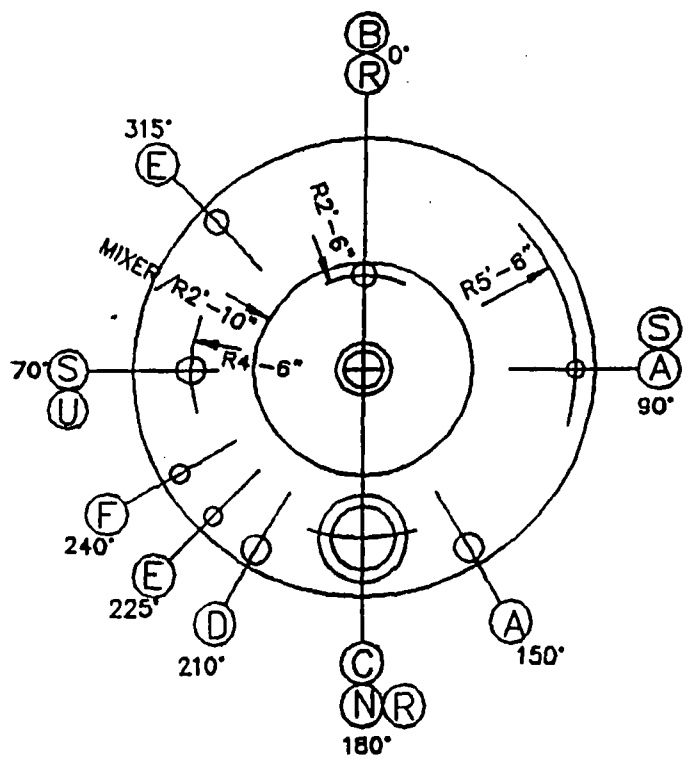
Signature: Lee F. Mount

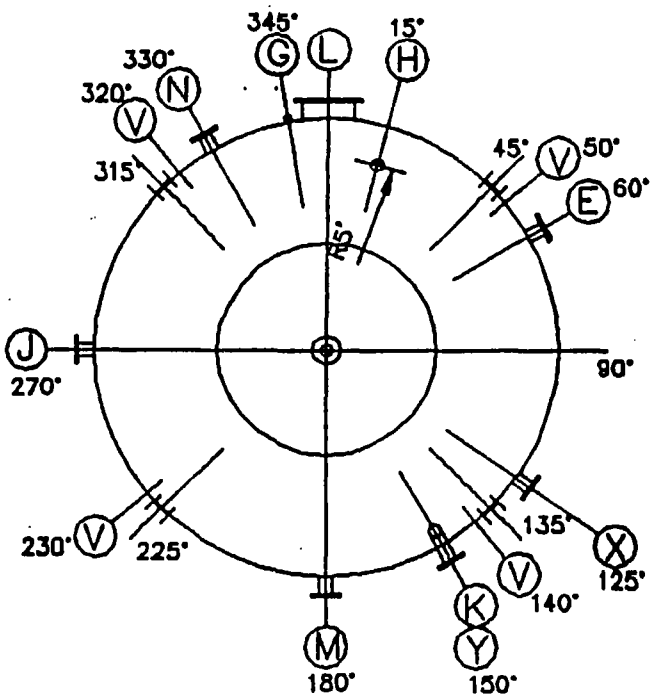
Date: 24 January 1995

Massachusetts Registration No: 21193

MARK	REQD.	SIZE	TYPE	ELEVATION	DESCRIPTION
A	2	2"	150# RFSO	ROOF	NITROGEN BLANKET
B*	1	3"	150# RFSO	ROOF	COV - FA
C	1	20"	150#	ROOF	EMERGENCY VENT
D	1	4"	150# RFSO	ROOF	FILL
E(225)	1	3"	150# RFSO	ROOF	HIGH LEVEL-LSH109
E(315)	1	3"	150# RFSO	ROOF	SPARE
F	1	3"	150# RFSO	ROOF	DPSL109 & DPSH109
G	1	2"	3000# CPLG	12" F/CONE	SPARE
H	1	2"	3000# CPLG	CONE	SAMPLE
J	1	3"	150# RFSO	6" F/CONE	LOW LEVEL-LSL109
K	1	3"	150# RFSO	13" F/CONE	SPARE
L	1	24"	150#	12" F/CONE	MANWAY W/COVER
M	1	4"	150#FB-VALVE	CONE	DRAW-OFF
N*	1	12"	150# RFSO	ROOF	MIXER MOUNT
R	AS SHWN		-	6'-3" F/ROOF	SUPPORT CLIP
S	AS SHWN		-	3'-9" F/ROOF	SUPPORT CLIP
E	1	3"	150# RFSO	6" F/CONE	SPARE
U*	1	4"	150# RFSO	ROOF	LEVEL MONITOR-LT109
V*	4		-	SHELL	BAFFLE
X*	2	4"	150# RFSO	9",6'-6" F/C	DRAW-OFF
Y*	2	2"	3000# CPLG	9",6'-6" F/C	SAMPLE

NOTE: * DESIGNATES NEW NOZZLE





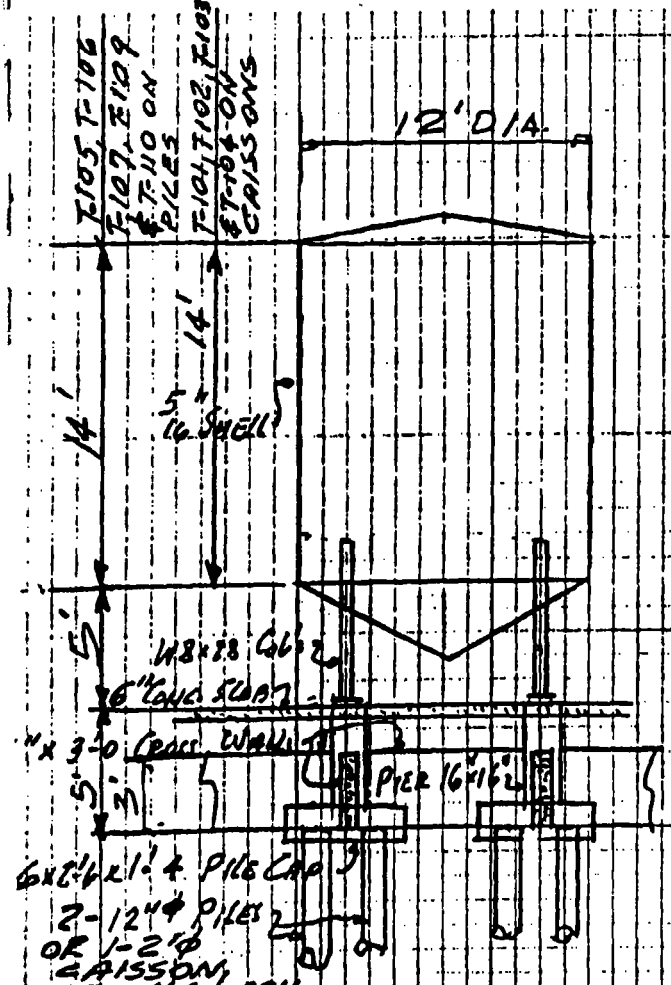
TK-109

HOYER-SCHLESINGER-TURNER, INC.

SHEET 2 OF 8
PROJECT NO. 17851
DATE 1.19.95
BY BERNES
CHK. C.K. 1.27.95

PROJECT CLEAN HARBORS - CHICAGO, IL

SUBJECT EXIST. TANK FARM SUPPORT COMPUTATIONS



SECTION "A-A"
SEE SH-1

TANKS T-101 TRU T-107, T-109 & T-110

EMPTY TANK =
$= \pi(12 \times 14' + 12^2/4 + 6 \times \sqrt{3^2 \times 12^2}) \times 12.8 \times 1.05$
$= 11.985 + 4 \text{ LEGS} \times 7 \times 28 = 184$
TOTAL = 12,170#

PLUS NOZZLES, FLANGES AND SUPPORTS =
= 7,830#

TOTAL EMPTY TANK = 12,170 + 7,830 =
= 20,000# ✓

LIQUID = 12,100 GAL × 8.33L × 1.5 =
= 151,298# ✓

TOTAL EMPTY + LIQUID =
= 20,000 + 151,298" = 171k

EACH LEG = 171/4 = 43k/LEG ✓

CONCRETE + SNOW

PILE CAP = 4.5' × 2.5 × 1.33 × .15	= 2.25k
PIER 1.33 × 1.33 × 5' × .15	= 1.33k
CROSS WALL 3' × .67' × 16 × .15	= 4.82k
FILL 4.5 × 2.5 × 3.5 × .10	= 3.94k
6" CONC. SLAB = 4.5 × 2.5 × .5 × .15	= .84k
SNOW $\pi R^2 \times 25^{\#}$	= 2.83k
	16.01k/LEG

TOTAL LOAD PER LEG ON PILES
= 43k + 16k = 59k

TWO 2-12"# WOOD PILES = 20 TON CAP. EACH
= 2 × 40k = 80k > 59k O.K.

CAISSON CAP. = $\pi \times R^2 \times 9^k = \pi \times 2.25^2 \times 9 = 143^k > 59^k$ O.K.

H-S-T

HOYER-SCHLESINGER-TURNER,Inc.
ENGINEERS-ARCHITECTS
3074 University Ave.
Highland Park,IL 60035
Phone:847-461-0470 Fax:847-266-9829

November 18, 1999

Mr. James R. Laubsted
Facility Compliance Manager
CLEAN HARBORS SERVICES, INC.
11800 S. Stony Island Avenue
Chicago, IL 60617

RE: Inspection Report
Tank T-110

Dear Mr. Laubsted:

On October 28, 1999 I visually inspected the interior and exterior of Tank T-110.

Tank T-110 is located on the south side of the Flammable Storage Tank Farm (Unit 16). Previous visual inspections include July 7, 1995. Hydrostatic testing was completed in July, 1995. From the time of the earlier inspection, the tank was used for storing Class I flammable hazardous wastes and is intended to store PCB contaminated wastes also. Tank T-110 is located outdoors and has a dedicated concrete dike. The containment is coated with Protecto-Coat 900, 30 mils thick as manufactured by Dudick, Inc. This coating is compatible with the stored materials. The containment dike for T-110 and the remaining tanks within the tank farm were inspected August 31, 1999.

Tank T-110 is a carbon steel vessel fabricated in 1981. Tank T-110 was empty at the time of inspection and was cleaned by Clean Harbors personnel. The tank is operated at ambient temperature and under 2" WC pressure from nitrogen blanketing. The tank is equipped with a conversation vent and is vented through a carbon bed.

Tank T-110 stores Class I flammable liquids including hazardous waste fuels and is intended for PCB contaminated wastes. Maximum specific gravity of stored liquids is 1.5 and pH may vary from 4 to 10. The tank is constructed from carbon steel. It is 12'0" in diameter and 14"0" high straight side with a cone bottom and top. The operating capacity is 12,000 gallons. There is no record that this tank was built to UL-142 standard. The assumption that the tank was built to this standard is based on a comparison with another tank which was fabricated to the UL-142 standard.

The tank is supported by steel legs on caissons. The steel legs are encased in concrete.

The internal and external visual inspection did not reveal any defects. The welds around nozzles and tank shell welds inspected from inside the tank were in good condition. The roof was covered with rust. The rust was sandblasted by Clean Harbors. There was no sign of pitting or other visible defects.

It is not possible to inspect the entire exterior of the tank by visual inspection. The tank is insulated with 2" thick insulation with metal jacket. The insulation and jacketing was removed where nozzles were added in 1995. At that time the welds could be inspected from the outside. The condition of the welds was good; there were no vertical defects.

In October, 1999 Clean Harbors performed NDE-ultrasonic thickness measurements from the interior of the tank. In October, 1998 external NDE-ultrasonic thickness measurements were taken. These ultrasonic thickness test results and prior results are listed in Appendix TK-110-1.

The top as-built thickness was 0.250 inches. The four latest readings each show minor decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.214 inches which is 74% over the minimum of 0.123 inches recommended by the UL-142 standard.

The wall as-built thickness was 0.313 inches. The twelve latest readings each show minor decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.280 inches which is 68% over the minimum of 0.167 inches recommended by the UL-142 standard.

The bottom as-built thickness was 0.375 inches. The four latest readings each show decreases in thickness compared to the 1991 ultrasonic thickness readings. The minimum reading was 0.342 inches which is 43% over the minimum of 0.240 inches recommended by the UL-142 standard.

For tank evaluations, modifications and calculations, see certification reports by Mr. Lee F. Mount, PE, dated January 1995 and May 23, 1995 in Appendix TK-110-2.

For tank nozzle orientation and description, see Appendix TK-110-3.

For Tank T-110 supports evaluation, see calculations by Mr. Peter J. Bernes, SE, dated January 19, 1995 in Appendix TK-110-4.

Therefore, I certify that after visual inspection, the tank is structurally sound, properly supported and set. No evidence of cracks, bulging, corrosion pits or scales or weld defects were observed. Based on my inspection, the tank can be used for the intended purpose.

Very truly yours,

HOYER-SCHLESINGER-TURNER, INC.

Peter J. Bernes

Peter J. Bernes
Illinois #3659

STATE OF ILLINOIS
PETER J.
BERNES
3659
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11.30.01

APPENDIX TK-110-1

ULTRA SONIC THICKNESS TESTING
T-110

October 28, 1999

INTERNAL

TOP

East	South	West	North
.217	.218	.214	.230

SHELL

.288	.284	.280	.300
.284	.284	.288	.288
.288	.292	.288	.282

BOTTOM

.342	.358	.358	.348

ULTRA SONIC THICKNESS TESTING
T-110

October 17, 1998

TOP

East	South	West	North
#1 .200	#2 .213	#3 .235	#4 .242

SHELL

#6 .293	#12 .301	#11 .297	#5 .298
#10 .307	#15 .290	#14 .296	#7 .308
#9 .291	#16 .296	#13 .298	#8 .302

BOTTOM

#20 .384	#17 .408	#18 .399	#19 .408

CleanHarbors

ULTRASONIC THICKNESS TESTING - 12-17-97

TANK #110

EAST	SOUTH	WEST	NORTH
1 .204	2 .226	3 .201	4 .228
6 .292	12 .300	11 .298	5 .295
10 .301	15 .299	14 .294	7 .297
9 .290	16 .291	13 .293	8 .294
20 .397	17 .405	18 .396	19 .403

CLEAN HARBORS OF CHICAGO, INC.

CWM TANK FARM

EXISTING TANK STATUS FORM

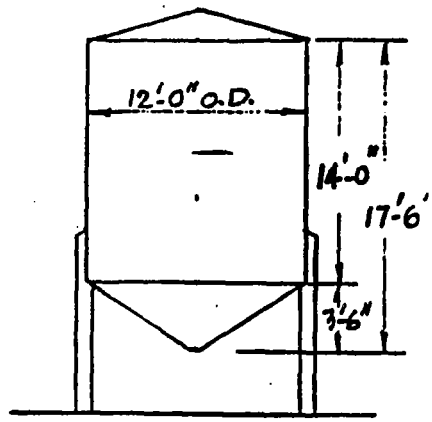
Tank No. T-110

Nominal Capacity 12,000 gals.

Mat'l. of Const. CARBON STEEL

Approx. Year of Build 1981

Designed Corrosion Allow. 1/16"



Stored Waste Characteristics:

	Past	Future
Specific Grav.	1.5 (design)	0.5 → 1.5
Class	WASTE OILS	PCB's
	FUEL OIL	

Material Thicknesses (Inches):

Surface	per UL-142 Std.	As Built A	Ultrasonic Test Results 08/89 B		10/91 C	
			Avg.	Min.	Avg.	Min.
Top	0.123	0.250	0.251	0.249	0.230	0.225
Shell	0.167	0.313	0.312	0.303	0.314	0.310
Bottom	0.240	0.375	0.388	0.387	0.428	0.414

NOTES:

A. FROM STRAUBING, RUBIN, & KENES DESIGN DWG. 1-0-006

B. FROM ALPHA CONSULTANTS JAN. '90 RPT.

C. FROM SIRRINE ENVIR. CONSULTANTS NOV. '91 RPT.

1785

LEE F. MOUNT, P.E.

CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

23 May 1995

Mr. Alan F. Mount, Project Manager
Clean Harbors of Chicago, Inc.
11800 S. Stony Island Avenue
Chicago, Illinois 60617

Subject: CWM Tank Farm
Tank Agitator Mounting and Nozzle Details

Enclosure: 1) Design Calculations and Fabrication Details
(10 sheets, original issue date 14 March 1995)

Dear Alan,

Enclosure 1) is submitted herewith for your information and records. Sheet nos. 1, 5, 6 & 9 have been updated and revised where necessary to reflect your actual "as built" conditions.

Yours truly,

Lee F. Mount

Lee F. Mount

Reviewed by:

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-96

LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANK FARM
SHEET NO. COVER OF
CALCULATED BY L. F. MOUNT DATE 14 MAR '95
CHECKED BY REV. 17 MAR. '95. DATE
SCALE FINAL ISSUE TO REFLECT "AS BUILT" CONDITIONS 22 MAY '95

THE ENCLOSED CALCULATIONS AND FABRICATION DETAILS WERE CARRIED OUT IN SUPPORT OF CURRENT TANK UPGRADES PROPOSED FOR THE CLEAN HARBORS, CHICAGO STONY ISLAND FACILITY. AN OVERALL REVIEW AND ASSESSMENT OF THE STRUCTURAL INTEGRITY OF THESE EXISTING TANKS WAS COVERED IN A REPORT BY THE UNDERSIGNED DATED JAN. 1995. THIS REPORT ADDRESSES THE FITTING OF NEW TANK AGITATORS AS WELL AS ADDITIONAL NOZZLES.

CONTENTS

DESCRIPTION	SHEET NO.
SKETCH OF AGITATOR MOUNTING FLANGE (FOR TANKS 105, 106, 107	1
REFERENCES 109, 110, 112)	2
ESTIMATE OF STRESS DUE TO BENDING MOMENT @ FLANGE	2
ESTIMATE OF STRESS DUE TO TORQUE @ FLANGE	3
ESTIMATE OF STRESS DUE TO AGITATOR VERTICAL LOAD	3
CHECK OF LOADED TANK SUPPORT LEGS W/ AGITATOR VERT. LOAD	4
TYPICAL PROPOSED 4" NOZZLE INSTALLATIONS	5
BAFFLE PLATE DESIGN REQ'MTS.	6
CHECK TANK INTEGRITY FOR OPERATION WITH 1.0 PSIG VAPOR PRESS.	7-8
SKETCH OF MODIFIED AGITATOR MOUNTING FLANGE (FOR TANKS 103 + 104)	9
TABULAR SUMMARY OF AGITATOR SPECS. + TANK PROPERTIES	10

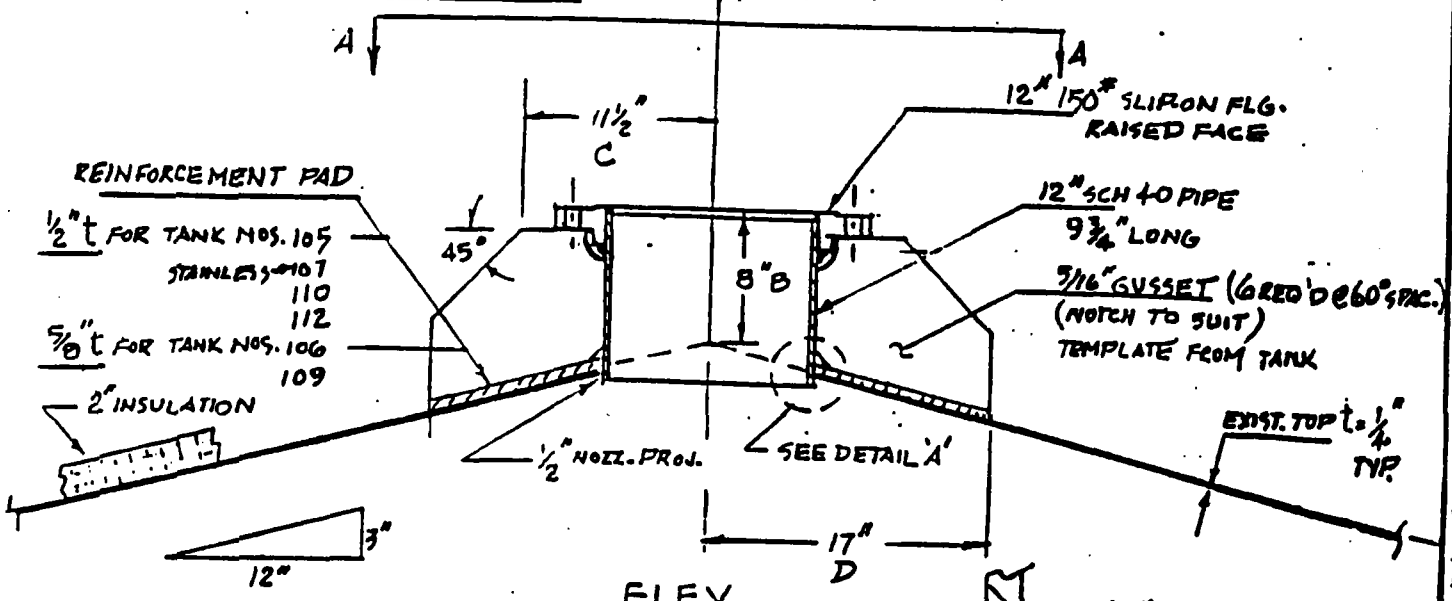
PREPARED BY Lee F. Mount
LEE F. MOUNT
14 MARCH 1995

COMMONWEALTH OF MASSACHUSETTS
LEE FORREST MOUNT
21193
REGISTERED PROFESSIONAL ENGINEER

LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANK AGITATORS
SHEET NO. 1 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR.'95
CHECKED BY REV. DATE 15 MAR.'95
SCALE 1"=1'-0" & AS NOTED 22 MAY'95
"AS BUILT"

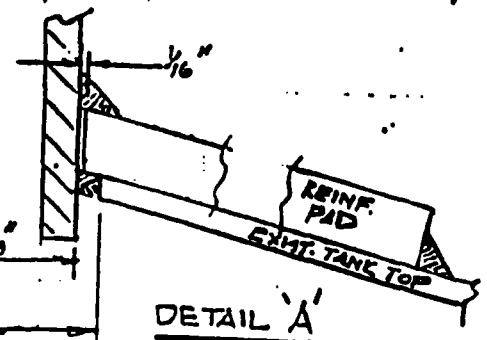
NEW MOUNTING FLANGE FOR TANK NOS. 105, 106, 107, 109, 110 & 112



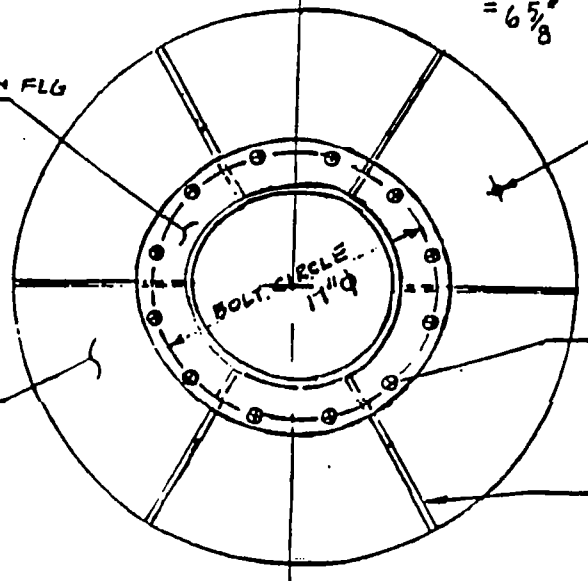
ELEV.

CONE TOP SLOPE SHOWN

(SOME TANKS HAVE 2"/12" SLOPE)



DETAIL 'A'
(HALF SIZE)
PER UL-142 FIG. 11.2



REINFORCEMENT PAD
(FIT TO TANK TOP SLOPE)
PROJECTED O.D. = 34"
I.D. = 12.875"
SEE NOTE IN ELEV. FOR t

PLAN A-A

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JOB CWM/CHI TANK AGITATOR & NOZZLE INSTALLA
SHEET NO. 2 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. '95
CHECKED BY _____ DATE _____
SCALE _____

REFERENCES: 1) CHEMINEER AGITATOR DESIGN SYSTEM SPEC. SHEETS
2) UL-142, STEEL ABOVE GROUND TANKS
3) FORMULAS FOR STRESS & STRAIN, ROARK 4TH ED. 1965
4) API-650 WELDED STEEL TANKS FOR OIL STORAGE
5) CHEMINEER IOM MANUAL PG. 4-9 JUNE '93
6) ASME SECT VIII PRESSURE VESSEL CODE

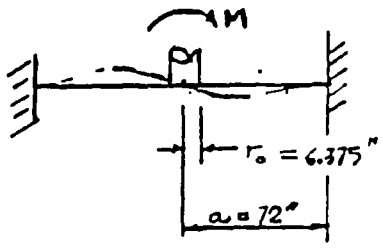
CHECK REINFORCED TANK TOP FOR AGITATOR LOADINGS

ASSUMPTIONS: LOADINGS - USE 15 HP TYPE C UNIT FOR MAX. BENDING MOMENT OF 5036 FT.-LBS & TORQUE OF 4274 FT.-LBS

- USE 5 HP TYPE B UNIT FOR MAX. VERTICAL LOAD OF SAY 3000 LBS

ESTIMATE STRESS DUE TO BENDING MOMENT

FROM REF 3) PG. 219, CASE 10 ASSUMES FLAT CIRCULAR PLT, EDGES FIXED, CENTRAL COUPLE



$$\text{MAX } S_r \text{ AT } r = r_o = \frac{3M}{4\pi t^2 r_o}\left[1 + \left(\frac{m+1}{m}\right)\log \frac{2(.45a - r_o)}{.45 k a}\right]$$

WHERE: $k = \dfrac{0.1a^2}{(r_o + .28a)^2} = \dfrac{0.1(72)^2}{[6.375 + .28(72)]^2}$

$= 0.736$

$M = 5036 \text{ FT-LBS} \times 12 = 60432 \text{ IN-LBS}$

$t = .25 + .625 = 0.875''$ (REINF. PAD)

m = RECIPROCAL OF POISSON'S RATIO

$= \dfrac{1}{.3} = 3.33$

$a = 72''$

$r_o = 6.375''$

$$\text{MAX } S_r = \frac{3(60432)}{4\pi(.875)^2(6.375)}\left[1 + 1.30 \log \frac{2[.45(72) - 6.375]}{.45(.736)(72)}\right]$$

2.183

$= 2956\ [1 + 1.3(.781)]$

$= 2956\ (2.02) = \boxed{5971 \text{ PSI}}$

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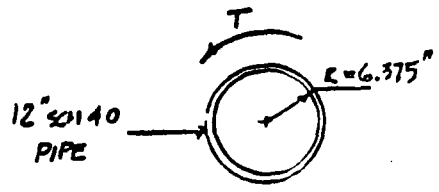
JOB CWM/CHI TANK AGITATORS
SHEET NO. 3 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. '95
CHECKED BY _____ DATE _____
SCALE _____

ESTIMATE SHEAR STRESS DUE TO TORQUE

$T = 4274$ FT-LBS $\times 12 = 51288$ IN-LBS

FORCE $= \frac{T}{r} = \frac{51288 \text{ IN-LBS}}{6.375''} = 8045$ LBS



CIRCUM. $= 2\pi(r) = 40''$

$\therefore$ LOAD/" OF CIRCUM. $= \frac{8045}{40} = 201$ LBS/IN

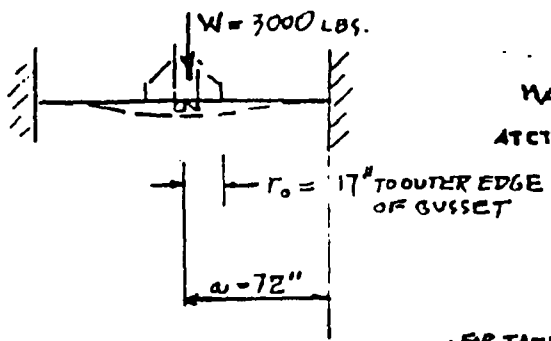
SAY TORQUE IS CARRIED BY 3/8" FILLET WELD @ REINF. PAD TO NOZZLE CONNECTION

ALLOWABLE WELD LOAD $= 11{,}200(.375'') = \boxed{4200 \text{ LBS/IN} > 201 \text{ OK}}$

CONSERVATIVE IN THAT LOWER TANK TOP TO NOZZLE FULL PENETRATION WELD HAS NOT BEEN TAKEN INTO ACCOUNT.

ESTIMATE STRESS DUE TO VERTICAL LOAD

FROM REF. 3) PG 218, CASE 7 ASSUMES FLAT CIRCULAR PLT., EDGES FIXED, UNIFORM LOAD OVER CONCENTRIC CIRCULAR AREA OF RADIUS r_o



$$\text{MAX } S_r \text{ AT } r_o = \frac{3W}{2\pi m t^2}\left[(m+1)\log\frac{a}{r_o} + (m+1)\frac{r_o^2}{4a^2}\right]$$

WHERE: $W = 3000$ LBS

FOR TANK No 112

$t = .25 + .50$ (REINF PAD) $= 0.75''$

$m = 3.33$

$a = 72''$

$r_o = 17''$

$$\text{MAX } S_r = \frac{3(3000)}{2\pi(3.33)(.75)^2}\left[4.33\log 4.235 + 4.33(.0139)\right]$$

$$= 765\,(6.25 + .06)$$

$$= \boxed{4827 \text{ PSI}}$$

CONCLUDE: COMBINING STRESS DUE TO BENDING (5971) + STRESS DUE TO VERT. LOAD (4827) = 10,798 PSI

API 650 GIVES ALLOW STRESS OF 20,000 PSI FOR ASTM A285-C STEEL

THUS, THE STRESS DUE TO EXTERNAL LOADS IS ABT. 54% OF ALLOWABLE WHICH APPEARS TO BE REASONABLE

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JOB CWM/CHI TANKS
SHEET NO. 4 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR '95
CHECKED BY _____ DATE _____
SCALE _____

CHECK TANK SUPPORT LEGS FOR AGITATOR VERT. LOAD

USE TANK NO 112 (LARGEST TANK + HEAVIEST AGITATOR)

ESTIMATED WEIGHT TO BE SUPPORTED BY 4 LEGS @ L=7.0' SIZE = W8×31

TANK STEEL

CONE TOP (1/4" PLT.) LATERAL AREA = BASE CIRCUM × 1/2 SLANT HT.

$= \pi D \times \frac{6.18'}{2}$

$= \pi 12 \times 3.09 = 116.5$ □' × 10.2#/FT² = 1188 LBS.

SHELL (5/16" PLT.) AREA = $\pi D H$

$= \pi 12 \times 22 = 829.4$ □' × 12.75#/FT² = 10575 LBS.

CONE BOTTOM (3/8" PLT.) LATERAL AREA = BASE CIRCUM × 1/2 SLANT HT.

$= \pi D \times \frac{6.95}{2}$

$= \pi 12 \times 3.48 = 131.2$ □' × 15.7#/FT² = 2007 LBS.

AGITATOR WEIGHT ——————→ 3000 LBS

SUBTOTAL 16770 LBS

ADD 20% FOR MISC. PIPING, PLATFORMS INSULATION, ETC. ——————→ 3350 LBS

LIQUID CONTENTS @ S.G. = 1.5 CAP. = $\frac{20{,}000 \text{ GAL.}}{7.48 \text{ GAL/CU.FT}}$ = 2674 CU FT × 62.4 × 1.5 = 250,286 LBS

TOTAL ESTIMATED WT. TO BE SUPPORTED = 270,406 LBS.

USE 276 KIPS

∴ EACH LEG CARRIES 276/4 = 69 KIPS

FROM AISC COL TABLE @ KL = 2(7) = 14 FOR W8×31 (A36 STL.)

READ ALLOWABLE LOAD = $\boxed{137 \text{ KIPS} > 69 \text{ KIPS}}$

CONCLUDE: EXISTING COLUMN SUPPORT IS ADEQUATE FOR CONDITIONS

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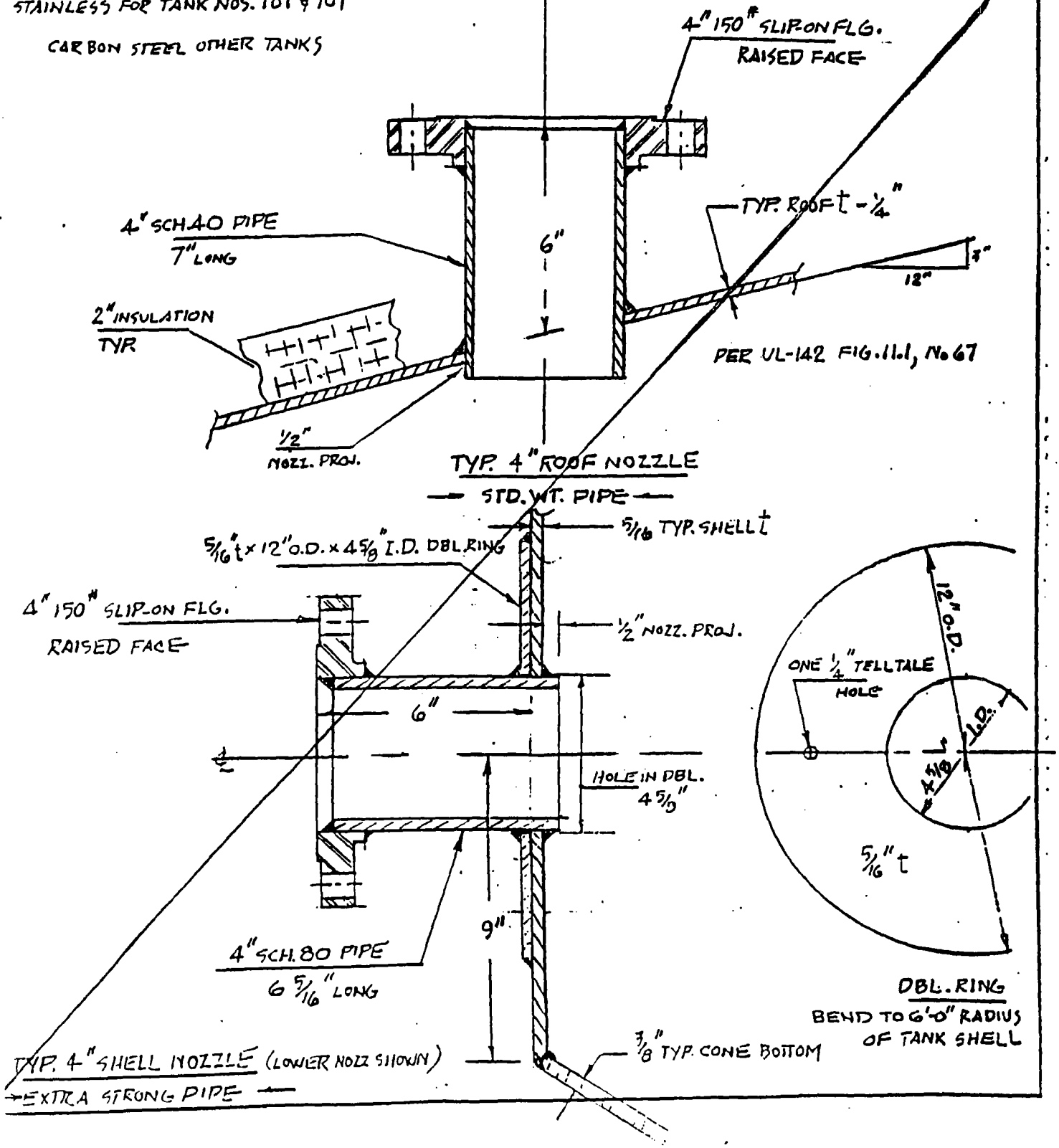
JOB CWM/CHI TANKS
SHEET NO. 5 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR.'95
REV. 15 MAR.95
CHECKED BY DATE
SCALE 3" = 1'-0" 22 MAY'95
"AS BUILT"

NOT APPLICABLE

4" NOZZLE INSTALLATIONS

STAINLESS FOR TANK NOS. 101 & 107

CARBON STEEL OTHER TANKS



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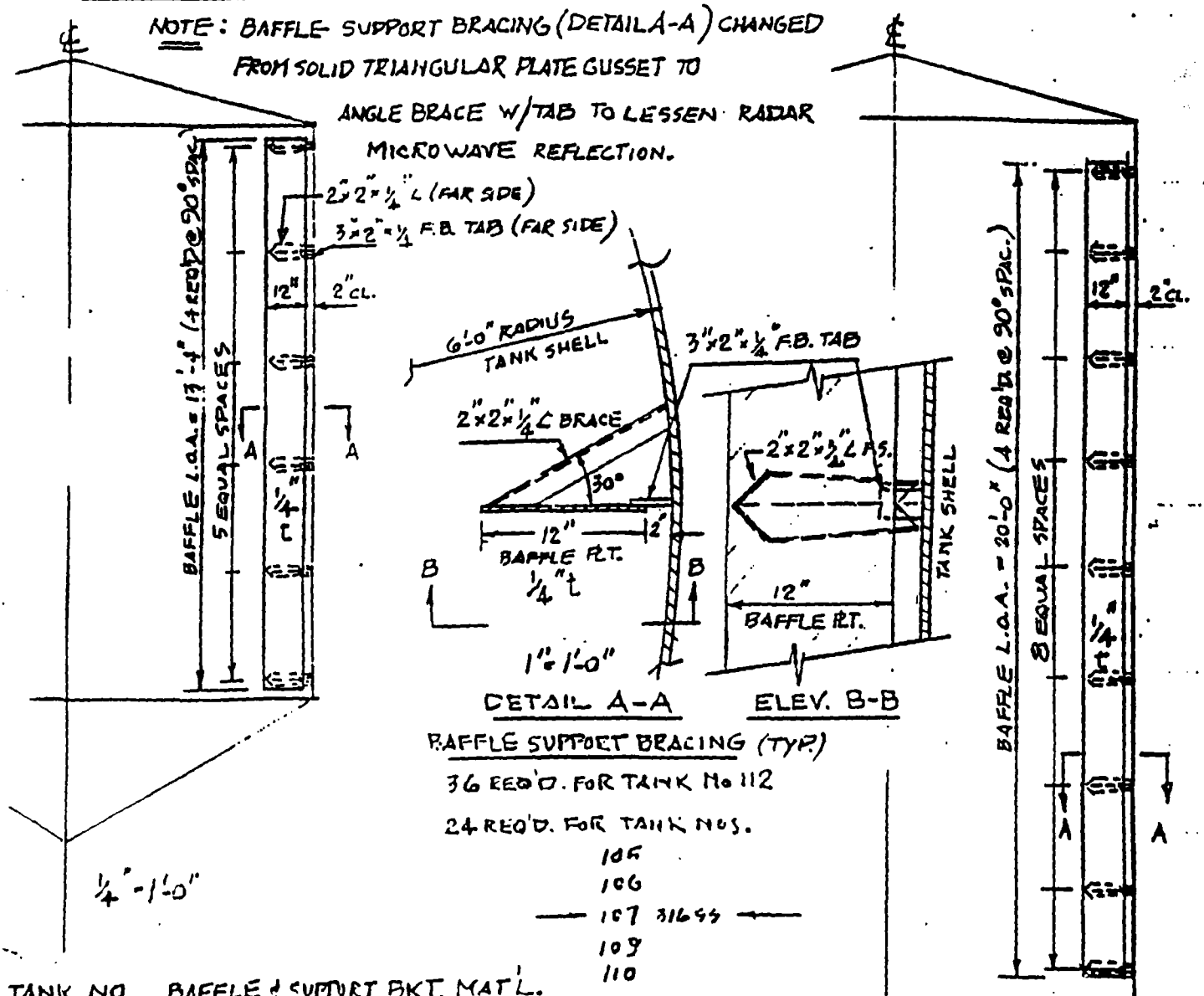
JOB C.W.M./CHI TANKS
SHEET NO. 6 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. '95
CHECKED BY DATE REV. 15 MAR. '95
SCALE AS NOTED "ASBUILT" 22 MAY '95

BAFFLE PLATE DESIGN (SIZES AS RECOMMENDED IN REF. 1)

NOTE: BAFFLE SUPPORT BRACING (DETAIL A-A) CHANGED FROM SOLID TRIANGULAR PLATE GUSSET TO ANGLE BRACE W/TAB TO LESSEN RADAR MICROWAVE REFLECTION.



BAFFLE SUPPORT BRACING (TYP)
36 REQ'D. FOR TANK No 112
24 REQ'D. FOR TANK NOS.
105
106
107 316SS
109
110

TANK NO.	BAFFLE & SUPPORT BKT. MAT'L.
101	316 SS (EXISTING)
102	A36 (EXISTING)
103	A36 (EXISTING)
104	A36 (EXISTING)
(105)	(A36) NEW
(106)	(A36) NEW
(107)	(316 SS) NEW
(109)	(A36) NEW
(110)	(A36) NEW

TANK No (112)
BAFFLE & SUPPORT BKTS.
A36 STEEL (NEW)

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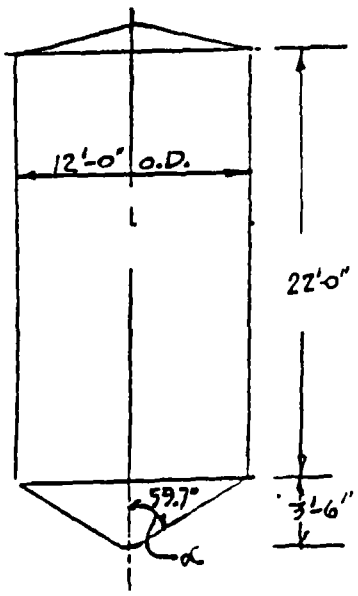
JOB CWM/CHI TANKS
SHEET NO. 7 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. '95
CHECKED BY _____ DATE _____
SCALE _____

CHECK FOR TANK SERVICE OPERATION WITH 1.0 PSIG INTERNAL VAPOR PRESSURE (APPT. 24" WATER)

USE TANK NO 112 WHICH HAS GREATEST DEPTH

ASSUME S.G. @ 1.5



MAX PRESSURE @ CONE BOTTOM $= \frac{62.4 \times 1.5 \times 25.5'}{144} = 16.6$ PSI

PLUS VAPOR PRESSURE 1.0 PSI

17.6 PSI

USE 18 PSI = P

USE ASME SECT VIII - DIV 1, APPENDIX 1 TO DETERMINE MIN. REQ'D PLT. t FOR SHELL & CONE BOTTOM

FOR CYLINDRICAL SHELL:

$$t = \frac{PR_o}{SE + 0.4P}$$

WHERE: $P = 18$ PSI

$R_o = \frac{12}{2}(12) = 72''$

$$t = \frac{18(72)}{(13800).7 + 0.4(18)}$$

$S = 13{,}800$ PSI FOR A 285-C STL.

$E = 0.7$

$t = 0.134'' + .0625'' = 0.197$ IN. (UL-142 WOULD REDUCE $t = 0.167$ IN)

CORR. ALLOW.

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $\boxed{0.30'' > .197''}$ O.K.

FOR CONE BOTTOM:

$$t = \frac{PD_o}{2\cos\alpha\,(SE + .4P)}$$

WHERE: $D_o = 144''$

$\alpha = 59.7°$

$$= \frac{18(144)}{2\cos 59.7°(13{,}800 \times .7 + .4 \times 18)}$$

$= 0.266'' + .0625'' = 0.329$ IN.

CORR. ALLOW.

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $\boxed{.375'' > .329}$ O.K.

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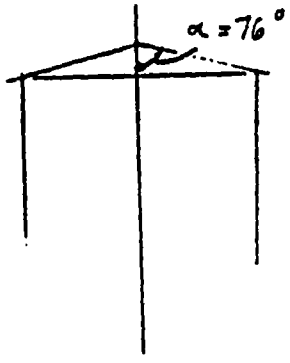
JOB CWM/CHI TANKS
SHEET NO. 8 OF 10
CALCULATED BY L.F. MOUNT DATE 16 MAR. 95
CHECKED BY DATE
SCALE

CHECK FOR 1.0 PSIG INTERNAL VAPOR PRESSURE (CON'D.)

FOR CONE TOP



FROM ASME SECT. VIII - DIV. 1

SOLVE FOR P:

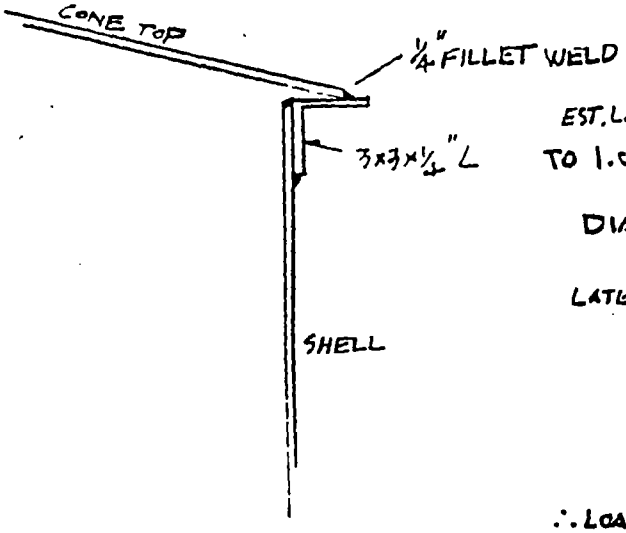
$$P = \frac{2SEt\cos\alpha}{D_o - 0.8t\cos\alpha}$$

WHERE S = 13,800 PSI
E = 0.7
D_o = 144 IN
α = 76°
t = USE .25 − 1/16" CORR ALL.
= .1875"

$$P = \frac{2(13{,}800)(.7)(.1875)(.242)}{144 - [.8(.1875)(.242)]}$$

$$= \frac{876.65}{144} = \boxed{6 \text{ PSI} > 1.0 \quad \text{O.K.}}$$

CHECK ROOF TOP CONNECTION WELD DETAIL



EST. LATERAL SURFACE AREA CONE TOP SUBJECTED TO 1.0 PSI PRESSURE

DIA. ≈ 148" (ROOF OVERHANGS SHELL)

LATERAL AREA = BASE CIRCUM. × ½ SLANT HT

$$= \pi D \times \frac{76.2''}{2}$$

$$= \pi(148) \times 38.1 = 17{,}715 \text{ IN}^2$$

∴ LOAD TO ROOF = 17,715 IN² × 1 LB/IN² = 17,715 LBS

CIRCUM. OF 1/4" FILLET ATTACHMENT WELD = πD = π(148) = 465 IN

∴ LOAD/IN ON 1/4" FILLET WELD = $\frac{17715}{465}$ = 38 #/IN — O.K.

VS

ALLOWABLE WELD LOAD OF 11,200 × .25 = 2800 #/IN

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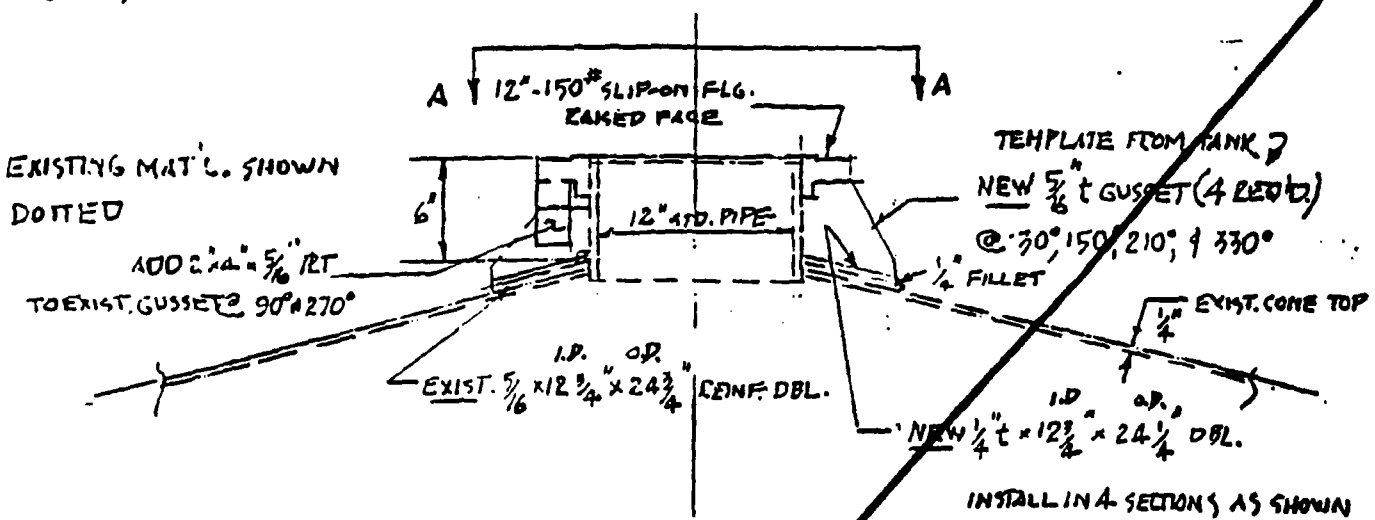
JOB CWM / CHI TANKS
SHEET NO. 9 OF 10
CALCULATED BY L. F. MOUNT DATE 16 MAR. '95
CHECKED BY DATE
SCALE 1" = 1'-0" 22 MAY '95

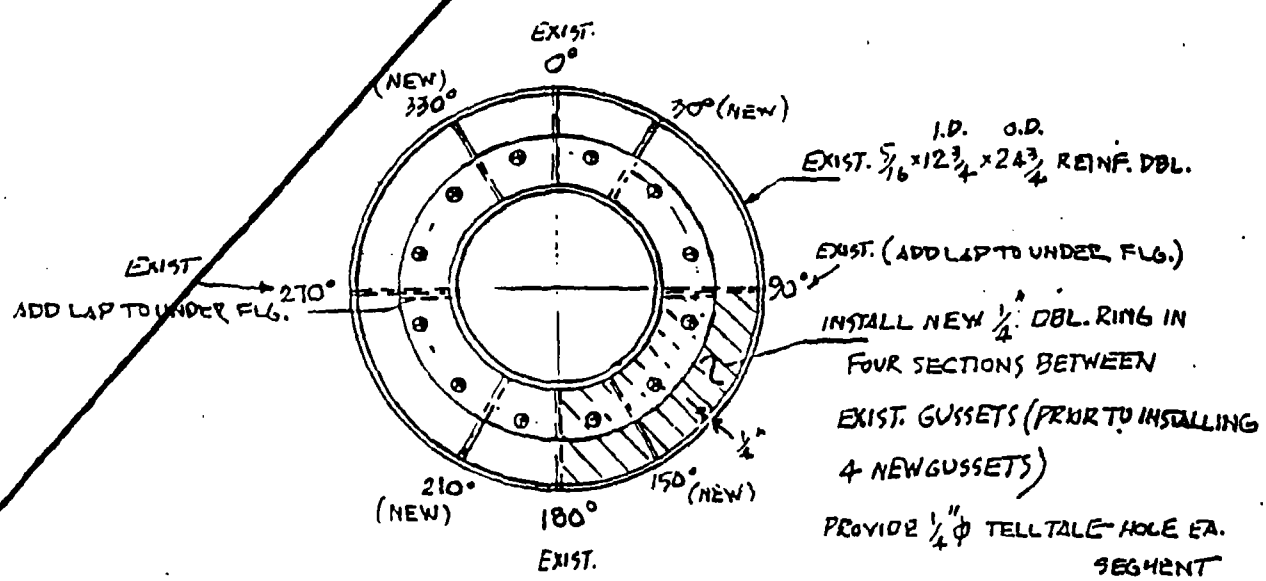
NOT APPLICABLE

"AS BUILT"

MODS. TO TANK 103 & 104 EXISTING AGITATOR MOUNTING; TO ACCOMMODATE NEW 7.5 HP UNITS



ELEV.



PLAN A-A

CWM/CHI TANK AGITATORS
L.F. MOUNT 10 MAR '95
REV. 15 MAR '95
SHT 10 OF 10

TANK I.D.	AGITATOR SPECS. (FROM REF. 1) TYPE	HP	RPM	SHAFT L IN.	SHAFT DIA. IN.	WT. LBS.	NOZZLE BEND MOM FT.-LBS	NOZZLE TORQUE FT.-LBS.	BAFFLE REQ'D.	CASE SIZE	TANK PROPERTIES TOP HEAD t"	MIN HEAD t" (TBL 3)	NOZZLE SIZE	REINF PAD DIMENS. B (TBL 2)	C	D FIG 3	
101 S.S.	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.313 S.S.		12" EXIST				
102	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.250		12" EXIST				
103	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.250	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5	17" 12.375	(ACTUAL)
104	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.241	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5"	17" 12.375	AS MODIFIED (ACTUAL)
105	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"	
106	C NEW	15	45	190.5	3.5	2745	5036 MAX.	4274 MAX.	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"	
107 S.S.	EXIST. FROM 103	3.0							YES (NEW)	2 DESIGN FOR 4	.250 S.S.	.500	12"	8"	11.5"	17"	
109	C NEW	15	45	190.5	3.5	2745	5036	4274	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"	
110	EXIST. FROM 104	3.0							YES (NEW)	2 DESIGN FOR 4	.230	.500	12"	8"	11.5"	17"	
112	B NEW	5	30	270.0	3.5	2872 MAX.	2898	2337	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"	

NO CHANGE

MODIFY (SHT. 9) MOUNTING

NEW MOUNTING (SHT. 1)

FROM ULTRASONIC TEST RESULTS

REINF. PAD t FROM REF. 5

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(617) 749-5394

RECEIVED
JUN 20 1995
HOYER-SCHLESINGER-TURNER, INC.

19 June 1995

Marie Vanagas
Hoyer-Schlesinger-Turner, Inc.
300 West Adams Street
Chicago, ILL. 60606

Subject: Clean Harbors of Chicago, Inc.
CWM Tank Farm

Enclosure: 1) Review and Assessment of Structural Integrity of Existing Tanks; LFMount Report dated January 1995

Dear Ms Vanagas,

In response to Clean Harbors' request, enclosure 1) is herewith forwarded for your information and records.

Yours truly,

Lee F. Mount

Lee F. Mount

REVIEWED BY
Peter J. Bernes
PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-96

LEE F. MOUNT, P.E.
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CWM TANK FARM

Review and Assessment of Structural Integrity of Existing Tank Nos.

T - 101	T - 106
T - 102	T - 107
T - 103	T - 109
T - 104	T - 110
T - 105	T - 112

January 1995

Prepared For:

Clean Harbors of Chicago, Inc.

(In response to Illinois EPA comments)

INTRODUCTION

This report was prepared in response to the Illinois EPA's request for additional information on the structural condition of the existing hazardous waste storage and/or fuel tanks scheduled for reuse at your CWM Tank Farm.

The work scope involved a technical review of all available tank related documents furnished by Clean Harbors. Pertinent data was then summarized and tabulated for each tank on a "Existing Tank Status Form". The ultrasonic test measurements for thickness, shown on the status forms, were then analyzed in order to make estimates of corrosion rates and projected service life.

Reference documents consulted during the course of this study include:

* RCRA Tank Assessment - Tank Farm System, prepared for CWM Chemical Services Inc. by ALpha Consultants, Ltd. Jan. 1990

* Tank System Inspection, prepared for CWM Chemical Services Inc. by Sirrine Environmental Consultants Nov. 1991

* Straubing, Rubin & Kenes, Inc. Tank Design Drawings

* Imperial Steel Tank Co. Fabrication Drawings

* Supplemental ultrasonic thickness measurements taken on stainless steel Tank No. T-101 on 23 January '95 by MQS Inspection, Inc. (raw data)

TANK GENERAL DESCRIPTIONS AND HISTORY

The ten (10) existing tanks, numbered T-101 to T-107, T-109, T-110, & T-112, are 12 ft. dia. vertical, cone bottomed, leg supported, above ground, insulated tanks.

Tank T-112 has a nominal capacity of 20,000 gals. All other tanks are of 12,000 gal. capacity each.

Tank nos. T-101 and T-107 are of stainless steel construction. All others are of carbon steel.

The four (4) newer tank nos. T-101 to T-104, fabricated by Imperial Steel Tank Co., were placed in service during 1986. The remaining older six (6) tanks date from 1981.

Available records and fabrication drawings for tank nos. T-101 to T-104 indicate they were built to the Underwriters Laboratories, Inc. Standard UL-142 for steel above ground tanks and were to be labeled as such. The published UL-142 Standards "do not cover vertical tanks that are elevated by means of legs" and are not intended for liquids having a specific gravity exceeding that of water. In order to satisfy these exceptions, it was necessary for Imperial Steel to apply for Underwriters Lab review and inspection to obtain the UL Listing for these cone bottomed above ground steel tanks on legs.

The Imperial fabrication drawings list the following tank design parameters:

Design Pressure = hyrdostatic head due to contents

Design Temperature = 250° F

Specific Gravity = 1.5

Corrosion Allowance = 1/16 "

Although no fabrication drawings were found for the six (6) older tanks, the Straubing, Rubin & Kenes design plans indicate the same material thicknesses for the top, shell, and bottom as shown on the Imperial plans. Since these thicknesses have been further verified by ultrasonic test measurements, it seems reasonable to conclude that these older tanks were also built to the design standards of UL-142.

The most recent ultrasonic thickness measurements include those taken by Alpha Consultants in Aug. '89 and by MQS Inspection in Oct. '91 for the Serrine report.

Alpha Consultants conducted visual internal inspections on all tanks (except T-110, which was in service) in early Dec. '89 and an external site inspection on 3 Jan. '90. Serrine Environmental Consultants conducted a visual site inspection, including all tank externals, in Sept. '91.

SPECIFIC TANK DETAILS

For tabulation of existing tank detail design information and summary of latest ultrasonic thickness measurements, refer to the tank status form provided in Appendix A for each of the ten (10) tanks.

PROJECTED SERVICE LIFE

The following table summarizes results of calculations undertaken to establish corrosion rates, based on past service, in order to predict an expected service life for the eight (8) carbon steel tanks. For calculation details, refer to Appendix B.

Surface	Estimated Corrosion Rate	Estimated Retirement Thickness	% of "as built" Thickness Remaining at Retirement	Projected Life as of 1995
Tank Top T-110	2.5 Mils/yr	0.156"	62%	24 yrs.
Side Shell T-105&T-112	3.6 Mils/yr	0.188"	60%	21 yrs.
Cone Bottom T-102	3.0 Mils/yr	0.281"	71%	28 yrs.

NOTE:
The following assumptions were used in the development of this table:

Corrosion rates for the tank top and shell surfaces were arrived at by subtracting the lowest recorded minimum ultrasonic thickness reading to date from the "as built" thickness and then dividing by the tank age at time of thickness reading.

In arriving at an estimated corrosion rate for the bottom cone surface, it was found necessary to develop an adjusted "as built" thickness. This was required since the average recorded bottom thickness measurement for all tanks, and in most cases the minimum value also, exceeded the 0.375" thickness shown on the fabrication drawing. The "as built" thickness was therefore adjusted to 0.392" to more accurately reflect the ultrasonic readings which ten years later were giving averages and minimums greater than 0.375".

INSPECTION/TESTING PLAN PRIOR TO REUSE

In order to assess each tank's internal condition, material thickness, and integrity prior to being placed back in service, it is planned to do the following, once the tank has been found safe for man-entry:

* Conduct an initial visual inspection by a tank experienced technician in company with a registered professional engineer to determine general tank condition. A standard check list, similar to that used by Alpha Consultants for Tank T-109 and shown in Figure 1 will be used as a guide and for recording findings. Suspicious areas will be noted for a more rigorous inspection and scheduled for ultrasonic measurement if deemed necessary.

* Since these tanks are insulated, past ultrasonic readings taken from the tank exterior have been limited to those areas where a removable patch permits direct access to the plate surface beneath. Past surveys have included at each of 4 - 90° quadrants, 1 top point, 3 side points and 1 cone bottom point giving a total of 20 readings/tank. With the tank out of service and clean, it would seem desirable to take additional ultrasonic thickness measurements from within. The cone bottom and tank height will make this difficult and require a tank ladder or other means to reach the underside of the top plate.

* It is recommended that a minimum of 12 readings each be taken in a + pattern on the top and bottom surfaces. For the shell at mid-height, a girth sample of about 20 points around the circumference is desirable. Finally, a vertical row sample, top to bottom, of about 10 points at a location determined from the visual inspection to be most worthy of further exploration, should provide more than enough data to verify the existing surface thicknesses and to form a base for comparison with past and future thickness measurement readings. The ultrasonic test readings are to be taken by personnel qualified and certified as competent to use the test equipment. The test results are to be analyzed by a registered professional engineer experienced in steel tank design and construction.

FIGURE 1

ALPHA CONSULTANTS, Ltd.

CHECKLIST FOR VISUAL INSPECTION OF UNLINED VESSELS

OWNER CWM Chemical Services, Inc.-Chicago Incinerator
TEST SITE 11700 So. Stony Island Ave., Chicago, Il. 60617
DATE OF INSPECTION December 5, 1989
TIME OF INSPECTION 1525
SUPERVISORY ENGINEER Harris E. Dicker, P. E.
PHOTOGRAPHER/TECHNICIAN Robert A. Dicker
TECHNICIAN James L. Eggert

TANK NO. 109 (NO PCB IN TANK)
INTERIOR SHELL MATERIAL CS
CLADDING MATERIAL SST
INSULATION 2' FIBREGLASS SIDES & BOTTOM, 2" COL BLOCK TOP
EQUIPPED WITH MIXER NO

INITIAL ROOF INSPECTION FOR SAFETY

HAZARDS OF FALLING OBJECTS NONE
VISIBLE CORROSION NONE

MORE RIGOROUS INSPECTION OF ROOF & STRUCTURAL SUPPORTS

VISIBLE LOSS OF METAL THICKNESS NONE
VISIBLE CRACKS OR LEAKS AT WELDS NONE
VISIBLE CRACKS AT NOZZLE CONNECTIONS NONE
MALFUNCTIONING OF ROOF SEALS NONE
VISIBLE DETERIORATION OF WATER DRAIN SYSTEM NONE
CONDUCT HAMMER TESTING NO

TANK SHELL

VISIBLE CRACKS AT SEAMS NONE
VISIBLE CORROSION AT VAPOR SPACE/LIQUID LEVEL LINE NONE
VISIBLE CRACKING OF PLATE JOINTS NONE
VISIBLE CRACKING OF NOZZLE CONNECTION JOINTS NONE
VISIBLE LOSS OF METAL THICKNESS NONE

TANK BOTTOM

TYPE OF BOTTOM, SLOPED OR FLAT SLOPED
VISIBLE CORROSION PITS NONE
VISIBLE CRACKED SEAMS NONE
TYPE OF CONNECTION TO SIDEWALL, WELDED OR RIVETED WELDED
VISIBLE TIGHTNESS AT CONNECTION NONE
VISIBLE DEPRESSIONS IN BOTTOM AREAS AROUND OR UNDER ROOF OR PIPE SUPPORTS NONE
VISIBLE LOSS OF METAL THICKNESS NONE
VISIBLE UNEVENESS OF BOTTOM NONE
CONDUCT HAMMER TEST NO
VISIBLE BULGES, BLISTERING OR SPALLING NONE
WAS ULTRASONIC TESTING OF TANK WALLS, ETC. CONDUCTED YES

Source: OSWER Policy Directive No. 9483.00-1
Modified Version of Table 4-7, Page 4-35
"Permit Writer's Guidance for Hazardous Waste Tanks" U. S. EPA Contract 68-01-6515
(undated draft) pp 8-10.

SUMMARY DISCUSSION

Projected Service Life - The projected useful service life for the eight (8) carbon steel tanks is estimated to be on the order of 20 years from today.

- The projected service life for the two (2) stainless steel tanks (T-101 & T-107) is estimated to be more than 20 years as evidenced by the ultrasonic thickness readings which indicate little, if any significant material loss as of '91.

- These projected service life estimates are believed to be conservative in that minimum point readings, rather than average readings, were used to establish the corrosion rates. Furthermore, the projected service life calculations assume that corrosion has continued at the same rate during the past 3 years when the tanks have been out of service.

- These estimated rates can be expected to remain in effect so long as the future stored waste product corrosivity characteristics are compatible with and do not differ significantly from those products stored in the past. Also, the integrity of the external insulation cladding material must be maintained to prevent exterior corrosion from the weather.

- It is anticipated that these tanks, once returned to service, will be ultrasonically tested on an annual basis, at which time these estimated corrosion rates should be reviewed and modified if necessary to suit existing service conditions.

Type of Wastes Stored - The individual tank status forms, Appendix A, list the typical types of waste products stored in past service as well as those planned for future operations. Before any wastes are stored, the facility management is required to assess the compatibility of the waste with (1) the storage unit materials of construction and (2) the wastes being presently stored.

Conclusion - Based on a detailed technical review of the page 1 referenced documents, it is my opinion that the ten (10) existing tanks proposed for reuse at the CWM Tank Farm are structurally sound, free from leaks, and exhibit sufficient material thickness, as determined by ultrasonic measurements. They appear to meet applicable design guidance standards and the past visual inspection reports indicate them to be substantially free from corrosion. Therefore, it is my opinion that the existing reported condition and structural integrity of these storage tanks demonstrate suitability for continued service.

CERTIFICATION

"I certify, under penalty of law, that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately 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 possible fines and imprisonment"

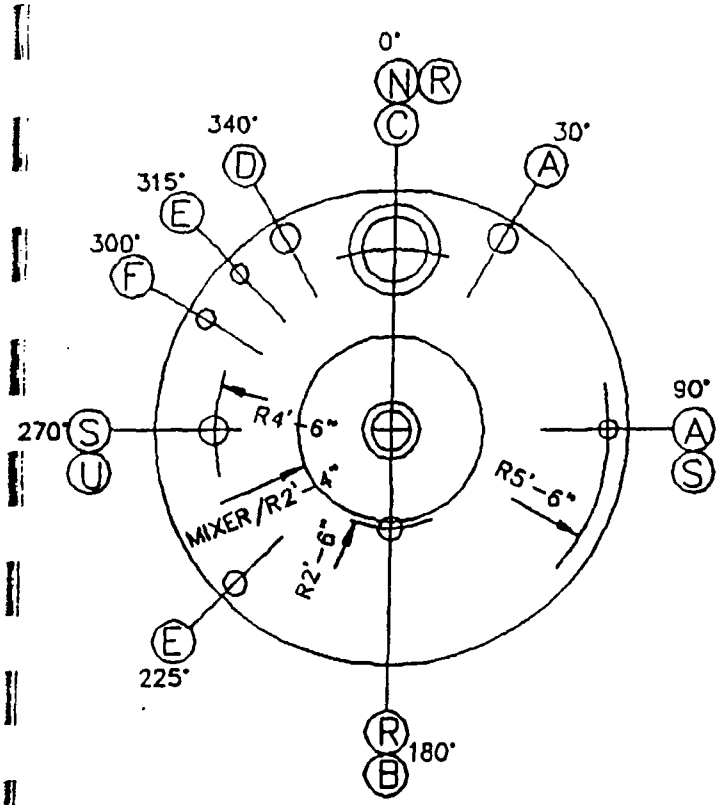
Registered Professional Engineer

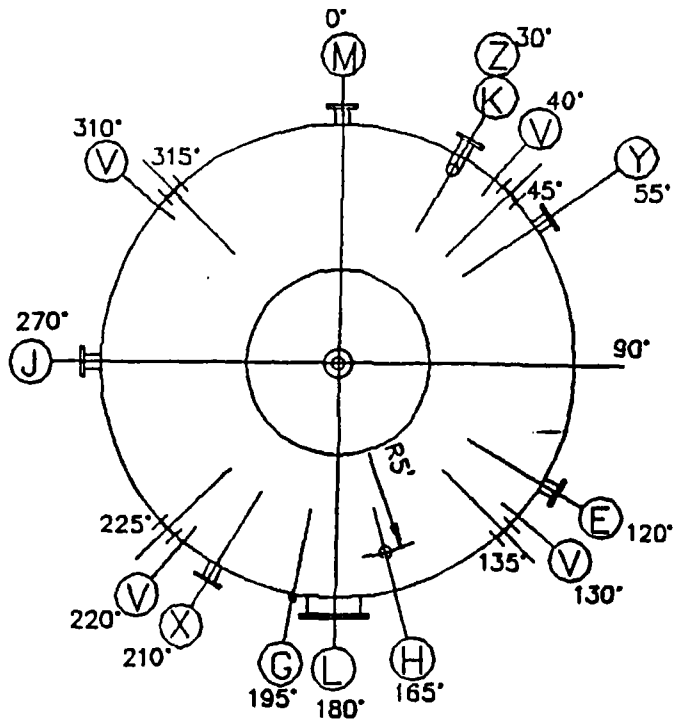
Name: Lee F. Mount

Signature Lee F. Mount

Date: 24 January 1995

Massachusetts Registration No: 21193





TK-110

MARK	REQD.	SIZE	TYPE	ELEVATION	DESCRIPTION
A	2	2"	150# RFSO	ROOF	NITROGEN BLANKET
B*	1	3"	150# RFSO	ROOF	COV - FA
C	1	20"	150#	ROOF	EMERGENCY VENT
D	1	4"	150# RFSO	ROOF	FILL
E(315)	1	3"	150# RFSO	ROOF	HIGH LEVEL-LSH110
E(225)	1	3"	150# RFSO	ROOF	SPARE
F	1	3"	150# RFSO	ROOF	DPSL110 & DPSH110
G	1	2"	3000# CPLG	12" F/CONE	SPARE
H	1	2"	3000# CPLG	CONE	SAMPLE
J	1	3"	150# RFSO	6" F/CONE	LOW LEVEL-LSL110
K	1	3"	150# RFSO	13" F/CONE	SPARE
L	1	24"	150#	12" F/CONE	MANWAY W/COVER
M	1	4"	150#FB-VALVE	CONE	DRAW-OFF
N*	1	12"	150# RFSO	ROOF	MIXER MOUNT
R	AS SHWN		-	6'-3" F/ROOF	SUPPORT CLIP
S	AS SHWN		-	3'-9" F/ROOF	SUPPORT CLIP
E	1	3"	150# RFSO	6" F/CONE	SPARE
U*	1	4"	150# RFSO	ROOF	LEVEL MONITOR-LT110
V*	4		-	SHELL	BAFFLE
X	1	12"	150# RFSO	12" F/CONE	HEATER
Y*	2	4"	150# RFSO	9",6'-6" F/C	DRAW-OFF
Z*	2	2"	3000# CPLG	9",6'-6" F/C	SAMPLE

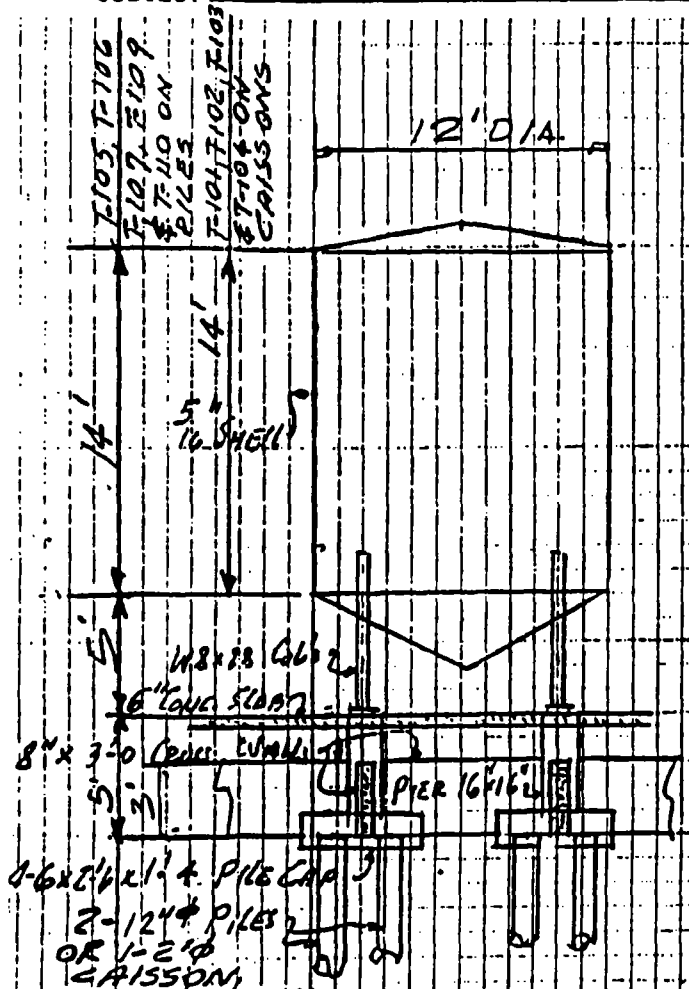
NOTE: * DESIGNATES NEW NOZZLE

HOYER-SCHLESINGER-TURNER, INC.

SHEET 2 OF 8
PROJECT NO. 17851
DATE 1.19.95
BY BERNES
CHK. C.K. 1.27.95

PROJECT CLEAN HARBORS - CHICAGO, IL

SUBJECT EXIST. TANK FARM SUPPORT COMPUTATIONS



SECTION "A-A"
SEE SH-1

TANKS T-101 TRU T-107, T-109 & T-110

EMPTY TANK =
$= \pi(12 \times 14' + 12^2/4 + 6 \times \sqrt{3^2 \times 12^2}) \times 12.8 \times 1.05$
$= 11.985 + 4 \text{ LEGS} \times 7 \times 28 = 184$
TOTAL = 12,170#

PLUS NOZZLES, FLANGES AND SUPPORTS:
= 7,830#

TOTAL EMPTY TANK = 12,170 + 7,830 =
= 20,000# ✓

LIQUID = 12,100 GAL × 8.332 × 1.5 =
= 151,298# ✓

TOTAL EMPTY + LIQUID =
= 20,000 + 151,298# = 171k

EACH LEG = 171/4 = 43k/LEG ✓

CONCRETE + SNOW

PILE CAP = 4.5' × 2.5 × 1.33 × .15 = 2.25k
PIER 1.33 × 1.33 × 5' × .15 = 1.33k
CROSS WALL 3' × .67' × 16 × .15 = 4.82k
FILL 4.5 × 2.5 × 3.5 × .10 = 3.94k
6" CONC. SLAB = 4.5 × 2.5 × .5 × .15 = .84k
SNOW $\pi R^2 \times 25^{\#}$ = 2.83k

16.01 k/L

TOTAL LOAD PER LEG ON PILES
= 43k + 16k = 59k

TWO 2-12"φ WOOD PILES = 20 TON CAP. EACH
= 2 × 40k = 80k > 59k O.K.

CAISSON CAP = $\pi \times R^2 \times 9^k = \pi \times 2.25^2 \times 9 = 143^k > 59^k$ O.K.

H-S-T

HOYER-SCHLESINGER-TURNER,Inc.
ENGINEERS-ARCHITECTS
3074 University Ave.
Highland Park,IL 60035
Phone:847-461-0470 Fax:847-266-9829

October 18, 2000

Mr. James R. Laubsted
Facility Compliance Manager
CLEAN HARBORS SERVICES, INC.
11800 S. Stony Island Avenue
Chicago, IL 60617

RE: Inspection Report
Tank T-112

Dear Mr. Laubsted:

On October 2, 2000 I visually inspected the interior and exterior of Tank T-112.

Tank T-112 is located on the south side of the Flammable Storage Tank Farm (Unit 16). Previous visual inspections include July 7, 1995. Hydrostatic testing was completed in July, 1995. From the time of the earlier inspection, the tank was used for storing Class II and III flammable hazardous wastes. Tank T-112 is located outdoors and has a dedicated concrete dike. The containment is coated with Protecto-Coat 900, 30 mils thick as manufactured by Dudick, Inc. This coating is compatible with the stored materials. The containment dike for T-112 and the remaining tanks within the tank farm were inspected August 31, 2000.

Tank T-112 is a carbon steel vessel fabricated in 1981. Tank T-112 was empty at the time of inspection and was cleaned by Clean Harbors personnel. The tank is operated at ambient temperature and under 2" WC pressure from nitrogen blanketing. The tank is equipped with a conversation vent and is vented through a carbon bed.

Tank T-112 stores Class II and III flammable liquids including hazardous waste fuels and lean waters. Maximum specific gravity of stored liquids is 1.5 and pH may vary from 4 to 10. The tank is constructed from carbon steel. It is 12'0" in diameter and 22"0" high straight side with a cone bottom and top. The operating capacity is 20,000 gallons. There is no record that this tank was built to UL-142 standard. The assumption that the tank was built to this standard is based on a comparison with another tank which was fabricated to the UL-142 standard.

The tank is supported by steel legs on caissons. The steel legs are encased in concrete.

The internal and external visual inspection did not reveal any defects. The welds around nozzles and tank shell welds inspected from inside the tank were in good condition. The interior top half of the tank shell and roof were covered with rust. The rust was sandblasted by Clean Harbors. There was no sign of pitting or other visible defects.

It is not possible to inspect the entire exterior of the tank by visual inspection. The tank is insulated with 2" thick insulation with metal jacket. The insulation and jacketing was removed where nozzles were added in 1995. At that time the welds could be inspected from the outside. The condition of the welds was good; there were no vertical defects.

In October, 2000 Clean Harbors performed NDE-ultrasonic thickness measurements from the interior of the tank. In October, 1999 external NDE-ultrasonic thickness measurements were taken. These ultrasonic thickness test results and prior results are listed in Appendix TK-112-1.

The top as-built thickness was 0.250 inches. The four latest readings each show minor decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.214 inches which is 74% over the minimum of 0.123 inches recommended by the UL-142 standard.

The wall as-built thickness was 0.313 inches. The twelve latest readings each show minor decreases in thickness compared to the 1991 ultrasonic thickness results. The minimum reading was 0.260 inches which is 56% over the minimum of 0.167 inches recommended by the UL-142 standard.

The bottom as-built thickness was 0.375 inches. The four latest readings each show minor decreases in thickness compared to the 1991 ultrasonic thickness readings. The minimum reading was 0.364 inches which is 52% over the minimum of 0.240 inches recommended by the UL-142 standard.

For tank evaluations, modifications and calculations, see certification reports by Mr. Lee F. Mount, PE, dated January 1995 and May 23, 1995 in Appendix TK-112-2.

For tank nozzle orientation and description, see Appendix TK-112-3.

For Tank T-112 supports evaluation, see calculations by Mr. Peter J. Bernes, SE, dated January 19, 1995 in Appendix TK-112-4.

Therefore, I certify that after visual inspection, the tank is structurally sound, properly supported and set. No evidence of cracks, bulging, corrosion pits or scales or weld defects were observed. Based on my inspection, the tank can be used for the intended purpose.

Very truly yours,

HOYER-SCHLESINGER-TURNER, INC.

Peter J. Bernes

Peter J. Bernes
Illinois #3659

STATE OF ILLINOIS
PETER J.
BERNES
3659
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11.30.01

ULTRA SONIC THICKNESS TESTING
T-112

October 2, 2000

INTERNAL

TOP

East	South	West	North
.214	.216	.216	.216

SHELL

.284	.284	.284	.284
.264	.272	.272	.264
.262	.260	.260	.261

BOTTOM

.388	.374	.388	.364

ULTRA SONIC THICKNESS TESTING
T-112

October 12, 1999

EXTERNAL

TOP

East	South	West	North
.210	.206	.208	.208

SHELL

.276	.276	.274	.276
.270	.260	.268	.280
.252	.250	.252	.248

BOTTOM

.364	.376	.388	.364

ULTRA SONIC THICKNESS TESTING
T-112

October 17, 1998

TOP

East	South	West	North
#8	#7	#6	#10
.212	.229	.201	.220

SHELL

#13	#14	#15	#11
.281	.268	.267	.267
#21	#16	#18	#12
.255	.258	.264	.276
#20	#19	#17	#22
.257	.249	.250	.245

BOTTOM

#1	#2	#3	#4
.364	.373	.395	.359

CleanHarbors

ULTRASONIC THICKNESS TESTING - 12-17-97

TANK #112

EAST	SOUTH	WEST	NORTH
9 .193	7 .211	6 .222	10 .242

NORTHEAST	SOUTHEAST		
13 .287	14 .297	15 .291	11 .278
21 .259	16 .265	18 .272	12 .282
20 .268	19 .264	17 .261	22 .259
1 .370	2 .376	3 .395	4 .368

CLEAN HARBORS OF CHICAGO, INC.

CWM TANK FARM

EXISTING TANK STATUS FORM

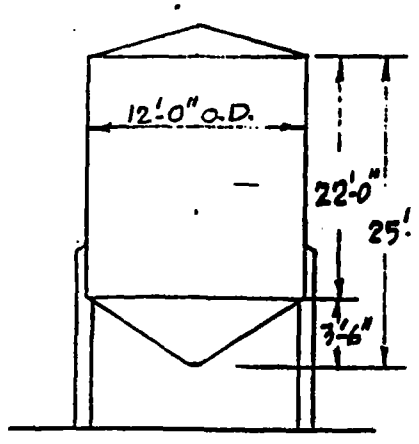
Tank No. T-112

Nominal Capacity 20,000 gals.

Mat'l. of Const. CARBON STEEL

Approx. Year of Build 1981

Designed Corrosion Allow. 1/16"



Stored Waste Characteristics:

	Past	Future
Specific Grav.	1.5 (design)	0.5 → 1.5
Class	NFPA CLASS 2 (FEED)	NEUTRAL PH WATERS, LEAN WATER
	LEAN WATER	AND/OR HAZARDOUS WASTE FUEL
	PCB / FUEL BLEND	(NFPA CLASS 2-3 LIQUIDS ONLY)

Material Thicknesses (Inches):

Surface	per UL-142 Std.	As Built	Ultrasonic Test Results			
			08/89 B		10/91 C	
		A	Avg.	Min.	Avg.	Min.
Top	0.123	0.250	0.255	0.242	0.254	0.250
Shell	0.167	0.313	0.304	0.301	0.296	0.277
Bottom	0.240	0.375	0.375	0.370	0.401	0.389

NOTES:

A. FROM STRAUBING, RUBIN, & KENES DESIGN DWG. 1-Q-008

B. FROM ALPHA CONSULTANTS JAN. '90 RPT.

C. FROM SIRRINE ENVIR. CONSULTANTS NOV. '91 RPT.

16 BIOTENSE A 1

1785

LEE F. MOUNT, P.E.
CIVIL ENGINEER
2 BAY VIEW AVENUE HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

23 May 1995

Mr. Alan F. Mount, Project Manager
Clean Harbors of Chicago, Inc.
11800 S. Stony Island Avenue
Chicago, Illinois 60617

Subject: CWM Tank Farm
Tank Agitator Mounting and Nozzle Details

Enclosure: 1) Design Calculations and Fabrication Details
(10 sheets, original issue date 14 March 1995)

Dear Alan,

Enclosure 1) is submitted herewith for your information and records. Sheet nos. 1, 5, 6 & 9 have been updated and revised where necessary to reflect your actual "as built" conditions.

Yours truly,

Lee F. Mount

Lee F. Mount

Reviewed by:

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-96

LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANK FARM
SHEET NO. COVER OF
CALCULATED BY L. F. MOUNT DATE 14 MAR '95
REV. 17 MAR. '95.
CHECKED BY DATE
SCALE FINAL ISSUE TO REFLECT "AS BUILT" CONDITIONS 22 MAY '95

THE ENCLOSED CALCULATIONS AND FABRICATION DETAILS WERE CARRIED OUT IN SUPPORT OF CURRENT TANK UPGRADES PROPOSED FOR THE CLEAN HARBORS, CHICAGO STONY ISLAND FACILITY. AN OVERALL REVIEW AND ASSESSMENT OF THE STRUCTURAL INTEGRITY OF THESE EXISTING TANKS WAS COVERED IN A REPORT BY THE UNDERSIGNED DATED JAN. 1995. THIS REPORT ADDRESSES THE FITTING OF NEW TANK AGITATORS AS WELL AS ADDITIONAL NOZZLES.

CONTENTS

DESCRIPTION	SHEET NO.
SKETCH OF AGITATOR MOUNTING FLANGE (FOR TANKS 105, 106, 107	1
REFERENCES 109, 110, 112)	2
ESTIMATE OF STRESS DUE TO BENDING MOMENT @ FLANGE	2
ESTIMATE OF STRESS DUE TO TORQUE @ FLANGE	3
ESTIMATE OF STRESS DUE TO AGITATOR VERTICAL LOAD	3
CHECK OF LOADED TANK SUPPORT LEGS W/ AGITATOR VERT. LOAD	4
TYPICAL PROPOSED 4" NOZZLE INSTALLATIONS	5
BAFFLE PLATE DESIGN REQ'MTS.	6
CHECK TANK INTEGRITY FOR OPERATION WITH 1.0 PSIG VAPOR PRESS.	7-8
SKETCH OF MODIFIED AGITATOR MOUNTING FLANGE (FOR TANKS 103 + 104)	9
TABULAR SUMMARY OF AGITATOR SPECS. + TANK PROPERTIES	10

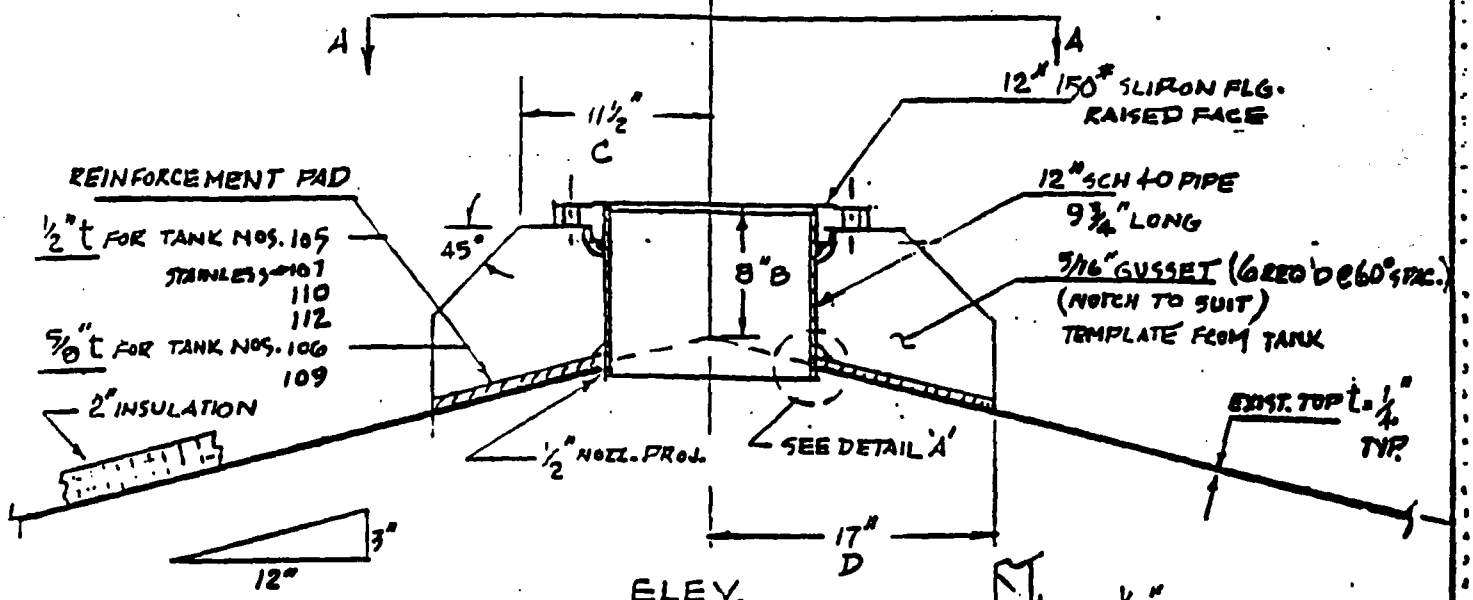
PREPARED BY Lee F. Mount
LEE F. MOUNT
14 MARCH 1995

COMMONWEALTH OF MASSACHUSETTS
LEE FORREST MOUNT
21193
REGISTERED PROFESSIONAL ENGINEER

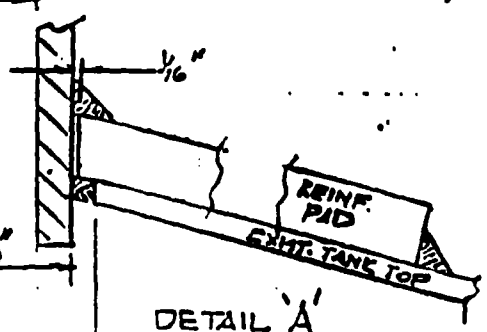
LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANK AGITATORS
SHEET NO. 1 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. '95
REV. 15 MAR. '95
CHECKED BY DATE
SCALE 1" = 1'-0" & AS NOTED 22 MAY '95
"AS BUILT"

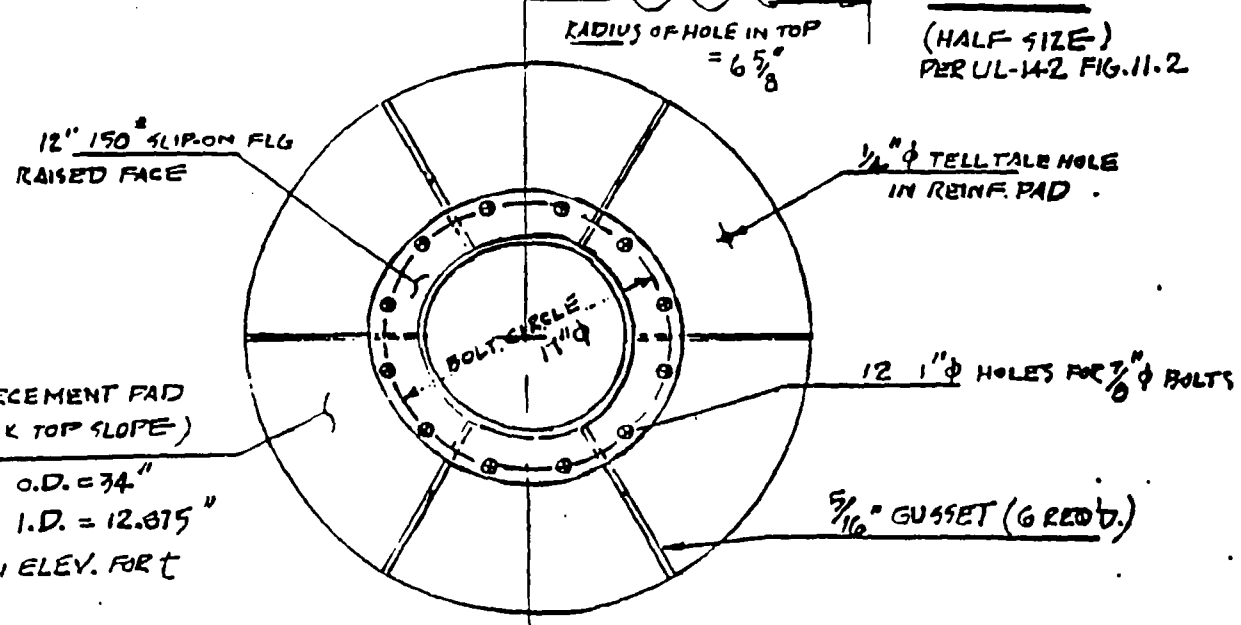
NEW MOUNTING FLANGE FOR TANK NOS. 105, 106, 107, 109, 110 & 112



ELEV.



DETAIL 'A'
(HALF SIZE)
PER UL-142 FIG. 11.2



PLAN A-A

LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANK AGITATOR & NOZZLE INSTALL.
SHEET NO. 2 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. '95
CHECKED BY _____ DATE _____
SCALE _____

REFERENCES: 1) CHEMINEER AGITATOR DESIGN SYSTEM SPEC. SHEETS
2) UL-142, STEEL ABOVE GROUND TANKS
3) FORMULAS FOR STRESS & STRAIN, ROARK 4TH ED. 1965
4) API-650 WELDED STEEL TANKS FOR OIL STORAGE
5) CHEMINEER IOM MANUAL PG. 4-9 JUNE '93
6) ASME SECT VIII PRESSURE VESSEL CODE

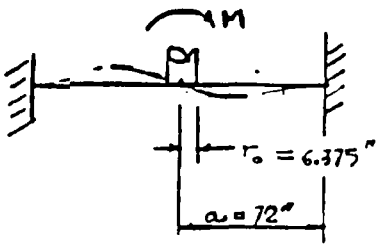
CHECK REINFORCED TANK TOP FOR AGITATOR LOADINGS

ASSUMPTIONS: LOADINGS - USE 15 HP TYPE C UNIT FOR MAX. BENDING MOMENT OF 5036 FT.-LBS & TORQUE OF 4274 FT.-LBS

- USE 5 HP TYPE B UNIT FOR MAX. VERTICAL LOAD OF SAY 3000 LBS

ESTIMATE STRESS DUE TO BENDING MOMENT

FROM REF 3) PG. 219, CASE 10 ASSUMES FLAT CIRCULAR PLT, EDGES FIXED, CENTRAL COUPLE



$$\text{Max } S_r \text{ at } r = r_o = \frac{3M}{4\pi t^2 r_o}\left[1 + \left(\frac{m+1}{m}\right)\log \frac{2(.45a - r_o)}{.45 k a}\right]$$

WHERE: $k = \dfrac{0.1a^2}{(r_o + .28a)^2} = \dfrac{0.1(72)^2}{[6.375 + .28(72)]^2}$

$= 0.736$

$M = 5036 \text{ FT-LBS} \times 12 = 60432 \text{ IN-LBS}$

$t = .25 + .625 = 0.875''$ (REINF. PAD)

m = RECIPROCAL OF POISSON'S RATIO $= \frac{1}{.3} = 3.33$

$a = 72''$

$r_o = 6.375''$

$$\text{Max } S_r = \frac{3(60432)}{4\pi(.875)^2(6.375)}\left[1 + 1.30 \log \frac{2(.45(72) - 6.375)}{.45(.736)(72)}\right]$$

(2.183)

$= 2956\,[1 + 1.3(.781)]$

$= 2956\,(2.02) = \boxed{5971 \text{ PSI}}$

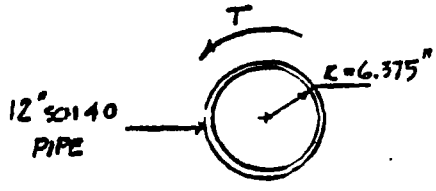
LEE F. MOUNT, P.E.
Civil Engineer/Naval Architect
2 Bay View Avenue
HINGHAM, MASSACHUSETTS 02043
(617) 749-5394

JOB CWM/CHI TANK AGITATORS
SHEET NO. 3 OF 10
CALCULATED BY L.F. MOUNT DATE 13 MAR. '95
CHECKED BY DATE
SCALE

ESTIMATE SHEAR STRESS DUE TO TORQUE

$T = 4274$ FT-LBS $\times 12 = 51288$ IN-LBS

FORCE $= \frac{T}{r} = \frac{51288 \text{ IN-LBS}}{6.375''} = 8045$ LBS



CIRCUM. $= 2\pi(r) = 40''$

$\therefore$ LOAD/" OF CIRCUM. $= \frac{8045}{40} = 201$ LBS/IN

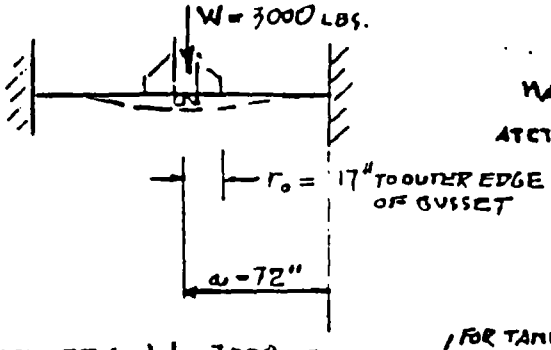
SAY TORQUE IS CARRIED BY 3/8" FILLET WELD @ REINF. PAD TO NOZZLE CONNECTION

ALLOWABLE WELD LOAD $= 11{,}200(.375'') = \boxed{4200 \text{ LBS/IN} > 201 \text{ O.K.}}$

CONSERVATIVE IN THAT LOWER TANK TOP TO NOZZLE FULL PENETRATION WELD HAS NOT BEEN TAKEN INTO ACCOUNT.

ESTIMATE STRESS DUE TO VERTICAL LOAD

FROM REF. 3) PG 218, CASE 7 ASSUMES FLAT CIRCULAR PLT., EDGES FIXED, UNIFORM LOAD OVER CONCENTRIC CIRCULAR AREA OF RADIUS r_o



$$\text{MAX } S_r \text{ AT } r_o = \frac{3W}{2\pi m t^2}\left[(m+1)\log\frac{a}{r_o} + (m+1)\frac{r_o^2}{4a^2}\right]$$

WHERE: $W = 3000$ LBS
$t = .25 + .50$ (REINF PAD) $= 0.75''$ (FOR TANK No 112)
$m = 3.33$
$a = 72''$
$r_o = 17''$

$$\text{MAX } S_r = \frac{3(3000)}{2\pi(3.33)(.75)^2}\left[4.33\log 4.235 + 4.33(.0139)\right]$$

$$= 765\,(6.25 + .06)$$

$$= \boxed{4827 \text{ PSI}}$$

CONCLUDE: COMBINING STRESS DUE TO BENDING (5971) + STRESS DUE TO VERT. LOAD (4827) = 10,798 PSI
API 650 GIVES ALLOW STRESS OF 20,000 PSI FOR ASTM A285-C STEEL
THUS, THE STRESS DUE TO EXTERNAL LOADS IS ABT. 54% OF ALLOWABLE WHICH APPEARS TO BE REASONABLE

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JOB CWM/CHI TANKS
SHEET NO. 4 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR 95
CHECKED BY DATE
SCALE

CHECK TANK SUPPORT LEGS FOR AGITATOR VERT. LOAD

USE TANK NO 112 (LARGEST TANK + HEAVIEST AGITATOR)

ESTIMATED WEIGHT TO BE SUPPORTED BY 4 LEGS @ L=7.0' SIZE = W8x31

TANK STEEL

CONE TOP (1/4" RT.) LATERAL AREA = BASE CIRCUM x 1/2 SLANT HT.

$= \pi D \times \frac{6.18'}{2}$

$= \pi 12 \times 3.09 = 116.5 \text{ ft}^2 \times 10.2 \text{ \#/ft}^2 = 1188$ LBS.

SHELL (3/16" RT.) AREA = $\pi D H$

$= \pi 12 \times 22 = 829.4 \text{ ft}^2 \times 12.75 \text{ \#/ft}^2 = 10575$ LBS.

CONE BOTTOM (3/8" RT.) LATERAL AREA = BASE CIRCUM x 1/2 SLANT HT.

$= \pi D \times \frac{6.95}{2}$

$= \pi 12 \times 3.48 = 131.2 \text{ ft}^2 \times 15.7 \text{ \#/ft}^2 = 2007$ LBS.

AGITATOR WEIGHT ——— 3000 LBS

SUBTOTAL 16770 LBS

ADD 20% FOR MISC. PIPING, PLATFORMS INSULATION, ETC. ——— 3350 LBS

LIQUID CONTENTS @ S.G. = 1.5 CAP. = $\frac{20{,}000 \text{ GAL.}}{7.48 \text{ GAL/CU.FT}}$ = 2674 CU FT x 62.4 x 1.5 = 250,286 LBS

TOTAL ESTIMATED WT. TO BE SUPPORTED = 270,406 LBS.

USE 276 KIPS

∴ EACH LEG CARRIES $\frac{276}{4}$ = 69 KIPS

FROM AISC COL TABLE @ KL = 2(7) = 14 FOR W8x31 (A36 STL.)

READ ALLOWABLE LOAD = 137 KIPS > 69 KIPS

CONCLUDE: EXISTING COLUMN SUPPORT IS ADEQUATE FOR CONDITIONS

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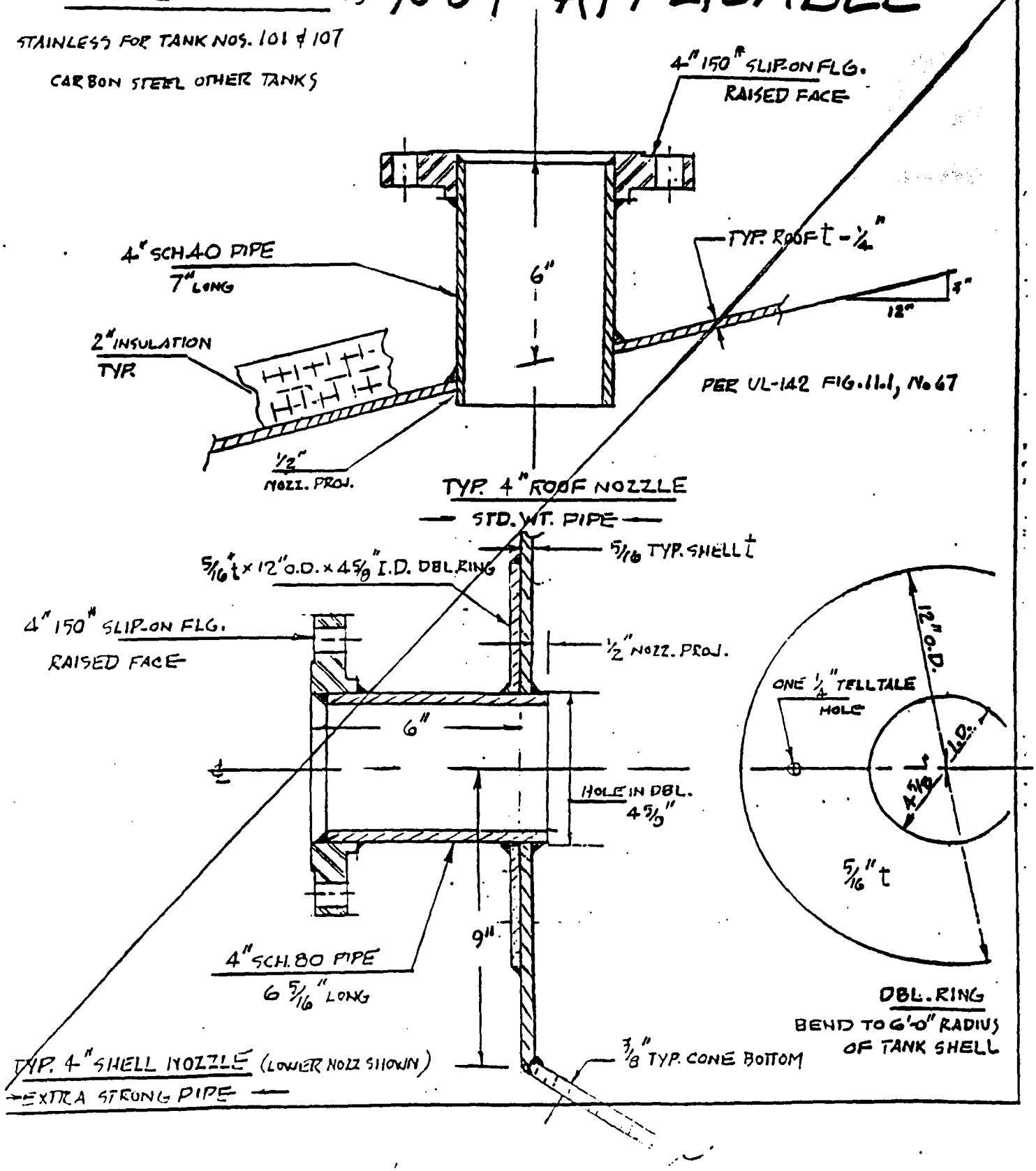
JOB CWM/CHI TANKS
SHEET NO. 5 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR.'95
REV. 15 MAR.95
CHECKED BY DATE
SCALE 3" = 1'-0" 22 MAY'95
"AS BUILT"

4" NOZZLE INSTALLATIONS NOT APPLICABLE

STAINLESS FOR TANK NOS. 101 & 107

CARBON STEEL OTHER TANKS



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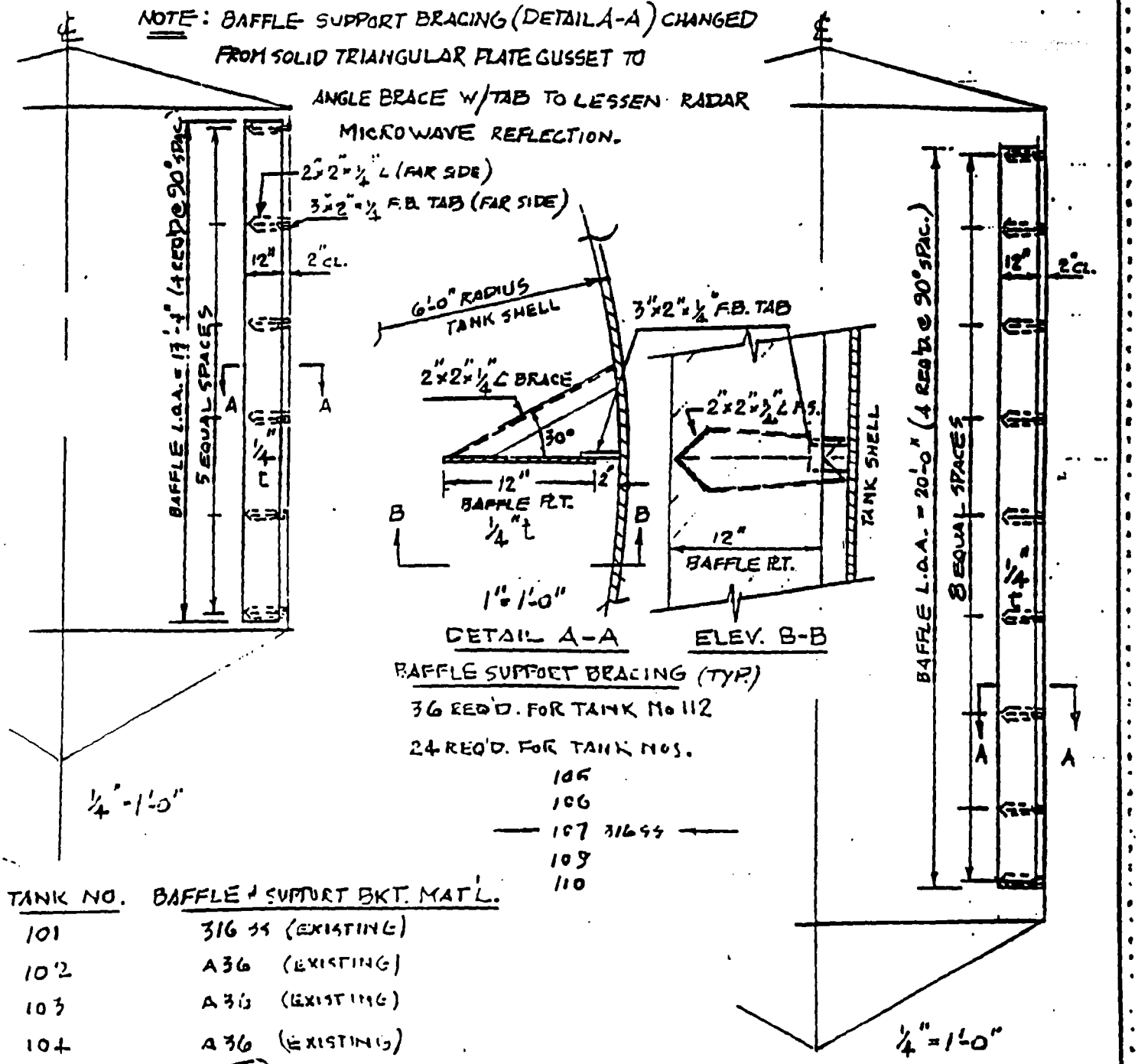
JOB C.W.M./CHI TANKS
SHEET NO. 6 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. '95
CHECKED BY DATE REV. 15 MAR. '95
SCALE AS NOTED "AS BUILT" 22 MAY '95

BAFFLE PLATE DESIGN (SIZES AS RECOMMENDED IN REF. 1)

NOTE: BAFFLE SUPPORT BRACING (DETAIL A-A) CHANGED FROM SOLID TRIANGULAR PLATE GUSSET TO ANGLE BRACE W/TAB TO LESSEN RADAR MICROWAVE REFLECTION.



BAFFLE SUPPORT BRACING (TYP.)
36 REQ'D. FOR TANK No 112
24 REQ'D. FOR TANK NOS.
105
106
107 316 SS
109
110

TANK NO.	BAFFLE & SUPPORT BKT. MAT'L.
101	316 SS (EXISTING)
102	A36 (EXISTING)
103	A36 (EXISTING)
104	A36 (EXISTING)
105	A36 NEW
106	A36 NEW
107	316 SS NEW
109	A36 NEW
110	A36 NEW

TANK NO. 112
BAFFLE & SUPPORT BKTS.
A36 STEEL (NEW)

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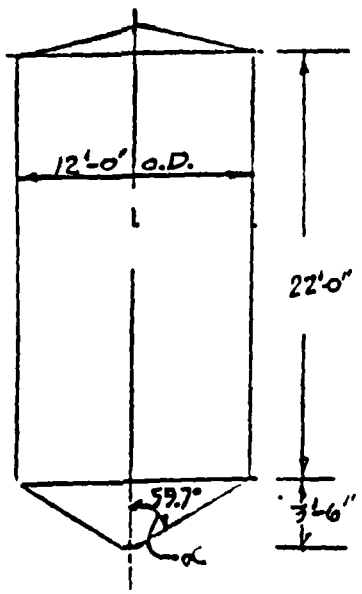
JOB CWM/CHI TANKS
SHEET NO. 7 OF 10
CALCULATED BY L.F. MOUNT DATE 14 MAR. '95
CHECKED BY _____ DATE _____
SCALE _____

CHECK FOR TANK SERVICE OPERATION WITH 1.0 PSIG INTERNAL VAPOR PRESSURE (APPT. 24" WATER)

USE TANK NO 112 WHICH HAS GREATEST DEPTH

ASSUME S.G. @ 1.5



MAX PRESSURE @ CONE BOTTOM $= \frac{62.4 \times 1.5 \times 25.5'}{144} = 16.6$ PSI

PLUS VAPOR PRESSURE 1.0 PSI

17.6 PSI

USE 18 PSI = P

USE ASME SECT VIII - DIV 1, APPENDIX 1 TO DETERMINE MIN. REQ'D PLT. t FOR SHELL & CONE BOTTOM

FOR CYLINDRICAL SHELL:

$$t = \frac{PR_o}{SE + 0.4P}$$

WHERE: $P = 18$ PSI

$R_o = \frac{12}{2}(12) = 72''$

$$t = \frac{18(72)}{(13800).7 + 0.4(18)}$$

$S = 13{,}800$ PSI FOR A 285-C STL.

$E = 0.7$

$t = 0.134'' + .0625'' = 0.197$ IN. (UL-142 WOULD REDUCE $t = 0.167$ IN)

CORR. ALLOW.

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $0.30'' > .197''$ O.K.

FOR CONE BOTTOM:

$$t = \frac{PD_o}{2\cos\alpha\,(SE + .4P)}$$

WHERE: $D_o = 144''$

$\alpha = 59.7°$

$$= \frac{18(144)}{2\cos 59.7°\,(13{,}800 \times .7 + .4 \times 18)}$$

$= 0.266'' + .0625'' = 0.329$ IN.

CORR ALLOW

EXISTING AVG. t BASED ON ULTRASONIC TESTS IS $.375'' > .329$ O.K.

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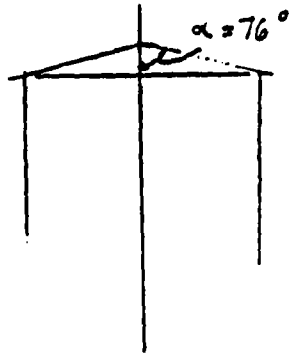
JOB CWM/CHI TANKS
SHEET NO. 8 OF 10
CALCULATED BY L.F. MOUNT DATE 16 MAR. 95
CHECKED BY DATE
SCALE

CHECK FOR 1.0 PSIG INTERNAL VAPOR PRESSURE (CON'D.)

FOR CONE TOP



FROM ASME SECT. VIII - DIV. 1

SOLVE FOR P:

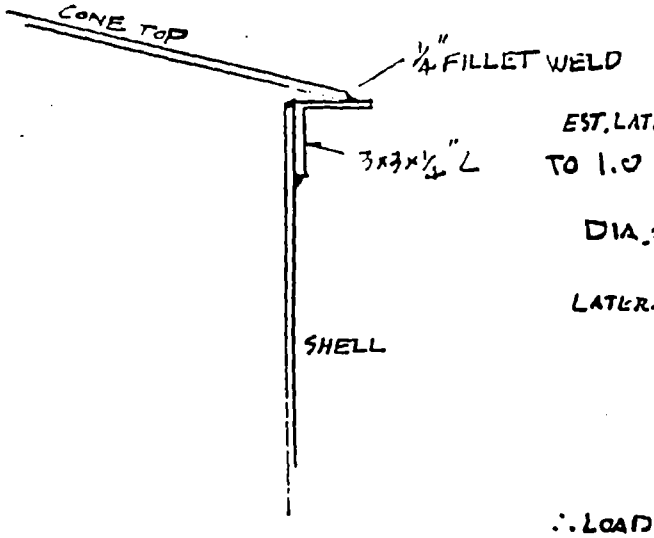
$$P = \frac{2SEt\cos\alpha}{D_o - 0.8t\cos\alpha}$$

WHERE S = 13,800 PSI
E = 0.7
D_o = 144 IN
α = 76°
t = USE .25 − 1/16" CORR ALL.
= .1875"

$$P = \frac{2(13{,}800)(.7)(.1875)(.242)}{144 - [.8(.1875)(.242)]}$$

$$= \frac{876.65}{144} = \boxed{6 \text{ PSI} > 1.0 \quad \text{O.K.}}$$

CHECK ROOF TOP CONNECTION WELD DETAIL



EST. LATERAL SURFACE AREA CONE TOP SUBJECTED TO 1.0 PSI PRESSURE

DIA. ≈ 140" (ROOF OVERHANGS SHELL)

LATERAL AREA = BASE CIRCUM. × 1/2 SLANT HT

$$= \pi D \times \frac{76.2''}{2}$$

$$= \pi(148) \times 38.1 = 17{,}715 \text{ IN}^2$$

∴ LOAD TO ROOF = 17,715 IN² × 1.0/IN² = 17,715 LBS

CIRCUM. OF 1/4" FILLET ATTACHMENT WELD = πD = π(148) = 465 IN

∴ LOAD/IN ON 1/4" FILLET WELD = 17715/465 = 38 #/"

VS

ALLOWABLE WELD LOAD = 11,200 × .25 = 2800 #/" O.K.

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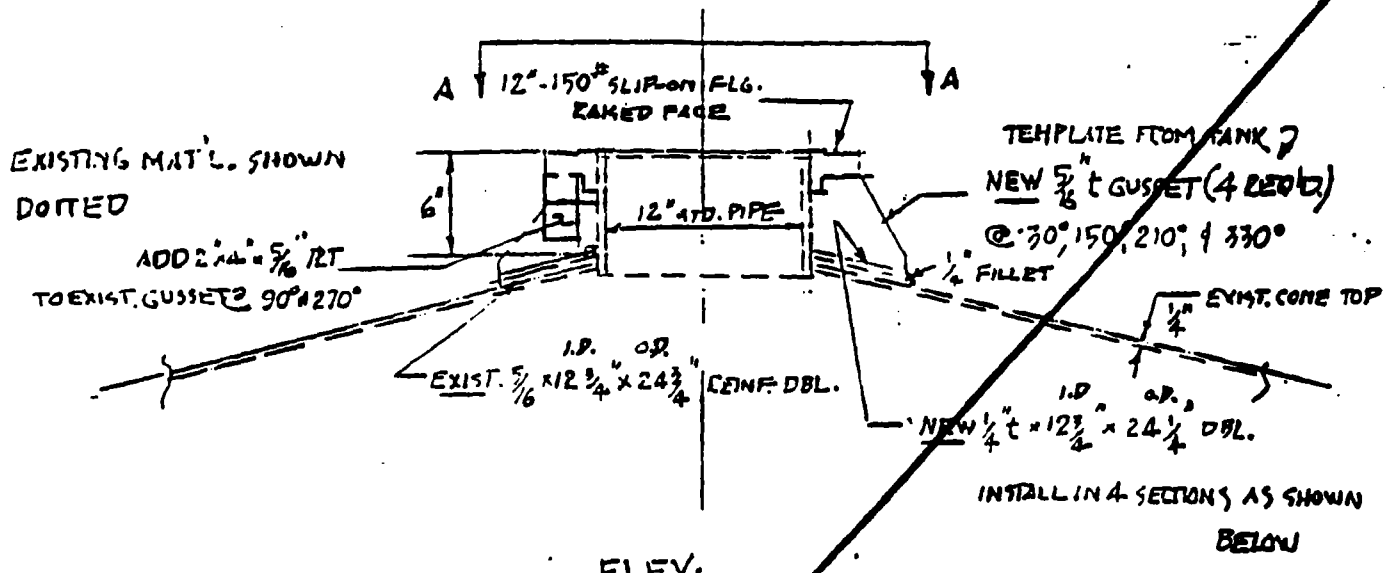
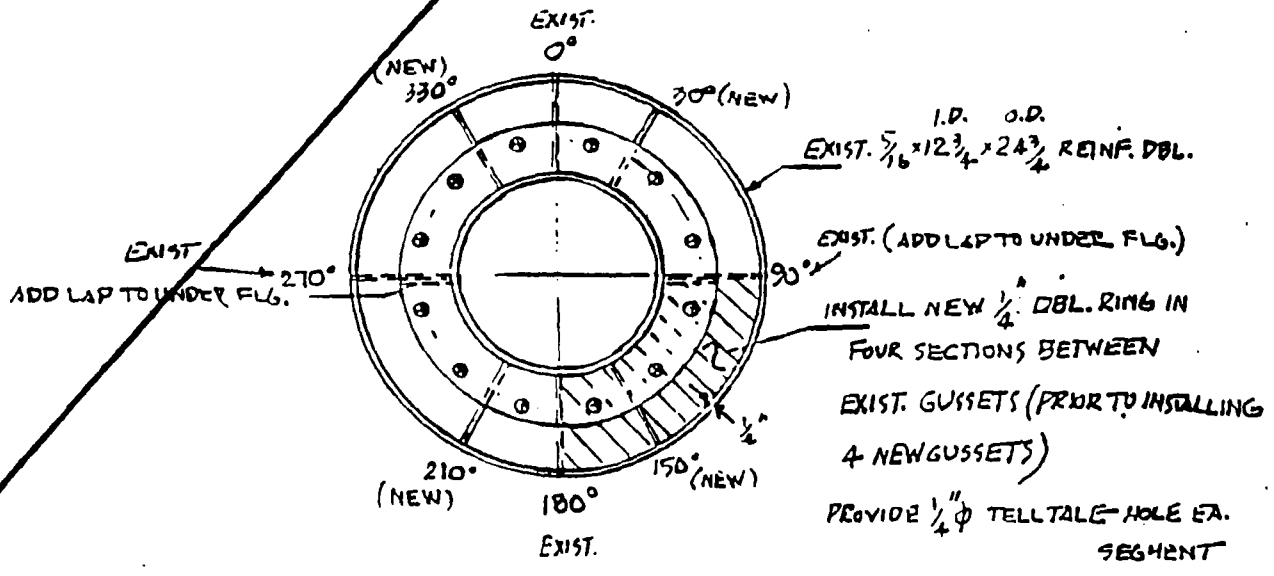
JOB CWM/CHI TANKS
SHEET NO. 9 OF 10
CALCULATED BY L.F. MOUNT DATE 16 MAR. '95
CHECKED BY DATE
SCALE 1" = 1'-0" 22 MAY '95

NOT APPLICABLE "AS BUILT"

MODS. TO TANK 103 & 104 EXISTING AGITATOR MOUNTING, TO ACCOMMODATE NEW 7.5HP UNITS



ELEV.



PLAN A-A

CWM/CHI TANK AGITATORS
L.F. MOUNT 10 MAR '95
REV. 15 MAR '95
SHT 10 OF 10

EXISTING AGITATED TANKS

TANK I.D.	AGITATOR SPECS. (FROM REF. 1) TYPE	HP	RPM	SHAFT L IN.	SHAFT DIA. IN.	WT. LBS.	NOZZLE BEND MOM FT.-LBS	NOZZLE TORQUE FT.-LBS.	BAFFLE REQ'D.	CASE SIZE	TANK PROPERTIES TOP HEAD t"	MIN HEAD t" (TBL 3)	NOZZLE SIZE	REINF PAD DIMENS. B (TBL 2)	C	D FIG 3
101 S.S.	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.313 S.S.		12" EXIST			
102	EXIST. (AS IS)	3.0			NO	CHANGE			YES (EXIST.)	2	.250		12" EXIST			
103	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.250	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5	17" 12.375 ← (ACTUAL)
104	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (EXIST.)	4	.241	.500 .5625	12" EXIST.	8" 6"	11.5" 9.5"	17" 12.375 ← (ACTUAL)
105	A NEW	7.5	45	190.5	3	1914	2482	2099	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"
106	C NEW	15	45	190.5	3.5	2745	5036 MAX.	4274 MAX.	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"
107 S.S.	EXIST. FROM 103	3.0							YES (NEW)	2 DESIGN FOR 4	.250 S.S.	.500	12"	8"	11.5"	17"
109	C NEW	15	45	190.5	3.5	2745	5036	4274	YES (NEW)	5	.250	.625	12"	8"	11.5"	17"
110	EXIST. FROM 104	3.0							YES (NEW)	2 DESIGN FOR 4	.230	.500	12"	8"	11.5"	17"
112	B NEW	5	30	270.0	3.5	2872 MAX.	2898	2337	YES (NEW)	4	.250	.500	12"	8"	11.5"	17"

NO CHANGE

MODIFY (SHT. 9) MOUNTING

NEW MOUNTING (SHT. 1)

FROM ULTRASONIC TEST RESULTS

REINF. PAD t FROM REF. 5

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RECEIVED
JUN 20 1995
HOYER-SCHLESINGER-TURNER, INC.

19 June 1995

Marie Vanagas
Hoyer-Schlesinger-Turner, Inc.
300 West Adams Street
Chicago, ILL. 60606

Subject: Clean Harbors of Chicago, Inc.
CWM Tank Farm

Enclosure: 1) Review and Assessment of Structural Integrity of Existing Tanks; LFMount Report dated January 1995

Dear Ms Vanagas,

In response to Clean Harbors' request, enclosure 1) is herewith forwarded for your information and records.

Yours truly,

Lee F. Mount

Lee F. Mount

REVIEWED BY
Peter J. Bernes
PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3059
MY LICENSE EXPIRES ON 11-30-96

LEE F. MOUNT, P.E.
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CWM TANK FARM

Review and Assessment of Structural Integrity of Existing Tank Nos.

T - 101	T - 106
T - 102	T - 107
T - 103	T - 109
T - 104	T - 110
T - 105	T - 112

January 1995

Prepared For:

Clean Harbors of Chicago, Inc.

(In response to Illinois EPA comments)

INTRODUCTION

This report was prepared in response to the Illinois EPA's request for additional information on the structural condition of the existing hazardous waste storage and/or fuel tanks scheduled for reuse at your CWM Tank Farm.

The work scope involved a technical review of all available tank related documents furnished by Clean Harbors. Pertinent data was then summarized and tabulated for each tank on a "Existing Tank Status Form". The ultrasonic test measurements for thickness, shown on the status forms, were then analyzed in order to make estimates of corrosion rates and projected service life.

Reference documents consulted during the course of this study include:

* RCRA Tank Assessment - Tank Farm System, prepared for CWM Chemical Services Inc. by ALpha Consultants, Ltd. Jan. 1990

* Tank System Inspection, prepared for CWM Chemical Services Inc. by Sirrine Environmental Consultants Nov. 1991

* Straubing, Rubin & Kenes, Inc. Tank Design Drawings

* Imperial Steel Tank Co. Fabrication Drawings

* Supplemental ultrasonic thickness measurements taken on stainless steel Tank No. T-101 on 23 January '95 by MQS Inspection, Inc. (raw data)

TANK GENERAL DESCRIPTIONS AND HISTORY

The ten (10) existing tanks, numbered T-101 to T-107, T-109, T-110, & T-112, are 12 ft. dia. vertical, cone bottomed, leg supported, above ground, insulated tanks.

Tank T-112 has a nominal capacity of 20,000 gals. All other tanks are of 12,000 gal. capacity each.

Tank nos. T-101 and T-107 are of stainless steel construction. All others are of carbon steel.

The four (4) newer tank nos. T-101 to T-104, fabricated by Imperial Steel Tank Co., were placed in service during 1986. The remaining older six (6) tanks date from 1981.

Available records and fabrication drawings for tank nos. T-101 to T-104 indicate they were built to the Underwriters Laboratories, Inc. Standard UL-142 for steel above ground tanks and were to be labeled as such. The published UL-142 Standards "do not cover vertical tanks that are elevated by means of legs" and are not intended for liquids having a specific gravity exceeding that of water. In order to satisfy these exceptions, it was necessary for Imperial Steel to apply for Underwriters Lab review and inspection to obtain the UL Listing for these cone bottomed above ground steel tanks on legs.

The Imperial fabrication drawings list the following tank design parameters:

Design Pressure = hyrdostatic head due to contents

Design Temperature = 250° F

Specific Gravity = 1.5

Corrosion Allowance = 1/16 "

Although no fabrication drawings were found for the six (6) older tanks, the Straubing, Rubin & Kenes design plans indicate the same material thicknesses for the top, shell, and bottom as shown on the Imperial plans. Since these thicknesses have been further verified by ultrasonic test measurements, it seems reasonable to conclude that these older tanks were also built to the design standards of UL-142.

The most recent ultrasonic thickness measurements include those taken by Alpha Consultants in Aug. '89 and by MQS Inspection in Oct. '91 for the Serrine report.

Alpha Consultants conducted visual internal inspections on all tanks (except T-110, which was in service) in early Dec. '89 and an external site inspection on 3 Jan. '90. Serrine Environmental Consultants conducted a visual site inspection, including all tank externals, in Sept. '91.

SPECIFIC TANK DETAILS

For tabulation of existing tank detail design information and summary of latest ultrasonic thickness measurements, refer to the tank status form provided in Appendix A for each of the ten (10) tanks.

PROJECTED SERVICE LIFE

The following table summarizes results of calculations undertaken to establish corrosion rates, based on past service, in order to predict an expected service life for the eight (8) carbon steel tanks. For calculation details, refer to Appendix B.

Surface	Estimated Corrosion Rate	Estimated Retirement Thickness	% of "as built" Thickness Remaining at Retirement	Projected Life as of 1995
Tank Top T-110	2.5 Mils/yr	0.156"	62%	24 yrs.
Side Shell T-105&T-112	3.6 Mils/yr	0.188"	60%	21 yrs.
Cone Bottom T-102	3.0 Mils/yr	0.281"	71%	28 yrs.

NOTE:

The following assumptions were used in the development of this table:

Corrosion rates for the tank top and shell surfaces were arrived at by subtracting the lowest recorded minimum ultrasonic thickness reading to date from the "as built" thickness and then dividing by the tank age at time of thickness reading.

In arriving at an estimated corrosion rate for the bottom cone surface, it was found necessary to develop an adjusted "as built" thickness. This was required since the average recorded bottom thickness measurement for all tanks, and in most cases the minimum value also, exceeded the 0.375" thickness shown on the fabrication drawing. The "as built" thickness was therefore adjusted to 0.392" to more accurately reflect the ultrasonic readings which ten years later were giving averages and minimums greater than 0.375".

INSPECTION/TESTING PLAN PRIOR TO REUSE

In order to assess each tank's internal condition, material thickness, and integrity prior to being placed back in service, it is planned to do the following, once the tank has been found safe for man-entry:

* Conduct an initial visual inspection by a tank experienced technician in company with a registered professional engineer to determine general tank condition. A standard check list, similar to that used by Alpha Consultants for Tank T-109 and shown in Figure 1 will be used as a guide and for recording findings. Suspicious areas will be noted for a more rigorous inspection and scheduled for ultrasonic measurement if deemed necessary.

* Since these tanks are insulated, past ultrasonic readings taken from the tank exterior have been limited to those areas where a removable patch permits direct access to the plate surface beneath. Past surveys have included at each of 4 - 90° quadrants, 1 top point, 3 side points and 1 cone bottom point giving a total of 20 readings/tank. With the tank out of service and clean, it would seem desirable to take additional ultrasonic thickness measurements from within. The cone bottom and tank height will make this difficult and require a tank ladder or other means to reach the underside of the top plate.

* It is recommended that a minimum of 12 readings each be taken in a + pattern on the top and bottom surfaces. For the shell at mid-height, a girth sample of about 20 points around the circumference is desirable. Finally, a vertical row sample, top to bottom, of about 10 points at a location determined from the visual inspection to be most worthy of further exploration, should provide more than enough data to verify the existing surface thicknesses and to form a base for comparison with past and future thickness measurement readings. The ultrasonic test readings are to be taken by personnel qualified and certified as competent to use the test equipment. The test results are to be analyzed by a registered professional engineer experienced in steel tank design and construction.

FIGURE 1

ALPHA CONSULTANTS, Ltd.

CHECKLIST FOR VISUAL INSPECTION OF UNLINED VESSELS

OWNER CWM Chemical Services, Inc.-Chicago Incinerator
TEST SITE 11700 So. Stony Island Ave., Chicago, Il. 60617
DATE OF INSPECTION December 5, 1989
TIME OF INSPECTION 1825
SUPERVISORY ENGINEER Harris E. Dicker, P. E.
PHOTOGRAPHER/TECHNICIAN Robert A. Dicker
TECHNICIAN James L. Eggert

TANK NO. 109 (NO PCB IN TANK)
INTERIOR SHELL MATERIAL CS
CLADDING MATERIAL SST
INSULATION 2' FIBREGLASS SIDES & BOTTOM, 2" COL BLOCK TOP
EQUIPPED WITH MIXER NO

INITIAL ROOF INSPECTION FOR SAFETY

HAZARDS OF FALLING OBJECTS NONE
VISIBLE CORROSION NONE

MORE RIGOROUS INSPECTION OF ROOF & STRUCTURAL SUPPORTS

VISIBLE LOSS OF METAL THICKNESS NONE
VISIBLE CRACKS OR LEAKS AT WELDS NONE
VISIBLE CRACKS AT NOZZLE CONNECTIONS NONE
MALFUNCTIONING OF ROOF SEALS NONE
VISIBLE DETERIORATION OF WATER DRAIN SYSTEM NONE
CONDUCT HAMMER TESTING NO

TANK SHELL

VISIBLE CRACKS AT SEAMS NONE
VISIBLE CORROSION AT VAPOR SPACE/LIQUID LEVEL LINE NONE
VISIBLE CRACKING OF PLATE JOINTS NONE
VISIBLE CRACKING OF NOZZLE CONNECTION JOINTS NONE
VISIBLE LOSS OF METAL THICKNESS NONE

TANK BOTTOM

TYPE OF BOTTOM, SLOPED OR FLAT SLOPED
VISIBLE CORROSION PITS NONE
VISIBLE CRACKED SEAMS NONE
TYPE OF CONNECTION TO SIDEWALL, WELDED OR RIVETED WELDED
VISIBLE TIGHTNESS AT CONNECTION NONE
VISIBLE DEPRESSIONS IN BOTTOM AREAS AROUND OR UNDER ROOF OR PIPE SUPPORTS NONE
VISIBLE LOSS OF METAL THICKNESS NONE
VISIBLE UNEVENESS OF BOTTOM NONE
CONDUCT HAMMER TEST NO
VISIBLE BULGES, BLISTERING OR SPALLING NONE
WAS ULTRASONIC TESTING OF TANK WALLS, ETC. CONDUCTED YES

Source: OSWER Policy Directive No. 9483.00-1
Modified Version of Table 4-7, Page 4-35
"Permit Writer's Guidance for Hazardous Waste Tanks" U. S. EPA Contract 68-01-6515
(undated draft) pp 8-10.

SUMMARY DISCUSSION

Projected Service Life - The projected useful service life for the eight (8) carbon steel tanks is estimated to be on the order of 20 years from today.

- The projected service life for the two (2) stainless steel tanks (T-101 & T-107) is estimated to be more than 20 years as evidenced by the ultrasonic thickness readings which indicate little, if any significant material loss as of '91.

- These projected service life estimates are believed to be conservative in that minimum point readings, rather than average readings, were used to establish the corrosion rates. Furthermore, the projected service life calculations assume that corrosion has continued at the same rate during the past 3 years when the tanks have been out of service.

- These estimated rates can be expected to remain in effect so long as the future stored waste product corrosivity characteristics are compatible with and do not differ significantly from those products stored in the past. Also, the integrity of the external insulation cladding material must be maintained to prevent exterior corrosion from the weather.

- It is anticipated that these tanks, once returned to service, will be ultrasonically tested on an annual basis, at which time these estimated corrosion rates should be reviewed and modified if necessary to suit existing service conditions.

Type of Wastes Stored - The individual tank status forms, Appendix A, list the typical types of waste products stored in past service as well as those planned for future operations. Before any wastes are stored, the facility management is required to assess the compatibility of the waste with (1) the storage unit materials of construction and (2) the wastes being presently stored.

Conclusion - Based on a detailed technical review of the page 1 referenced documents, it is my opinion that the ten (10) existing tanks proposed for reuse at the CWM Tank Farm are structurally sound, free from leaks, and exhibit sufficient material thickness, as determined by ultrasonic measurements. They appear to meet applicable design guidance standards and the past visual inspection reports indicate them to be substantially free from corrosion. Therefore, it is my opinion that the existing reported condition and structural integrity of these storage tanks demonstrate suitability for continued service.

CERTIFICATION

"I certify, under penalty of law, that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately 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 possible fines and imprisonment"

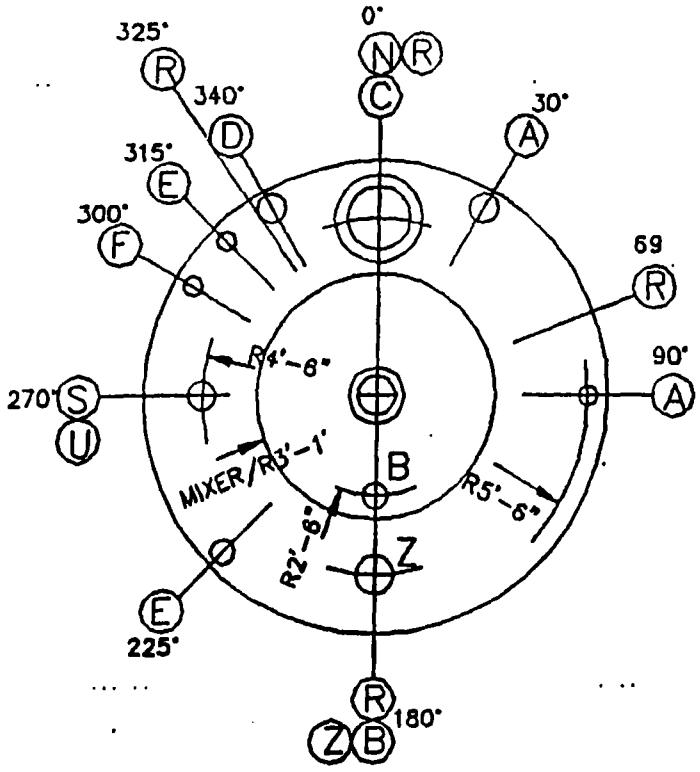
Registered Professional Engineer

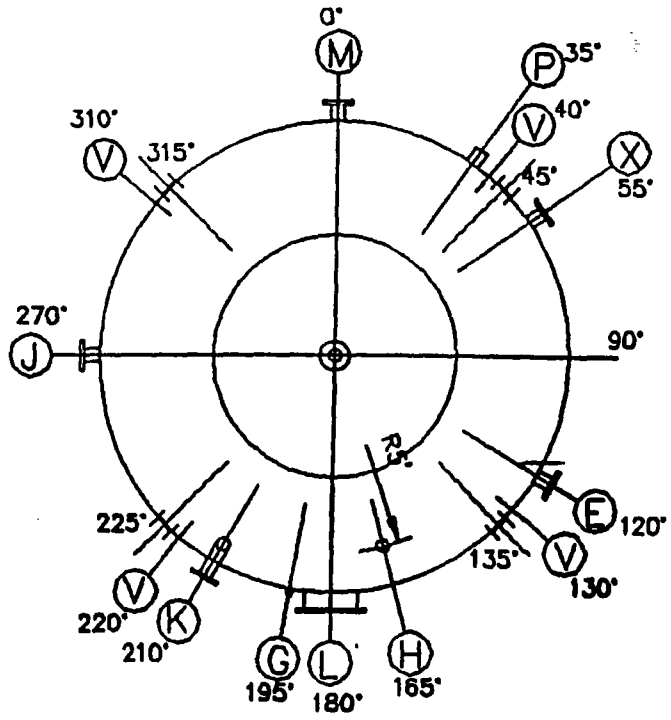
Name: Lee F. Mount

Signature: Lee F. Mount

Date: 24 January 1995

Massachusetts Registration No: 21193





TK-112

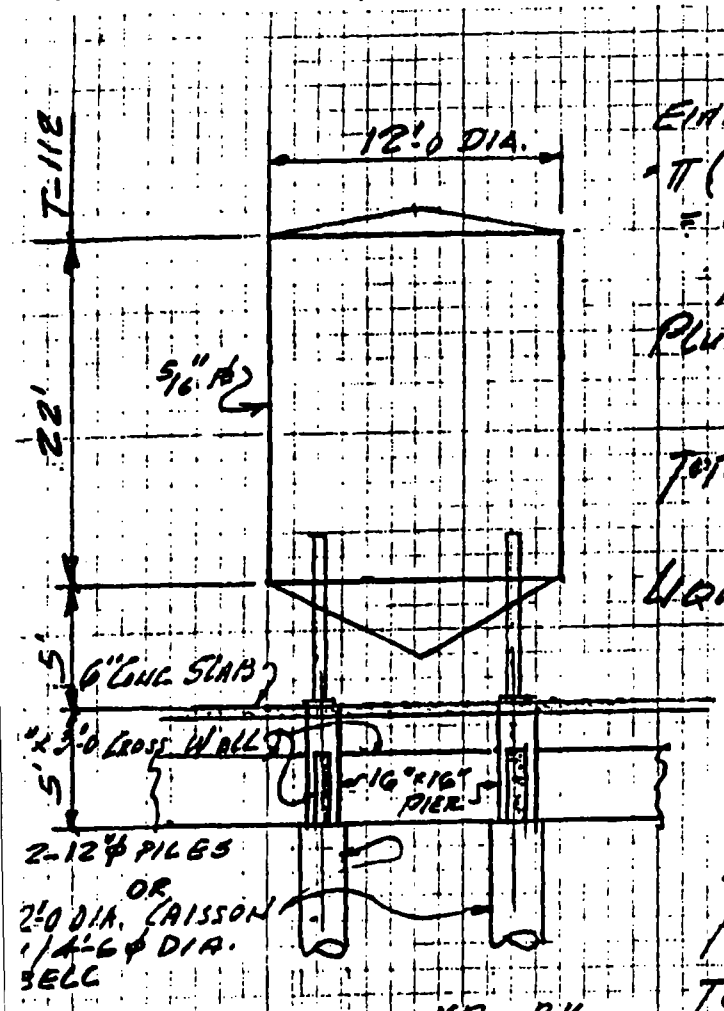
MARK	REQD.	SIZE	TYPE	ELEVATION	DESCRIPTION
A	2	2"	150# RFSO	ROOF	NITROGEN BLANKET
B	1	3"	150# RFSO	ROOF	COV - FA
C	1	20"	150#	ROOF	EMERGENCY VENT
D	1	4"	150# RFSO	ROOF	FILL
E(315)	1	3"	150# RFSO	ROOF	HIGH LEVEL-LSH112
E(225)	1	3"	150# RFSO	ROOF	SPARE
F	1	3"	150# RFSO	ROOF	DPSL112 & DPSH112
G	1	2"	3000# CPLG	12" F/CONE	SPARE
H	1	2"	3000# CPLG	CONE	SAMPLE
J	1	3"	150# RFSO	6" F/CONE	LOW LEVEL-LSL112
K	1	3"	150# RFSO	13" F/CONE	SPARE
L	1	24"	150#	12" F/CONE	MANWAY W/COVER
M	1	4"	150#FB-VALVE	CONE	DRAW-OFF
N*	1	12"	150# RFSO	ROOF	MIXER MOUNT
P*	2	2"	3000# CPLG	9",6'-6" F/C	SAMPLE
R	AS SHWN		-	6'-3" F/ROOF	SUPPORT CLIP
S	AS SHWN		-	3'-9" F/ROOF	SUPPORT CLIP
E	1	3"	150# RFSO	6" F/CONE	SPARE
U*	1	4"	150# RFSO	ROOF	LEVEL MONITOR-LT112
V*	4		-	SHELL	BAFFLE
Z	1	12"	150# RFSO	ROOF	SPARE
X*	2	4"	150# RFSO	6",6'-6"	DRAW-OFF

NOTE: * DESIGNATES NEW NOZZLE

HOYER-SCHLESINGER-TURNER, INC.

SHEET 3 OF 8
PROJECT NO. 17851
DATE 1.20.95
BY BERNES
CHKD. C.K. 1.27.9

PROJECT CLEAN HARBORS - CHICAGO, IL
SUBJECT EXIST. TANK FARM SUPPORT COMPUTATIONS



SECTION "B-B"
SEE SH. 1

TANK T-112

EMPTY TANK =
$\pi(12\times22+12^2/4+6\times\sqrt{3^2\times12^2})\times12.8\times1.05$
$= 15{,}834^{\#} + 4\text{ LEGS}\times17\times28 = 184^{\#}$
TOTAL $\approx 16{,}000^{\#}$

PLUS NOZZLES, FLANGES & SUPPORTS = $8{,}000^{\#}$

TOTAL EMPTY TANK = $16{,}000^{\#} + 8{,}000^{\#}$
$= 24{,}000^{\#}$

LIQUID = 19,600 GAL × 8.336 × 1.5 =
$= 245{,}000^{\#}$

TOTAL EMPTY + LIQUID =
$= 24{,}000 + 245{,}000^{\#} = 269^{K}$

LOAD PER LEG = $269/4 = 67^{K}$

FOR CONCRETE SEE SH. 2

TOTAL LOAD PER LEG =
$= 67^{K} + 16^{K} = 83^{K}$

TWO - 12"⌀ WOOD PILES @ 20 TON CAP. EACH =
$= 80^{K} \approx 83^{K}$ O.K.

TANKS T-101, T-102, T-103 & T-104 ON CAISSONS W/BELL

TOTAL LOAD PER LEG = 43^{K} (SEE SH. 2)
CONC. PIER = $1.33\times1.33\times5'\times.15 = 1.33^{K}$
CROSS WALLS $3'\times.67'\times16\times.15 = 4.80^{K}$
CAISSON $= 12.00^{K}$
18.00^{K}

LIQUID = 151^{K} (SEE SH. 2)

TOTAL PER LEG = $43 + 18 = 61^{K}$

ONE CAISSON CAPACITY = $\pi R^2\times9^{K} = \pi\times2.25^2\times9^{K} = 143^{K}$

$143^{K} > 61^{K}$ O.K.

H-S-T

HOYER-SCHLESINGER-TURNER,Inc.
ENGINEERS-ARCHITECTS
3074 University Ave.
Highland Park,IL 60035
Phone:847-461-0470 Fax:847-266-9829

July 13, 2000

Mr. James R. Laubsted
Facility Compliance Manager
CLEAN HARBORS SERVICES, INC.
11800 S. Stony Island Avenue
Chicago, IL 60617

RE: Inspection Report
Dispersion Tank
Overflow Tank

Dear Mr. Laubsted:

On June 28, 2000 I visually inspected the interior and exterior of the Dispersion Tank and Overflow Tank.

The Dispersion Tank and Overflow Tank are located in Unit 43. Previous visual inspections include September 11, 1995. From the time of the earlier inspection, these tanks were used to mix organic-based solids, sludge and liquids to produce a low viscosity liquid hazardous waste fuel that can be burned for energy recovery. These tanks are located in a fully enclosed building which was built in 1987. The building is 4-HR fire rated with fire vents and explosion vents located in the roof structure. The building has a six-inch reinforced concrete floor with a six-inch high containment curb around the perimeter. The entire secondary containment is topped with a non-absorbent chemically resistant coating, Protecto-Crete 900, a 1/4 inch thick, unreinforced high density vinyl ester, trowel applied as manufactured by Dudick, Inc. This coating is compatible with the materials stored. The containment was inspected August 31, 1999.

The Dispersion Tank and Overflow Tank are carbon steel vessels fabricated in 1995. Both tanks were empty at the time of the inspection and were cleaned by Clean Harbors personnel. These tanks are equipped with ultrasonic liquid level sensors to maintain proper liquid levels in the Dispersion Tank and the Overflow Tank. The process tanks and equipment operate in fully-enclosed, nitrogen-blanketed atmosphere to prevent formation and ignition of vapors. The system vents to an activated carbon air pollution control device.

The hazardous waste liquids which are processed are the same as those stored in Unit 16 Tank Farm. The Dispersion Tank and Overflow Tank were both constructed from carbon steel plate, all welded construction. The tanks are not internally coated. They are painted on the outside to protect the surface against corrosion. The operating capacities for the Dispersion Tank and Overflow Tank are 1,225 gallons and 275 gallons respectively. The Dispersion Tank has a 6 foot diameter with a 5 foot straight shell. The top dish is 3/4 inch thick. The Overflow Tank has a 3 foot diameter with a 90 inch straight shell. The shell cone and dish are 3/8 inch thick. These tanks were built in accordance with ASME Code, Section VIII, Division I, 1992/93 addendum. Both tanks are vertical cylindrical with top dish and bottom, supported by legs.

The Dispersion Tank dish bottom was replaced with a 1/2 inch bottom to overcome the effects of abrasion.

The internal and external visual inspection did not reveal any defects. The welds around the nozzles and tank shell welds inspected from inside and outside the tanks were in good condition. There was rust on the top half of the tank shell and roof of the Dispersion Tank. There was rust on the shell and roof of the Overflow Tank. The rust was sandblasted by Clean Harbors. The rust was not heavy and no sign of pitting or any other damage was observed.

On June 28, 2000 Clean Harbors performed NDE-ultrasonic thickness measurements from the interior of the tanks. On June 21, 1999 external NDE-ultrasonic thickness measurements were taken. These ultrasonic thickness test results and prior results are listed in Appendix 1.

The top results show minor variations in thicknesses. The Dispersion Tank showed minor decreases in each of the four readings.

The shell results show minor decreases in thickness in both tanks.

The bottom results show minor decreases in thickness in the Overflow Tank. The bottom on the Dispersion Tank has just been replaced with a 1/2 thick dish bottom.

For tank supports evaluation, see calculations by Casimir Kraucunas, dated September 10, 1995 in Appendix 2.

For tank assessment, see report by Marie Vanagas dated September 15, 1995 in Appendix 3.

Therefore, I certify that after visual inspection, these tanks are structurally sound, properly supported and set. No evidence of cracks, bulging, corrosion pits or scales or weld defects were observed. Based on my inspection, these tanks can be put into operation.

Very truly yours,

HOYER-SCHLESINGER-TURNER, INC.

Peter J. Bernes
Illinois #3659

STATE OF ILLINOIS
PETER J.
BERNES
3659
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11.30.01

ULTRA SONIC THICKNESS TESTING
DISPERSION TANK

June 28, 2000

INTERNAL

TOP

East	South	West	North
.320	.330	.322	.326

SIDE

.320	.320	.318	.330
.326	.321	.322	.332

BOTTOM

.499	.498	.500	.496

ULTRA SONIC THICKNESS TESTING
OVERFLOW TANK

June 28, 2000

INTERNAL

TOP

East	South	West	North
.380	.380	.380	.380

SIDE

.380	.380	.380	.380
.376	.372	.372	.372

BOTTOM

.360	.356	.360	.360

ULTRA SONIC THICKNESS TESTING
DISPERSION TANK

June 21, 1999

TOP

East	South	West	North
.756	.774	.724	.756

SIDE

.354	.348	.320	.356
.345	.354	.340	.360

BOTTOM

.208	.248	.260	.264

ULTRA SONIC THICKNESS TESTING
OVERFLOW TANK

June 21, 1999

TOP

East	South	West	North
.371	.368	.374	.375

SIDE

.371	.368	.374	.371
.370	.374	.372	.368

BOTTOM

.375	.374	.374	.375

ULTRA SONIC THICKNESS TESTING
DISPERSION TANK

October 17, 1998

HIGH

East	South	West	North
.345	.337	.318	.306

MIDDLE

.298	.341	.333	.348

LOW

.347	.336	.332	.348

ULTRA SONIC THICKNESS TESTING
OVERFLOW TANK

October 17, 1998

HIGH

East	South	West	North
.372	.376	.367	.381

MIDDLE

.371	.376	.371	.373

LOW

.377	.377	.375	.369

CleanHarbors

ULTRASONIC THICKNESS TESTING - 12-17-97

PEGASUS PUMP FEED CHAMBER

WEST		EAST
.360	(Top)	.347
.386		.382
.372		.388
.390	(Bottom)	.368

PEGASUS DISPERSION TANK

WEST		SOUTH	EAST
.754	(Top)	.752	.758
.356		.362	.355
.356		.357	.328
.353		.351	.335
.299	(Bottom)	.327	.297

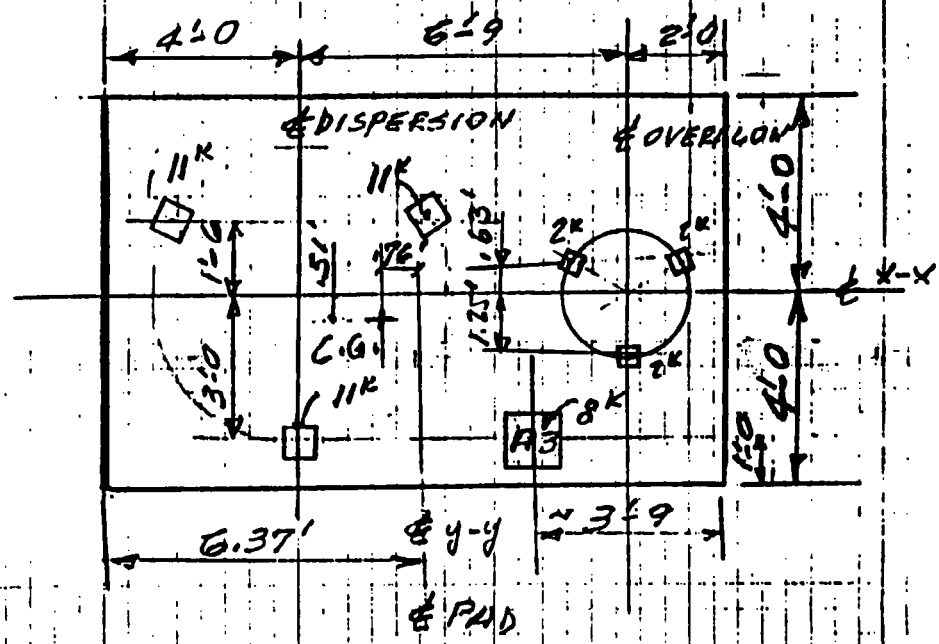
HOYER-SCHLESINGER-TURNER, INC.

SHEET 5 OF ____
PROJECT NO. 1785-1
DATE 9.10.95
BY C.K.

PROJECT CLEAN HARBORS - CHICAGO, IL.
SUBJECT SHREDDER FACILITIES - BLDG. #43

FOR CERTIFICATION

8. NEW COMMON CONC. PAD FOR DISPERSION TANK, OVERFLOW TANK & COL. A3 = 8,000#

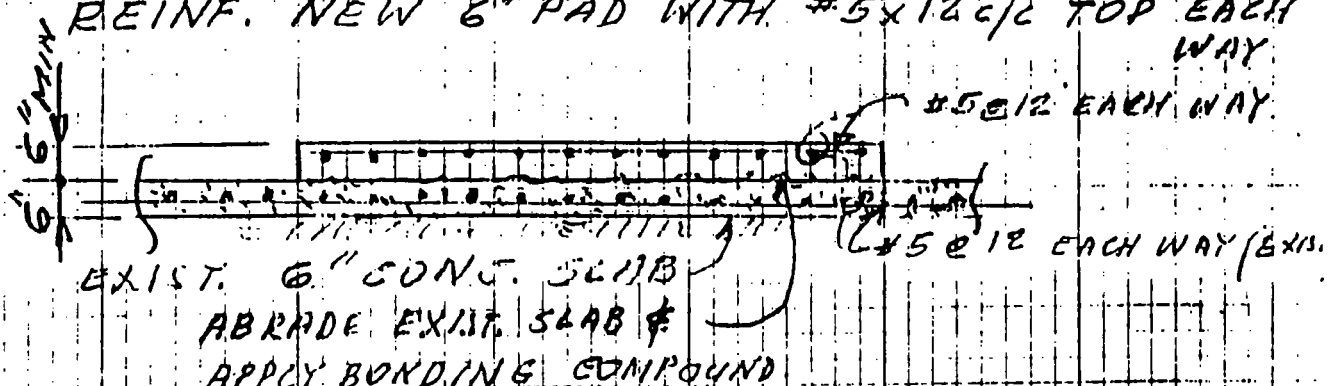


PLAN

$$P_s = \frac{47^k}{8 \times 12.75} + \frac{47 \times .76 \times 6}{8 \times 12.75^2} + \frac{47 \times .51 \times 6}{12.75 \times 8^2} = .46 + .16 + .18 = .80\ k/s$$

$= 880\#/SF < 1500$ OK

REINF. NEW 6" PAD WITH #5 x 12" c/c TOP EACH WAY.



SECTION

CLEAN HARBORS
ENVIRONMENTAL SERVICES, INC.
GENERAL WELDING & DESIGN
609 Pleasant Street P.O. Box 22
WEYMOUTH, MASSACHUSETTS 02189
(617) 331-5600 FAX (617) 335-2675

JOB GW5384
SHEET NO. _____ OF _____
CALCULATED BY L. SPAZIANI DATE 4-27-94
CHECKED BY _____ DATE _____
SCALE —

VERIFICATION OF LEG SUPPORTS — DISPERSION TANK

REF: SHAR, INC DRWG CC12331A (94-31-M16)

WEIGHT OF TANK —

TANK —	3340#	
NOZ —	800#	
MTR/DRIVES	3650#	
SCREW CONVR	2000#	(END SUPPORT)
	9790#	
WT LIQ @ 100%	22,440#	(1493 GAL @ 1.8 SD)
	32,230#	
MARGIN — 5%+ =	2000	
	34230#	

STATE OF ILLINOIS
PETER J. BERNES
3659
LICENSED STRUCTURAL ENGINEER

Peter J. Bernes
PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-96

TOTAL CAP. ~ 1493 GAL
ASSUME 4500 GALS.

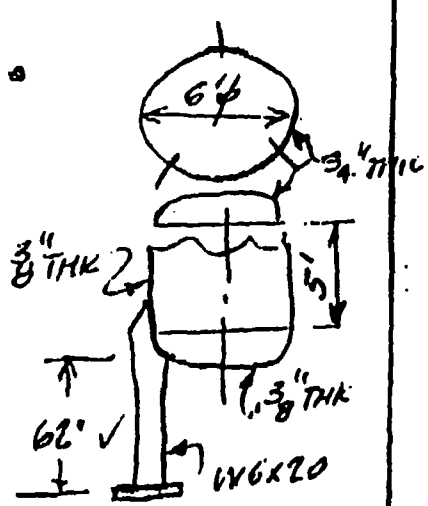
LEGS — W6 x 20 C.S. POSITIONED @ 120°

HEIGHT = 62' F_y = 36 KSI

ALLOWABLE LOAD - AISC — COL TABLES —

6'-HT = 109 KIPS EACH LEG.

W6 x 20 OK



$f_{act} = \frac{P}{A} = \frac{34,230^{+}(.33)}{5.87\ IN^2}$ 1924#/IN² EA LEG — OK

CLEAN HARBORS
ENVIRONMENTAL SERVICES, INC.
GENERAL WELDING & DESIGN
609 Pleasant Street P.O. Box 22
WEYMOUTH, MASSACHUSETTS 02189
(617) 331-5600 FAX (617) 335-2675

JOB GW53B4

SHEET NO. _____ OF _____

CALCULATED BY L. SARZIANI DATE 6-16-94

CHECKED BY _____ DATE _____

SCALE _____

VERIFICATION OF LEG SUPPORTS — PUMP FEED CHAMBER

REF: DWG 94-31-M28 —

WT TANK —	1200#
NOZ	400#
ATTACHMENTS	600#
	2200#
WT LIQ-300g —	4500#
	6700#
≈	7500#

3 LEGS @ 120° — 6" × 8.2# [A = 2.40 IN² Fy = 36 KSI

HEIGHT = 41"

$$f_{act} = \frac{P}{A} = \frac{7500^{\#}(.33)}{2.40\ IN^2} = 1031\ \#/IN^2 \text{ OK}$$

HOYER-SCHLESINGER-TURNER inc.
ENGINEERS - CONSTRUCTORS
300 west adams street chicago illinois 60606 telephone 263-0556 area code 312

September 15, 1995

Mr. Paul Ahearn
Manager, Regulatory Compliance
CLEAN HARBORS OF CHICAGO, INC.
11800 South Stony Island Avenue
Chicago, Illinois 60617

Re: Construction Certification Report
Unit #43 - Fuels Blending Operation
Unit #60 - Roll-Off Pad for Fuels Blending
11700 South Stony Island Avenue
Chicago, Illinois 60617
HST Project No. 17851

Gentlemen:

This report presents the results of Hoyer-Schlesinger-Turner, Inc.'s (HST) involvement in construction and construction modification of the Units #43-Fuels Blending Operation and Unit #60-Roll-Off Pad for Fuels Blending.

The construction documents for modifications of the existing building #43 and for the new structure #60 were prepared under HST supervision. HST engineers made numerous field trips to observe construction. The repair of cracks in the existing concrete slab of Unit #43 and application of the coating for both units was witnessed by HST Licensed Structural Engineer, Peter Bernes. The final inspection of Unit #43 and Unit #60 was performed by HST engineer, Marie Vanagas, PE on September 11, 1995.

The secondary containment system is designed and constructed to prevent any migration of wastes or accumulated liquid out to the soil, ground water or surface water at any time.

The presence of small drips, spills, leaks or precipitation in the secondary containment for Unit #43 and Unit #60 will be monitored through daily visual plant inspections.

Respectfully submitted,

HOYER-SCHLESINGER-TURNER, INC.

Marie Vanagas

Marie Vanagas, PE
Illinois Licensed Professional Engineer
License No. 062-040801
Expiration Date: 11/30/95

MARIE VANAGAS
62-40801
REGISTERED
PROFESSIONAL
ENGINEER
OF
ILLINOIS

TANK ASSESSMENT

TANK IDENTIFICATION			
	DISPERSION TANK	OVERFLOW TANK (PUMP FEED CHAMBER)	REMARKS
DESIGN CAPACITY	1493 gal.	311 gal.	
TANK SHAPE	Vertical cylindrical with dish top and bottom, supported by legs	Vertical cylindrical with dish top and cone bottom supported by legs	
DIAMETER X HEIGHT	6' Ø x 5' straight, shell and bottom dish is 3/8" tk. Top dish is 3/4" tk.	3' Ø x 90" straight, shell cone and dish are 3/8" tk.	
TANK DESIGN CODE	In accordance with ASME Boiler & Pressure Vessel Code, Sec. VII, Div. I, 1992 Edition, 1993 Addendum	In accordance with ASME Boiler & Pressure Vessel Code, Sec. VII, Div. I, 1992 Edition, 1993 Addendum	
OPERATING CAPACITY	1195 gal.	243 gal.	
MATERIAL OF DESIGN CONSTRUCTION	Carbon steel	Carbon steel	
INTERNAL CORROSION PROTECTION	None	None	Externally painted
YEAR BUILT	1995	1995	
TYPE OF FOUNDATION	Concrete slab	Concrete slab	

TANK ASSESSMENT

TANK IDENTIFICATION			
	DISPERSION TANK	OVERFLOW TANK (PUMP FEED CHAMBER)	REMARKS
DESIGN CAPACITY	1493 gal.	311 gal.	
TANK SHAPE	Vertical cylindrical with dish top and bottom, supported by legs	Vertical cylindrical with dish top and cone bottom supported by legs	
DIAMETER X HEIGHT	6' Ø x 5' straight, shell and bottom dish is 3/8" tk. Top dish is 3/4" tk.	3' Ø x 90" straight, shell cone and dish are 3/8" tk.	
TANK DESIGN CODE	In accordance with ASME Boiler & Pressure Vessel Code, Sec. VII, Div. I, 1992 Edition, 1993 Addendum	In accordance with ASME Boiler & Pressure Vessel Code, Sec. VII, Div. I, 1992 Edition, 1993 Addendum	
OPERATING CAPACITY	1195 gal.	243 gal.	
MATERIAL OF DESIGN CONSTRUCTION	Carbon steel	Carbon steel	
INTERNAL CORROSION PROTECTION	None	None	Externally painted
YEAR BUILT	1995	1995	
TYPE OF FOUNDATION	Concrete slab	Concrete slab	

CONTAINMENT CAPACITY CALCULATIONS FOR UNIT X

REQUIRED CAPACITY:

(A) Volume of largest container = 6500 gallon tanker
10% of maximum volume = 2 x 6500 x 0.10 = 1300
Use 6500 gallons

Unit X is covered by a canopy.

TOTAL REQUIRED CAPACITY = 6,500 gallons

AVAILABLE CAPACITY:

(A) Volume of sump
= 2' x 2' x 2' x 7.481 = 59 gallons

(B) Volume of large sloped section
= ½ x 58' x 28.67' x 1' x 7.481 = 6220 gallons

(C) Volume of small sloped section
= 2' x 28.67' x (0.5 + (½ x 0.5)) x 7.481 = 321 gallons

TOTAL AVAILABLE CAPACITY = 6,600 gallons

CONTAINMENT CAPACITY CALCULATIONS FOR UNIT Q

REQUIRED CAPACITY:

(A) Volume of largest container = 7200 gallon tanker
10% of maximum volume = (3 x 7200 gallons) + (3 x 30 CY x 202 gallons/CY) x 0.10 = 3978 gallons
Use 7200 gallons

Unit Q is covered by a canopy

TOTAL REQUIRED CAPACITY = 7,200 gallons

AVAILABLE CAPACITY:

(A) Volume of sump
= 2' x 2' x 2' x 7.481 = 59 gallons

(B) Volume of sloped section
= ½ x 70' x 58' x 2' x 7.481 = 30,372 gallons

(C) Volume displaced by roll-offs
= 22.5' x 8' x 3 x (2' – 0')/2 x 7.481 = 4040 gallons

TOTAL AVAILABLE CAPACITY = 26,391 gallons

CleanHarbors

APPENDIX 2: Laboratory Fume Hood Evaluation Data Sheet

Test Performed By: Tom Wedmyk Date 8-21-03

I. TEST LOCATION

Building: WWT #1 Department: Pour-Off

Room #: Top of Reactor Inspector: Tom Wedmyk

Hood #: 1-H-5 Hood Functioning Properly? (Y)/N

II. HOOD SPECIFICATIONS

Use of Hood

____ General Chemistry

____ High Hazard Chemistry

X Special Purpose Pour-Off

Manufacturer: CHES

Type: Fume Hood

Sash: ____ Vertical

____ Horizontal

Sash Operated at 14" Height? Y/(N)

If No, explain why: Fixed Sash

Special Conditions:

Bulky equipment stored in hood? Y/(N)

High heat used inside hood? Y/(N)

Carcinogens used in hood? Y/(N)

III. FACE VELOCITY TEST

Measurements: 9

Sum of Velocities: 2612

Average Face Velocity (FPM): 290

260	220	255
300	225	185
405	325	177

Take nine flow measurements, one at the center of each grid.

IV. SMOKE LEAKAGE TEST

Smoke Escapes from Hood? Y/N

Smoke Pulled Up Efficiently? Y/N

Continued on next page.

Appendix 2 Cont'd.

Comments: _____

_____

_____

_____

All tests conducted with hood sash in fully open position. All other hoods in the room should also be in fully open position during the test.

PASS CRITERIA: Each measurement in range of 80-120 fpm; average of the nine readings is 100 fpm; smoke pulled quickly and efficiently.

CleanHarbors

APPENDIX 2: Laboratory Fume Hood Evaluation Data Sheet

Test Performed By: Tom Wedryk Date 8-21-03

I. TEST LOCATION

Building 25 Department Lab Pack Pour Off

Room # South Side (Flam) Inspector Tom Wedryk

Hood # 25-H-1 Hood Functioning Properly? (Y)/N

II. HOOD SPECIFICATIONS

Use of Hood

____ General Chemistry Manufacturer: CHES

____ High Hazard Chemistry Type: Fume Hood

X Special Purpose Pour-Off

Sash: ____ Vertical Sash Operated at 14" Height? (Y)/N

X Horizontal If No, explain why: ____

Special Conditions:

Bulky equipment stored in hood? (Y)/N

High heat used inside hood? Y/(N)

Carcinogens used in hood? Y/(N)

III. FACE VELOCITY TEST

Measurements: 12

Sum of Velocities: 2640

Average Face Velocity (FPM) 220

250	220	230	210
210	205	215	200
235	220	230	215

Take twelve measurements, one in each grid

IV. SMOKE LEAKAGE TEST

Smoke Escapes from Hood? Y/N

Smoke Pulled Up Efficiently? Y/N

Continued on next page.

CleanHarbors

Appendix 2 Cont'd.

Comments: EXHAUST FAN ON (4) - OUTLIEAS DOOR OPEN

All tests conducted with hood sash in fully open position. All other hoods in the room should also be in fully open position during the test.

PASS CRITERIA: Each measurement in range of 80-120 fpm; average of the nine readings is 100 fpm; smoke pulled quickly and efficiently.

CleanHarbors

APPENDIX 2: Laboratory Fume Hood Evaluation Data Sheet

Test Performed By: Tom Wedryk Date 8-21-03

I. TEST LOCATION

Building 25 Department Lab Pack Pour Off

Room # South Side (Flam) Inspector Tom Wedryk

Hood # 25-H-1 Hood Functioning Properly? (Y)/N

II. HOOD SPECIFICATIONS

Use of Hood

____ General Chemistry Manufacturer: CHES

____ High Hazard Chemistry Type: Fume Hood

X Special Purpose Pour-Off

Sash: ____ Vertical Sash Operated at 14" Height? (Y)/N

X Horizontal If No, explain why: ____

Special Conditions:

Bulky equipment stored in hood? (Y)/N

High heat used inside hood? Y/(N)

Carcinogens used in hood? Y/(N)

III. FACE VELOCITY TEST

Measurements: 12

Sum of Velocities: 2525

Average Face Velocity (FPM) 214

215	215	215	225
200	200	195	210
220	225	225	220

Take twelve measurements, one in each grid

IV. SMOKE LEAKAGE TEST

Smoke Escapes from Hood? Y/N

Smoke Pulled Up Efficiently? Y/N

Continued on next page.

CleanHarbors

Appendix 2 Cont'd.

Comments: EXHAUST FANS ON (4) – OVERHEAD DOOR SHUT

All tests conducted with hood sash in fully open position. All other hoods in the room should also be in fully open position during the test.

PASS CRITERIA: Each measurement in range of 80-120 fpm; average of the nine readings is 100 fpm; smoke pulled quickly and efficiently.

CleanHarbors

APPENDIX 2: Laboratory Fume Hood Evaluation Data Sheet

Test Performed By: Tom Wedryk Date 8-21-03

I. TEST LOCATION

Building 25 Department Lab Pack Pour Off

Room # South Side (Flam) Inspector Tom Wedryk

Hood # 25-H-1 Hood Functioning Properly? (Y)/N

II. HOOD SPECIFICATIONS

Use of Hood

____ General Chemistry Manufacturer: CHES

____ High Hazard Chemistry Type: Fume Hood

X Special Purpose Pour-Off

Sash: ____ Vertical Sash Operated at 14" Height? (Y)N

X Horizontal If No, explain why: ____

Special Conditions:

Bulky equipment stored in hood? (Y)/N

High heat used inside hood? Y/(N)

Carcinogens used in hood? Y/(N)

III. FACE VELOCITY TEST

Measurements: 12

Sum of Velocities: 2505

Average Face Velocity (FPM) 209

215	215	215	215
205	200	200	190
230	230	210	180

Take twelve measurements, one in each grid

IV. SMOKE LEAKAGE TEST

Smoke Escapes from Hood? Y/N

Smoke Pulled Up Efficiently? Y/N

Continued on next page.

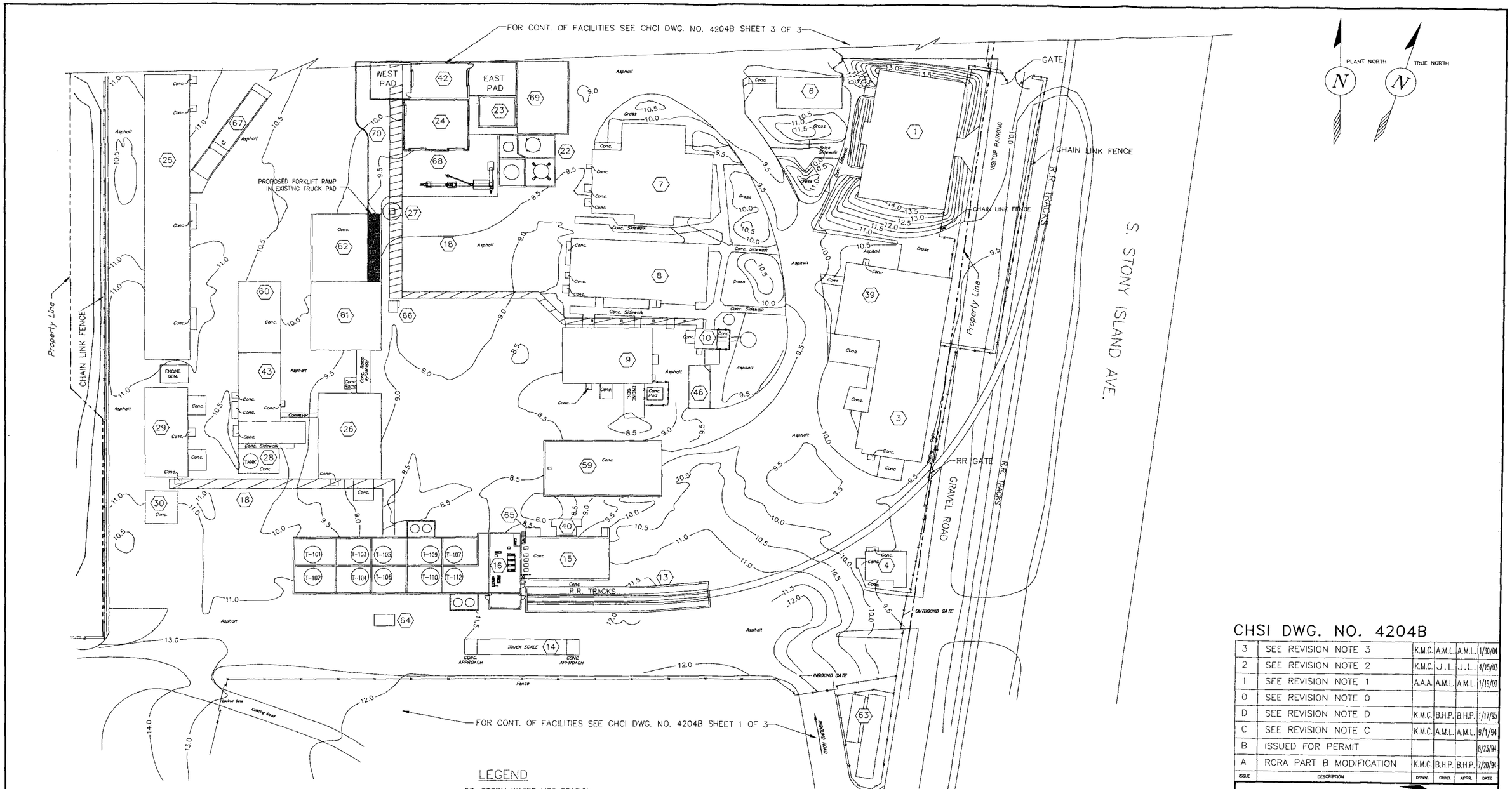
CleanHarbors

Appendix 2 Cont'd.

Comments: EXHAUST FANS (4) SHUT OFF - OVERHEAD DOOR CLOSED

All tests conducted with hood sash in fully open position. All other hoods in the room should also be in fully open position during the test.

PASS CRITERIA: Each measurement in range of 80-120 fpm; average of the nine readings is 100 fpm; smoke pulled quickly and efficiently.



LEGEND

1. OFFICE BUILDING
3. MAINTENANCE BUILDING
4. TRANSPORTATION/RECEIVING BUILDING
6. EAST PUMP HOUSE
7. PERSONNEL/TRAINING CENTER
8. LABORATORY BUILDING
9. CONTROL BUILDING
10. MWRDGC LIFT STATION
13. RAIL CAR UNLOADING AREA (SEE CHCI DWG. NO. 4217)
14. TRUCK SCALE
15. TRUCK UNLOADING PLATFORM (SEE CHCI DWG. NO. 4248)
16. FLAMMABLE STORAGE TANK FARM (SEE CHCI DWG. NO. 4215)
18. PIPE RACKS
22. APPROVED FLAMMABLE TANK FARM SHREDDING SYSTEM (SEE CHSI DWG. NO. 4291)
23. SHREDDING PROCESS CONTROL ROOM
24. SHREDDING PROCESS BUILDING #1 (SEE CHSI DWG NO. 4287 & 4288)
25. CONTAINER MANAGEMENT BUILDING (SEE CHSI DWG. NO. 4282)
26. IGNITABLE CONTAINER MANAGEMENT BUILDING (SEE CHCI DWG. NO. 4210 SHEET 2 OF 3)
27. STORM WATER LIFT STATION
28. NITROGEN STORAGE AREA
29. UTILITY BUILDING
30. FUEL OIL STORAGE
39. MAINTENANCE BUILDING ADDITION
40. DECONTAMINATION BUILDING
42. SHREDDING PROCESS BUILDING #2
43. FUELS BLENDING OPERATION (SEE CHCI DWG. NO. 4213 SHEET 2 OF 3)
46. FIRE EQUIPMENT BUILDING
59. TRUCK STAGING AREA (SEE CHCI DWG. NO. 4247)
60. ROLL-OFF PAD FOR FUELS BLENDING (SEE CHCI DWG. NO. 4213 SHEET 2 OF 3)
61. CONTAINER HANDLING DOCK (SEE CHCI DWG. NO. 4245)
62. TRUCK PAD (SEE CHCI DWG. NO. 4246)
63. OFFICE/DRIVERS FACILITIES
64. FOAM WATER VALVE HOUSE TANK FARM
65. FOAM WATER VALVE HOUSE UNLOADING AREA
66. FOAM WATER VALVE HOUSE CONTAINER AREA
67. TRUCK LOADING DOCK (SEE CHSI DWG. NO. 4283)
68. APPROVED METAL WASH PROCESS (SEE CHSI DWG. NO. 4290)
69. APPROVED TRUCK/ROLL-OFF PAD (SEE CHSI DWG. NO. 4292)
70. FORKLIFT ACCESS AREA

REV. #	REVISION NOTES
3	ADDED PROPERTY LINE
2	CHANGED TITLES OF AREA 22, 25, 67, 68 & 69.
1	ADDED AREAS 68, 69 & 70, CHANGED TITLES OF AREAS 22, 23, 24 & 42
0	AS BUILT
D	ADDED CONTOUR LINES AND GROUND SURFACE NOTATION. REVISED TITLE OF BUILDING 39.
C	REVISED FLAMMABLE STORAGE TANK FARM. RELOCATED 59. TRUCK STAGING AREA (PROPOSED)

CHSI DWG. NO. 4204B

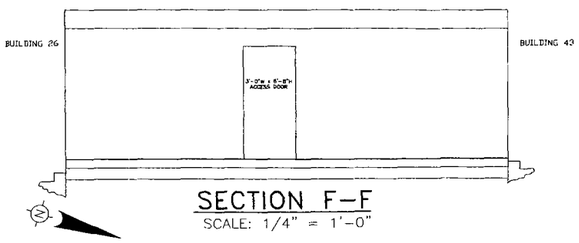
ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
3	SEE REVISION NOTE 3	K.M.C.	A.M.L.	A.M.L.	1/30/04
2	SEE REVISION NOTE 2	K.M.C.	J.L.	J.L.	4/15/03
1	SEE REVISION NOTE 1	A.A.A.	A.M.L.	A.M.L.	1/19/00
0	SEE REVISION NOTE 0				
D	SEE REVISION NOTE D	K.M.C.	B.H.P.	B.H.P.	1/11/95
C	SEE REVISION NOTE C	K.M.C.	A.M.L.	A.M.L.	9/1/94
B	ISSUED FOR PERMIT				8/23/94
A	RCRA PART B MODIFICATION	K.M.C.	B.H.P.	B.H.P.	7/20/94

CleanHarbors
ENVIRONMENTAL SERVICES, INC.
1501 Washington Street
Braintree, Massachusetts 02185
Telephone (781) 849-1800

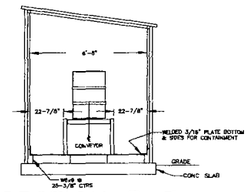
TITLE
CLEAN HARBORS SERVICES, INC.
11800 S. STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617

SITE PLAN –
EXISTING & MODIFIED ACTIVITIES
SHEET 2 OF 3

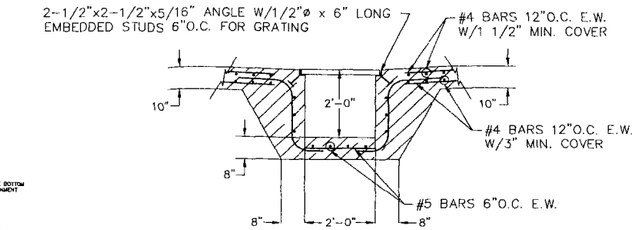
PROJECT NO. CH114630
SCALE 1"=30'
DRAWING NO. 2916-C-21



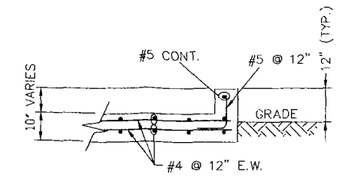
SECTION F–F
SCALE: 1/4" = 1'-0"



SECTION E–E
SCALE: 1/4" = 1'-0"



DETAIL NO. 1
SCALE: 1/2" = 1'-0"



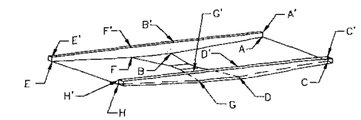
SECTION B–B
SCALE: 1/2" = 1'-0"

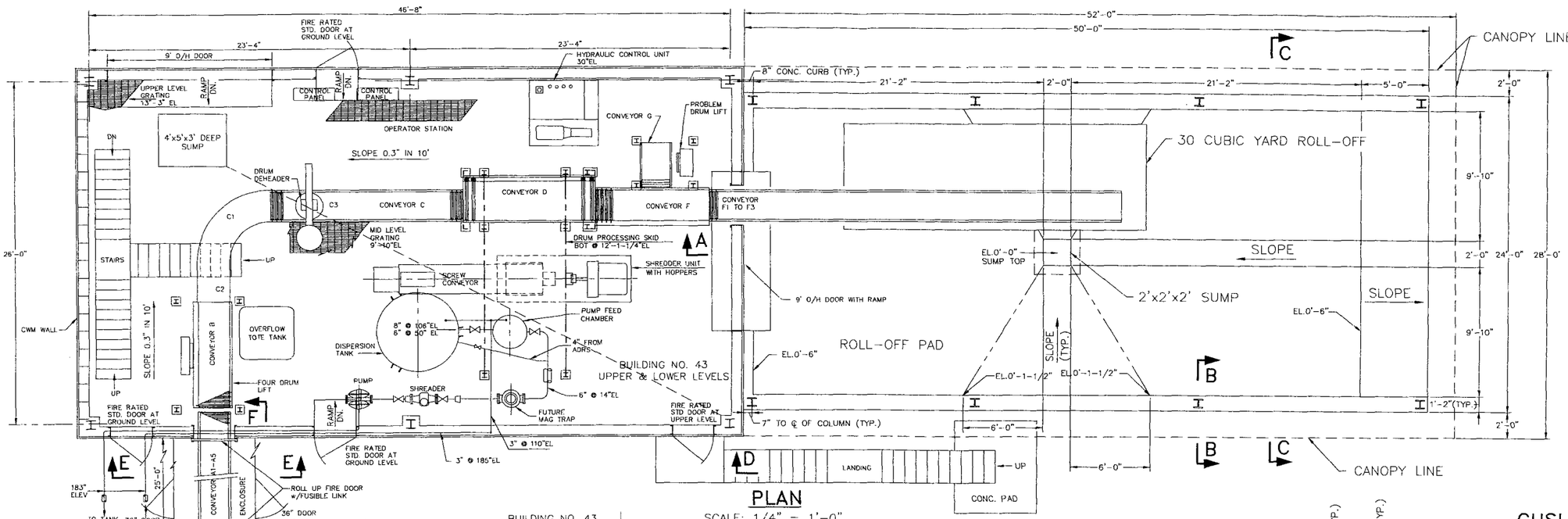
AVAILABLE CONTAINMENT CAPACITY FOR ROLL-OFF PAD

CONTAINMENT CAPACITY OF THE TRIANGULAR PAD SECTIONS
EE'=HH'=AA'=CC'= 3"
FF'=BB'=DD'=GG'= 7 1/2"

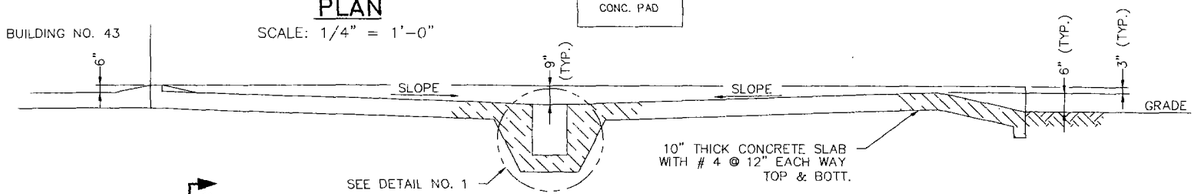
MAXIMUM DEPTH OF LIQUID= 4 1/2"
CAPACITY= (2)x1/2x(19'-8")x(15'-2")x4 1/2"/12x7.481
= 19.67'x15.17'x0.375'x7.481
= 837 GALS.

CONTAINMENT CAPACITY OF THE CENTER SECTION
ASSUME MINIMUM UNIFORM DEPTH OF 4 1/2"
= 14'x19.67'x0.375'x7.481
= 772 GALS.
SUMP CAPACITY= 2'x2'x2'x7.481= 59 GALS.
TOTAL CONTAINMENT CAPACITY= 1,668 GALS.

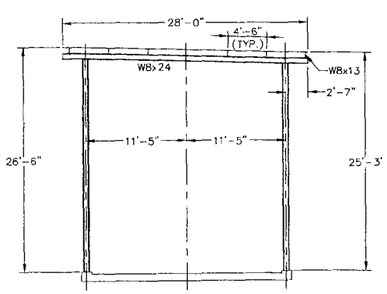




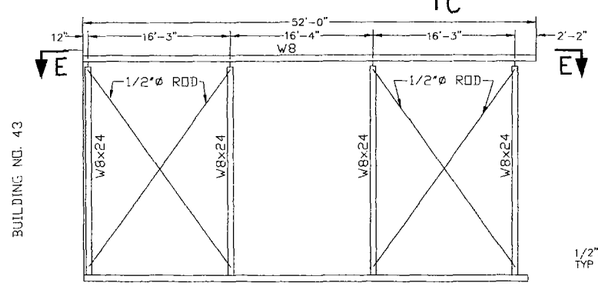
PLAN
SCALE: 1/4" = 1'-0"



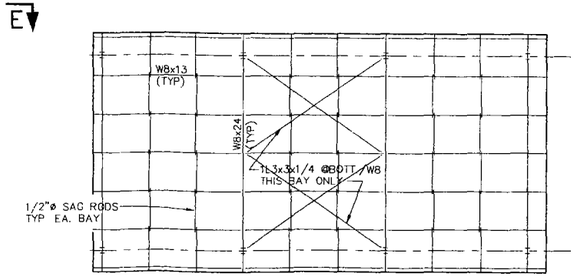
SECTION A–A
SCALE: HORIZ. 1/4" = 1'-0", VERT. 3/8" = 1'-0"



SECTION C–C
SCALE: 1/8" = 1'-0"
TYP. FRAME @ 16'-4" SPACING



SECTION D–D
SCALE: 1/8" = 1'-0"



ROOF PLAN "E–E"
SCALE: 1/8" = 1'-0"

CONTAINMENT CAPACITY CALCULATIONS FOR BUILDING #43

REQUIRED CONTAINMENT CAPACITY
= VOL. OF THE LARGEST TANK
= VOL. OF THE DISPERSION TANK + VOL. OF THE OVERFLOW TANK
= 1,493 + 311 GALS.
= 1,804 GALS.

AVAILABLE CONTAINMENT CAPACITY
= 26'x46.67'x0.5'x7.481
= 4,538 GALS.

REV. #	REVISION NOTES
1	SHOWED SUMP & FLOOR SLOPE
0	REVISED EQUIPMENT LAYOUT IN BUILDING 43 AND CONVEYOR ENCLOSURE BETWEEN BLDG. 43 AND 26. ADDED ROLL-OFF ROOF & STEEL SIZES
G	REVISED CONTAINMENT CAPACITY CALCULATIONS.
F	ADDED SECTIONS C-C & D-D AND CONTAINMENT CAPACITY CALCULATIONS.

HOYER-SCHLESINGER-TURNER, INC.
CONSULTING-ENGINEERS
300 WEST ADAMS STREET CHICAGO, ILLINOIS 60606
PROJECT #1785

CHSI DWG. NO. 4213

ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
1	SEE REVISION NOTE 1	K.M.C.	A.M.L.	A.M.L.	1/30/04
0	AS BUILT, SEE REVISION NOTE 0	K.M.C.	B.H.P.	B.H.P.	9/15/95
G	SEE REVISION NOTE G	K.M.C.	B.H.P.	B.H.P.	1/17/95
F	SEE REVISION NOTE F	K.M.C.	A.M.L.	A.M.L.	9/1/94
E	RCRA PART B MODIFICATION	K.M.C.	B.H.P.	B.H.P.	7-20-94
D	RCRA PART B SUBMITTAL UPDATE	TJR	MV	JIR	12-18-92
C	RCRA PART B SUBMITTAL UPDATE	TJG	JIR	JIR	2-14-92
B	RCRA PART B SUBMITTAL UPDATE	PVS	INS	A.M.L.	2/1/91
A	RCRA PART B SUBMITTAL	K.M.C.	P.W.	P.W.	9/19/90

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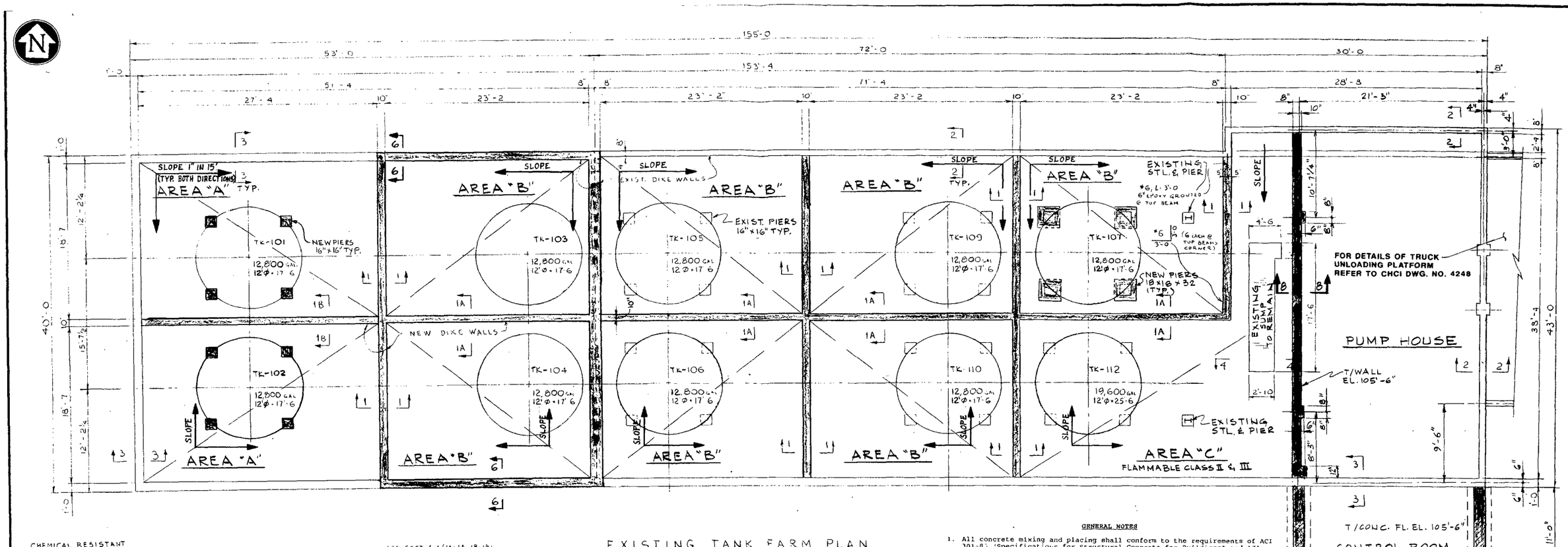
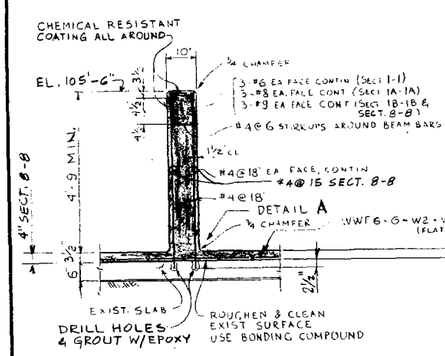
TITLE
CLEAN HARBORS SERVICES, INC.
11800 S. STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617
EQUIPMENT LAYOUT
FUELS BLENDING OPERATION
SHEET 2 OF 3

PROJECT NO. CH114630
DRAWING NO. 2916-M-07
SCALE AS NOTED



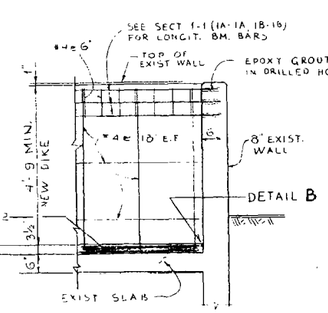
EXISTING TANK FARM PLAN

SCALE 3/16" = 1'-0



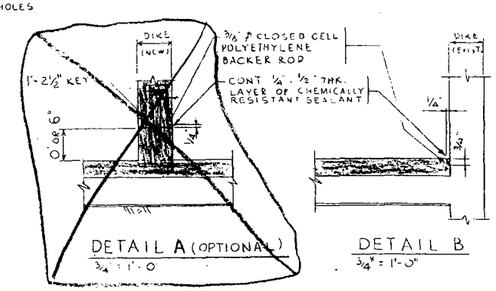
SECTION 1-1, 1A-1A, 1B-1B

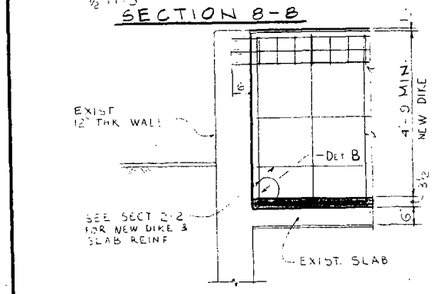
1/2" = 1'-0



SECTION 2-2

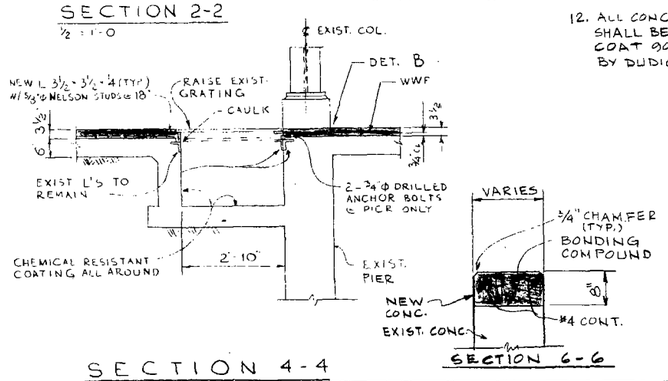
1/2" = 1'-0





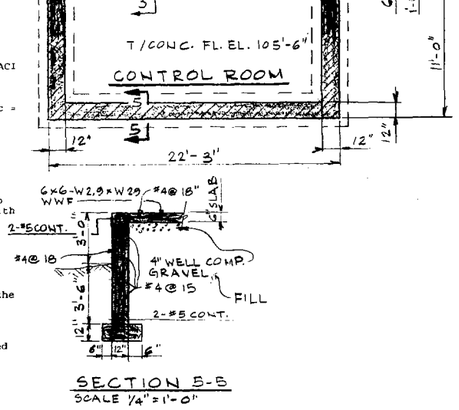
SECTION 3-3

1/2" = 1'-0



SECTION 4-4

1/2" = 1'-0



SECTION 5-5

SCALE 1/4" = 1'-0"

GENERAL NOTES

1. All concrete mixing and placing shall conform to the requirements of ACI 301-89 "Specifications for Structural Concrete for Buildings" and ACI 318-89 "Building Code Requirements for Reinforced Concrete".
2. All concrete shall have the minimum compressive strength @ 28 days f'c = 4000 psi and minimum slump = 4".
3. Concrete shall be air entrained with air content 4% - 6% for exterior exposed concrete.
4. Minimum concrete cover for reinforcement to be 3" for concrete cast against soil and 1-1/2" for concrete exposed to weather.
5. All reinforcing bars shall be Grade 60 billet steel bars conforming to ASTM A615 Specifications and shall be bent and placed in accordance with ACI 318-89 Code.
6. All dimensions to be verified in field.
7. Minimum lap for reinforcing steel to be 30 bar diameters.
8. Metal reinforcing, at the time concrete is placed, to be free from loose, flaky rust, oil or other coatings that will destroy or reduce the bond.
9. All exposed concrete to have a 3/4" chamfer.
10. All floors, walls, piers and sumps inside the tank farm shall be coated using chemical resistant coating system specified by Clean Harbors.
11. Shop drawings shall be submitted for HST approval.
12. ALL CONCRETE CONTAINMENT SURFACES SHALL BE COATED WITH PROTECTO-COAT 900 SYSTEM AS MANUFACTURED BY DUDICK INC.

CONTAINMENT CAPACITY CALCULATIONS

AREA DESCRIPTION	ITEM	UNITS	FORMULA	AREA "A"	AREA "B"	AREA "C"
AREA DIMENSIONS						
AREA LENGTH	L	FEET		27.34	23.17	24.00 7.25
AREA WIDTH	W	FEET		18.58	18.58	18.58 41.34
AREA HEIGHT	H	FEET		4.61	4.75	4.75 4.75
REQD CONTAINMENT PER RCRA						
TANK CAPACITY	T	GALS.		12,800.00	12,800.00	19,600.00
RAINFALL	R	FEET		0.39	0.39	0.39
ALLOWANCE	A	GALS	(L)(W)(R)(7.48)	1,481.87	1,255.85	2,175.27
TOTAL REQD. CONTAINMENT	TR	GALS.	T + A	14,281.87	14,056.85	21,775.27
AVAILABLE CAPACITY						
VOLUME OF CONTAINMENT AREA	V1	GALS	(L)(W)(H)(7.48)	16,754.54	15,205.62	26,492.41
VOLUME OF COLUMN LEGS						
NO. OF LEGS	N2			4.00	4.00	4.00
VOLUME OF EACH LEG	VC	GALS	(1.0 X 1.0)(H)(7.48)	35.53	35.53	35.53
TOTAL	V2	GALS	(N2)(VC)	142.12	142.12	142.12
TOTAL AVAILABLE CAPACITY	TA	GALS	V1 - V2	16,612.42	15,063.50	26,350.29

ISSUE	DESCRIPTION	DRWN	CKD	APPR	DATE
0	AS BUILT	MV	PJB		7-24-95
F	ISSUED FOR PUMP HOUSE & C.R. PERMIT	MV	PJB		3-16-95
E	REVISED SEC. B-B & CONTROL ROOM	MV	PJB		2-9-95
D	REVISED TANKS CAPACITIES & SEC. 1-1 ADDED: PUMP HOUSE, WALL STIFFENERS	MV	PJB		1-30-95
C	DELETED RCRA HAZ. WASTE CONTAINMENT REQUIREMENTS. REVISED CONTAIN. CALC.	MV	PJB		10-28-94

ISSUE	DESCRIPTION	DRWN	CHKD	APPR	DATE
1	ADDED SLOPED DIRECTIONS	K.M.C.	[illegible]	[illegible]	1-30-04

HOYER-SCHLESINGER-TURNER, INC.
CONSULTING-ENGINEERS
301 WEST ADAMS STREET CHICAGO, ILLINOIS 60606
PROJECT NO. 17851

CHCI DWG. NO. 4215

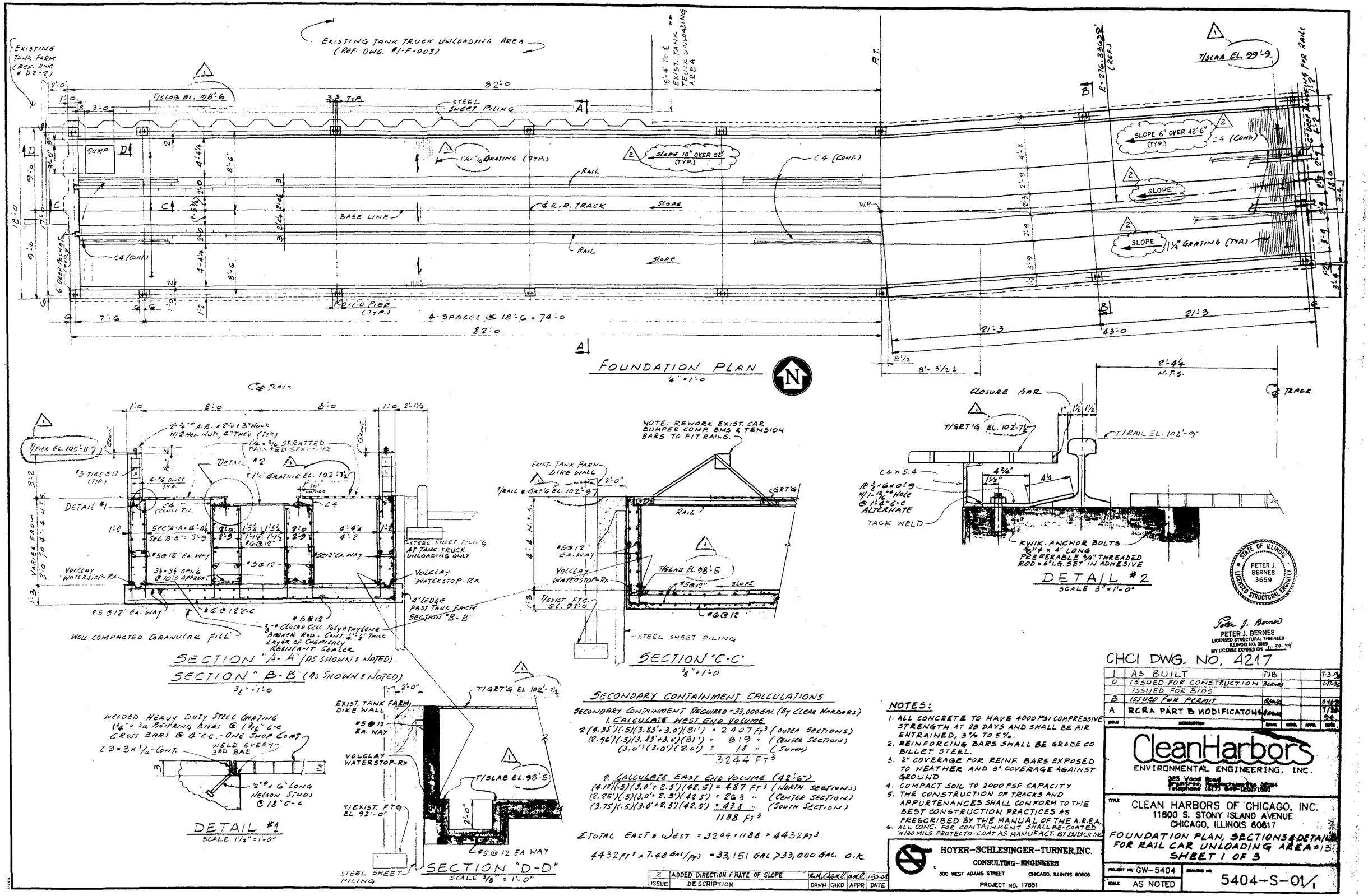
ISSUE	DESCRIPTION	DRWN	CHKD	APPR	DATE
B	ADDED: RCRA HAZ. WASTE CONT. REQUIREMENT - TRUCK UNLOADING PLATFORM REFERENCE	K.M.C.	[illegible]	[illegible]	9/14/94
A	RCRA PART B MODIFICATIONS	I.N.S.			7/12/94

CleanHarbors
ENVIRONMENTAL ENGINEERING, INC.
325 Wood Road
Braintree, Massachusetts 02184
Telephone (617) 849-1200/1800

TITLE
CLEAN HARBORS OF CHICAGO, INC.
11800 S. STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617

MODIFIED FLAMMABLE STORAGE TANK FARM-UNIT #16
SHEET 1 OF 4

PROJECT NO. GW-5404
SCALE AS NOTED
DRAWING NO. 5404-S-04/0



SECONDARY CONTAINMENT CALCULATIONS

SECONDARY CONTAINMENT REQUIRED = 33,000 GAL (BY CLEAR HARBORS)

1. CALCULATE WEST END VOLUME

2(4.35')(.5)(3.83'+3.0')(81') = 2407 ft³ (OUTER SECTIONS)
(2.96')(.5)(3.83'+3.0')(81') = 819 " (CENTER SECTIONS)
(3.0')(3.0')(2.0') = 18 " (SUMP)
3244 FT³

2. CALCULATE EAST END VOLUME (42'-6")

(4.17')(.5)(3.0'+2.5')(42.5') = 487 FT³ (NORTH SECTIONS)
(2.25')(.5)(3.0'+2.5')(42.5') = 263 " (CENTER SECTION)
(3.75')(.5)(3.0'+2.5')(42.5') = 438 " (SOUTH SECTION)
1188 FT³

ΣTOTAL EAST & WEST = 3244 + 1188 = 4432 FT³

4432 FT³ x 7.48 GAL/FT³ = 33,151 GAL > 33,000 GAL. O.K.

NOTES:

1. ALL CONCRETE TO HAVE 4000 PSI COMPRESSIVE STRENGTH AT 28 DAYS AND SHALL BE AIR ENTRAINED, 3% TO 5%.
2. REINFORCING BARS SHALL BE GRADE 60 BILLET STEEL.
3. 2" COVERAGE FOR REINF. BARS EXPOSED TO WEATHER AND 3" COVERAGE AGAINST GROUND
4. COMPACT SOIL TO 2000 PSF CAPACITY
5. THE CONSTRUCTION OF TRACKS AND APPURTENANCES SHALL CONFORM TO THE BEST CONSTRUCTION PRACTICES AS PRESCRIBED BY THE MANUAL OF THE A.R.E.A.
6. ALL CONC. FOR CONTAINMENT SHALL BE COATED W/30 MILS PROTECTO-COAT AS MANUFACT. BY DUDICK INC.

ISSUE	DESCRIPTION	DRWN	CHKD	APPR	DATE
2	ADDED DIRECTION / RATE OF SLOPE	M.H.	C.M.L.	C.M.L.	1-30-04

HOYER-SCHLESINGER-TURNER, INC.
CONSULTING-ENGINEERS
300 WEST ADAMS STREET CHICAGO, ILLINOIS 60606
PROJECT NO. 17851

STATE OF ILLINOIS — PETER J. BERNES 3659 — LICENSED STRUCTURAL ENGINEER

PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-94

CHCI DWG. NO. 4217

SYMBOL	DESCRIPTION	DRWN	CHKD	APPR	DATE
1	AS BUILT	PJB			7-3-94
0	ISSUED FOR CONSTRUCTION	BERNES			1-17-94
	ISSUED FOR BIDS				
B	ISSUED FOR PERMIT				8-18-93
A	RCRA PART B MODIFICATIONS				7-13-93

CleanHarbors
ENVIRONMENTAL ENGINEERING, INC.
325 Wood Road
Braintree, Massachusetts 02184
Telephone (617) 848-1000

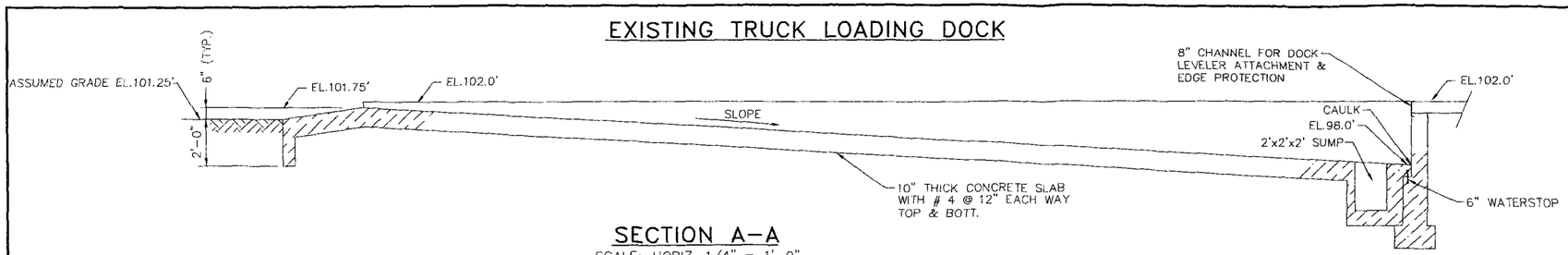
TITLE: CLEAN HARBORS OF CHICAGO, INC.
11800 S. STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617

FOUNDATION PLAN, SECTIONS & DETAILS FOR RAIL CAR UNLOADING AREA #13
SHEET 1 OF 3

PROJECT NO. GW-5404
SCALE: AS NOTED
DRAWING NO. 5404-S-01/1

REV. #	REVISION NOTES
C	REVISED CONTAINMENT CAPACITY
D	ADDED NOTE 6.
E	ADDED PROPOSED EXTENSION TO TRUCK SAMPLING PAD
F	WATERSTOP SHOWN

EXISTING TRUCK LOADING DOCK

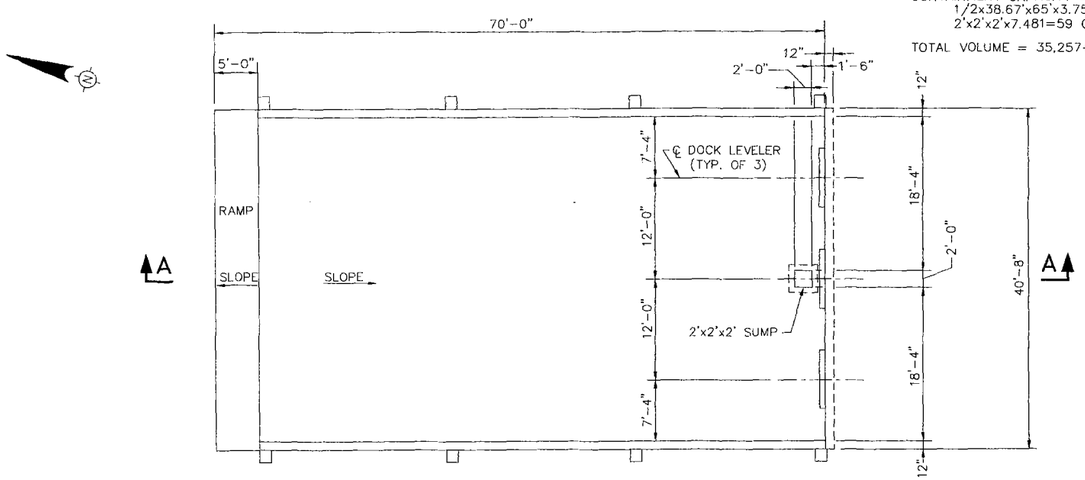


SECTION A–A

SCALE: HORIZ. 1/4" = 1'-0"
VERT. 3/8" = 1'-0"

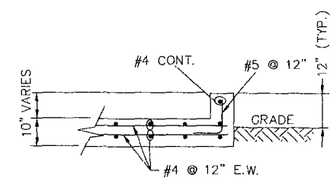
CONTAINMENT CAPACITY =
1/2x38.67'x65'x3.75'x7.481=35,257 GALS.
2'x2'x2'x7.481=59 GALS.

TOTAL VOLUME = 35,257+59=35,316 GALS.



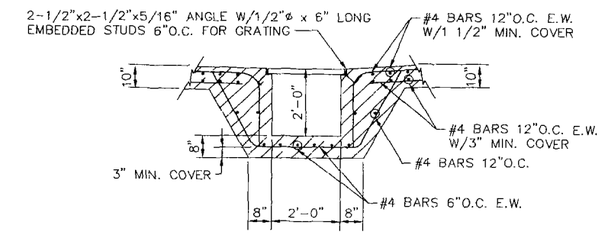
PLAN

(EXISTING TRUCK LOADING DOCK)
SCALE: 1/8" = 1'-0"



SECTION B–B

SCALE: 1/2" = 1'-0"



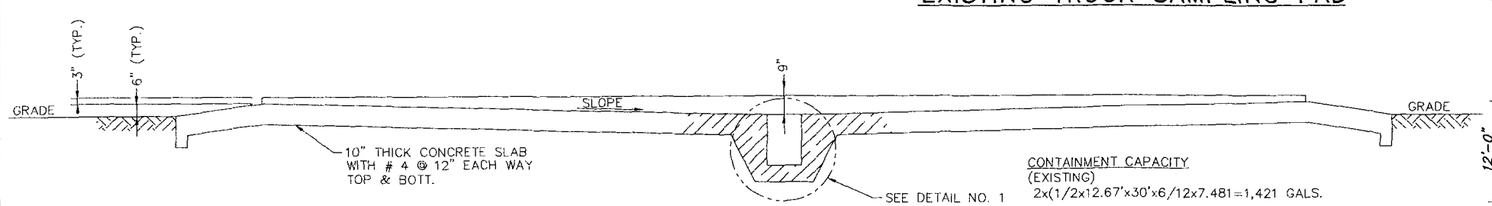
DETAIL NO. 1

SCALE: 1/2" = 1'-0"

NOTES:

1. ALL CONCRETE AREAS TO BE COVERED WITH BURLAP AND KEPT CONTINUOUSLY MOIST FOR A MINIMUM PERIOD OF THREE DAYS IMMEDIATELY AFTER PLACEMENT AND FINISHING. CURING COMPOUNDS ARE NOT TO BE USED. CONCRETE TO BE FINISHED SUCH THAT EXCESS MORTAR IS NOT BROUGHT TO THE SURFACE. NO ADDED CEMENT, WATER IS TO BE USED DURING FINISHING.
2. TOP OF ALL EXPOSED CONCRETE WALL/CURB POURS TO BE FINISHED PERFECTLY LEVEL FOR PROPER ARCHITECTURAL APPEARANCE. CHAMFER ON ALL RE-ENTRANT CORNERS IS REQUIRED.
3. SUMPS TO BE TESTED BY CONTRACTOR WITH WATER AT FULL HEIGHT FOR A PERIOD OF 24 HOURS AND NO LEAKAGE ALLOWED.
4. ALL CONCRETE MIXING AND PLACING SHALL CONFORM TO THE REQUIREMENT OF ACI 301-89 "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS" AND ACI 318-89 "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE".
5. ALL CONCRETE FOR CONTAINMENT AREAS INCLUDING CONCRETE FOR SLABS AND DIKES SHALL BE IMPERMEABLE CONCRETE WITH ABSOLUTE MINIMUM CRACKING DUE TO SHRINKAGE. THE MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS TO BE F'c=4000 psi.
6. THIS AREA WILL ALSO BE USED FOR THE MANAGEMENT AND STORAGE OF COMPRESSED GAS WASTES.

EXISTING TRUCK SAMPLING PAD



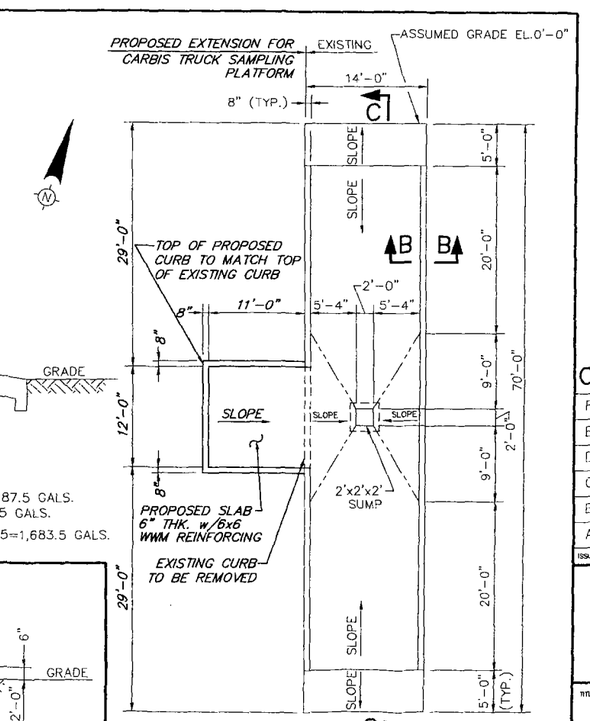
SECTION C–C

SCALE: HORIZ. 1/4" = 1'-0"
VERT. 3/8" = 1'-0"

CONTAINMENT CAPACITY
(EXISTING)
2x(1/2x12.67'x30'x6/12x7.481=1,421 GALS.

(PROPOSED)
TRIANGULAR AREA = 1/2x11.67'x12'x2/12x7.481=87.5 GALS.
RECTANGULAR AREA = 11.67'x12'x2/12x7.481=175 GALS.

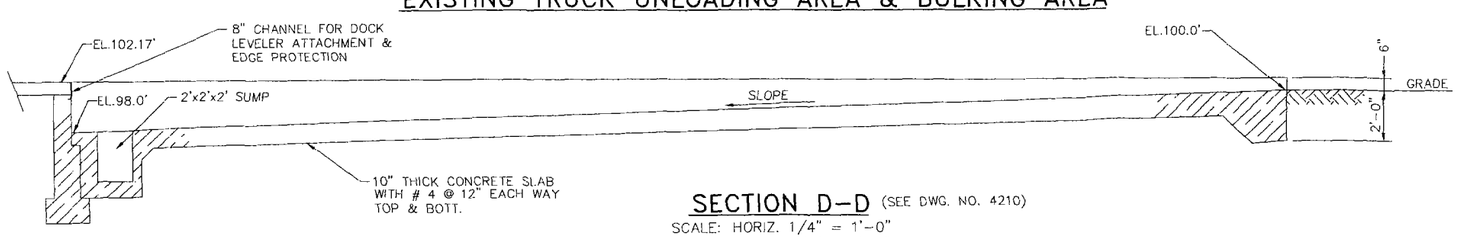
TOTAL CONTAINMENT CAPACITY = 1,421+87.5+175=1,683.5 GALS.



PLAN

(TRUCK SAMPLING PAD)
SCALE: 1/8" = 1'-0"

EXISTING TRUCK UNLOADING AREA & BULKING AREA



SECTION D–D (SEE DWG. NO. 4210)

SCALE: HORIZ. 1/4" = 1'-0"
VERT. 3/8" = 1'-0"

CHSI DWG. NO. 4234

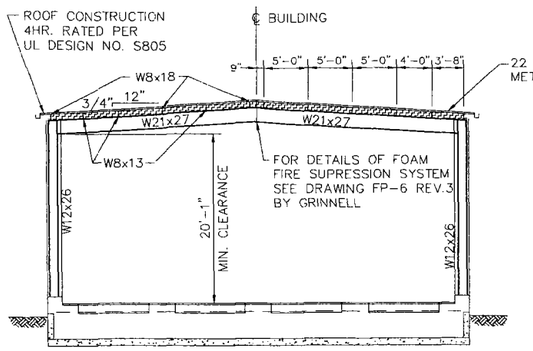
ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
F	SEE REVISION NOTE F	K.M.C.	A.M.L.	A.M.L.	1/30/04
E	SEE REVISION NOTE E	K.M.C.	A.M.L.	A.M.L.	8/12/98
D	SEE REVISION NOTE D	K.M.C.	—	—	8/28/95
C	SEE REVISION NOTE C	K.M.C.	A.M.L.	A.M.L.	1/17/95
B	RCRA PART B MODIFICATION	K.M.C.	B.H.P.	B.H.P.	7/20/94
A	RCRA PART B SUBMITTAL	K.M.C.	B.H.P.	B.H.P.	2/14/92

CleanHarbors
ENVIRONMENTAL SERVICES, INC.
1501 Washington Street
Braintree, Massachusetts 02185
Telephone (781) 849-1800

TITLE
CLEAN HARBORS SERVICES, INC.
11800 S. STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617

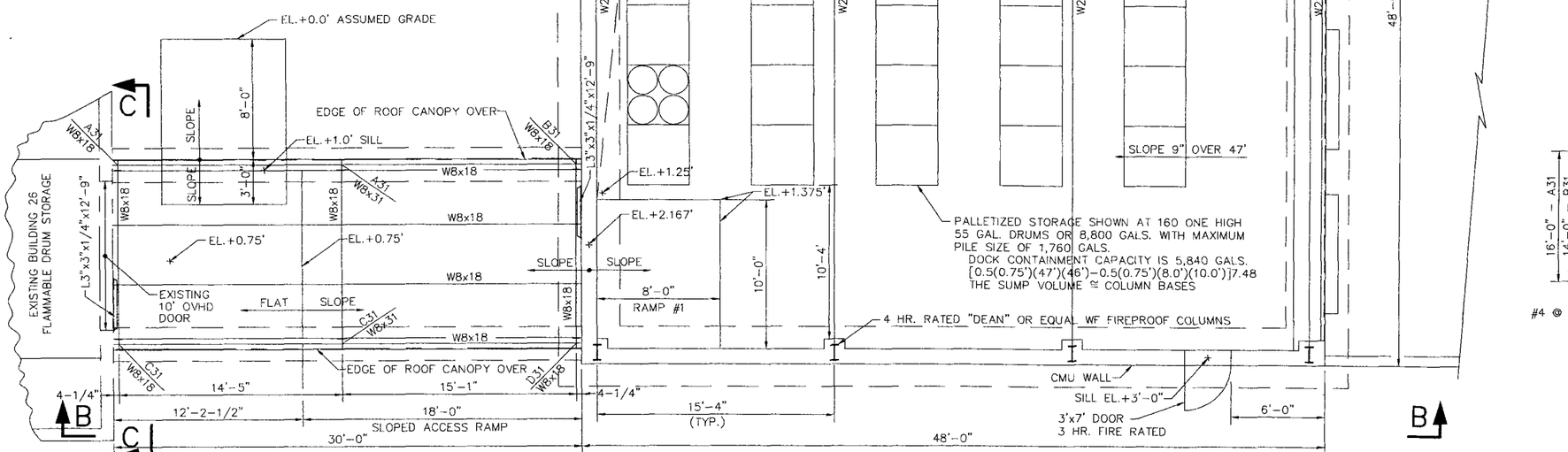
TRUCK LOADING DOCK & TRUCK SAMPLING PAD DETAILS

PROJECT NO. CH114630
SCALE AS NOTED
DRAWING NO. 2916-S-10



ELEVATION A–A

SCALE: 1/8"=1'-0"



PLAN VIEW

SCALE: 1/4"=1'-0"

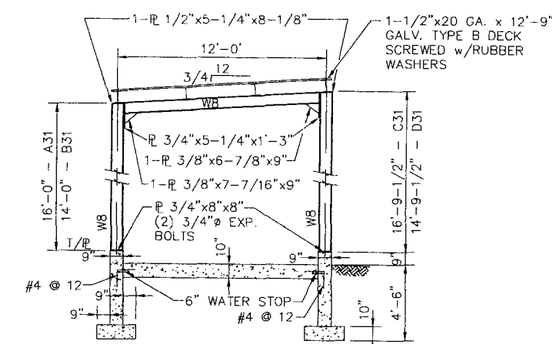
CONTAINMENT:
REQUIRED:
46'x47'x6"/12 = 1,081 FT.^{3} = 8,086 GALS.

AVAILABLE:

FLOOR:	46'x47'x9"/12x1/2	= 810.75	
	46'x47'x2"/12	= 360.33	
SUMP:	2'x2'x4"	= 16.00	
		1,187.08	1,187.08
SUBTRACT:	RAMP#1: 1/2x8'x10'x11"/12	=	37.67
	TOTAL	=	1,149.41

NOTES:

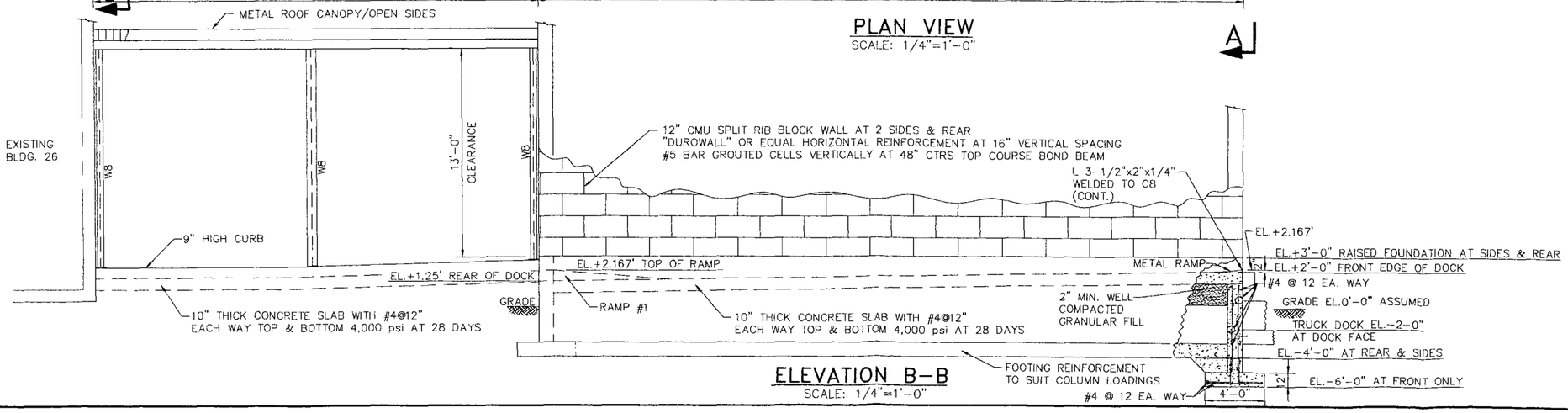
1. ALL JOINTS BETWEEN FLOORS AND WALLS TO BE CONTINUOUSLY WATER STOPPED AND CAULKED.
2. ALL CONCRETE TO HAVE 4,000 psi COMPRESSIVE STRENGTH AT 28 DAYS.
3. BUILDING FLOOR INCLUDING CONTAINMENT SURFACES TO BE COVERED WITH 1/4" THICK VINYL ESTER BASED FLOOR TOPPING SYSTEM PROTECTO-CRETE BY DUDICK INC. OR EQUAL.
4. ALL STRUCTURAL STEEL TO RECEIVE ONE SHOP COAT OF RED OXIDE PRIMER.
5. STEEL FABRICATOR TO VERIFY ANCHOR BOLT LOCATION FOR COLUMNS IN FIELD PRIOR STEEL FABRICATION.
6. FLOOR SHALL BE COATED WITH 1/4" OF PROTECTO CRETE 900 & DIKE WALLS SHALL BE COATED WITH PROTECTO COAT 900 AS MANUFACTURED BY DUDICK INC.
7. THIS AREA WILL ALSO BE USED FOR THE MANAGEMENT AND STORAGE OF COMPRESSED GAS WASTE.



ELEVATION C–C

SCALE: 1/4"=1'-0"

CHSI DWG. NO. 4245



ELEVATION B–B

SCALE: 1/4"=1'-0"

ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
3	HAND DWG. TO CADD DWG. ADDED FLOOR SLOPE & ELEVATIONS	K.M.C.	A.M.L.	A.M.L.	1/30/04
2	ADDED NOTE 7	K.M.C.			8/28/95
1	AS BUILT	M.V.	P.J.B.		6/30/95
0	ISSUED FOR CONSTRUCTION ADDED SETION C-C, CHANGED STEEL SIZES	M.V.	P.J.B.		1/27/95
C	ISSUED FOR PERMIT-BLDG	M.V.	P.J.B.		1/24/95
B	ISSUED FOR PERMIT	P.T.W.	P.B.		8/23/94
A	RCRA PART B MODIFICATION	P.T.W.	P.T.W.	P.T.W.	7/20/94

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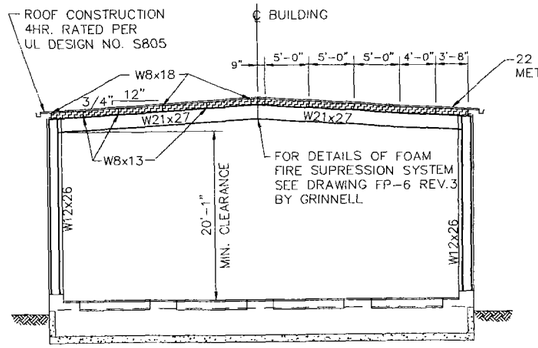
TITLE

CLEAN HARBORS SERVICES, INC.
11800 S. STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617

UNIT #61
CONTAINER HANDLING DOCK

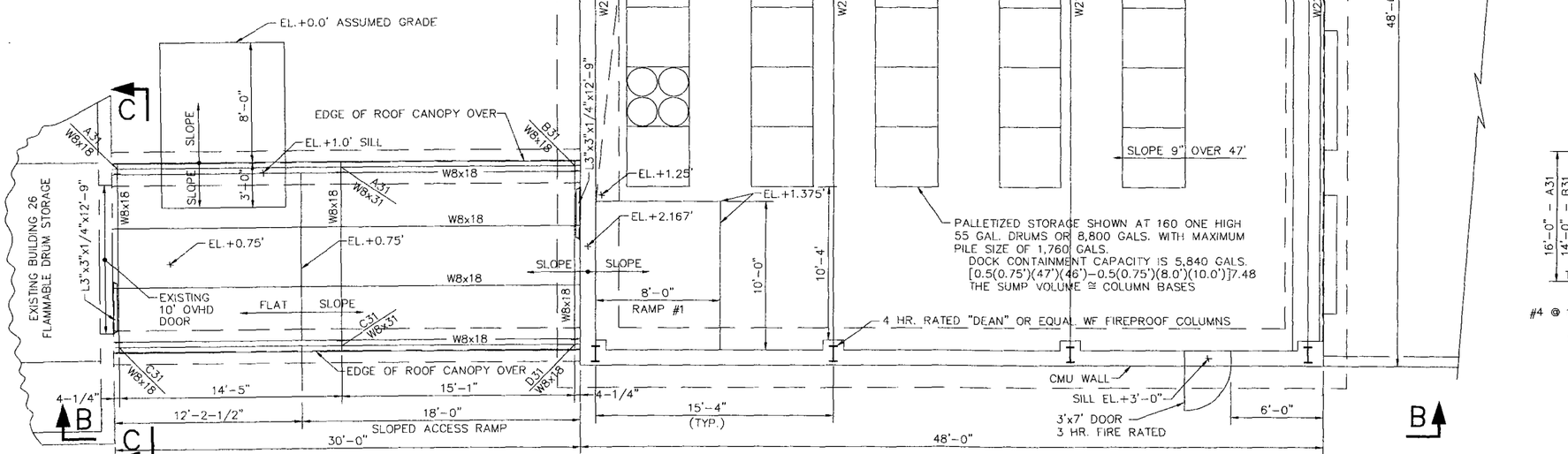
PROJECT NO. CH114630 | DRAWING NO. 2916-S-12

SCALE. AS NOTED



ELEVATION A–A

SCALE: 1/8"=1'-0"



PLAN VIEW

SCALE: 1/4"=1'-0"

CONTAINMENT:

REQUIRED:

46'x47'x6"/12 = 1,081 FT.^{3} = 8,086 GALS.

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	46'x47'x2"/12	= 360.33	
SUMP:	2'x2'x4"	= 16.00	
		1,187.08	1,187.08
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	TOTAL	=	1,149.41

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5. STEEL FABRICATOR TO VERIFY ANCHOR BOLT LOCATION FOR COLUMNS IN FIELD PRIOR STEEL FABRICATION.
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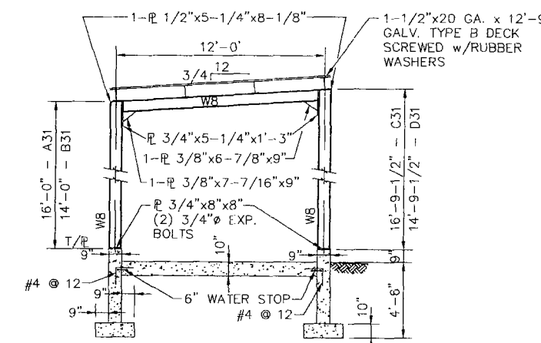
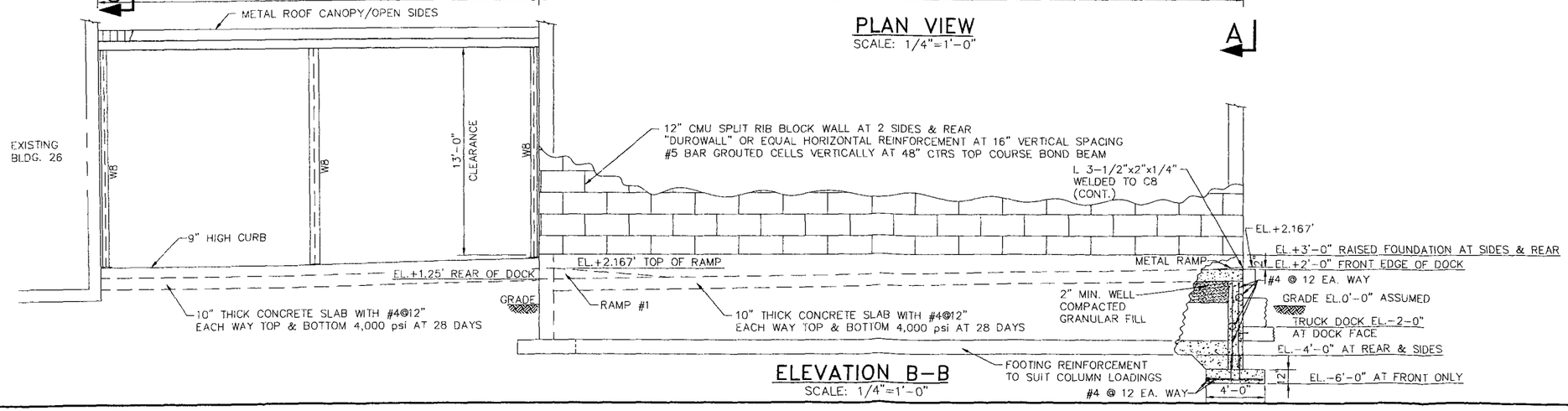
7. THIS AREA WILL ALSO BE USED FOR THE MANAGEMENT AND STORAGE OF COMPRESSED GAS WASTE.



ELEVATION C–C

SCALE: 1/4"=1'-0"

CHSI DWG. NO. 4245



ELEVATION B–B

SCALE: 1/4"=1'-0"

ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
3	HAND DWG. TO CADD DWG. ADDED FLOOR SLOPE & ELEVATIONS	K.M.C.	A.M.L.	A.M.L.	1/30/04
2	ADDED NOTE 7	K.M.C.			8/28/95
1	AS BUILT	M.V.	P.J.B.		6/30/95
0	ISSUED FOR CONSTRUCTION ADDED SETION C-C, CHANGED STEEL SIZES	M.V.	P.J.B.		1/27/95
C	ISSUED FOR PERMIT-BLDG	M.V.	P.J.B.		1/24/95
B	ISSUED FOR PERMIT	P.T.W.	P.B.		8/23/94
A	RCRA PART B MODIFICATION	P.T.W.	P.T.W.	P.T.W.	7/20/94

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TITLE

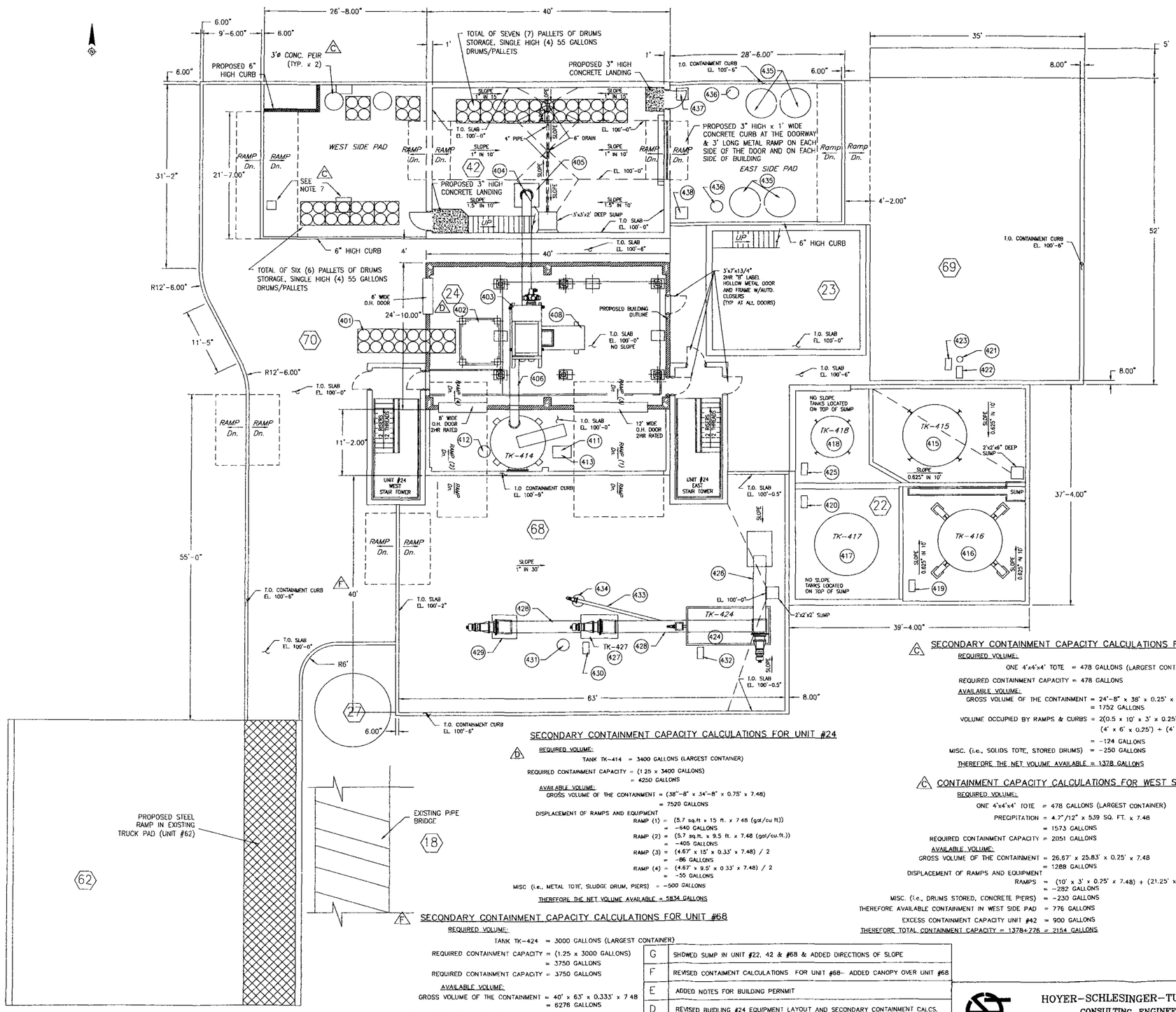
CLEAN HARBORS SERVICES, INC.
11800 S. STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617

UNIT #61
CONTAINER HANDLING DOCK

PROJECT NO. CH114630

DRAWING NO 2916-S-12

SCALE AS NOTED



ITEM NO.	QTY.	DESCRIPTION
401	1	DRUM FEED ROLLER CONVEYOR
402	1	DRUM LIFT
403	1	DUAL SHREDDER PACKAGE UNIT CONTAINING AIRLOCK CHAMBER, DRUM RAM, PRIMARY SHREDDER WITH HYDRAULIC RAM, SECONDARY SHREDDER AND ROTARY MAGNET
404	1	NON-DISPERSABLE SOLIDS AUGER
405	1	4'x4' NON-DISPERSABLE SOLIDS COLLECTION HOPPER W/SCISSOR LIFT OR EQUAL
406	1	DISPERSABLE LIQUIDS/SOLIDS AUGER
407	1	4'x4' DEBRIS COLLECTION TOTE/HOPPER W/SCISSOR LIFT OR EQUAL
408	1	VIBRATORY SHAKER SCREEN-MODEL KDSNBD-36-HDDT
409	1	SLUDGE COLLECTION DRUM W/SCISSOR LIFT OR EQUAL
410	1	METAL COLLECTION DRUM W/SCISSOR LIFT OR EQUAL
411	1	200 GPM POSITIVE DISPLACEMENT PUMP
412	1	NON-DISPERSABLE DEBRIS COLLECTION DRUM
413	1	200 GPM GRINDER PUMP
414	1	3400 GALLONS HYDRAPULPER TK-414
415	1	10,000 GALLONS BLENDED WASTE STORAGE TANK TK-415
416	1	10,000 GALLONS BLENDED WASTE STORAGE TANK TK-416
417	1	15,000 GALS. DILUENT WASTE STORAGE TANK TK-417
418	1	6,000 GALS. METAL WASH SOLVENT TANK TK-418
419	1	150 GPM BLENDED WASTE TRANSFER PUMP
420	1	150 GPM DILUENT FEED/TRANSFER PUMP
421	1	INLINE STRAINER
422	1	200 GPM RECEIVING PUMP
423	1	DRUM WASTE CONSOLIDATION PUMP
424	1	3,000 GALS. METAL WASH TANK TK-424
425	1	100 GPM METAL WASH SOLVENT FEED PUMP
426	1	METAL WASH METAL FEED AUGER
427	1	950 GALS. RINSE TANK TK-427
428	2	METAL TRANSFER AUGERS
429	1	4'x4' WASHED METAL COLLECTION TOTE W/SCISSOR LIFT OR EQUAL
430	1	50 GPM RINSATE TRANSFER PUMP
431	1	RINSATE COLLECTION DRUM
432	1	150 GPM SPENT SOLVENT - TRANSFER PUMP
433	1	SLUDGE TRANSFER AUGER
434	1	SLUDGE COLLECTION DRUM W/SCISSOR LIFT OR EQUAL
435	4	1800 lbs. GRANULATED ACTIVATED CARBON VESSELS
436	2	KNOCK-OUT DRUMS
437	1	300 SCFM BLOWER
438	1	200 SCFM BLOWER
439	1	150 GPM DILUENT FEED/TRANSFER PUMP LOCATED IN EXISTING TANK FARM (SEE CHSI. DWG. NO 4293)

NOTES:

1. BUILDING #42 AND THE TWO ADJOINING CONCRETE PADS ARE EXISTING.
2. WEST END CONCRETE PAD AND THE BUILDING FLOOR WILL BE SEALED AS NECESSARY AND COATED WITH PROTECTO-CRETE 900, TROWEL APPLIED VINYL ESTER COATING, AS MANUFACTURED BY DUDICK, INC. OR EQUIVALENT.
3. STORAGE AREAS WILL BE USED FOR THE STORAGE OF CONTAINERS LIKE FLEX BINS AND 55 GALLON DRUMS.
4. ITEM NO.S 409 & 410 ARE NOT SHOWN. THEY ARE LOCATED UNDER ITEM NO. 408
5. ITEM NO. 407 IS NOT SHOWN IT IS LOCATED UNDERNEATH ITEM NO. 403
6. CONTAINMENT CAPACITY CALCULATIONS:

   UNIT #69 SEE CHSI DWG. NO. 4292
   UNIT #22 SEE CHSI DWG. NO. 4291

7. (C) REMOVE EXISTING PIPE RACK CONCRETE PIERS TO BE RELOCATED AS SHOWN

(A) SECONDARY CONTAINMENT CAPACITY CALCULATIONS FOR UNIT #24

REQUIRED VOLUME:

TANK TK-414 = 3400 GALLONS (LARGEST CONTAINER)

REQUIRED CONTAINMENT CAPACITY = (1.25 x 3400 GALLONS)
= 4250 GALLONS

AVAILABLE VOLUME:

GROSS VOLUME OF THE CONTAINMENT = (38'-8" x 34'-8" x 0.75' x 7.48)
= 7520 GALLONS

DISPLACEMENT OF RAMPS AND EQUIPMENT

RAMP (1) = (5.7 sq.ft x 15 ft. x 7.48 (gal/cu ft))
= -640 GALLONS

RAMP (2) = (5.7 sq.ft. x 9.5 ft. x 7.48 (gal/cu.ft.))
= -405 GALLONS

RAMP (3) = (4.67' x 15' x 0.33' x 7.48) / 2
= -86 GALLONS

RAMP (4) = (4.67' x 9.5' x 0.33' x 7.48) / 2
= -55 GALLONS

MISC (i.e., METAL TOTE, SLUDGE DRUM, PIERS) = -500 GALLONS

THEREFORE THE NET VOLUME AVAILABLE = 5834 GALLONS

(B) SECONDARY CONTAINMENT CAPACITY CALCULATIONS FOR UNIT #68

REQUIRED VOLUME:

TANK TK-424 = 3000 GALLONS (LARGEST CONTAINER)

REQUIRED CONTAINMENT CAPACITY = (1.25 x 3000 GALLONS)
= 3750 GALLONS

REQUIRED CONTAINMENT CAPACITY = 3750 GALLONS

AVAILABLE VOLUME:

GROSS VOLUME OF THE CONTAINMENT = 40' x 63' x 0.333' x 7.48
= 6276 GALLONS

DISPLACEMENT OF RAMPS AND EQUIPMENT = 998

THEREFORE THE NET VOLUME AVAILABLE = 5278 GALLONS

(C) SECONDARY CONTAINMENT CAPACITY CALCULATIONS FOR UNIT #42

REQUIRED VOLUME:

ONE 4'x4'x4' TOTE = 478 GALLONS (LARGEST CONTAINER)

REQUIRED CONTAINMENT CAPACITY = 478 GALLONS

AVAILABLE VOLUME:

GROSS VOLUME OF THE CONTAINMENT = 24'-8" x 38' x 0.25' x 7.48
= 1752 GALLONS

VOLUME OCCUPIED BY RAMPS & CURBS = 2(0.5 x 10' x 3' x 0.25') +
(4' x 6' x 0.25') + (4' x 3' x 0.25') x (7.48)
= -124 GALLONS

MISC. (i.e., SOLIDS TOTE, STORED DRUMS) = -250 GALLONS

THEREFORE THE NET VOLUME AVAILABLE = 1378 GALLONS

(C) CONTAINMENT CAPACITY CALCULATIONS FOR WEST SIDE PAD

REQUIRED VOLUME:

ONE 4'x4'x4' TOTE = 478 GALLONS (LARGEST CONTAINER)

PRECIPITATION = 4.7"/12" x 539 SQ. FT. x 7.48
= 1573 GALLONS

REQUIRED CONTAINMENT CAPACITY = 2051 GALLONS

AVAILABLE VOLUME:

GROSS VOLUME OF THE CONTAINMENT = 26.67' x 25.83' x 0.25' x 7.48
= 1288 GALLONS

DISPLACEMENT OF RAMPS AND EQUIPMENT

RAMPS = (10' x 3' x 0.25' x 7.48) + (21.25' x 5.67' x 0.25' x 7.48)
= -282 GALLONS

MISC. (i.e., DRUMS STORED, CONCRETE PIERS) = -230 GALLONS

THEREFORE AVAILABLE CONTAINMENT IN WEST SIDE PAD = 776 GALLONS

EXCESS CONTAINMENT CAPACITY UNIT #42 = 900 GALLONS

THEREFORE TOTAL CONTAINMENT CAPACITY = 1378+776 = 2154 GALLONS

REV.	DESCRIPTION
G	SHOWED SUMP IN UNIT #22, 42 & #68 & ADDED DIRECTIONS OF SLOPE
F	REVISED CONTAIMENT CALCULATIONS FOR UNIT #68-- ADDED CANOPY OVER UNIT #68
E	ADDED NOTES FOR BUILDING PERNMIT
D	REVISED BUIDLING #24 EQUIPMENT LAYOUT AND SECONDARY CONTAINMENT CALCS.
C	ADDED NOTE 7, REVISED SECONDARY CONTAINMENT CALCULATIONS

HOYER-SCHLESINGER-TURNER, INC.
CONSULTING-ENGINEERS
300 WEST ADAMS STREET CHICAGO, ILLINOIS 60606
PROJECT 1785-2

CHSI DWG. NO. 4287

ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
G	SEE REVISION NOTE G	K.M.C.	A.M.L.	A.M.L.	1/30/04
F	RCRA PERMIT	A.A.A.			8/23/01
E	BUILDING PERMIT SUBMITTAL	A.A.A.	A.M.L.	A.M.L.	5/10/01
D	RCRA PERMIT	A.A.A.	A.M.L.		03/12/01
C	RCRA PERMIT	A.A.A.	A.M.L.		08/29/00
B	RCRA PERMIT	A.A.A.	A.M.L.		02/10/00
A	RCRA PERMIT	A.A.A.	A.M.L.		01/18/00

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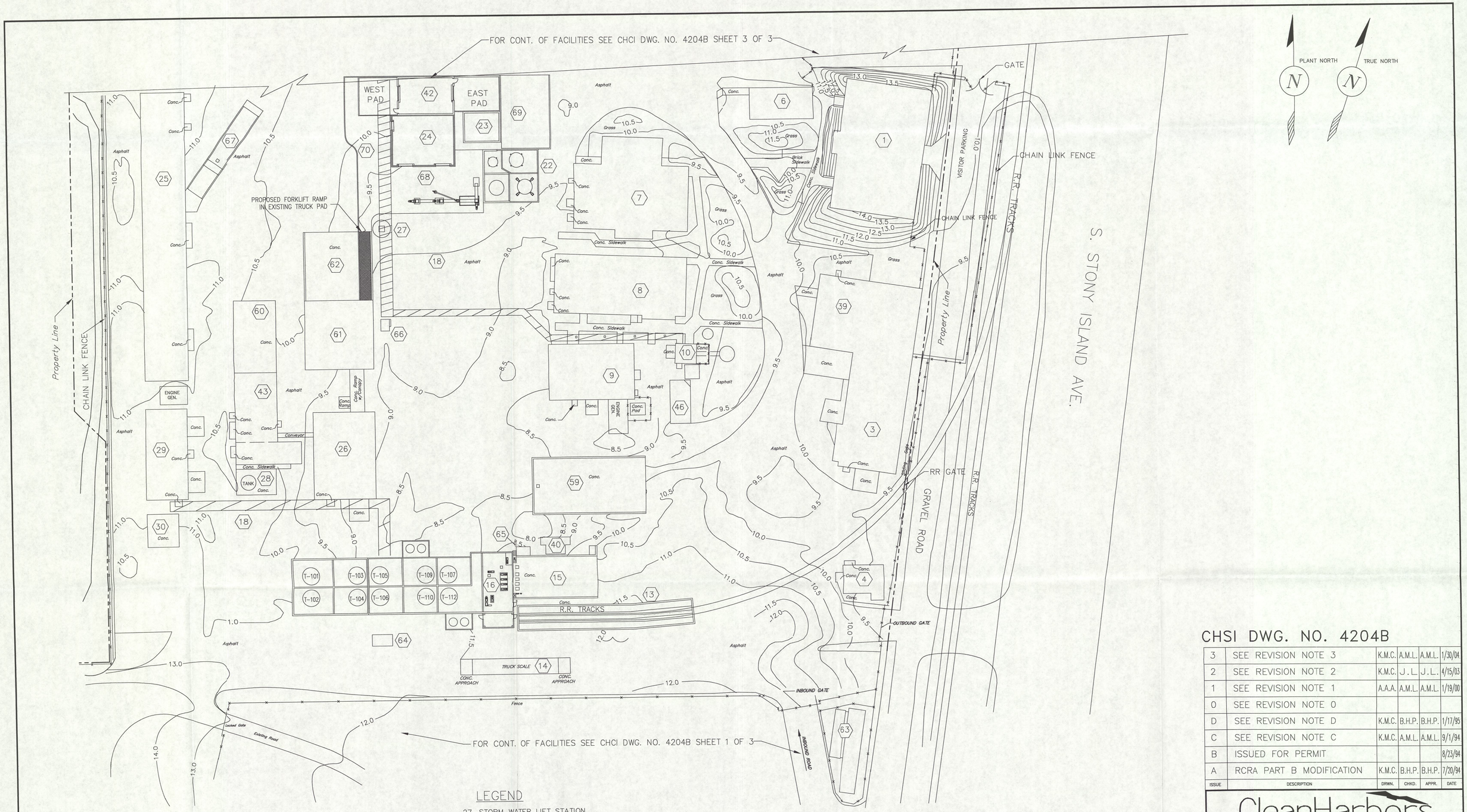
TITLE
CLEAN HARBORS SERVICES, INC.
11800 S. STONY ISLAND AVE.
CHICAGO, ILLINOIS 60617
SHREDDING PROCESS EQUIPMENT LAYOUT

PROJECT NO. CH114630
SCALE 1/8"=1'-0"
DRAWING NO. 4630-M-17



LEGEND

1. OFFICE BUILDING
3. MAINTENANCE BUILDING
4. TRANSPORTATION/RECEIVING BULDING
6. EAST PUMP HOUSE
7. PERSONNEL/TRAINING CENTER
8. LABORATORY BUILDING
9. CONTROL BUILDING
10. MWRDGC LIFT STATION
13. RAIL CAR UNLOADING AREA (SEE CHCI DWG. NO. 4217)
14. TRUCK SCALE
15. TRUCK UNLOADING PLATFORM (SEE CHCI DWG. NO. 4248)
16. FLAMMABLE STORAGE TANK FARM (SEE CHCI DWG. NO. 4215)
18. PIPE RACKS
22. APPROVED FLAMMABLE TANK FARM SHREDDING SYSTEM (SEE CHSI DWG. NO. 4291)
23. SHREDDING PROCESS CONTROL ROOM
24. SHREDDING PROCESS BUILDING #1 (SEE CHSI DWG NO. 4287 & 4288)
25. CONTAINER MANAGEMENT BUILDING (SEE CHSI DWG. NO. 4282)
26. IGNITABLE CONTAINER MANAGEMENT BUILDING (SEE CHCI DWG. NO. 4210 SHEET 2 OF 3)
27. STORM WATER LIFT STATION
28. NITROGEN STORAGE AREA
29. UTILITY BUILDING
30. FUEL OIL STORAGE
39. MAINTENANCE BUILDING ADDITION
40. DECONTAMINATION BUILDING
42. SHREDDING PROCESS BUILDING #2
43. FUELS BLENDING OPERATION (SEE CHCI DWG. NO. 4213 SHEET 2 OF 3)
46. FIRE EQUIPMENT BUILDING
59. TRUCK STAGING AREA (SEE CHCI DWG. NO. 4247)
60. ROLL-OFF PAD FOR FUELS BLENDING (SEE CHCI DWG. NO. 4213 SHEET 2 OF 3)
61. CONTAINER HANDLING DOCK (SEE CHCI DWG. NO. 4245)
62. TRUCK PAD (SEE CHCI DWG. NO. 4246)
63. OFFICE/DRIVERS FACILITIES
64. FOAM WATER VALVE HOUSE TANK FARM
65. FOAM WATER VALVE HOUSE UNLOADING AREA
66. FOAM WATER VALVE HOUSE CONTAINER AREA
67. TRUCK LOADING DOCK (SEE CHSI DWG. NO. 4283)
68. APPROVED METAL WASH PROCESS (SEE CHSI DWG. NO. 4290)
69. APPROVED TRUCK/ROLL-OFF PAD (SEE CHSI DWG. NO. 4292)
70. FORKLIFT ACCESS AREA

REV. #	REVISION NOTES
3	ADDED PROPERTY LINE
2	CHANGED TITLES OF AREA 22, 25, 67, 68 & 69.
1	ADDED AREAS 68, 69 & 70, CHANGED TITLES OF AREAS 22, 23, 24 & 42
0	AS BUILT
D	ADDED CONTOUR LINES AND GROUND SURFACE NOTATION. REVISED TITLE OF BUILDING 39.
C	REVISED FLAMMABLE STORAGE TANK FARM. RELOCATED 59. TRUCK STAGING AREA (PROPOSED)

CHSI DWG. NO. 4204B

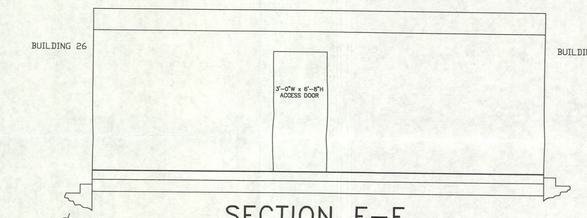
ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
3	SEE REVISION NOTE 3	K.M.C.	A.M.L.	A.M.L.	1/30/04
2	SEE REVISION NOTE 2	K.M.C.	J.L.	J.L.	4/15/03
1	SEE REVISION NOTE 1	A.A.A.	A.M.L.	A.M.L.	1/19/00
0	SEE REVISION NOTE 0				
D	SEE REVISION NOTE D	K.M.C.	B.H.P.	B.H.P.	1/17/95
C	SEE REVISION NOTE C	K.M.C.	A.M.L.	A.M.L.	9/1/94
B	ISSUED FOR PERMIT				8/23/94
A	RCRA PART B MODIFICATION	K.M.C.	B.H.P.	B.H.P.	7/20/94

CleanHarbors
ENVIRONMENTAL SERVICES, INC.
1501 Washington Street
Braintree, Massachusetts 02185
Telephone (781) 849-1800

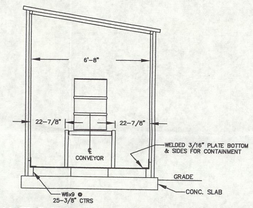
TITLE
CLEAN HARBORS SERVICES, INC.
11800 S. STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617

SITE PLAN –
EXISTING & MODIFIED ACTIVITIES
SHEET 2 OF 3

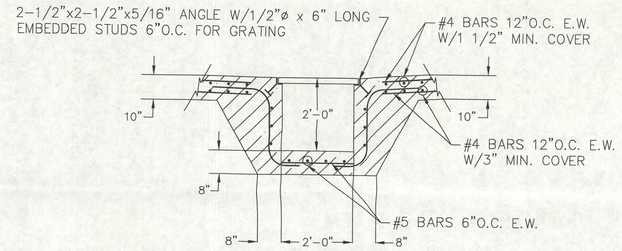
PROJECT NO. CH114630
SCALE 1"=30'
DRAWING NO. 2916-C-21



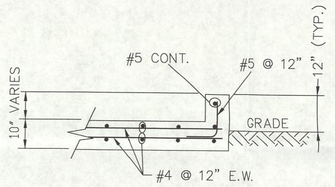
SECTION F-F
SCALE: 1/4" = 1'-0"



SECTION E-E
SCALE: 1/4" = 1'-0"



DETAIL NO. 1
SCALE: 1/2" = 1'-0"



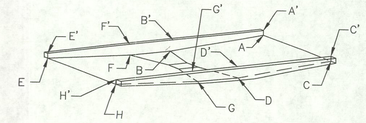
SECTION B-B
SCALE: 1/2" = 1'-0"

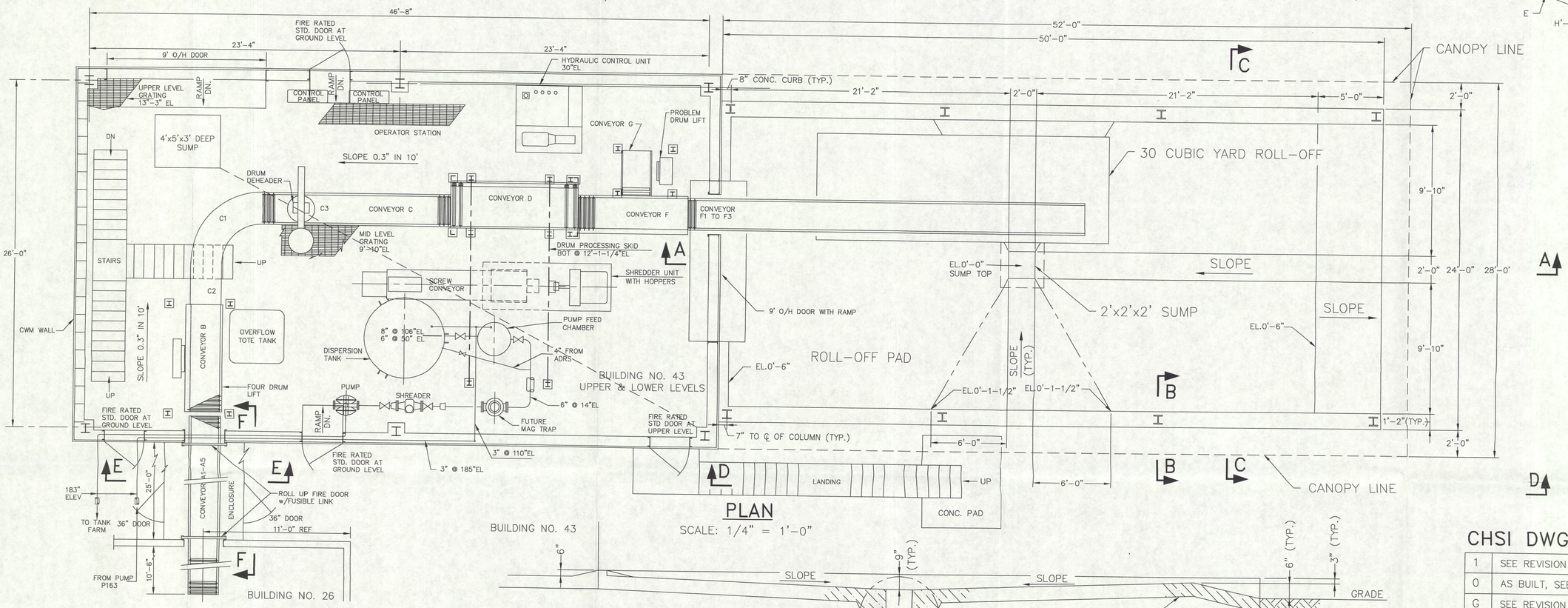
AVAILABLE CONTAINMENT CAPACITY FOR ROLL-OFF PAD

CONTAINMENT CAPACITY OF THE TRIANGULAR PAD SECTIONS
EE'=HH'=AA'=CC'= 3"
FF'=BB'=DD'=GG'= 7 1/2"

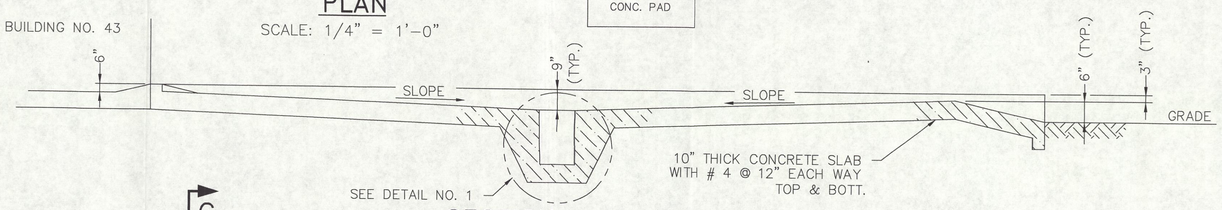
MAXIMUM DEPTH OF LIQUID= 4 1/2"
CAPACITY= (2)x1/2x(19'-8")x(15'-2")x4 1/2"/12x7.481
= 19.67'x15.17'x0.375'x7.481
= 837 GALS.

CONTAINMENT CAPACITY OF THE CENTER SECTION
ASSUME MINIMUM UNIFORM DEPTH OF 4 1/2"
= 14'x19.67'x0.375'x7.481
= 772 GALS.
SUMP CAPACITY= 2'x2'x2'x7.481= 59 GALS.
TOTAL CONTAINMENT CAPACITY= 1,668 GALS.

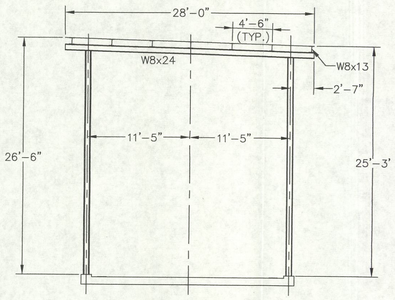




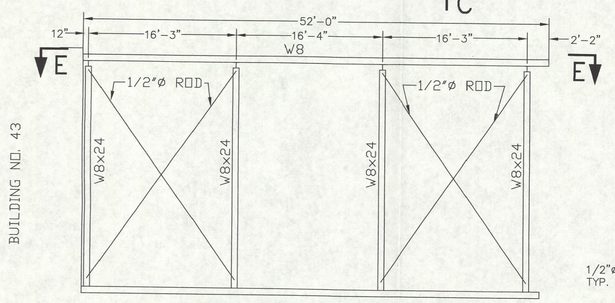
PLAN
SCALE: 1/4" = 1'-0"



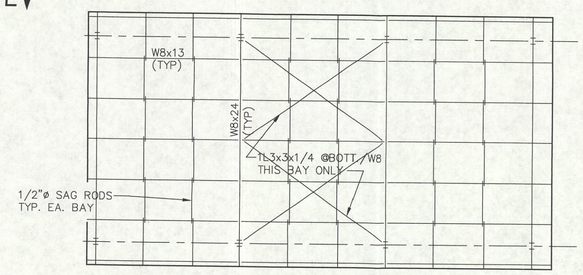
SECTION A-A
SCALE: HORIZ. 1/4" = 1'-0", VERT. 3/8" = 1'-0"



SECTION C-C
SCALE: 1/8" = 1'-0"
TYP. FRAME @ 16'-4" SPACING



SECTION D-D
SCALE: 1/8" = 1'-0"



ROOF PLAN "E-E"
SCALE: 1/8" = 1'-0"

CONTAINMENT CAPACITY CALCULATIONS FOR BUILDING #43

REQUIRED CONTAINMENT CAPACITY
= VOL. OF THE LARGEST TANK
= VOL. OF THE DISPERSION TANK + VOL. OF THE OVERFLOW TANK
= 1,493 + 311 GALS.
= 1,804 GALS.

AVAILABLE CONTAINMENT CAPACITY
= 26'x46.67'x0.5'x7.481
= 4,538 GALS.

REV. #	REVISION NOTES
1	SHOWED SUMP & FLOOR SLOPE
0	REVISED EQUIPMENT LAYOUT IN BUILDING 43 AND CONVEYOR ENCLOSURE BETWEEN BLDG. 43 AND 26. ADDED ROLL-OFF ROOF & STEEL SIZES
G	REVISED CONTAINMENT CAPACITY CALCULATIONS.
F	ADDED SECTIONS C-C & D-D AND CONTAINMENT CAPACITY CALCULATIONS.

HOYER-SCHLESINGER-TURNER,INC.
CONSULTING-ENGINEERS
300 WEST ADAMS STREET CHICAGO, ILLINOIS 60606
PROJECT #1785

CHSI DWG. NO. 4213

ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
1	SEE REVISION NOTE 1	K.M.C.	A.M.L.	A.M.L.	1/30/04
0	AS BUILT, SEE REVISION NOTE 0	K.M.C.	B.H.P.	B.H.P.	9/15/95
G	SEE REVISION NOTE G	K.M.C.	B.H.P.	B.H.P.	1/17/95
F	SEE REVISION NOTE F	K.M.C.	A.M.L.	A.M.L.	9/1/94
E	RCRA PART B MODIFICATION	K.M.C.	B.H.P.	B.H.P.	7-20-94
D	RCRA PART B SUBMITTAL UPDATE	TJR	MV	JIR	12-18-92
C	RCRA PART B SUBMITTAL UPDATE	TJG	JIR	JIR	2-14-92
B	RCRA PART B SUBMITTAL UPDATE	PVS	INS	A.M.L.	2/1/91
A	RCRA PART B SUBMITTAL	K.M.C.	P.W.	P.W.	9/19/90

CleanHarbors
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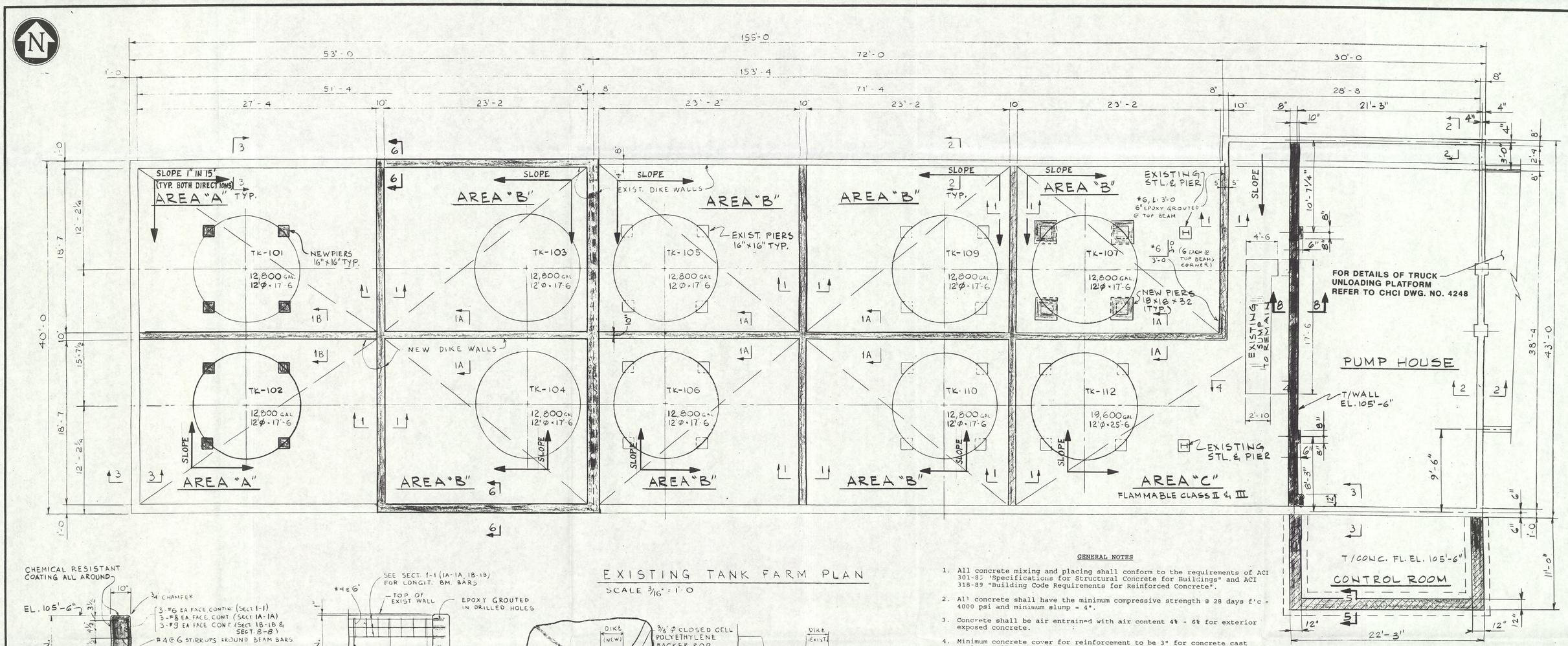
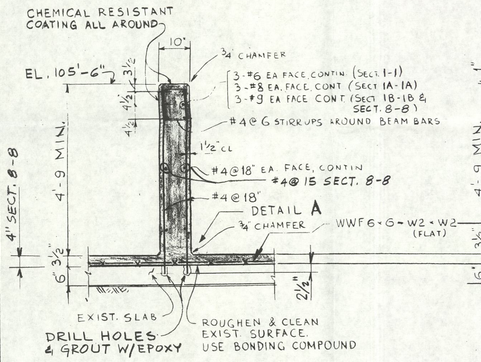
TITLE
CLEAN HARBORS SERVICES, INC.
11800 S. STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617
EQUIPMENT LAYOUT
FUELS BLENDING OPERATION
SHEET 2 OF 3

PROJECT NO. CH114630
DRAWING NO. 2916-M-07
SCALE AS NOTED



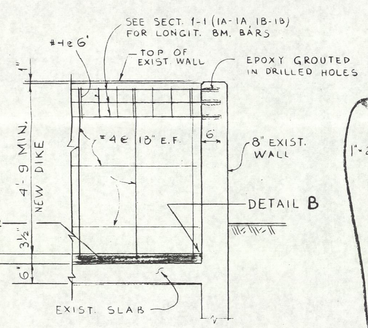
EXISTING TANK FARM PLAN

SCALE 3/16" = 1'-0



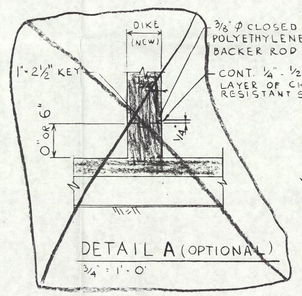
SECTION 1-1, 1A-1A, 1B-1B

1/2" = 1'-0



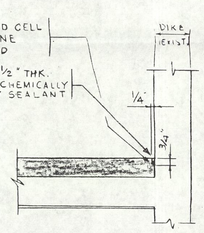
SECTION 2-2

1/2" = 1'-0



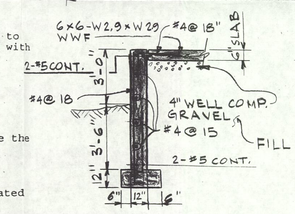
DETAIL A (OPTIONAL)

3/4" = 1'-0"



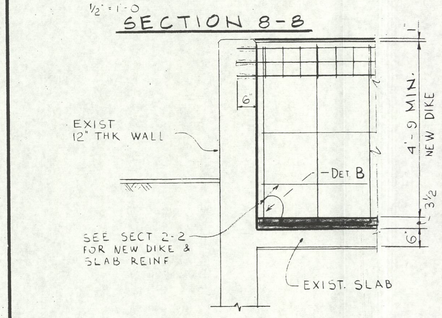
DETAIL B

3/4" = 1'-0"



SECTION 5-5

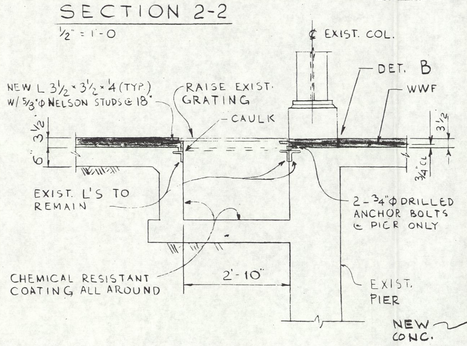
SCALE 1/4" = 1'-0"



SECTION 8-8

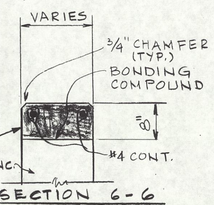
SECTION 3-3

1/2" = 1'-0"



SECTION 4-4

1/2" = 1'-0"



SECTION 6-6

12. ALL CONCRETE CONTAINMENT SURFACES SHALL BE COATED WITH PROTECTO-COAT 900 SYSTEM AS MANUFACTURED BY DUDICK INC.

GENERAL NOTES

1. All concrete mixing and placing shall conform to the requirements of ACI 301-82 "Specifications for Structural Concrete for Buildings" and ACI 318-89 "Building Code Requirements for Reinforced Concrete".
2. All concrete shall have the minimum compressive strength @ 28 days f'c = 4000 psi and minimum slump = 4".
3. Concrete shall be air entrained with air content 4% - 6% for exterior exposed concrete.
4. Minimum concrete cover for reinforcement to be 3" for concrete cast against soil and 1-1/2" for concrete exposed to weather.
5. All reinforcing bars shall be Grade 60 billet steel bars conforming to ASTM A615 Specifications and shall be bent and placed in accordance with ACI 318-89 Code.
6. All dimensions to be verified in field.
7. Minimum lap for reinforcing steel to be 30 bar diameters.
8. Metal reinforcing, at the time concrete is placed, to be free from loose, flaky rust, oil or other coatings that will destroy or reduce the bond.
9. All exposed concrete to have a 3/4" chamfer.
10. All floors, walls, piers and sumps inside the tank farm shall be coated using chemical resistant coating system specified by Clean Harbors.
11. Shop drawings shall be submitted for HST approval.

CONTAINMENT CAPACITY CALCULATIONS

AREA DESCRIPTION	ITEM	UNITS	FORMULA	AREA "A"	AREA "B"	AREA "C"
AREA DIMENSIONS						
AREA LENGTH	L	FEET		27.34	23.17	24.00 7.25
AREA WIDTH	W	FEET		18.58	18.58	18.58 41.34
AREA HEIGHT	H	FEET		4.41	4.75	4.75 4.75
REQD CONTAINMENT PER RCRA						
TANK CAPACITY	T	GALS.		12,800.00	12,800.00	19,600.00
RAINFALL	R	FEET		0.39	0.39	0.39
ALLOWANCE	A	GALS.	(L)(W)(R)(7.48)	1,481.87	1,255.85	2,175.27
TOTAL REQD. CONTAINMENT	**TR**	**GALS.**	**T + A**	**14,281.87**	**14,055.85**	**21,775.27**
AVAILABLE CAPACITY						
VOLUME OF CONTAINMENT AREA	V1	GALS.	(L)(W)(H)(7.48)	16,756.54	15,295.62	26,492.41
VOLUME OF COLUMN LEGS						
NO. OF LEGS	N2			4.00	4.00	4.00
VOLUME OF EACH LEG	VC	GALS.	(1.0 X 1.0)(H)(7.48)	35.53	35.53	35.53
TOTAL	V2	GALS.	(N2)(VC)	142.12	142.12	142.12
TOTAL AVAILABLE CAPACITY	**TA**	**GALS.**	**V1 - V2**	**16,614.42**	**15,153.5**	**26,350.29**

ISSUE	DESCRIPTION	DRWN	CHKD	APPR	DATE
1	ADDED SLOPED DIRECTIONS	K.M.C.	[illegible]	[illegible]	1-30-09

ISSUE	DESCRIPTION	DRWN	CKD	APPR	DATE
O	AS BUILT	MV	PJB		7-24-95
F	ISSUED FOR PUMP HOUSE & C.R. PERMIT	MV	PJB		3-16-95
E	REVISED SEC. 8-8 & CONTROL ROOM	MV	PJB		2-9-95
D	REVISED: TANKS CAPACITIES & SEC. 1-1 ADDED: PUMP HOUSE, WALL STIFFENERS	MV	PJB		1-30-95
C	DELETED RCRA HAZ. WASTE CONTAINMENT REQUIREMENTS. REVISED CONTAIN. CALC.	MV	PJB		10-28-94

HOYER–SCHLESINGER–TURNER, INC.
CONSULTING–ENGINEERS
300 WEST ADAMS STREET CHICAGO, ILLINOIS 60606
PROJECT NO. 17851

CHCI DWG. NO. 4215

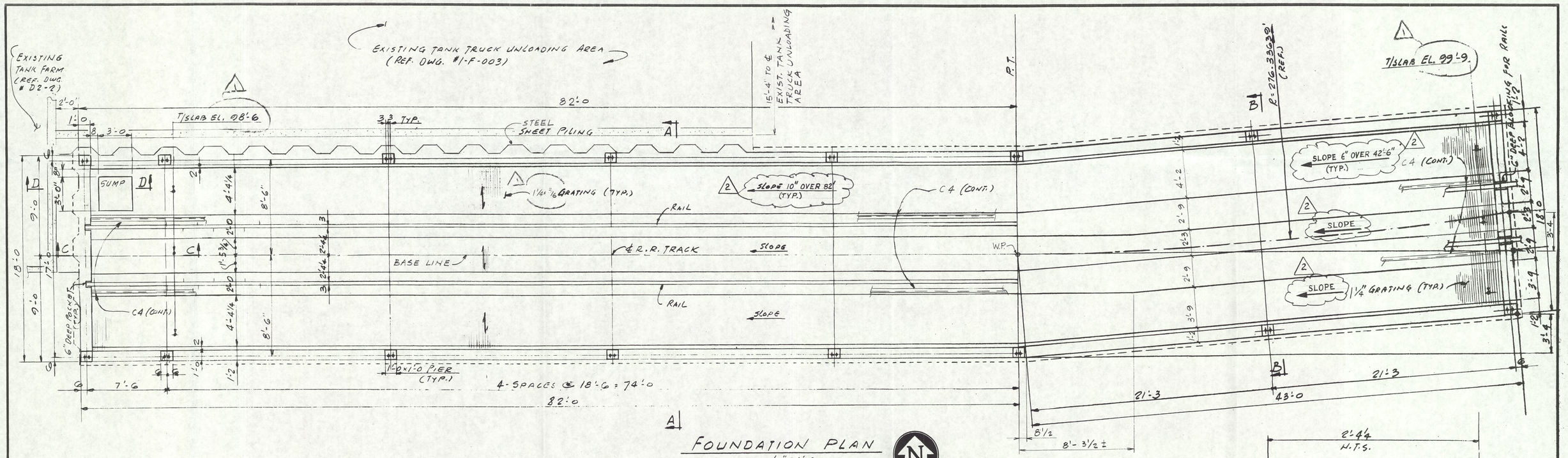
ISSUE	DESCRIPTION	DRWN	CHKD	APPR	DATE
B	ADDED: RCRA HAZ. WASTE CONT. REQUIREMENT - TRUCK UNLOADING PLATF. REFERENCE	K.M.C.	[illegible]	[illegible]	9/11/14
A	RCRA PART B MODIFICATIONS	I.N.S.			7/1/94

CleanHarbors
ENVIRONMENTAL ENGINEERING, INC.
325 Wood Road
Braintree, Massachusetts 02184
Telephone (617) 849-1200/1800

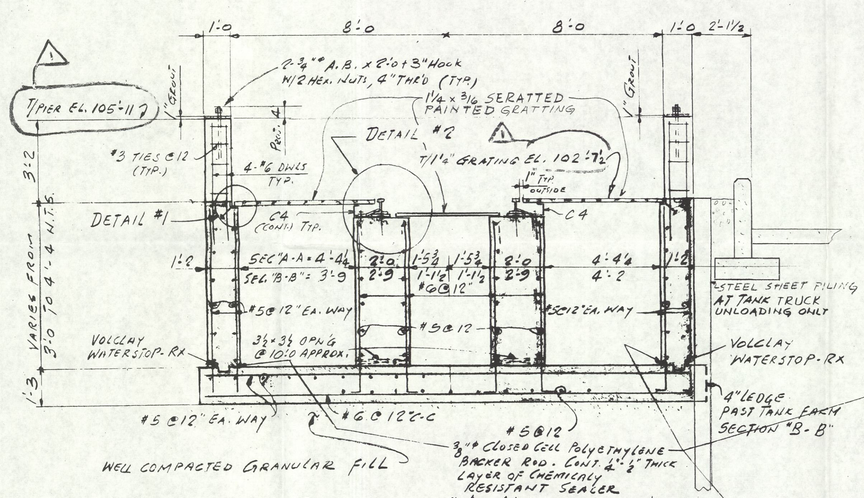
TITLE: CLEAN HARBORS OF CHICAGO, INC.
11800 S. STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617

MODIFIED FLAMMABLE STORAGE TANK FARM-UNIT #16
SHEET 1 OF 4

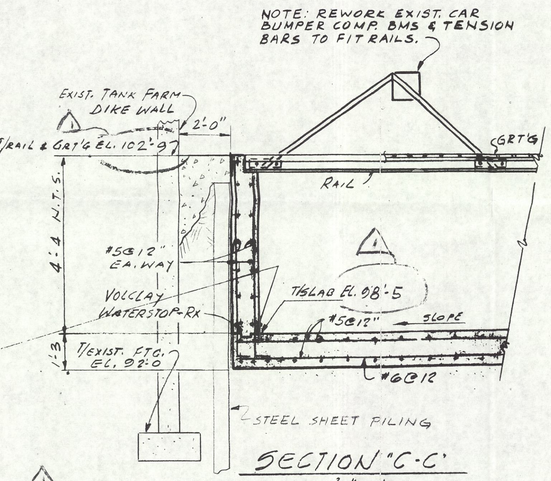
PROJECT NO. GW-5404
SCALE: AS NOTED
DRAWING NO. 5404-S-04/0



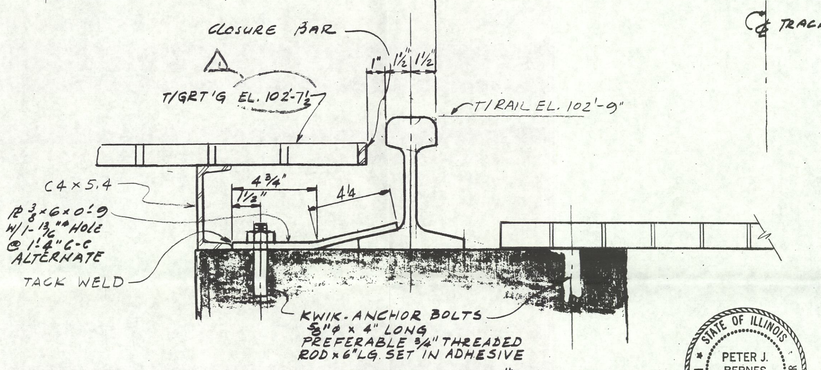
FOUNDATION PLAN
4" = 1'-0



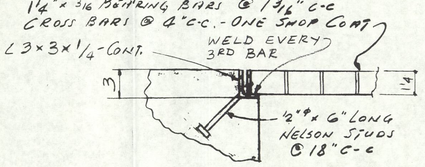
SECTION "A-A" (AS SHOWN & NOTED)
SECTION "B-B" (AS SHOWN & NOTED)
⅜" = 1'-0



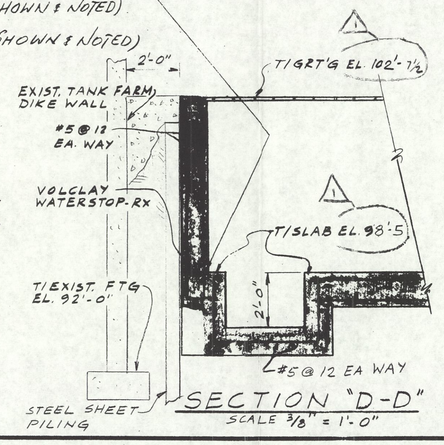
SECTION "C-C"
⅜" = 1'-0



DETAIL #2
SCALE 3" = 1'-0"



DETAIL #1
SCALE 1½" = 1'-0"



SECTION "D-D"
SCALE ⅜" = 1'-0"

SECONDARY CONTAINMENT CALCULATIONS

SECONDARY CONTAINMENT REQUIRED = 33,000 GAL (BY CLEAR HARBORS)

1. CALCULATE WEST END VOLUME

2(4.35')(.5)(3.83'+3.0')(81') = 2407 FT³ (OUTER SECTIONS)
(2.96')(.5)(3.83'+3.0')(81') = 819 " (CENTER SECTION)
(3.0')(3.0')(2.0') = 18 " (SUMP)
3244 FT³

2. CALCULATE EAST END VOLUME (42'-6")

(4.17')(.5)(3.0'+2.5')(42.5') = 487 FT³ (NORTH SECTIONS)
(2.25')(.5)(3.0'+2.5')(42.5') = 263 " (CENTER SECTION)
(3.75')(.5)(3.0'+2.5')(42.5') = 438 " (SOUTH SECTION)
1188 FT³

ΣTOTAL EAST & WEST = 3244 + 1188 = 4432 FT³

4432 FT³ x 7.48 GAL/FT³ = 33,151 GAL > 33,000 GAL. O.K.

NOTES:

1. ALL CONCRETE TO HAVE 4000 PSI COMPRESSIVE STRENGTH AT 28 DAYS AND SHALL BE AIR ENTRAINED, 3% TO 5%.
2. REINFORCING BARS SHALL BE GRADE 60 BILLET STEEL.
3. 2" COVERAGE FOR REINF. BARS EXPOSED TO WEATHER AND 3" COVERAGE AGAINST GROUND
4. COMPACT SOIL TO 2000 PSF CAPACITY
5. THE CONSTRUCTION OF TRACKS AND APPURTENANCES SHALL CONFORM TO THE BEST CONSTRUCTION PRACTICES AS PRESCRIBED BY THE MANUAL OF THE A.R.E.A.
6. ALL CONC. FOR CONTAINMENT SHALL BE COATED W/30 MILS PROTECTO-COAT AS MANUFACT. BY DUDICK INC.

ISSUE	DESCRIPTION	DRWN	CHKD	APPR	DATE
2	ADDED DIRECTION & RATE OF SLOPE	W.M.C.	[illegible]	[illegible]	1-30-04

HOYER-SCHLESINGER-TURNER, INC.
CONSULTING-ENGINEERS
300 WEST ADAMS STREET CHICAGO, ILLINOIS 60606
PROJECT NO. 17851

STATE OF ILLINOIS — PETER J. BERNES 3659 — LICENSED STRUCTURAL ENGINEER

Peter J. Bernes
PETER J. BERNES
LICENSED STRUCTURAL ENGINEER
ILLINOIS NO. 3659
MY LICENSE EXPIRES ON 11-30-94

CHCI DWG. NO. 4217

ISSUE	DESCRIPTION	DRWN	CHKD	APPR	DATE
1	AS BUILT	PJB			7-3-96
0	ISSUED FOR CONSTRUCTION	BERNES			1-17-96
	ISSUED FOR BIDS				
B	ISSUED FOR PERMIT	[illegible]			8-4-95
A	RCRA PART B MODIFICATONS	[illegible]			7/20/94

CleanHarbors
ENVIRONMENTAL ENGINEERING, INC.
325 Wood Road
Braintree, Massachusetts 02184
Telephone (617) 849-1820/1800

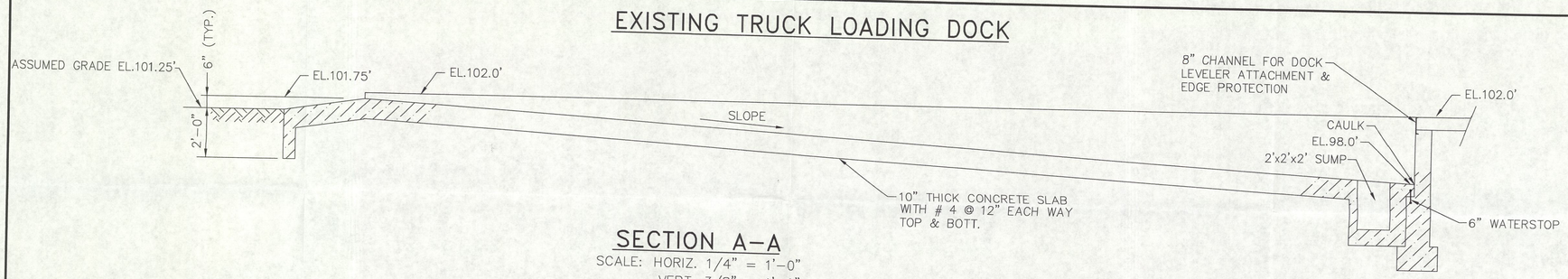
TITLE: CLEAN HARBORS OF CHICAGO, INC.
11800 S. STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617

FOUNDATION PLAN, SECTIONS & DETAILS FOR RAIL CAR UNLOADING AREA #13
SHEET 1 OF 3

PROJECT NO. GW-5404
SCALE: AS NOTED
DRAWING NO. 5404-S-01/1

REV. #	REVISION NOTES
C	REVISED CONTAINMENT CAPACITY
D	ADDED NOTE 6.
E	ADDED PROPOSED EXTENSION TO TRUCK SAMPLING PAD
F	WATERSTOP SHOWN

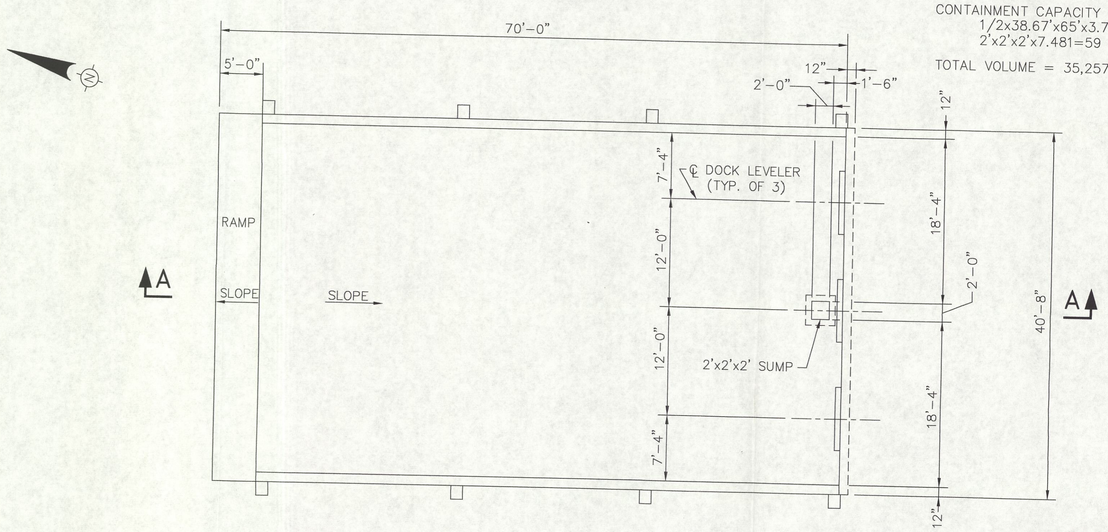
EXISTING TRUCK LOADING DOCK



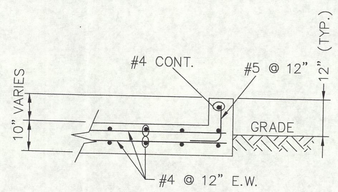
SECTION A–A
SCALE: HORIZ. 1/4" = 1'–0"
VERT. 3/8" = 1'–0"

CONTAINMENT CAPACITY =
1/2x38.67'x65'x3.75'x7.481=35,257 GALS.
2'x2'x2'x7.481=59 GALS.

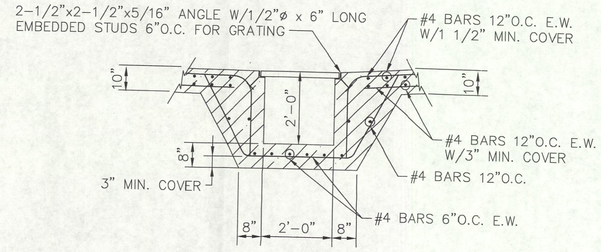
TOTAL VOLUME = 35,257+59=35,316 GALS.



PLAN
(EXISTING TRUCK LOADING DOCK)
SCALE: 1/8" = 1'–0"



SECTION B–B
SCALE: 1/2" = 1'–0"

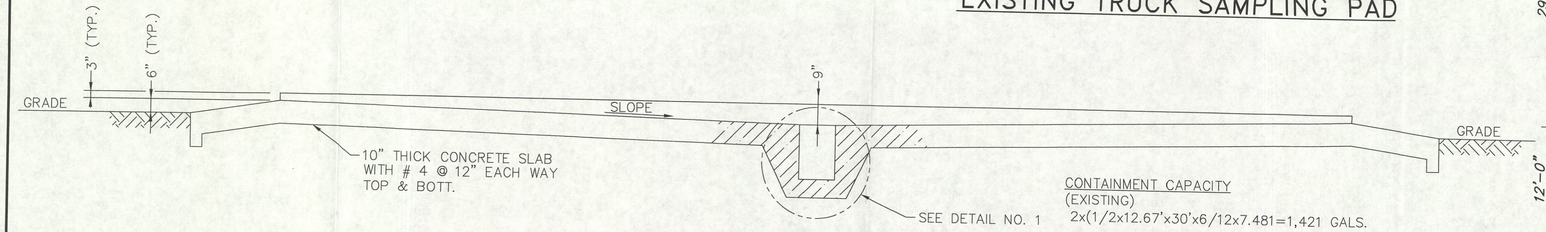


DETAIL NO. 1
SCALE: 1/2" = 1'–0"

NOTES:

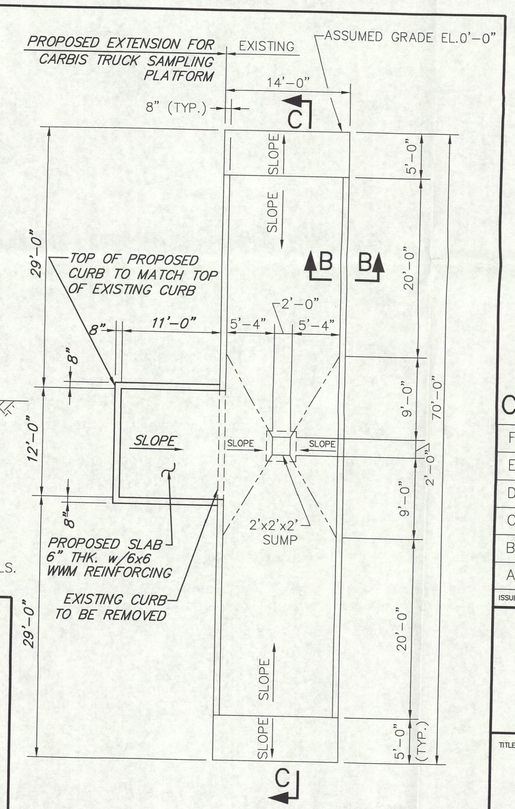
1. ALL CONCRETE AREAS TO BE COVERED WITH BURLAP AND KEPT CONTINUOUSLY MOIST FOR A MINIMUM PERIOD OF THREE DAYS IMMEDIATELY AFTER PLACEMENT AND FINISHING. CURING COMPOUNDS ARE NOT TO BE USED. CONCRETE TO BE FINISHED SUCH THAT EXCESS MORTAR IS NOT BROUGHT TO THE SURFACE. NO ADDED CEMENT, WATER IS TO BE USED DURING FINISHING.
2. TOP OF ALL EXPOSED CONCRETE WALL/CURB POURS TO BE FINISHED PERFECTLY LEVEL FOR PROPER ARCHITECTURAL APPEARANCE. CHAMFER ON ALL RE–ENTRANT CORNERS IS REQUIRED.
3. SUMPS TO BE TESTED BY CONTRACTOR WITH WATER AT FULL HEIGHT FOR A PERIOD OF 24 HOURS AND NO LEAKAGE ALLOWED.
4. ALL CONCRETE MIXING AND PLACING SHALL CONFORM TO THE REQUIREMENT OF ACI 301–89 "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS" AND ACI 318–89 "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE".
5. ALL CONCRETE FOR CONTAINMENT AREAS INCLUDING CONCRETE FOR SLABS AND DIKES SHALL BE IMPERMEABLE CONCRETE WITH ABSOLUTE MINIMUM CRACKING DUE TO SHINKAGE, THE MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS TO BE F'c=4000 psi.
6. THIS AREA WILL ALSO BE USED FOR THE MANAGEMENT AND STORAGE OF COMPRESSED GAS WASTES.

EXISTING TRUCK SAMPLING PAD



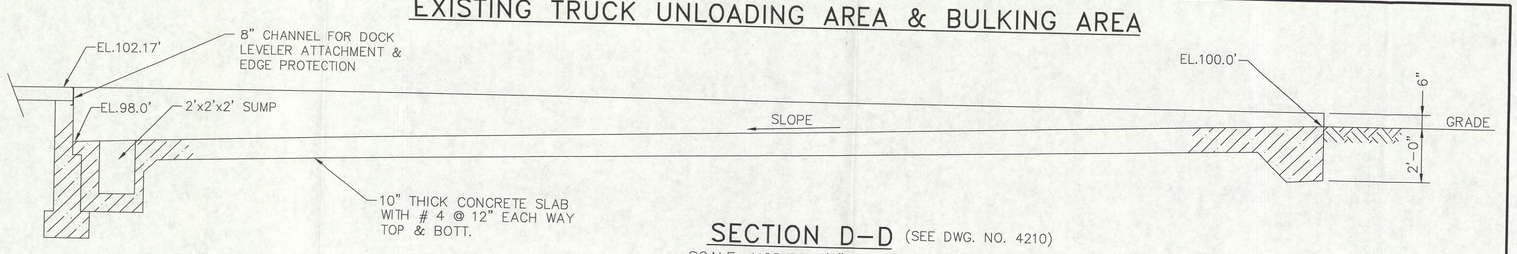
SECTION C–C
SCALE: HORIZ. 1/4" = 1'–0"
VERT. 3/8" = 1'–0"

CONTAINMENT CAPACITY
(EXISTING)
2x(1/2x12.67'x30'x6/12x7.481=1,421 GALS.
(PROPOSED)
TRIANGULAR AREA = 1/2x11.67'x12'x2/12x7.481=87.5 GALS.
RECTANGULAR AREA = 11.67'x12'x2/12x7.481=175 GALS.
TOTAL CONTAINMENT CAPACITY = 1,421+87.5+175=1,683.5 GALS.



PLAN
(TRUCK SAMPLING PAD)
SCALE: 1/8" = 1'–0"

EXISTING TRUCK UNLOADING AREA & BULKING AREA



SECTION D–D (SEE DWG. NO. 4210)
SCALE: HORIZ. 1/4" = 1'–0"
VERT. 3/8" = 1'–0"

CHSI DWG. NO. 4234

ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
F	SEE REVISION NOTE F	K.M.C.	A.M.L.	A.M.L.	1/30/04
E	SEE REVISION NOTE E	K.M.C.	A.M.L.	A.M.L.	8/12/98
D	SEE REVISION NOTE D	K.M.C.	——	——	8/28/95
C	SEE REVISION NOTE C	K.M.C.	A.M.L.	A.M.L.	1/17/95
B	RCRA PART B MODIFICATION	K.M.C.	B.H.P.	B.H.P.	7/20/94
A	RCRA PART B SUBMITTAL	K.M.C.	B.H.P.	B.H.P.	2/14/92

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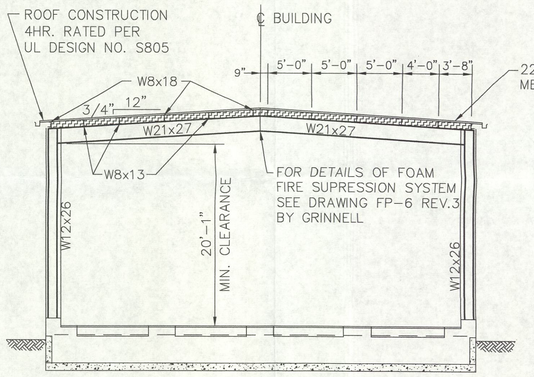
TITLE
CLEAN HARBORS SERVICES, INC.
11800 S. STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617

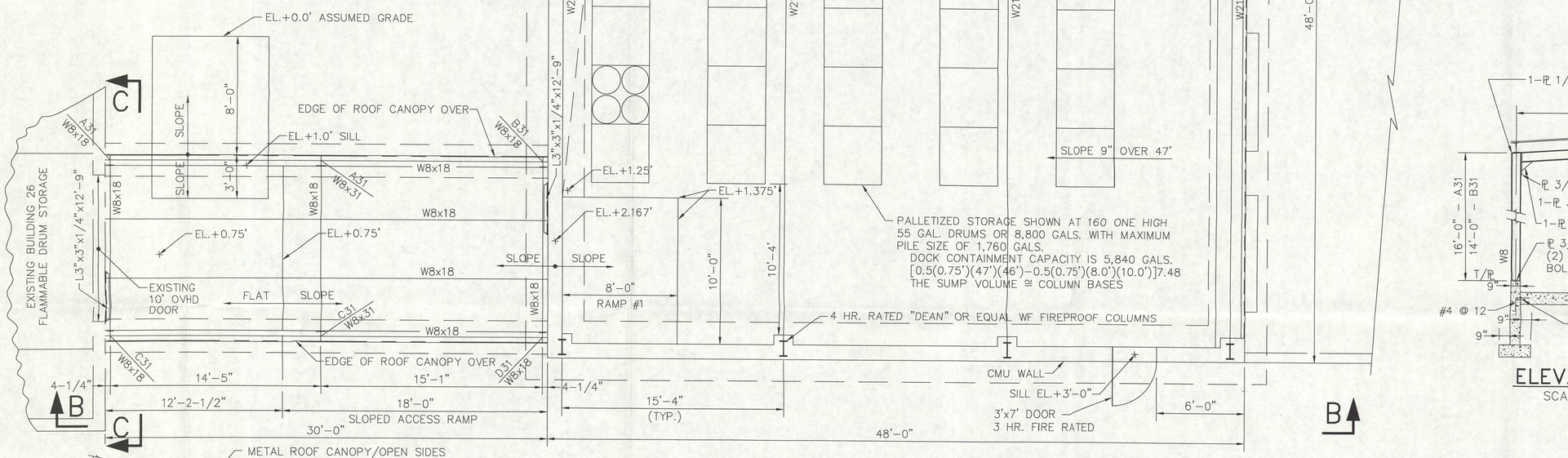
TRUCK LOADING DOCK & TRUCK SAMPLING PAD DETAILS

PROJECT NO. CH114630
SCALE AS NOTED
DRAWING NO. 2916–S–10



ELEVATION A-A

SCALE: 1/8"=1'-0"



PLAN VIEW

SCALE: 1/4"=1'-0"

CONTAINMENT:

REQUIRED:

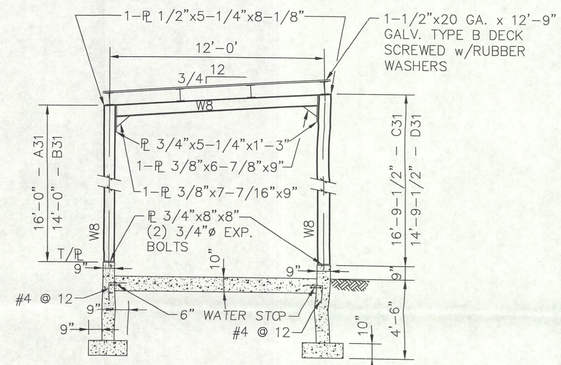
46'x47'x6"/12 = 1,081 FT.^{3} = 8,086 GALS.

AVAILABLE:

FLOOR:	46'x47'x9"/12x1/2	= 810.75	
	46'x47'x2"/12	= 360.33	
SUMP:	2'x2'x4"	= 16.00	
		1,187.08	1,187.08
SUBTRAC:	RAMP#1: 1/2x8'x10'x11"/12	=	37.67
	TOTAL	=	1,149.41

NOTES:

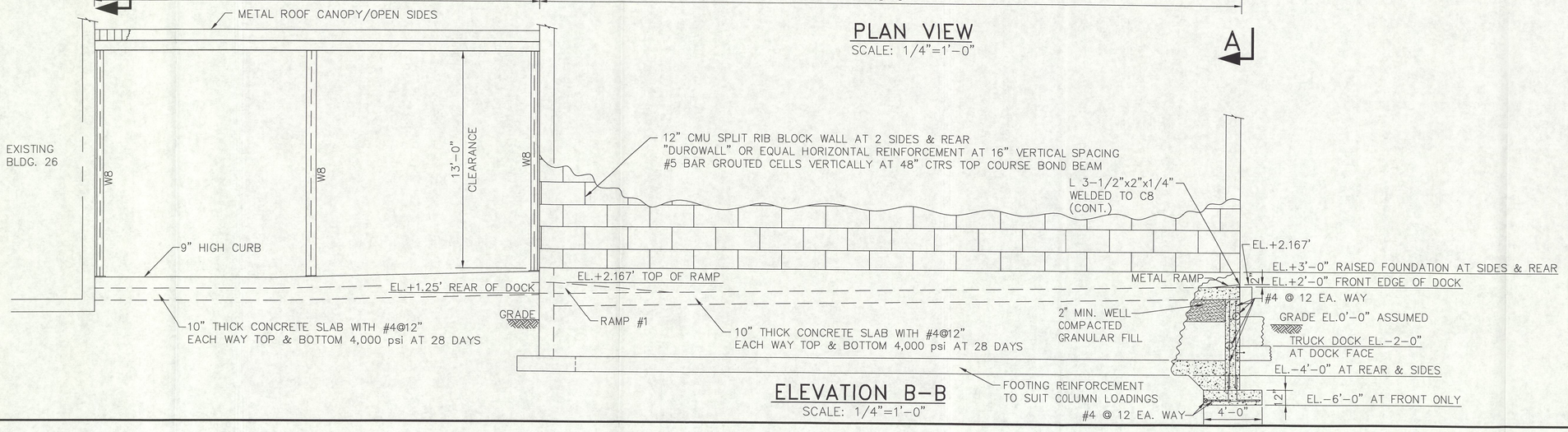
1. ALL JOINTS BETWEEN FLOORS AND WALLS TO BE CONTINUOUSLY WATER STOPPED AND CAULKED.
2. ALL CONCRETE TO HAVE 4,000 psi COMPRESSIVE STRENGTH AT 28 DAYS.
3. BUILDING FLOOR INCLUDING CONTAINMENT SURFACES TO BE COVERED WITH 1/4" THICK VINYL ESTER BASED FLOOR TOPPING SYSTEM PROTECTO-CRETE BY DUDICK INC. OR EQUAL.
4. ALL STRUCTURAL STEEL TO RECEIVE ONE SHOP COAT OF RED OXIDE PRIMER.
5. STEEL FABRICATOR TO VERIFY ANCHOR BOLT LOCATION FOR COLUMNS IN FIELD PRIOR STEEL FABRICATION.
6. FLOOR SHALL BE COATED WITH 1/4" OF PROTECTO CRETE 900 & DIKE WALLS SHALL BE COATED WITH PROTECTO COAT 900 AS MANUFACTURED BY DUDICK INC.
7. THIS AREA WILL ALSO BE USED FOR THE MANAGEMENT AND STORAGE OF COMPRESSED GAS WASTE.



ELEVATION C-C

SCALE: 1/4"=1'-0"

CHSI DWG. NO. 4245



ELEVATION B-B

SCALE: 1/4"=1'-0"

ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
3	HAND DWG. TO CADD DWG. ADDED FLOOR SLOPE & ELEVATIONS	K.M.C.	A.M.L.	A.M.L.	1/30/04
2	ADDED NOTE 7	K.M.C.			8/28/95
1	AS BUILT	M.V.	P.J.B.		6/30/95
0	ISSUED FOR CONSTRUCTION ADDED SETION C-C, CHANGED STEEL SIZES	M.V.	P.J.B.		1/27/95
C	ISSUED FOR PERMIT-BLDG	M.V.	P.J.B.		1/24/95
B	ISSUED FOR PERMIT	P.T.W.	P.B.		8/23/94
A	RCRA PART B MODIFICATION	P.T.W.	P.T.W.	P.T.W.	7/20/94

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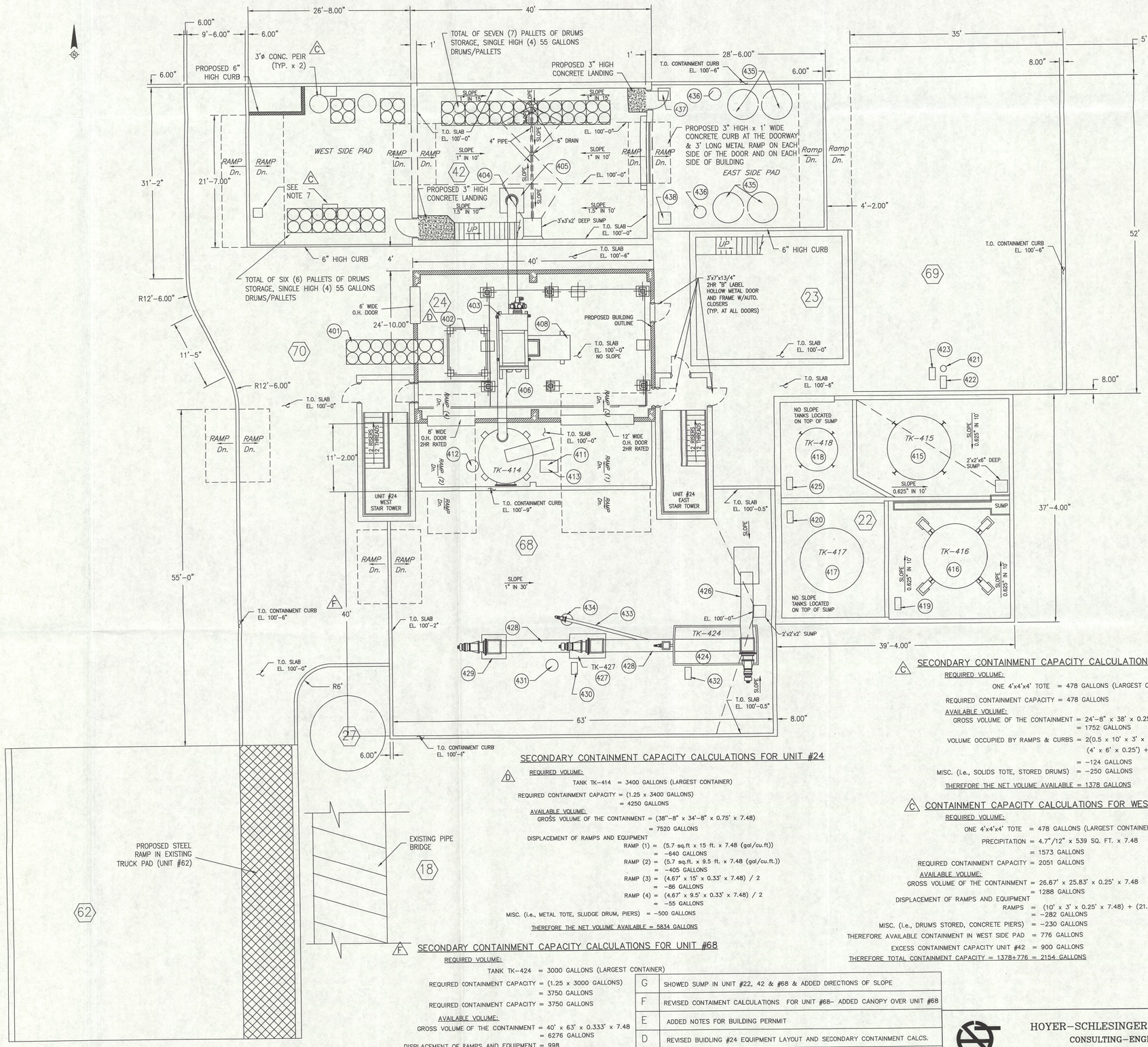
Telephone (781) 849-1800

TITLE

CLEAN HARBORS SERVICES, INC.
11800 S. STONY ISLAND AVENUE
CHICAGO, ILLINOIS 60617

UNIT #61
CONTAINER HANDLING DOCK

PROJECT NO.	CH114630	DRAWING NO.	2916-S-12
SCALE	AS NOTED		



ITEM NO.	QTY.	DESCRIPTION
401	1	DRUM FEED ROLLER CONVEYOR
402	1	DRUM LIFT
403	1	DUAL SHREDDER PACKAGE UNIT CONTAINING AIRLOCK CHAMBER, DRUM RAM, PRIMARY SHREDDER WITH HYDRAULIC RAM, SECONDARY SHREDDER AND ROTARY MAGNET
404	1	NON-DISPERSABLE SOLIDS AUGER
405	1	4'x4' NON-DISPERSABLE SOLIDS COLLECTION HOPPER W/SCISSOR LIFT OR EQUAL
406	1	DISPERSABLE LIQUIDS/SOLIDS AUGER
407	1	4'x4' DEBRIS COLLECTION TOTE/HOPPER W/SCISSOR LIFT OR EQUAL
408	1	VIBRATORY SHAKER SCREEN-MODEL KDSNBD-36-HDDT
409	1	SLUDGE COLLECTION DRUM W/SCISSOR LIFT OR EQUAL
410	1	METAL COLLECTION DRUM W/SCISSOR LIFT OR EQUAL
411	1	200 GPM POSITIVE DISPLACEMENT PUMP
412	1	NON-DISPERSABLE DEBRIS COLLECTION DRUM
413	1	200 GPM GRINDER PUMP
414	1	3400 GALLONS HYDRAPULPER TK-414
415	1	10,000 GALLONS BLENDED WASTE STORAGE TANK TK-415
416	1	10,000 GALLONS BLENDED WASTE STORAGE TANK TK-416
417	1	15,000 GALS. DILUENT WASTE STORAGE TANK TK-417
418	1	6,000 GALS. METAL WASH SOLVENT TANK TK-418
419	1	150 GPM BLENDED WASTE TRANSFER PUMP
420	1	150 GPM DILUENT FEED/TRANSFER PUMP
421	1	INLINE STRAINER
422	1	200 GPM RECEIVING PUMP
423	1	DRUM WASTE CONSOLIDATION PUMP
424	1	3,000 GALS. METAL WASH TANK TK-424
425	1	100 GPM METAL WASH SOLVENT FEED PUMP
426	1	METAL WASH METAL FEED AUGER
427	1	950 GALS. RINSE TANK TK-427
428	2	METAL TRANSFER AUGERS
429	1	4'x4' WASHED METAL COLLECTION TOTE W/SCISSOR LIFT OR EQUAL
430	1	50 GPM RINSATE TRANSFER PUMP
431	1	RINSATE COLLECTION DRUM
432	1	150 GPM SPENT SOLVENT - TRANSFER PUMP
433	1	SLUDGE TRANSFER AUGER
434	1	SLUDGE COLLECTION DRUM W/SCISSOR LIFT OR EQUAL
435	4	1800 lbs. GRANULATED ACTIVATED CARBON VESSELS
436	2	KNOCK-OUT DRUMS
437	1	300 SCFM BLOWER
438	1	200 SCFM BLOWER
439	1	150 GPM DILUENT FEED/TRANSFER PUMP LOCATED IN EXISTING TANK FARM (SEE CHSI. DWG. NO 4293)

NOTES:

1. BUILDING #42 AND THE TWO ADJOINING CONCRETE PADS ARE EXISTING.
2. WEST END CONCRETE PAD AND THE BUILDING FLOOR WILL BE SEALED AS NECESSARY AND COATED WITH PROTECTO-CRETE 900, TROWEL APPLIED VINYL ESTER COATING, AS MANUFACTURED BY DUDICK, INC. OR EQUIVALENT.
3. STORAGE AREAS WILL BE USED FOR THE STORAGE OF CONTAINERS LIKE FLEX BINS AND 55 GALLON DRUMS.
4. ITEM NO.S 409 & 410 ARE NOT SHOWN. THEY ARE LOCATED UNDER ITEM NO. 408
5. ITEM NO. 407 IS NOT SHOWN IT IS LOCATED UNDERNEATH ITEM NO. 403
6. CONTAINMENT CAPACITY CALCULATIONS:
   UNIT #69 SEE CHSI DWG. NO. 4292
   UNIT #22 SEE CHSI DWG. NO. 4291
7. (C) REMOVE EXISTING PIPE RACK CONCRETE PIERS TO BE RELOCATED AS SHOWN

SECONDARY CONTAINMENT CAPACITY CALCULATIONS FOR UNIT #24

(D)

REQUIRED VOLUME:

TANK TK-414 = 3400 GALLONS (LARGEST CONTAINER)

REQUIRED CONTAINMENT CAPACITY = (1.25 x 3400 GALLONS)
= 4250 GALLONS

AVAILABLE VOLUME:

GROSS VOLUME OF THE CONTAINMENT = (38'-8" x 34'-8" x 0.75' x 7.48)
= 7520 GALLONS

DISPLACEMENT OF RAMPS AND EQUIPMENT

RAMP (1) = (5.7 sq.ft x 15 ft. x 7.48 (gal/cu.ft))
= -640 GALLONS

RAMP (2) = (5.7 sq.ft. x 9.5 ft. x 7.48 (gal/cu.ft.))
= -405 GALLONS

RAMP (3) = (4.67" x 15' x 0.33' x 7.48) / 2
= -86 GALLONS

RAMP (4) = (4.67" x 9.5' x 0.33' x 7.48) / 2
= -55 GALLONS

MISC. (i.e., METAL TOTE, SLUDGE DRUM, PIERS) = -500 GALLONS

THEREFORE THE NET VOLUME AVAILABLE = 5834 GALLONS

SECONDARY CONTAINMENT CAPACITY CALCULATIONS FOR UNIT #68

(F)

REQUIRED VOLUME:

TANK TK-424 = 3000 GALLONS (LARGEST CONTAINER)

REQUIRED CONTAINMENT CAPACITY = (1.25 x 3000 GALLONS)
= 3750 GALLONS

REQUIRED CONTAINMENT CAPACITY = 3750 GALLONS

AVAILABLE VOLUME:

GROSS VOLUME OF THE CONTAINMENT = 40' x 63' x 0.333' x 7.48
= 6276 GALLONS

DISPLACEMENT OF RAMPS AND EQUIPMENT = 998

THEREFORE THE NET VOLUME AVAILABLE = 5278 GALLONS

SECONDARY CONTAINMENT CAPACITY CALCULATIONS FOR UNIT #42

(C)

REQUIRED VOLUME:

ONE 4'x4'x4' TOTE = 478 GALLONS (LARGEST CONTAINER)

REQUIRED CONTAINMENT CAPACITY = 478 GALLONS

AVAILABLE VOLUME:

GROSS VOLUME OF THE CONTAINMENT = 24'-8" x 38' x 0.25' x 7.48
= 1752 GALLONS

VOLUME OCCUPIED BY RAMPS & CURBS = 2(0.5 x 10' x 3' x 0.25') +
(4' x 6' x 0.25') + (4' x 3' x 0.25') x (7.48)
= -124 GALLONS

MISC. (i.e., SOLIDS TOTE, STORED DRUMS) = -250 GALLONS

THEREFORE THE NET VOLUME AVAILABLE = 1378 GALLONS

CONTAINMENT CAPACITY CALCULATIONS FOR WEST SIDE PAD

(C)

REQUIRED VOLUME:

ONE 4'x4'x4' TOTE = 478 GALLONS (LARGEST CONTAINER)

PRECIPITATION = 4.7"/12" x 539 SQ. FT. x 7.48
= 1573 GALLONS

REQUIRED CONTAINMENT CAPACITY = 2051 GALLONS

AVAILABLE VOLUME:

GROSS VOLUME OF THE CONTAINMENT = 26.67' x 25.83' x 0.25' x 7.48
= 1288 GALLONS

DISPLACEMENT OF RAMPS AND EQUIPMENT

RAMPS = (10' x 3' x 0.25' x 7.48) + (21.25' x 5.67' x 0.25' x 7.48)
= -282 GALLONS

MISC. (i.e., DRUMS STORED, CONCRETE PIERS) = -230 GALLONS

THEREFORE AVAILABLE CONTAINMENT IN WEST SIDE PAD = 776 GALLONS

EXCESS CONTAINMENT CAPACITY UNIT #42 = 900 GALLONS

THEREFORE TOTAL CONTAINMENT CAPACITY = 1378+776 = 2154 GALLONS

REV.	DESCRIPTION
G	SHOWED SUMP IN UNIT #22, 42 & #68 & ADDED DIRECTIONS OF SLOPE
F	REVISED CONTAIMENT CALCULATIONS FOR UNIT #68- ADDED CANOPY OVER UNIT #68
E	ADDED NOTES FOR BUILDING PERNMIT
D	REVISED BUIDLING #24 EQUIPMENT LAYOUT AND SECONDARY CONTAINMENT CALCS.
C	ADDED NOTE 7, REVISED SECONDARY CONTAINMENT CALCULATIONS

HOYER-SCHLESINGER-TURNER, INC.
CONSULTING-ENGINEERS
300 WEST ADAMS STREET CHICAGO, ILLINOIS 60606
PROJECT 1785-2

CHSI DWG. NO. 4287

ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
G	SEE REVISION NOTE G	K.M.C.	A.M.L.	A.M.L.	1/30/04
F	RCRA PERMIT	A.A.A.			8/23/01
E	BUILDING PERMIT SUBMITTAL	A.A.A.	A.M.L.	A.M.L.	5/10/01
D	RCRA PERMIT	A.A.A.	A.M.L.		03/12/01
C	RCRA PERMIT	A.A.A.	A.M.L.		08/29/00
B	RCRA PERMIT	A.A.A.	A.M.L.		02/10/00
A	RCRA PERMIT	A.A.A.	A.M.L.		01/18/00

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TITLE:
CLEAN HARBORS SERVICES, INC.
11800 S. STONY ISLAND AVE.
CHICAGO, ILLINOIS 60617
SHREDDING PROCESS
EQUIPMENT LAYOUT

PROJECT NO. CH114630
SCALE 1/8"=1'-0"
DRAWING NO. 4630-M-17