09-32-293456

6/1/92

La Crosse - WI
WCR0123
6-1-92

PROJECT DOCUMENTATION
UST SITE ASSESSMENT

DESMOND'S FORMAL WEAR
2338 COMMERCE STREET
LA CROSSE, WISCONSIN

Prepared by:

MIDWEST ENVIRONMENTAL MANAGEMENT COMPANY
123 North 4th Street, Suite 303
La Crosse, WI. 54602-3143
(608) 784-5688

Date: 8/5/92

Project Manager: Todd L. Schini, B.S.
Earth Sciences

nfa only 1/7/93

SITE ASSESSMENT
REMOVAL OF UNDERGROUND STORAGE TANK

For
DESMOND'S FORMAL WEAR
2338 COMMERCE STREET
LA CROSSE, WISCONSIN

1.0 Background

1.1 Midwest Environmental Management Company (MEMCo.) was hired by Mr. Deak Swanson to perform an underground storage tank (UST) removal and site assessment for the above referenced site. Swanson Construction was the contractor hired by Desmond's to remove the UST for this project. Concerned Parties involved in this project are as follows:

Responsible Party:
Desmond's Formal Wear
2338 Commerce Street
La Crosse, Wisconsin

Tank Excavator/Cleaner/Disposer:
Swanson Construction
2850 Hemstock Drive
La Crosse, WI. 54601

Waste Hauler:
Bill's Pumping Service
106 East Clinton St.
La Crosse, WI 54601

Environmental Consultant:
Midwest Environmental Management Company
123 North 4th Street, Suite 303
La Crosse, WI. 54601

1.2 The scope of services for this project involved removal of (1) 2, 000 gallon unleaded gasoline UST located on the East side of the property, and the related system piping located directly on top of the UST.

1.3 Notification was sent to the La Crosse Fire Department, Deputy Chief Storey, as the local DILHR Representative prior to the start of the project.

1.4 A Site Safety Plan was developed for this project and is attached as an enclosure to this site closure assessment. This plan was used during the course of this project as a working document for the contractor performing the work and MEM, Co. in relation to the safety and health hazards and prevention guidelines for work involving UST purging, testing, removal, cleaning and disposal.

1.5 Site Information: The topography of this site is fairly flat with surface water drainage running to the west southwest. Ground water is estimated to be at 40 to 50 feet. The soils in this area consist of medium to course well drained sands. The installation date of the tank being removed is known to be 1989 and the fill is clean sand. The tank appears to be constructed of coated steel. The water supply for this site is from city municipal wells and the nearest city well is located two miles away.

2.0 Field Observations/Data

6/01/92 Conditions were sunny, 80 degrees F, with no wind. Swanson Construction mobilized their equipment to the job site and began excavation of the UST. All piping runs to the gasoline tank were exposed as well as the vent line. The pump island is on top of the tank. There are four observation wells around the site which were installed to observe leakage from the tank. These wells were installed at the same time as the tank. All system piping was drained into buckets and placed back into the UST for removal by Bill's Pumping Service. The (1) 2,000 gallon UST was tilted slightly to allow product to settle in the most accessible end for pumping and cleaning. Bill's Pumping Service removed the remaining free product from inside the tank. At this time the tank was purged with dry ice. Todd Schini with MEMCo. checked the purge with an MSA Explosimeter, Model 5, to determine if vapor levels were well below the LEL for methane (see enclosed log). An acceptable purge was verified below 4% of the LEL by MEMCo. At this time the tank was removed.

There was no evidence of any holes in the UST. Samples were collected below the UST at the East and West sides by MEMCo personell. There was no sampling from the pump island because the pump island was located on top of the tank. Any contamination due to the pump island would be discovered at the side of the tank. See Laboratory Sample Chain of Custody and enclosed Hnu Log form.

Conclusions / Recommendations

A total of (1) 2,000 gallon gasoline UST, and the related pump island and piping were removed from the site. The tank removed from this site appeared to be in very good condition. Based on the laboratory results as well as field screening there is a very low concentration of petroleum contamination at this site, well below the 10 ppm critical condition. This site is recommended for closure.

Soil Sampling Protocol:

All soil samples were collected using a stainless steel trowel which was decontaminated between sampling with laboratory cleaner (alconox). Headspace samples were collected by filling a mason jar half full of soil with a stainless steel trowel. The top of the jar was covered with aluminum foil, then sealed and the jar allowed to stabilize to 70 degrees F. The Hnu probe (10.2 ev) is then inserted into the middle of the headspace region of the jar for a reading in ppm for petroleum product. The Hnu is calibrated before each weeks use with a cylinder of Hnu Span gas consisting of Isobutylene. A regulator is used to step down pressure and this gas is fed into the probe. The span adjustment is set with the instrument fan running and set to the most sensitive range (see Hnu Logs for calibration data specifics).

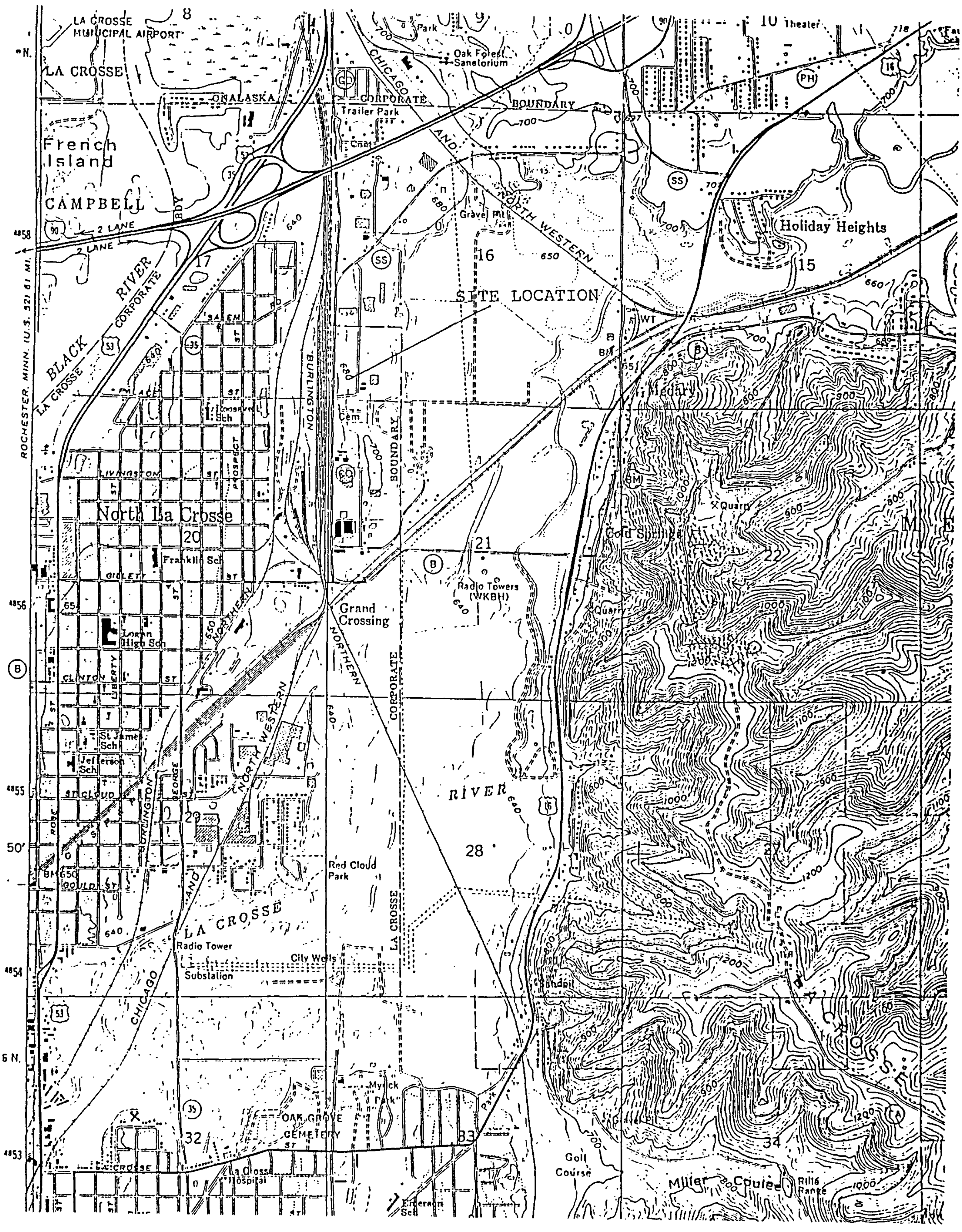
The combustible gas detector was calibrated in a similar manner using MSA methane gas and a rubber gas chamber for introduction into the instrument (see combustible gas detector logs for specific calibration data).

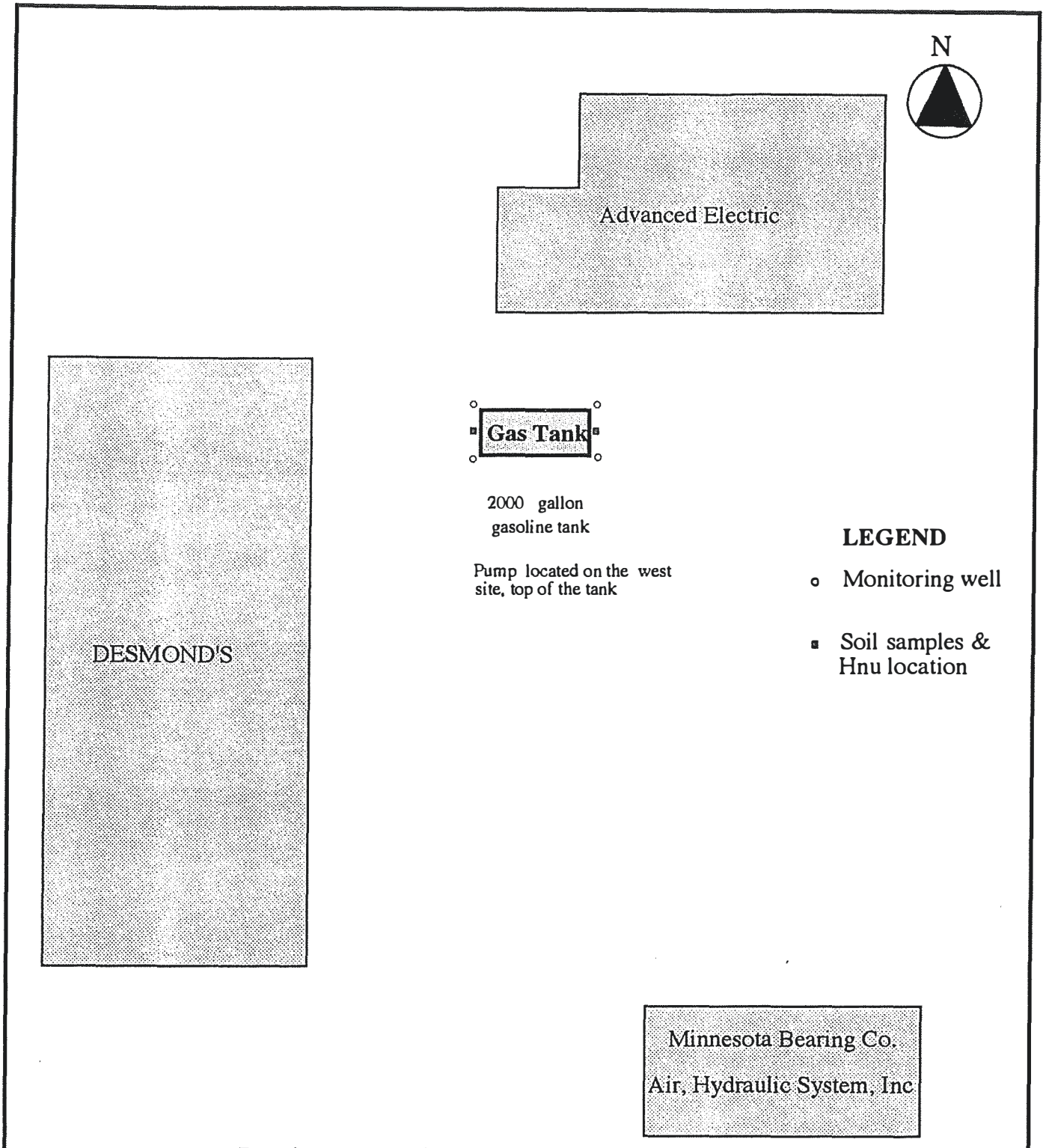
All TPH & BETX soils samples were placed in 100 ml graduated glass screw capped bottles with teflon inserts inside of screw caps. Samples were stored in an ice chest and shipped to a laboratory with containerized ice packs. See State of Wisconsin accreditation number for Davy Laboratory on enclosed laboratory report.

Disposal of Tank

The UST removed from this site was opened and cleaned by Swanson Construction. The tank was marked with identification of the job site, tank contents and shipped via flatbed trailer to the

Swanson Construction yard in La Crosse, WI., by Swanson Construction. There it was dismantled and shipped out and sold as scrap metal.


LA CROSSE MUNICIPAL AIRPORT
LA CROSSE
ONALASKA
CORPORATE
BOUNDARY
French Island
CAMPBELL
Trailer Park
Oak Forest Sanatorium
Theater
Holiday Heights
SITE LOCATION
Gravel Pit
CHICAGO AND NORTH WESTERN
BLACK RIVER
LA CROSSE CORPORATE
BURLINGTON
North La Crosse
Franklin Sch
Logan High Sch
Medary
Cold Springs
Quarry
Grand Crossing
Radio Towers (WKBH)
NORTHERN
St James Sch
Jefferson Sch
RIVER
LA CROSSE
Red Cloud Park
Radio Tower
City Wells
Substation
Sandpit
OAK GROVE CEMETERY
Myrick Park
La Crosse Hospital
Emerson Sch
Golf Course
Miller Coulee
Rifle Range
ROCHESTER, MINN. (U.S. 52) 61 MI.



Drawing not to scale

Midwest Environmental Management, Co.

DESMOND'S, 2338 Commerce St.
LA CROSSE, WISCONSIN

SITE LAYOUT AND LOCATION OF REMOVED UST & Hnu LOCATION

Midwest Environmental Management, Co.

UST Field Log Form

Facility ID: DESMOND Proj. No: N/A

Collected By: QUAN LI Date Collected: JUNE 1, 1992

Submitted To: DAVY LAB Date Submitted: JUNE 15,1992

Type of Sample: SOIL Submitted By: QUAN LI

Sample Number	Hnu Reading	Lab Results	Sample Type	Location & Description of Sample
East/Tank	0.2 ppm	1.86 ppm	GRO	East side of the tank
West/Tank	0.01ppm	2.09 ppm	GRO	West side of the tank

123 North 4th Street, Suite 303, La Crosse, WI. 54601 - (608) 784-5688 - Fax (608) 791-1021

DAVY LABORATORIES

115 South 6th Street
P.O. Box 2076
La Crosse WI 54602-2076
(608) 782-3130
FAX: (608) 784-6611

Division of Davy Engineering Co.

Midwest Environmental Management, Co.
123 North 4th Suite 303
La Crosse, Wisconsin 54602-3143

June 15, 1992
Project No. Desmonds
Client No. 12803

Attn: Mr. Quan Li

INTRODUCTION:

Two soil samples were received on June 1, 1992. The client requests that the samples be analyzed for Wisconsin Method Gasoline Range Organics (WMGRO).

SAMPLE IDENTIFICATION:

The samples were collected on June 1, 192 by Quan Li at Desmonds, 2338 Commerce Street, La Crosse, Wisconsin. The samples were delivered to the laboratory on June 1, 1992 by the client. Upon the arrival at the laboratory, the samples were given the following identification numbers:

Davy Lab Number	Sample Site
23172	East of Tank
23173	West of Tank
23174	Methanol Blank

METHODOLOGY:

The samples were analyzed according to the Wisconsin Department of Natural Resources modified GRO Method.

GASOLINE RANGE ORGANICS (GRO) -

The 25 g samples were analyzed for WM gasoline range organics (WMGRO) by preserving in the field with 25 ml of methanol. Each sample is then extracted for 20 minutes using a sonic bath. A portion of the extract was then injected into 5-ml organic free water. Each sample was then purged for 11-minutes and dry purged for 12-minutes using helium as the carrier gas.

Following the purge cycle, each sample was desorbed into a Perkin-Elmer Sigma 2B GC equipped with a FID detector. A ten component standard was used to determine the range and to quantitate the sample response. Quantitation was based on the total area of the sample response falling between the first and last eluting compounds of the ten component standard.

RESULTS:

The results of the analysis for Gasoline Range Organics (GRO) are given on the next page:

SAMPLE NO.	SAMPLE SITE	GRO (mg/kg)	DATE EXTRACTED	DATE ANALYZED
23172	East/Tank	1.86 (a)	060292	061092
23173	West/Tank	2.09 (a)	060292	061092
23174	Blank	ND	—	061092

a = calculated on a dry weight basis
ND = Not Detected

Minimum Detection Limit = Soil - GRO = 1 mg/kg

DAVY LABORATORIES

115 South 6th Street
P.O. Box 2076
La Crosse WI 54602-2076
(608) 782-3130
FAX: (608) 784-6611

Division of Davy Engineering Co.

Submitted by:

DAVY LABORATORIES

Paul A. Harris, Director

The laboratory analysis reported were determined in accordance with current methodology. The results are only representative of the samples received; conditions can be expected to vary at different times and under different sampling conditions.

DAVY LABORATORIES
115 South Sixth Street
P.O. Box 2076
La Crosse, Wisconsin 54602-2076
(608) 782-3130 FAX (608)784-6611

CHAIN OF CUSTODY REPORT FORM

DAVY LABORATORIES

SAMPLE COLLECTOR(S) (Print)	SAMPLE COLLECTOR(S) (Signature)	Telephone Number (include area code)
QUINN LI	Quinn Li	
CLIENT	**CLIENT ADDRESS**	**City, State, Zip Code**
MEM Co.	123 N 4th St. Suite 303	LA CROSSE, WI 54601

I hereby certify that I received, properly handled, and disposed of these samples as noted below:

Relinquished By (signature)	Date/Time	Received by (Signature)
Quinn Li	4:30 / 6-1-92	Quinn Li
Relinquished By (signature)	Date/Time	Received by (Signature)
Relinquished By (signature)	Date/Time	Received for Laboratory by (Signature)
		DATE/TIME 6-1-92 (16:30)

Purchase Order Number: DESMONDS

Temperature ~~of Temperature Blank~~* cold

NOTE: SHADED AREAS FOR LAB USE ONLY!

*If Samples were received on ice, and there was ice remaining, you may report the temperature as "Received on ice". If all of the ice was melted, the temperature of the melt may be substituted for a temperature blank.

Field I.D. Number	Date Collected	Time Collected	Sample Type [1]	Preserv. Type [2]	SAMPLE Description/Parameters (see footnote)[3]	SAMPLE CONDITION: Lab ID Number	No./Type of Containers	Cracked/ Broken?	Improperly Sealed?	Good Condition?	Other Comments?[4]
EAST 160	6-1-92	4:00 PM	S		GRO EAST of the Tank	23172	3 glass jars				This jar (160) arrived leaking
~~161~~	"		~~S~~		GRO "		2 40 ml vials			✓	
162	"	"	S		GRO "						
~~165~~	~~6-1-92~~	~~4:05~~	~~S~~		GRO WEST of Tank		"			✓	
WEST 153	"	"	S		GRO WEST of Tank	23173					
156	"	"	S		GRO						
					Trip Blank	23174					

[1]Specify groundwater (GW), surface water (SW), soil (S), leachate (L), sludge (SL), Wastewater Effluent (WWE), Wastewater Influent (WWI), Drinking Water (DW), Other (O).

[2]Preservation Codes: (1)HNO_3, (2)H_2SO_4, (3)NaOH, (4) Refrigerated at 4°C, (5) $Na_2S_2O_3$+EDTA, (6)HCl, (7)None, (8)Other:_____

[3]Sample description must *clearly* correlate the sample ID to the sampling location. The types of analyses should be specified here.

JAH 5/12/92

Disposition of unused portion of sample

Laboratory should: ☐ Dispose ☐ Return ☐ Retain for____days ☐ Other_____

[4]Laboratory codes:

(A)____ Duplicate out
(B)____ Spike out
(C)____ Holding Time
(D)____ Matrix Interference
(E)____ Preserva ion Procedures
(F)____ Other_____

Wisconsin Department of Industry, Labor and Human Relations

UNDERGROUND PETROLEUM PRODUCT TANK INVENTORY

Information Required By Sec. 102.142, Wis. Stats.

Send Completed Form To:
Safety & Buildings Division
P.O. Box 7969
Madison, WI 53707
Telephone (608) 267-5280

For Office Use Only:
Tank ID #

Underground tanks in Wisconsin that have stored or currently store petroleum or regulated substances must be registered. Please see the reverse side for additional information on this program. An underground storage tank is defined as any tank with at least 10 percent of its total volume (included piping) located below ground level. A separate form is needed for each tank. Send each completed form to the agency designated in the top right corner. Have you previously registered this tank by submitting a form? ☐ YES ☒ NO If yes, are you correcting/updating information only? ☐ Yes ☐ No

This registration applies to a tank that is (check one):
1A. ☐ In Use or 1B. ☐ Newly Installed
2. ☐ Abandoned With Product
3. ☐ Abandoned No Product (empty) or With Water
4. ☒ Closed - Tank Removed
6. ☐ Closed - Filled With Inert Material
7. ☐ Out of Service - Provide Date: _____
8. ☐ Changed Ownership (Indicate new owner below)

Fire Department Providing Fire Coverage Where Tank Located: LaCrosse, WI

A. IDENTIFICATION: (Please Print)

1. Tank Site Name	Site Address	Site Telephone No.
Desmond's Formal Wear	2338 Commerce St.	(608) 781-7770

☒ City ☐ Village ☐ Town of:	State	Zip Code	County
LaCrosse	WI	54603	LaCrosse

2. Owner Name (mail sent here unless indicated otherwise in #3 below)	Owner Mailing Address (mail sent here unless indicated otherwise in #3)		
☐ City ☐ Village ☐ Town of:	State	Zip Code	County

3. Alternate Mailing Name If Different Than #2	Alternate Mailing Street Address If Different From #2		
☐ City ☐ Village ☐ Town of:	State	Zip Code	County

4. Tank Age (date installed, if known: or years old)	5. Tank Capacity (gallons)	6. Tank Manufacturer's Name (if known)

B. TYPE OF USER (check one):
1. ☐ Gas Station 2. ☐ Bulk Storage 3. ☐ Utility 4. ☒ Mercantile
5. ☐ Industrial 6. ☐ Government 7. ☐ School 8. ☐ Residential
9. ☐ Agricultural 10. ☐ Other (specify): _____

C. TANK CONSTRUCTION:
1. ☒ Bare Steel 2. ☐ Cathodically Protected and Coated Steel (A. ☐ Sacrificial Anodes or B. ☐ Impressed Current)
3. ☐ Coated Steel 4. ☐ Fiberglass 5. ☐ Other (specify): _____
6. ☐ Relined - Date _____ 7. ☐ Steel - Fiberglass Reinforced Plastic Composite 9. ☐ Unknown

Approval: 1. ☐ Nat'l Std. 2. ☐ UL 3. ☐ Other: | Is Tank Double Walled? ☐ Yes ☒ No

Overfill Protection Provided? ☐ Yes ☐ No If yes, identify type: | Spill Containment? ☐ Yes ☒ No

Tank leak detection method: 1. ☐ Automatic tank gauging 2. ☐ Vapor monitoring 3. ☐ Groundwater monitoring 4. ☐ Inventory control and tightness testing 5. ☐ Interstitial monitoring 6. ☐ Not required at present 7. ☐ Manual Tank Gauging (only for tanks of 1,000 gallons or less)

D. PIPING CONSTRUCTION
1. ☒ Bare Steel 2. ☐ Cathodically Protected and Coated or Wrapped Steel (A. ☐ Sacrificial Anodes or B. ☐ Impressed Current) 3. ☐ Coated Steel
4. ☐ Fiberglass 5. ☐ Other (specify): _____ 9. ☐ Unknown

Piping System Type: 1. ☐ Pressurized piping with: A. ☐ auto shutoff; B. ☐ alarm; or C. ☐ flow restrictor 2. ☐ Suction piping with check valve at tank
3. ☐ Suction piping with check valve at pump and inspectable

Piping leak detection method: used if pressurized or check valve at tank: 1. ☐ Vapor monitoring 2. ☐ Interstitial monitoring
3. ☐ Groundwater monitoring 4. ☐ Tightness testing 5. ☐ Line Leak Detector 6. ☐ Not Required

Approval: 1. ☐ Nat'l Std 2. ☐ UL 3. ☐ Other: | Double Walled: ☐ Yes ☒ No

E. TANK CONTENTS
1. ☐ Diesel 2. ☐ Leaded 3. ☒ Unleaded 4 ☐ Fuel Oil
5 ☐ Gasohol 6 ☐ Other 7. ☐ Empty 8. ☐ Sand/Gravel/Slurry
9. ☐ Unknown 10. ☐ Premix 11. ☐ Waste Oil 12 ☐ Propane
13. ☐ Chemical * _____ _____ _____ 14. ☐ Kerosene 15 ☐ Aviation

* If # 13 is checked, indicate the chemical name(s) or number(s) of the chemical or waste.

If Tank Closed, Give Date (mo/day/yr):	Has a site assessment been completed? (see reverse side for details)
6/1/92	☒ Yes ☐ No

If installation of a new tank is being reported, indicate who performed the installation inspection:
1. ☐ Fire Department 2. ☐ DILHR 3 ☐ Other (identify) _____

Name of Owner or Operator (please print):	Indicate Whether:
Desmond's Formal Wear	☒ Owner or ☐ Operator
Signature of Owner or Operator:	Date Signed:
[signature] Asst	6/22/92

SBD-7437 (R 12/91)

IMPORTANT: Complete as many items on this form as possible. Failure to provide sufficient information may cause you to fall under additional regulations.

Wisconsin Department of Industry, Labor and Human Relations

Complete one form for each site closure.

CHECKLIST FOR UNDERGROUND TANK CLOSURE

RETURN COMPLETED CHECKLIST T
Safety & Buildings Division
Fire Prevention & Underground Storage Tank Section
P. O. Box 7969, Madison, WI 53707

A. IDENTIFICATION: (Please Print)

1. Installation Name: Dairyland Power

Installation Street Address: 2338 Commerce St

☒ City ☐ Village ☐ Town of:

State: WI | Zip Code: 54601 | County: La Crosse

2. Owner Name:

Owner Street Address:

☐ City ☐ Village ☐ Town of: | State | Zip Code

County | Telephone No. (include area code) ( )

3. Closure Company Name: Skinner's Const.

Company Telephone No. (include area code): (608) 781-0377

Closure Company Street Address, City, State, Zip Code: 2850 Hemstock Dr LACROSSE WI 54601

Certified Remover Name: Charles Hoehne | Remover Certification No.: 29424

4. Name of Company Performing Closure Assessment: MIDWEST ENVIRONMENTAL MGMT. CO.

Company Telephone No. (include area code) ( )

Assessment Company Street Address, City, State, Zip Code: 123 N 4th St. RM 303 LACROSSE, WI 54601

Certified Assessor Name: TODD L. SCHINI | Assessor Certification No.

Tank ID #	Closure	Temp. Closure	Closure In Place	Tank Capacity	Contents *	Closure Assessmer
1.	☒	☐	☐	2000	03	☒Y ☐N
2.	☐	☐	☐			☐Y ☐N
3.	☐	☐	☐			☐Y ☐N
4.	☐	☐	☐			☐Y ☐N
5.	☐	☐	☐			☐Y ☐N
6.	☐	☐	☐			☐Y ☐N

* Indicate which product by numeric code: 01-Diesel; 02-Leaded; 03-Unleaded; 04-Fuel Oil; 05-Gasohol; 06-Other; 09-Unknown; 10-Prem 11-Waste oil; 13-Chemical (indicate the chemical name(s) or numbers(s) _____ _____ _____; 14-Kerosene; 15-Aviatio

Notification was provided to the local authorities 15 days in advance of closure date. ☒Y ☐N ☐N

All local permits were obtained before beginning closure. ☒Y ☐N ☐N

Check applicable box at right in response to all statements in Sections B - E.

	Remover Verified	Inspector Verified	N
B. TEMPORARILY OUT OF SERVICE			
1. Product Removed			
a. Product lines drained into tank (or other container) and resulting liquid removed, AND	☐Y ☐N	☐	
b. All product removed to bottom of suction line, OR	☐Y ☐N	☐	
c. All product removed to within 1" of bottom.	☐Y ☐N	☐	
2. Fill pipe, gauge pipe, tank truck vapor recovery fittings, and vapor return lines capped.	☐Y ☐N	☐	
3. All product lines at the islands or pumps located elsewhere are removed and capped, OR	☐Y ☐N	☐	
4. Dispensers/pumps left in place but locked and power disconnected.	☐Y ☐N	☐	
5. Vent lines left open.	☐Y ☐N	☐	
6. Written inspector approval of temporary closure obtained, which is effective until _____ (Date)	☐Y ☐N	☐	
7. Inventory form filed by owner indicating temporary closure.	☐Y ☐N	☐	
C. CLOSURE BY REMOVAL			
1. Product from piping drained into tank (or other container).			
2. Piping disconnected from tank and capped or removed.	☒Y ☐N	☐	
3. All liquid and residue removed from tank using explosion proof pumps or hand pumps.	☒Y ☐N	☐	
4. All pump motors and suction hoses bonded to tank or otherwise grounded.	☒Y ☐N	☐	
5. Fill pipes, gauge pipes, vapor recovery connections, submersible pumps and other fixtures removed. **NOTE: DROP TUBE SHOULD NOT BE REMOVED IF THE TANK IS TO BE PURGED THROUGH THE USE OF AN EDUCTOR.**	☒Y ☐N	☐	
7. Vent lines left connected until tanks purged.	☒Y ☐N	☐	
8. Tank openings temporarily plugged so vapors exit through vent.	☒Y ☐N	☐	
9. Tank atmosphere reduced to 10% of the lower flammable range (LEL) - see Section F.	☒Y ☐N	☐	
10. Tank removed from excavation after **PURGING/INERTING**; placed on level ground and blocked to prevent movement.	☐Y ☒N	☐	

SBD-8051 (N. 9/2/91)

- CONTINUE ON NEXT PAGE -

C. CLOSURE BY REMOVAL (continued)

	Remover Verified	Inspector Verified	NA
12. Tank labeled in 2" high letters after removal but before being moved from site.	☒ Y ☐ N	☐	☐
NOTE: COMPLETE TANK LABELING SHOULD INCLUDE WARNING AGAINST REUSE; FORMER CONTENTS; VAPOR STATE; VAPOR FREEING TREATMENT; DATE.			
13. Tank vent hole (1/8 th " in uppermost part of tank) installed prior to moving the tank from site.	☒ Y ☐ N	☐	☐
14. Inventory form filed by owner with Safety and Buildings Division indicating closure by removal.	☒ Y ☐ N	☐	☐
15. Site security is provided while the excavation is open.	☒ Y ☐ N	☐	☐

D. CLOSURE IN PLACE

NOTE: CLOSURES IN PLACE ARE ONLY ALLOWED WITH THE PRIOR APPROVAL OF THE DEPARTMENT OF INDUSTRY, LABOR AND HUMAN RELATIONS.

1. Product from piping drained into tank (or other container).			
2. Piping disconnected from tank and capped or removed.	☐ Y ☐ N	☐	
3. All liquid and residue removed from tank using explosion proof pumps or hand pumps.	☐ Y ☐ N	☐	
4. All pump motors and suction hoses bonded to tank or otherwise grounded.	☐ Y ☐ N	☐	
5. Fill pipes, gauge pipes, vapor recovery connections, submersible pumps and other fixtures removed.	☐ Y ☐ N	☐	
NOTE: DROP TUBE SHOULD NOT BE REMOVED IF THE TANK IS TO BE PURGED THROUGH THE USE OF AN EDUCTOR.			
6. Vent lines left connected until tanks purged.	☐ Y ☐ N	☐	
7. Tank openings temporarily plugged so vapors exit through vent.	☐ Y ☐ N	☐	
8. Tank atmosphere reduced to 10% of the lower flammable range (LEL) - see Section F.	☐ Y ☐ N	☐	
9. Openings cut in tank top if necessary to introduce inert material.	☐ Y ☐ N	☐	
10. Solid inert material (sand, cyclone boiler slag, pea gravel recommended) introduced and tank filled.	☐ Y ☐ N	☐	
11. Vent line disconnected or removed.	☐ Y ☐ N	☐	
12. Inventory form filed by owner with Safety and Buildings Division indicating closure in place.	☐ Y ☐ N	☐	

E. CLOSURE ASSESSMENTS

NOTE: DETERMINE IF A CLOSURE ASSESSMENT IS REQUIRED BY REFERRING TO ILHR 10.

1. Individual conducting the assessment has a closure assessment plan (written) which is used as the basis for their work on the site.	☐ Y ☐ N	☐	
2. Do points of obvious contamination exist?	☐ Y ☐ N	☐	
3. Are there strong odors in the soils?	☐ Y ☐ N	☐	
4. Was a field screening instrument used to pre-screen soil sample locations?	☐ Y ☐ N	☐	
5. Was a closure assessment omitted because of obvious contamination?	☐ Y ☐ N	☐	
6. Was the DNR notified of suspected or obvious contamination?	☐ Y ☐ N	☐	

Agency and office contacted: _____

7. Contamination suspected because of: ☐ Odor ☐ Soil Staining ☐ Free Product ☐ Sheen On Groundwater ☐ Field Instrument Test

F. METHOD OF ACHIEVING 10% LEVEL DESCRIPTION

Educator Or Diffused Air Blower

Eductor driven by compressed air, bonded and drop tube left in place; vapors discharged minimum of 12 feet above ground. Diffused air blower bonded and drop tube removed. Air pressure not exceeding 5 psig.

Dry Ice

Dry ice introduced at 1.5 pounds per 100 gallons of tank capacity. Dry ice crushed and distributed over the greatest possible ta. area. Dry ice evaporated before proceeding.

Inert Gas (CO/2 or N/2) NOTE: INERT GASSES PRODUCE AN OXYGEN DEFICIENT ATMOSPHERE. THE TANK MAY NOT BE ENTERED IN THIS STATE WITHOUT SPECIAL EQUIPMENT

Gas introduced through a single opening at a point near the bottom of the tank at the end of the tank opposite the vent. Gas introduced under low pressure not to exceed 5 psig to reduce static electricity. Gas introducing device grounded.

Tank atmosphere monitored for flammable or combustible vapor levels.

Calibrate combustible gas indicator. Drop tube removed prior to checking atmosphere. Tank space monitored at bottom, midd and upper portion of tank. Readings of 10% or less of the lower flammable range (LEL) obtained before removing tank from ground.

G. NOTE SPECIFIC PROBLEMS OR NONCOMPLIANCE ISSUES BELOW

I. INSPECTOR INFORMATION

Francis Formanek	Francis Formanek	IT-00067
Inspector Name (print)	Inspector Signature	Inspector Certification No.
La Crosse		6/1/82
FDID # For Location Where Inspection Performed	Inspector Telephone Number	Date Signed

Site Safety Plan - UST Removal Project
Desmond's
La Crosse, Wisconsin

SECTION 1 - GENERAL

1.1 Scope

This publication describes those procedures and precautions for gas freeing, entry into, cleaning, and exiting from nonportable atmospheric and pressurized petroleum storage tanks. The practices described in this publication are intended as a guide for personnel engaged in these activities. These are considered necessary for the safety and health of personnel and for the prevention of property damage. It is recognized that circumstances will determine the specific application of the procedures described. This publication does not apply to refrigerated storage.

Further information on floating roof tanks is available in API Publication 2015B.

1.2 Definitions

Flammable limits (see 2.2.1 for definition and discussion).

Sour stock is the type of crude oil and intermediate products obtained from it that contains quantities of hydrogen sulfide.

Threshold limit values refer to airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect. Because of wide variation in individual susceptibility, however, a small percentage of workers may experience discomfort from some substances at concentrations at or below the threshold limit; a smaller percentage may be affected more seriously by aggravation of a preexisting condition or by development of an occupational illness. See the publications of the American Conference of Governmental Industrial Hygienists (1.3).

Vapor-freeing is the replacement of hydrocarbon vapors with fresh air in a tank.

Vapor indicators are instruments that detect or measure vapors, sometimes described elsewhere as combustible-gas indicators, gas indicators, and gasoline vapor indicators.

SECTION 2 - PRELIMINARY PRECAUTIONS AND PREPARATIONS

2.1 Policies and Training

Each company should organize and maintain a system for tank entry and cleaning. Personnel employed to clean petroleum storage tanks should be adequately trained and thoroughly familiar with the safety precautions for controlling the hazards associated with tank cleaning. If the work is done by a contractor, a Midwest Environmental Management Company representative should ensure that the contractor is made aware of the correct procedures to be followed. For additional information, see API Publications 2015A and 2015B, as well as the API-sponsored training program, *Safe Tank Cleaning*.

2.2 Hazards of Tank Cleaning

Petroleum storage tanks can be safely cleaned if proper procedures and adequate precautions are

followed. Without such safeguards, injury or property damage may result from explosions, five, oxygen deficiency, physical hazards, or the presence of toxic liquids, vapors, or dusts.

2.2.1 Explosions or Fires

Fuel (flammable vapors and gases), air (oxygen), and heat (a source of ignition) are necessary for afire. Fires and explosions cannot occur without the presence of all three of these elements. Mixtures of hydrocarbon vapor and air can be ignited only if the fuel-to-air ratio is within certain limits.

In the case of gases or vapors that form flammable mixtures with air or oxygen, there is a minimum concentration of vapor in air or oxygen below which propagation of flame does not occur on contact with a course of ignition. There is also a maximum proportion of vapor gas in air above which propagation of flame does not occur. The boudary-line mixtures of vapor or gas in air, which if ignited will just propagate flame, are know as the *lower and upper flammable or explosive limits* and are usually expressed in terms of percentage by volume of gas or vapor in air. NFPA 325M, *Fire Hazard Properties of Flammable Liquids, Gases and Volatile Solids*, refers to the mixture below the lower flammable limit as too "lean" to burn or explode and a mixture above the upper flammable limit as too "rich" to burn or explode.

The lower and upper flammable limits (LFL and UFL) for most of those mixtures are between 1 percent and 10 percent hydrocarbon vapor by volume in air, respectively. Other vapors may have different limits. For precise values for various hydrocarbons, see NFPA 325M.

Vapor indicators are calibrated to indicate the percentage of the lower flammable limit of vapors present in the mixture. Although a vapor indicator reading of zero is preferable, a concentration not exceeding 10 percent of the lower flammable limit will provide ample safety for performing hot work.

CAUTION: At 10 percent of the lower flammable limit, the hydrocarbon concentration will, in almost all cases, still exceed the threshold limit values of toxic materials, and appropriate personal protective equipment should be used. See 2.2, 2.3, and 4.7.

Ignition does not occur in petroleum vapor and air mixtures richer than the upper flammable limit. However, rich mixtures may be ignited and burn when diluted with outside air at tank openings such as hatches, manways, vents, or other openings. A rich mixture may remain in a tank after the liquid has been removed. When being vapor-freed by admission of air, tanks containing a rich vapor space will be in the flammable range sometime during the ventilation process. During the vapor-freeing operation, the presence of personnel on or adjacent to the tank should be minimized.

Vapor that issues from openings in a tank are usually heavier than air. If released near ground level, they may travel along the ground a considerable distance from the tank. During the tank vapor-freeing operation, all sources of ignition in the tank or in the vicinity of the tanks should be eliminated.

Even after a tank has been freed of vapor, flammable mixtures may still be formed later from remaining residual liquids and sludges or from the entry of a liquid or vapor from an outside source. Petroleum vapors or liquids may enter a tank through unblinded lines or leaks in the bottoms of the tank. Vapors may evolve within a supposedly empty and clean tank from flammables in overlooked places. Some of the more common sources are sludge, scale, hollow roof supports, unsealed sections of foam chambers, pontoons, heating coils, leaking bottoms, and internal wooden structures or other absorbent materials. Heat from the sun, steam tracing, or hot work may result in increasing the tank vapor content. Tank vapors should be checked frequently even if initial measurements indicate airborne quantities are within acceptable limits.

Flammable mixtures may be ignited by many ignition sources, including open flames, gasoline engines, diesel engines, lightning, electrical shorts in worn or defective extension cords, and sparks. Spark sources include electrical lamps, power tools, fixtures, switches, nonexplosionproof appliances, welding, and static electricity. Another source of ignition may be present in tanks that have been used for the storage of sour stocks or aromatic tars. Finely divided iron polysulfide deposits, which are pyrophoric on exposure to air, may form when sulfur compounds in sour stocks react with the iron of storage tanks. When these pyrophoric deposits come in contact with air, a heat-generating chemical reaction takes place. If the heat is not dissipated, spot temperatures high enough to ignite a flammable mixture or residues can be reached.

Flammable deposits, such as condensed hydrocarbon or scale that may have formed on the underside of the tank roof or on rafters, can be ignited by cutting or welding operations on the roof. Such underside areas should be wetted down and kept wet while hot work is being performed on the roof.

The cleaning of jumbo size tanks may present special problems due to their very great volumes and large diameters. Special consideration will have to be given to ventilation and sludge removal. Special precautions and procedures, not included in this publication, should be established by the tank owner. Deviation from the guidelines in this publication may be necessary; however, the end objective of conducting cleaning safely must be achieved.

2.2.4 Physical Hazards

In addition to injury or property damage, which may result from fires, explosions, toxic conditions, or asphyxiation, trouble may result from other causes, such as:

1. Inadequate training of workmen or lack of competent supervision.
2. Structural failure of the tank shell, roof, roof support members, swing line cables, or other tank members. Certain types of roof panels on internal floating roofs will not support a worker's weight.
3. Tools or other objects dropping from overhead.
4. Falls through thin, corroded roofs or from scaffolds, stairs, and ladders.
5. Tripping over hose, pipes, tools, or equipment.
6. Slipping on wet, oily surfaces or colliding with objects in inadequately lighted interiors.
7. Accidental discharge of steam, high-pressure air, water, or oil, either into the tank or against personnel working outside, due to the omission of piping blinds.
8. Insufficient or faulty personal protection equipment.
9. Use of improper or poorly maintained tools, especially electrical tools or equipment.
10. Failure to disconnect or make inoperative electrical or mechanical equipment when not in use or failure to blind pipes connected to the tank.
11. Noise in excess of acceptable levels.
12. Inadequate lighting.
13. Inadequate working space.

2.3 Personal Protection

2.3.1 Clothing

Before entering a tank, each tank cleaner must be properly dressed for tank cleaning work. Clothing and equipment must provide for personal protection. Each day, tank cleaners should wear clean clothing, including fresh socks and underwear. A hard had guards against head injuries. A long-sleeved shirt, long pants, and gloves help protect the skin against irritating

materials. Gloves and either shoes or boots should be made of a material that the residues cannot penetrate.

Light-colored clothing is preferred. This makes it easier to see the cleaning crew members when they are working inside the tank, and splashes of sludge show up better on light-colored clothing.

If a tank cleaner's clothing becomes contaminated with tank sludge, the cleaner should immediately shower and change into clean work clothes. This practice is particularly important if the cleaner is working in a tank that has contained a toxic substance. Oil-contaminated clothing should not be kept in locker rooms, stored in lockers, or piled in bins. If not decontaminated immediately, the clothing should be placed in closed metal containers.

Tank cleaners should bathe with soap and water at the end of each day's work and when a tank-cleaning job has been completed. Hands and face should be washed thoroughly before meals.

2.3.2 Breathing Apparatus

Protective respiratory equipment for tank cleaners should provide a positive air pressure in a full-facepiece mask throughout the breathing cycle. Canister-type masks must not be used while working inside tanks because they do not provide proper protection against vapor concentrations even below 2 percent, nor do they protect against oxygen deficiency. Positive air pressure may be supplied to the full facepiece mask in the following ways:

1. From a motor-driven positive-pressure blower, the discharge of which is connected to the full-facepiece mask by means of a low-pressure hose line from 0 to 25 pounds per square inch (0 to 1.76 kilograms per square centimeter). The blower air inlet should be located in an area where the air will remain free of contaminants, especially not near engine exhausts.

2. From equipment which supplies Grade "D" breathing air in conformance with the Compressed Gas Association Specification G-7.1, Grade "D" air. and in conformance with OSHA 29 CFR 1910.134 and ANSI Z - 88.1 for use of Class C airline breathing air systems. The discharge of the equipment is connected by means of an intermediate-pressure air line to a reducing valve carried by the tank cleaner. The use of air from plant air lines is not recommended because the air from such sources is not reliably free of toxic contaminants or oil, nor is the supply under the control of the tank crew. The use of portable engine-driven compressors, of the type used to power air tools, to supply breathing air is not recommended. Reliance on such units is unwise because the continuity of operation is not highly reliable, the fuel supply may be depleted with lax attendance, and the air delivered could contain toxic substances.

3. From one or more high-pressure breathing-air cylinders, from 200 to 2000 pounds per square inch (14.06 to 140.6 kilograms per square centimeter), fitted with reducing valves to reduce to intermediate pressure. The discharge side of one reducing valve is connected by means of an intermediate-pressure air line to a second reducing valve carried by the tank cleaner. A low-pressure air line, carried by the tank cleaner. A low-pressure air line, carried by the tank cleaner, connects the low-pressure side of the second reducing valve to the full-facepiece mask.

4. From a high-pressure, breathing-air cylinder, complete with reducing valve, carried by the tank cleaner. The low-pressure outlet of the reducing valve is connected by means of a low-pressure air line, carried by the tank cleaner, to the full-facepiece mask. Because of the limited air supply, this self-contained equipment is recommended only for tank entries of short duration, such as for inspection, minor repairs or to provide emergency assistance.

CAUTION: Do not use oxygen cylinders or bottles for breathing-air purposes due to potential fire hazards and the risk of hyperventilation.

Breathing air equipment should be located on the upwind side of the tank opening so that only fresh, uncontaminated air will be supplied. The breathing air intake of a blower or compressor should not be placed near an internal-combustion engine exhaust. Where practical, the equipment should be provided with a vertical intake extension or be placed on a bench to elevate the intake above ground level. Where air is supplied from one or more high-pressure breathing-air cylinders to protect them from physical damage. An uninterrupted air supply to the full-facepiece masks must be maintained until all persons are out of the tank and have removed their facepieces.

Appropriate standby surveillance should be provided to monitor persons working inside the tank, the supply of breathing air, and conditions outside the tank. The type of rescue that might be necessary should be reviewed for each type of tank before entry.

Low-and intermediate-pressure hose connections should be inspected frequently and kept tight at all times. If the hose is pulled or twisted, a connection may be loosened while the hose is in use. Therefore, personnel should be instructed not to step on or twist hose lines. Air-supply hose lines should be inspected daily during use and tested frequently to guard against leaks. Defective hose should be replaced.

If a workman detects an odor such as gasoline while wearing a full-facepiece mask, he should leave the tank immediately. The source of the odor must be determined and eliminated before re-entry into the tank is permitted.

The user of the mask may remove his hat or cap to enable him to adjust the facepiece for a tight fit. It is essential that articles such as tobacco, snuff, and chewing gum be removed from the mouth before putting on the mask. Contact lenses should not be worn with respiratory protection masks.

After the facepiece has been adjusted and tightened, it should be tested for leaks. This is accomplished by inhaling while the end of the supply tube is closed with the palm of the hand. Modified self-contained breathing apparatus tube masks require that the coupling be plugged to accomplish the test. If the facepiece collapses against the face, the fit is satisfactory. If it does not, leaks should be located and eliminated. Leaks may be caused by temple bars on glasses, facial hair, absence of dentures, scars, certain facial shapes, or an incorrect respirator facepiece size for the wearer.

Persons should not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. The local physician shall determine what health and physical conditions are pertinent. The respirator user's medical status should be reviewed periodically-annually, for instance.

Instructional written operating procedures for respiratory equipment should be available at the job site.

Under no circumstance should masks be removed inside the tank.

Facepieces should be cleaned frequently with soap and water, at least at the end of each day. Upon completion of the job, they should be properly stored in sealed plastic bags. The use of a mild disinfectant is recommended before storing the facepieces. The facepiece should be stored in a manner that will protect it from sunlight, dust, excessive heat or cold, moisture, and damaging chemicals.

Upon completion of the job, hoses should be thoroughly cleaned, dried, and capped before

storing. Parts of mask sets, including the harness and lifelines, should be cleaned and dried to prevent deterioration and should be ready for reuse. Equipment should be protected against exposure to excessive heat. Any repairs or replacements should be made as soon as the need for them has been established.

2.3.3 MISCELLANEOUS

Full-coverage eye-protection equipment should be worn while scraping scale, cutting rivets, or spreading sawdust or other absorbents. Such equipment should be cleaned frequently and should be washed and sterilized upon completion of each job. Frequent or prolonged contact with oil may irritate or burn the skin and cause serious discomfort. Should such exposure become unavoidable, use gloves or, if necessary, the hands may be coated with commercial, nongreasy barrier creams which will provide partial protection.

Tools and equipment should be cleaned thoroughly at the end of each day and immediately after a job has been completed.

After a tank has been cleaned and closed for an extended period, the tank atmosphere should be checked for oxygen deficiency and tested for threshold limit value before re-entry. Only when the threshold limit value requirement has been met and the oxygen content in the tank atmosphere is above 19.5 percent by volume is it safe for men to enter a tank without respiratory equipment (see 4.7 Case I).

2.4 EMERGENCY PLAN AND STANDBY PERSONNEL

An emergency plan should be developed and available. Standby personnel should be provided where indicated. Means of alerting workmen to come out of the tank in the event of an external emergency should be considered.

Site Specific Emergency Personnel:

Industrial Hygienist - Provide consultation on any chemicals used or encountered, recommend any personnel air monitoring based on the risk assessment of the job site, recommend any personnel protective equipment other than level "D" currently required for this project. - Rick Stickler, Midwest Environmental Management Company (608) 784-5688.

Environmental Specialist - Recommend soil sampling screening and laboratory sample collection and analysis protocol, verify degassing and purging of tanks with a combustible gas detector and investigate any impacts involving the subsurface encountered from LUST's.- Todd Schini, Midwest Environmental Management Co., (608) 784-5688.

Fire Department - La Crosse Fire Department, Emergency- 911.

Police Department - Emergency 911

Lutheran Hospital La Crosse - Emergency 785-0530

Bills Pumping Service - Waste Hauler, La Crosse, WI. 782-7633. Final destination - Buchner Inc., La Crosse, WI. 784-9000 WDNR approved waste oil burner.

No barricading of the adjacent streets will be necessary at this job site since there is adequate space available on the station property and vent pipes will be used for the degassing process. These vent

pipes are located near the middle of the property, approx. 12 feet above grade. No spark source is anticipated to be close enough to cause a problem.

SECTION 3 - TANK-CLEANING OPERATIONS

3.1 GENERAL

Hazards encountered while cleaning petroleum storage tanks can be controlled by proper planning, inspection, and training. Tank-cleaning operations involve the following major steps:

1. Preliminary preparations, including external inspection of the tank and surveying the immediate area, training and indoctrination of the crew, and inspection of equipment.
2. Determining that the dike area is free of flammable or toxic materials before personnel are permitted to enter the tank.
3. Controlling sources of ignition in, around, and on the tank.
4. Emptying the tank by pumping and floating with water. This is probably the most commonly used procedure, but other methods may be employed.
5. Blinding off the tank and deenergizing electrical circuits after as much as the contents as possible have been removed.
6. Vapor-freeing the tank.
7. Testing the tank for oxygen, hydrocarbon vapors, and toxic gases.
8. Opening the tank for entry and removal and disposal of sludge.

3.2 PREPARATION FOR CLEANING

A supervisor who is competent to handle tank-cleaning operations should be placed in charge of the operation. He should first determine the type of product that the tank last contained and those contained in the past, as well as the indicated amount of sludge within the tank and the physical condition of the tank itself. He should make a survey of the surrounding area to determine whether it is safe to perform the cleaning operations.

Equipment used for tank-cleaning operations should be inspected to ensure that it is free of defects and adequate for its intended purpose. Tank cleaners should be instructed in the proper use of all equipment, as well as safety precautions and rescue procedures.

Vigilance is required on the part of everyone engaged in tank cleaning. All persons involved in tank cleaning should be trained and well informed of the fire and health hazards of tank cleaning. Such a training and indoctrination program promotes efficiency and minimizes the possibility of injury and fire, which might result from error or misuse of equipment. Personal injury and property damage are less likely to occur when employees have a thorough knowledge of the operation, the proper use of protective equipment, and the hazards involved before the job begins.

3.3 CONTROL OF SOURCES OF IGNITION

Before any work is done that might involve release of vapors, roads in the tank vicinity should be barricaded and posted. All sources of ignition, including smoking, welding, or other work that might be a source of ignition, should be eliminated from the area where flammable vapors may be present or may travel. This area should be kept free of all sources of ignition, such as electrical and internal combustion engine equipment, from the time tank cleaning starts until the tank is vapor-free and the sludge has been removed. Then, if the equipment is used, it should be placed well away from the tank, preferably upwind to minimize the ignition hazard. No work should be done if the direction of the wind might carry vapors into areas where they might produce a

hazardous condition, or when an electrical storm is either in progress or threatening. Even after as much oil as possible has been floated out of the tank and vapor-freeing has been completed, a hazardous condition may recur because of change in temperature, because of agitation of the sludge within the tank, or other reasons.

Vacuum trucks, if used to remove sludge from the tanks, should be located outside the dike where vapors will not reach their internal-combustion engines. The vacuum pump exhaust gases should be discharged through hose of adequate size and length downwind of the truck.

No artificial lights except approved dry-cell-powered flashlights (see API Publication 2212), safety lanterns, cap lamps, or approved low-voltage lighting suitable for hazardous locations should be used inside the tank until the tank has been vapor-freed. Portable lights used outside the tank should be classified for hazardous locations, and extension cords should be equipped with connectors or switches approved for hazardous locations. Such equipment, when used, should be thoroughly inspected to ensure that it will not be a source of ignition.

Unexpected sources of ignition often occur, so it is not sufficient just to eliminate conditions known to be a possible source of ignition. Every effort must be made to avoid the release of vapors near ground level during ventilation and cleaning operations. Cleaning tanks at night should be discouraged because of limited visibility.

Fire extinguishers and fire hoses readily at hand are advisable.

To prevent spontaneous combustion, sludge removed from tanks that have contained sour stocks or aromatic tars should be kept wet until final disposal.

3.4 EMPTYING THE TANK

Before the tank is opened, all residual product should be pumped or drained off to the lowest possible level through the water draw or pumpout connection. This pumping or draining may be augmented by adding water through existing piping connections, not through a roof opening, to float any remaining residual out of the tank.

3.5 BLINDING OFF AND ELECTRICALLY ISOLATING THE TANK

After all possible residual oil has been removed, steam, foam, and all other piping connected to the tank should be blinded off as close as possible to the tank-on the tank side of tank valves. This will prevent hydrocarbon vapors or liquids from entering the tank from the lines. Blinding off is accomplished by first closing all the valves nearest the tank, then breaking the connections and placing blinds in all the lines. Blinds should be of sufficient strength and thickness to withstand the maximum pressure that might be exerted against the blind.

Before the blinds are installed, all lines between the tank and the blind location should be drained or flushed. In addition, valves in lines outside the dike and nearest to the tank should be closed, and caution tags should be attached to these valves. Foam chambers on the tank should be opened and inspected to ensure that the seal is intact and that oil is not trapped in an area open to the tank. Drains at the base of pipe risers to the chambers should be left open. Heating coils should be turned off and valves tagged or locked "closed."

Electrical connections to mixers and other electrical equipment should be disconnected, tagged, and locked out. If the tank bottom is protected from corrosion externally by an impressed current system, a bond wire should be used when disconnecting pipe flanges. All tank ground cables and

cable clamps should be inspected to ensure grounding and bonding integrity.

3.6 WORK ON THE TANK ROOF AND IN TANK VICINITY DURING VAPOR FREEING

CAUTION: Some tanks, on being emptied, may be in the flammable range. Work on the roof and adjacent to the tank should be limited to that which is essential. Workers should not be permitted on internal floating roofs during vapor freeing.

When it is necessary for workmen to go onto a tank roof, an inspection should be made to determine what safety measures are needed. Planks should be used to distribute workers' weight over a larger surface if the roof is in questionable condition. Safety belts and lifelines can be used, with a designated rescue worker standing by in the event of an accident.

When work is being performed on the outside of tanks that have contained sour stocks, in locations where exposure may occur, workers should wear protective respiratory equipment that provides an independent air supply.

3.7 VAPOR-FREEING THE TANK

Where conditions permit, it is preferable that the tank be freed of flammable vapors before other steps are undertaken. In the initial stage of vapor-freeing, while the tank still contains a flammable mixture, work in the area should be kept to a minimum.

A Principal consideration in vapor-freeing a tank is the disposal of displaced vapor to minimize the possibility of a hazardous condition in the surrounding area. Effective disposal and the precautions required depend to a large extent on whether vapors are to be displaced by mechanical ventilation, steam ventilation, or natural ventilation.

3.7.1 MECHANICAL VENTILATION

Several methods of mechanical ventilation are quick and are considered safe. Vapors may be drawn from top manways by educators or fans, or air may be forced through bottom shell manways by air, steam, or electric-motor driven fans suitable for hazardous locations. **In each case, the air mover should be electrically bonded to the tank.**

The time during which the vapor/air content in the tank will be flammable should be reduced to a minimum. One desirable method of accomplishing this is to place an educator in a top manway with a flexible tube attached to the educator and extending it to near the tank bottom. The heavy vapors are thus drawn from near the bottom through the tube and educator and discharged upward. The shell manway cover is left on, and the lighter air enters the tank through the top manway.

Discharging the vapors at the top of the tank allows maximum mixing with outside air and reduces the chances of flammable mixtures reaching a source of ignition. No work should be permitted on top of the tank while vapors are being educted.

Another method is to use an educator or an air-, steam-, or electric motor-driven blower to draw vapors from the top manway and allow air to enter the tank from the bottom shell manway. Such an exhaust fan or educator should be started at a low delivery rate to avoid a vacuum in the tank before the shell manway is opened. This will establish a pressure differential so that there will be

no release of vapor at ground level when the shell manway cover is removed. After the shell manway cover has been removed, the exhaust educator should be operated at full capacity.

Another mechanical method is to place the blower in the bottom manway and force air into the tank, allowing the vapor-air mixture to escape through the roof manway. The cover should be left on the roof manway until after the blower is installed in the shell manway. The roof manway cover is then removed and the blower started.

The blower may be air-, steam- or electric motor-driven. If an electric motor-driven blower is used, the motor and all electrical cables and connectors must be suitable for hazardous locations. If If a gasoline engine-driven blower must be used, the engine is an additional source of ignition and must be located away from the tank, preferably outside the dike and on the upwind side of the tank.

A canvas duct may be used to carry air from the blower outlet to the manway. Care must be taken not to place the blower intake near other possible sources of vapor release, such as adjacent tanks, sewers, or loading racks.

3.7.2 STEAM VENTILATION

Steam ventilation may prove advantageous in some cases, but its use introduces some special hazards. To be effective, it must be introduced at a rate high enough to raise the temperature inside the tank to at least 170 F (77 C). Often the available steam is insufficient to do this, particularly during cold weather or on large tanks. If the temperature in the tank reaches equilibrium below 170 F (77 C), the steam will condense as fast as it is introduced and no more vapors will be expelled.

The flow of steam into the tank may also generate static electricity, which can cause sparks and the ignition of flammable vapors. The pipe or nozzle of the steam hose, if one is used, must be bonded to the tank, but this will not prevent a charge from being generated by the steam after it leaves the nozzle or the end of the pipe. A charge may accumulate on an electrically insulated object inside the tank and result in sparking when the object comes close to any part of the tank at ground potential.

Steam should be introduced through a connection near the bottom of the tank, and either the roof manway or the gage hatch should be left open during the entire operation. This will avoid both the building of excessive pressure while steaming and the creation of a vacuum while cooling. When employing steam vapor-freeing, be certain that sufficient vacuum venting is provided to prevent any vacuum formation within the vessel from rapid steam condensation.

3.7.3 NATURAL VENTILATION

The least desirable method of vapor free a tank, since it could allow vapors to drift to a source of ignition, is to simply remove roof and shell manway covers and let the tank stand until natural ventilation makes the tank gas-free. This is also a slow process. At least at the start, the vapors will flow from the shell manway and, at times of little wind, may drift considerable distances. Wind or heat from the sun may cause the vapors to reverse and flow from the roof manway, particularly near the end of the operation. Sometimes wind sails can be used to increase the rate of ventilation.

Because drift and concentration of vapors are unpredictable, no work should be permitted in the vicinity of the ventilation and only the person, in proper protective clothing and equipment, making occasional gas tests should be allowed in the area.

3.8 CONTROL OF PYROPHORIC DEPOSITS IN SOUR STOCK AND AROMATIC TAR TANKS

If the tank has contained sour stocks or aromatic tars, deposits in the tank may spontaneously generate heat and cause ignition if allowed to dry out and react with the oxygen of the air (see 2.2.1). This source of ignition can be controlled by isolating these deposits from air or by dissipating the heat to prevent a temperature rise until the atmosphere inside the tank is below the flammable range. This may be accomplished by wetting all interior surfaces of the tank with water. The wetting dissipates the heat of reaction and also tends to isolate these pyrophoric deposits from oxygen present during ventilation. Continuous wetting of the inside surfaces of a tank can be accomplished by positioning hoses with fog nozzles at open manways. The fog nozzles should be electrically bonded to the tank shell.

A suggested procedure for vapor-freeing and removal of pyrophoric deposits from shell and roof surfaces involves the following steps:

1. Steam the tank until the interior surfaces are wet with condensate (see 3.7.2).
2. Install a high-capacity air mover in the roof manhole and one or more large fog nozzles in the neck of the shell manhole. Bond the air mover and nozzles to the tank.
3. Without delay, turn on the fog nozzles and immediately thereafter turn on the air mover. (The interior surfaces of the tank will be kept wet and the ingoing air will be thoroughly wetted by the moisture from the fog stream). The air mover and fog nozzles must be operated without interruption until the tank is vapor-free.
4. With the air mover still in operation after the fog nozzle has been removed, knock down all loose scale with a high-pressure water stream.

CAUTION: Workmen who enter the tank with the high-pressure water line must wear adequate protective equipment (see 2.3), and the requirements for entry must be met.

5. Proceed with the tank cleaning operation.

3.9 VAPOR TESTING

To determine the progress of vapor-freeing operations, the atmosphere in the tank and the surrounding area should be tested frequently throughout the operation with a vapor indicator. (For testing inside the tank, in the case of tanks which have contained leaded gasoline, the tester should be equipped as described in API Publication 2015A.) The tester should be thoroughly familiar with the reading and handling of the instrument. Before taking readings, the tester should determine that the instrument is in proper working condition and correctly calibrated. It is important that the tester adhere to the manufacturer's recommendations for checking and calibrating the instrument and use of the instrument in high humidity conditions.

Samples of vapor should be taken, preferably at the exhaust outlet.

Vapor indicator tests should not be performed during steam operations because the results may be erroneous.

To perform a vapor test following steaming operations, permit the atmosphere within the tank to stabilize for at least 15 minutes. When vapor concentration has been reduced to 50 percent of the lower flammable limit and air is entering the shell manways, personnel need not be restricted from

around the tank. However, the introduction of potential ignition sources within the area should still be subject to rigorous control based on the vapor concentration tests, wind direction, and velocity.

When vapor concentration in the mixture leaving the tank is reduced to approximately 20 percent of the lower flammable limit, the first objective of removing the flammable atmosphere has essentially been accomplished. However, this condition is not necessarily permanent, and ventilation and vapor testing should be continued. The exact vapor concentration considered safe before proceeding with the next step in the work will depend upon the program set up for sludge removal. This, in turn, will depend on the size of the tank, the facilities available, the amount of sludge, and other factors.

CAUTION: The tester should wear respiratory equipment and protective clothing until it has been determined that:

1. Other toxic substances are not present at levels above the established exposure limit value, as specified by the employer.
2. The tank has not contained leaded gasoline or has previously been declared lead free.
3. The oxygen content is at least 19.5 percent.
4. The vapor indicator registers a reading not exceeding 10 percent of the lower flammable limit.

The ventilation should be shut down for 15 minutes prior to and while the tests are being made. Preferably no work should be started within the tank until it is vapor free. Any entry into the tank should follow the procedure outlined in 4.6 concerning the presence of an outside observer.

3.10 INITIAL CLEANING FROM OUTSIDE THE TANK

After the foregoing steps have been completed in the order outlined, cleaning of the tank may be started.

The tank should now be temporarily vapor-free and ready for removal of remaining manway covers, riveted door sheets, or bolted cleanout cover plates.

Initial cleaning should be performed from outside the tank when the vapor concentration has been reduced to 50 percent or less of the lower flammable limit. A water-hose stream directed through open manways or rotating nozzles pointing inward from the tank shell and numerous similar devices have been successfully used to dislodge sludge and float it to a water draw or pumpout connection. All nozzles should be electrically bonded to the tank shell. Ventilation should be continued to maintain inflow of air at shell manways during this process. Occasional tests should be made for flammable vapors. The stirring of sludge may release vapors and increase vapor concentration. If the concentration rises to above 50 percent of the lower flammable limit, washing should be stopped until a safe concentration has been re-established.

Pumping equipment used for the removal of sludge and excess water from tanks preferably should be driven by air, steam, or an approved electrical drive suitable for the area classification. If it becomes necessary to use open type, electric-power or gasoline-engine driven equipment, the following special precautions are recommended to minimize the potential hazards:

1. Steps should be taken to ensure that an adequate flow of fresh air will enter the tank at the shell opening and be exhausted from the roof manway, thereby ensuring that flammable vapors will not flow out of the tank shell manway at ground level.
2. Equipment should be located on the upwind side of the tank and out of range of probable

vapor travel preferably outside or on top of the dike.
3. The area around the tank should be tested for flammable vapors with a vapor indicator before any equipment, which may be a source of ignition, is started.
4. If a pump is used to remove residuals from the tank, it should be attended and properly maintained for continuous operation during the period of tank cleaning.

Each time the equipment is to be started, the area should first be tested for flammable vapors. A gasoline engine should always be stopped during refueling. Throughout the pumping period, close checks should be made to ensure that a flow of air is entering the shell manway. If at any time the inflow of air is stopped, the pump should be stopped immediately. The pumping operation should not be resumed until ventilation has been re-established and the area has been tested and found to be free of flammable vapors.

SECTION 4 - TANK ENTRY

4.1 Testing for Entry

A tank that has not previously contained leaded gasoline may be regarded as safe for entry without respiratory equipment if it has been determined that:

1. Toxic substances are not present at levels above the established exposure limit value set by the employer (see 1.3, 2.2.2, and 2.2.3).
2. The vapor indicator registers a reading not exceeding 10 percent of the lower flammable limit.
3. Oxygen content is at least 19.5 percent.

Entry may be made with approved supplied air respiratory equipment for cold work purposes provided that the flammable vapor concentration is not more than 20 percent of the lower flammable limit and the oxygen content is not less than 16 percent.

Prior to work, the interior of the tank should be inspected for physical hazards, such as loos rafters, angle irons, or columns and other materials that might fall. In addition, swing lines should be checked to ensure that they have been lowered to the tank bottom or are properly supported by angle frames.

4.2 Testing for Toxic Substances Including Lead

Tests should be made to ensure that vapor concentrations are within established exposure limit values set by the employer (see 1.3, 2.2.2, and 2.2.3). Otherwise, workers should be required to wear respiratory equipment and protective clothing.

Tanks that have contained leaded gasoline may contain residues of lead antiknock compounds in sufficient quantities to present a serious health hazard even though the tank may be hydrocarbon-vapor free and contain sufficient oxygen. Before entry without protective equipment, tests should be made to ensure that the tank may be considered lead-hazard free as outlined in API Publication 2015A. The requirements of Case I in 4.7 must also be met.

4.3 Testing for Oxygen

After a tank has been cleaned and then closed for an extended period, the tank atmosphere should be checked for oxygen deficiency and gas-tested before re-entry. Only when the oxygen content in air is at least 19.5 percent by volume is it safe for workers to enter a tank without supplied air respiratory equipment (see 2.2).

4.4 Other Physical Hazards

See 2.2.4 for special physical hazard precautions.

4.5 Entry Permit

A qualified person, authorized to do so, should sign and issue an entry permit before workers enter a petroleum storage vessel. Persons entering the vessel should be sure that the permit has been correctly issued. The permit should be readily available for review and should attest that the provisions of Sections 2 and 4 of this publication have been carried out.

4.6 Additional Precautions

While workmen are inside a tank completing the cleaning process, a workman should be available outside the tank to assist those within the tank in the event of an emergency. When entrance into the tank is made, lifelines attached to the D-rings of the workmen's harnesses should be considered for added protection. The outside observer also should have adequate respiratory equipment available. Anyone who has inhaled hydrocarbon vapors should have immediate medical attention if he appears weak or exhibits other unusual symptoms. Workmen should exercise caution to prevent skin contact with oil or sludge. In the event of such contact, the oil or sludge should be washed from the skin with soap and water as promptly as possible.

Safe and easy entrances and exits through manways should be provided. Tank-bottom sumps should be covered or guarded to prevent falls. Tools or other equipment should not be dropped or thrown from higher levels of the tank. Lighting should be provided, preferably by explosionproof lamps.

4.7 PROTECTIVE EQUIPMENT REQUIREMENTS AND PERMISSIBLE PERSONNEL ACTIVITY FOR VARIOUS TANK ATMOSPHERES

4.7.1 CASE I-ENTRANCE NOT REQUIRING FULL RESPIRATORY EQUIPMENT OR PROTECTIVE CLOTHING

A tank can be entered by workers without respiratory protection if the tank atmosphere meets all of the conditions listed below and a permit for personnel entry has been issued.

1. Flammable vapors are at 10 percent of their lower flammable limit or less.
2. Oxygen in the tank atmosphere is 19.5 percent by volume, or greater.
3. Airborne concentrations of toxic substances are below established exposure limit values as specified by the employer (see 1.3, 2.2.2, and 2.2.3).
4. The tank has not contained organic lead or, if it has, it has been cleaned and a lead-in-air test shows that airborne concentrations of organic lead are at 2 micrograms of lead per cubic foot (0.075 milligrams of lead per cubic meter) or less.

Respiratory and other personal protection may be required for some tank repairs (see 6.4).

4.7.2 CASE II - ENTRANCE REQUIRING RESPIRATORY EQUIPMENT AND PROTECTIVE CLOTHING

Workers wearing positive air pressure, full-facepiece respiratory equipment can enter the tank, provided that the tank atmosphere meets all the conditions listed below and a permit for entry has been issued. Protective clothing must be worn if toxic materials present can be absorbed through the skin. For entry into leaded gasoline storage tanks, see API Publication 2015A.

1. Flammable vapors are less than 20 percent of the lower flammable limit.
2. Oxygen in the tank atmosphere is 16 percent or more.
3. Hydrogen sulfide concentrations are less than 100 parts per million.
4. Airborne concentrations of other toxic vapors are below levels acceptable to the employer.

4.7.3 CASE III - ENTRANCE PROHIBITED

A tank must not be entered if any of the following conditions exist:

1. Flammable vapors are greater than 20 percent of the lower flammable limit.
2. Oxygen in the atmosphere is less than 16 percent.
3. Hydrogen sulfide concentrations are 100 parts per million or more
4. Airborne concentrations of toxic vapors are above levels acceptable to the employer for entry.

SECTION 5 - WORKING IN THE TANK

5.1 VENTILATION

Flammable and toxic vapors may be present as long as oil or sludge remain within the tank. For this reason, ventilation should be continued, regardless of acceptable test results for flammable vapors, until oil and sludge have been removed.

5.2 RETESTING

Tests for flammable and toxic vapors should be repeated at frequent intervals throughout the entire cleaning period. If the exposure limit and oxygen requirements are not met, workmen without respiratory equipment should leave the tank and ventilation should continue until the conditions specified in section 4 are re-established. Such tests are especially important before re-entry into a tank following any extended interruption of work or after an overnight break in operations.

5.3 REMOVAL OF SLUDGE

5.3.1 REMOVAL AND DISPOSAL OF LEADED GASOLINE TANK SLUDGE

For tanks that have contained leaded gasoline it is essential that sludge removal be performed with the precautions specified in Publication 2015A. The disposal method must comply with applicable federal and local waste disposal regulations.

5.3.2 METHODS FOR REMOVING SLUDGE

Sludge may be removed by various methods or by a combination of methods, depending on the construction of the tank and the number and size of shell openings. The simplest method is usually to:

1. Wash, brush, or sweep the sludge into piles.
2. Shovel the sludge into buckets or wheelbarrows to remove it from the tank.
3. Sweep and wash down the tank with a water-hose stream.

4. Remove remaining moisture from the tank by using an absorbent such as sawdust, spent clay, or rags.

While removing sludge by such methods, care must be taken to minimize release of vapors from the sludge.

If riveted or welded door sheets have been removed from the tank, or if the tank has floor-level cleanout manways, much of the sludge may be removed by flushing it from the tank with a high-pressure water stream. If such openings do not exist, self-priming pumps or steam- or water-operated ejectors may be useful. Any method of removing residual material that minimizes the time workers must spend inside the tank contributes to the safety of the tank-cleaning operations.

Vacuum tank trucks provide a fast and efficient method for removing and hauling sludge from tanks being cleaned. The area of operation for vacuum tank trucks must be proven to be vapor-free, and the truck should be located upwind from the tank and outside the path of probable vapor travel. In the area of discharge of sludge from the tank truck, vapor travel and sources of ignition must be considered.