EARTHTEC, Inc.
GEOTECHNICAL ENGINEERS • SPECIAL INSPECTORS
GEOLOGICAL AND ENVIRONMENTAL CONSULTANTS

STANDARDIZED PERMIT APPLICATION
RAMOS ENVIRONMENTAL SERVICES
1515 SOUTH RIVER ROAD
WEST SACRAMENTO, CALIFORNIA 95691

EARTHTEC, INC.
PROJECT NO. 308070

PREPARED FOR:

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
ATTENTION: MR. ALEJANDRO GALDAMEZ
700 HEINZ AVENUE, SUITE #200
BERKLEY, CALIFORNIA 94710

AUGUST 22, 2008

Prepared By:
Ed Hendrick
Principal Consultant

1830 Vernon Street, Suite #7 • Roseville, CA 95678 • (916) 786-5262 • Fax (916) 786-5263 •E-mail: earthtec@surewest.net

EARTHTEC, Inc.
GEOTECHNICAL ENGINEERS • SPECIAL INSPECTORS
GEOLOGICAL AND ENVIRONMENTAL CONSULTANTS

August 22, 2008

Department of Toxic Substances Control
Attn: Mr. Alejandro Galdamez
700 Heinz Avenue, Suite #200
Berkeley, California 94710

RE: STANDARDIZED PERMIT APPLICATION **PROJECT NO. 308070**
RAMOS ENVIRONMENTAL SERVICES
1515 SOUTH RIVER ROAD
WEST SACRAMENTO, CALIFORNIA 95691

Dear Mr. Galdamez:

On behalf of Kyle Ramos with Ramos Environmental Services, please find enclosed the standardized permit application.

SECTION I – FACILITY IDENTIFICATION/LOCATION

A) Facility Identification

Ramos Oil Recyclers, dba: Ramos Environmental Services, Inc. (RES)
EPA No. CAD 044003556
1515 South River Road
West Sacramento, California 95691
916-371-5747

The site and adjacent surrounding sites have been used for industrial purposes since 1951. RES is bound on the north by Shell Oil Company, on the west by the Kinder Morgan Pipeline, on the south by Arco Oil Company, and on the east by the Sacramento River. There is a residential area approximately 0.5 miles to the west of the facility. There are no hospitals in the immediate area. The closest school is Westmore Oaks Elementary located approximately 0.9 miles to the west of the facility. The closest park is Memorial park located approximately 0.75 miles southwesterly of the facility.

The average groundwater depth for the upper most aquifer is 25 feet below existing surface grade. The facility is located directly west of the Sacramento River. The facility sits on Quaternary basin deposits and Holocene alluvial deposits, comprised mainly of silts, sands and gravels.

Changes from existing permit:
Non hazardous waste and used oil filters are not regulated waste, so they will not be required to be stored on the drum storage pad.

The proposed 75,000 gallon tank and the proposed support pad were not and will not be installed.

After filling the roll off bins with non RCRA Solids, RES will transport the waste to an approved disposal facility within the standard ten (10) days.

The largest container to be used in the loading and unloading pad will be 7100 gallons capacity.

The Oily Water State Code 223 will not be tested with a clor-d-tect Q4000 test kit as this kit is intended to be used with oil, not oily water.

Hazardous waste may be handled during the hours of darkness if circumstances dictate.

B) Preparer of Standardized Permit Identification

Earthtec, Inc.
1830 Vernon Street, Suite #7
Roseville, California 95678
916-786-5262

Prepared by:
Ed Hendrick
Principal Consultant
Registered Civil Engineer
No. 29260 (expires 3/31/09)

C) Owner/Operator Signatures and Certification

"I certify under penalty of law that this document and all attachments were prepared under my direction of 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 be the best of my knowledge and belief, true, accurate and complete. I further certify that the property owner has been informed that a hazardous waste facility will be operated on the premises. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Owner, Print Name and Signature Date

Operator, Print Name and Signature Date

D) Facility Location Map and Site Layout Diagram
See Attachment 1, Figures 1 and 2

E) Legal Description of Property
Real property situated in the County of Yolo, State of California.

Parcel C, Parcel Map No. 3003, filed December 4, 1981, in Book 6 of Parcel Maps pages 40 and 41, Yolo county records.

Location: Latitude North 38 deg. 34 min. 14 sec, Longitude West 121 deg. 31 min. 04 sec.

SECTION II – FACILITY OPERATION AND HAZARDOUS WASTE MANAGEMENT PRACTICE

Facility Business Type:

Ramos Environmental Services, Inc. is a non-RCRA hazardous waste storage and transfer facility. Non-RCRA Liquids including used oil, antifreeze, oily water, and oily sludge are pumped from trucks into above ground storage tanks. The waste is pumped out of the tanks into larger trucks to be transported to a permitted TSDF for disposal/recycling. Ramos Environmental Services, Inc. is also permitted to perform bulking of non-RCRA solids into roll-off containers and perform truck to truck transfers of non-RCRA Liquids.

In addition to being a permitted storage and transfer facility Ramos Environmental Services, Inc. is also a permitted hazardous waste hauler. Hazardous waste is picked up from miscellaneous generators and manifested to appropriate disposal facilities for proper disposal.

SECTION III – WASTE ANALYSIS PLAN

See Attachment 2

SECTION IV – FACILITY DESIGN (STORAGE)

A) Container Storage Area:
See Attachment 1, Figures 1 and 2.

The container storage area is located near the middle of the facility property adjacent to the north of the tank farm. The container storage area is a six (6) inch thick steel rebar-reinforced concrete slab-on-grade pad with dimensions of thirty-seven (37) feet long by thirty-one (31) feet wide that is enclosed with a two (2) inch high by six (6) inch wide concrete containment berm. The Container Storage Area is enclosed with a six (6) foot high chain link fence with a locking gate.

The container storage area will be used to hold containers including but not limited to drums, totes, and boxes. The area will be used to temporarily hold containers for 10 day transport of RCRA and non-RCRA liquid and solid waste to designated TSDF facilities.

TANK STORAGE UNIT:
The tank storage unit is located in the middle of the facility property. The unit is made of steel rebar-reinforced concrete measuring fifty-five (55) feet in length by twenty (20) feet in width, with a four (4) foot high berm wall as secondary containment. The entire containment system has an impermeable synthetic rubber membrane under the tank concrete foundation and attached concrete loading/unloading area. The inside of the tank storage unit is coated with an oil resistant epoxy. The tank storage unit consists of four (4) vertical steel tanks each having different dimensions. The tank storage unit and loading/unloading pad are surrounded by a six (6) foot high chain link fence with locking gates at both ends.

The Tank Storage Area is used to transfer and store non-RCRA liquids, including used oil, oily water, antifreeze, and oily sludge.

LOADING/UNLOADING PAD (TRUCK TO TRUCK TRANSFER AREA):
The loading/unloading pad (truck-to-truck transfer area) is located in the middle of the facility property directly adjacent to and in front of the tank storage unit. The loading/unloading pad is a rectangular, six (6) inch thick steel rebar-reinforced concrete slab, sixty-eight and one-half (68½) feet long by twenty-one (21) feet wide. The loading/unloading pad is enclosed with a six (6) inch high by six (6) inch wide concrete containment berm. The entire loading/unloading pad and tank storage unit are surrounded by a six (6) foot high chain link fence with locking gates at each end.

The loading/unloading pad is used for loading from tanks to trucks and for unloading trucks to tanks. The truck-to-truck transfer area is used to transfer liquid waste from one truck to another.

SUMP TANK:
The sump tank is located in the middle of the facility property directly in front of the tank storage area secondary containment system. The sump tank is a sunken storage tank of two thousand five hundred (2,500) gallons maximum capacity with rectangular dimensions of sixteen (16) feet long, by five (5) feet wide, by four (4) feet deep. The sump tank is constructed of pre-cast concrete divided into two chambers.

The sump tank is an integral part of the facility's secondary containment and is also used to wash out trucks.

B) Hazardous Wastes Stored:
See Attachment 2.

C) Tank Storage Unit Description:
Tank #1
4000 gallon capacity, vertical, cylindrical, welded mild steel tank.
Dimensions: eight (8) feet in diameter by eighteen (18) feet in height and 0.191 to 0.201 inches wall thickness.
Constructed of mild UL 142 steel welded at the seam with a ridge roof that is vented to the ambient atmosphere.
Built in 1990

Tank #2
11,280 gallon capacity vertical, cylindrical, welded mild steel tank.
Dimensions: eight (8) feet in diameter by thirty (30) feet in height and 0.196 to 0.223 inches wall thickness.
Constructed of UL 142 Steel welded at the seam with a ridge roof.
Built in 1990.

TANK #3
12,925 gallon capacity vertical, cylindrical welded mild steel tank.
Dimensions: ten (10) feet in diameter by twenty-two (22) feet high and 0.210 to 0.223 inches wall thickness.
Constructed of UL 142 steel welded at the seam with a ridge roof.
Built in 1995.

TANK #4
11,280 gallon capacity vertical, cylindrical welded mild steel tank.
Dimensions: eight (8) feet in diameter by thirty (30) feet in height and 0.266 to 0.283 inches wall thickness.
Constructed of UL 142 steel welded at the seam with a ridge roof.
Built in 1990.

D) Secondary Containment System:
The loading/unloading pad (truck-to-truck transfer area) is surrounded by a six (6) inch high by six (6) inch wide concrete berm. There is a 2,500 gallon sump tank directly under the pad. The total secondary containment capacity is 7,814 gallons.

The tank storage unit is surrounded by a four (4) foot high berm wall. The total capacity of the secondary containment is 32,914 gallons.

E) Storage of Ignitable, Corrosive, or Reactive Hazardous Waste:
No ignitable, corrosive or reactive waste will be stored on site. The container storage area will be used to hold containers of ignitable, corrosive or reactive waste for 10 day transportation to a designated TSDF only. The container storage area is located a minimum of fifty (50) feet from any property line. The container storage area is surrounded by a two (2) inch high secondary containment berm. All containers will be held with a minimum isle space of thirty (30) inches and incompatible containers will not be held next to each other.

F) Specified Air Emissions Controls:
This section does not apply for this site, as the waste handled produces no fumes, gases, etc.

G) Engineer's Certification:

1. Engineering Certification of Tank Integrity
   - 1a. Refer to Attachment 3. Structural Engineers Specifications for new mechanical anchorage of Tanks 3 and 4 were installed and tested (copy of test results also contained in Attachment 3).
   - 1b. The tank material of construction is compatible with the hazardous waste contents.
   - 1c. Refer to Attachment 1, Figure 2.
   - 1d. Refer to Attachment 1, Figure 2.
   - 1e. Refer to Attachment 3.
   - 1f. Liquid level indicator includes an audible alarm system utilizing an electronic float. Also, refer to Attachment 4.
   - 1g. External corrosion protection is provided by paint.
   - 1h. Refer to Attachment 3.
   - 1i. Leak detection equipment – refer to Attachment 1 and 5.
   - 1j. The four tanks were placed in service in 1994. Tank numbers 1, 2 and 4 were unused. Tank 3 previously was used for temporary storage of waste oil. Based on a letter by Perkins Welding Works dated May 2, 1986, the useful life of the tanks is expected to be at least 20 years after being put into service.
   - 1k. Leak test report – not applicable.

11. **CERTIFICATION**

"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 gathered and evaluated 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 or 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."

Earthtec, Inc.

REGISTERED PROFESSIONAL ENGINEER CURTIS EDWARD HENDRICK No. 29260 exp. 3-31-09 STATE OF CALIFORNIA

Curtis Edward Hendrick
Principal Consultant

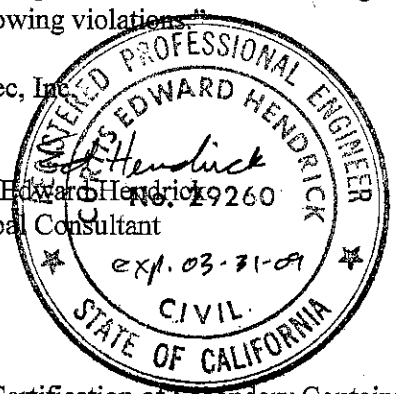
2. Engineering Certification of Tank Secondary Containment
   - 2a. Secondary containment volume can contain 100% of the largest tank volume plus the volume of the rainfall from a 24-hour, 25-year rainstorm.
   - 2b. The secondary containment pad and walls has been coated to mitigate migration of spilled liquids.
   - 2c. The coating material is compatible with the wastes handled in the tank system.
   - 2d. The secondary containment walls have sufficient structural strength and thickness to mitigate failure due to pressure gradients, physical contact with the waste to which it may be exposed, climatic conditions, and the stress of daily operation.
   - 2e. The secondary containment foundation is capable of providing support, resistance to pressure gradients above and below the system and capable of mitigating failure due to settlement, compression or uplift. The foundation concrete is in good condition and has no visible cracks or gaps.
   - 2f. Refer to Pollulert literature, Attachment 5, and to Attachment 1, Figure 2.
   - 2g. Refer to Attachment 1, Figure 2.
   - 2h. Refer to Attachment 1, Figure 2.

1830 Vernon Street, Suite #7 • Roseville, CA 95678 • (916) 786-5262 • Fax (916) 786-5263 •E-mail: earthtec@surewest.net

2i. **CERTIFICATION**

"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 gathered and evaluated 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 or 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."

Earthtec, Inc.

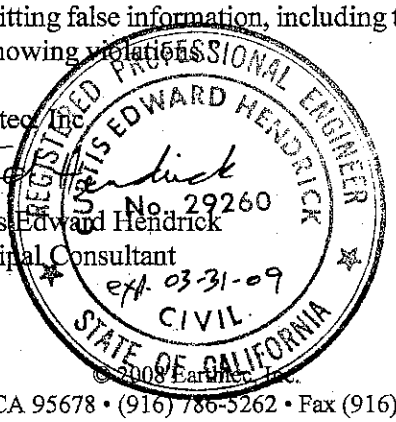


Curtis Edward Hendrick
Principal Consultant

3. Engineering Certification of Secondary Containment of Container Storage Areas
   - 3a. The containment system has sufficient capacity to contain precipitation from a 24-hour, 25-year storm plus 20 percent of the aggregate volume of all containers.
   - 3b. Refer to previous sections 2b. through 2h., same responses.
   - 3c. Refer to previous sections 2b. through 2h., same responses.
   - 3d. Refer to previous sections 2b. through 2h., same responses.
   - 3e. Refer to previous sections 2b. through 2h., same responses.
   - 3f. Refer to previous sections 2b. through 2h., same responses.
   - 3g. Refer to previous sections 2b. through 2h., same responses.
   - 3h. Refer to previous sections 2b. through 2h., same responses.
   - 3i. **CERTIFICATION**

"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 gathered and evaluated 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 or 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."

Earthtec, Inc.



Curtis Edward Hendrick
Principal Consultant

4. Engineering Certification of Compliance with Seismic Standards
Refer to Attachment 3.

H) Engineer's Qualification
Ed Hendrick
Principal Consultant
Registered Civil Engineer
No. 29260 (expires 3/31/09)

SECTION V – FACILITY DESIGN (TREATMENT)
This section is not applicable as Ramos Environmental Services, Inc. does not treat any waste.

SECTION VI – TRAINING PLAN
See Attachment 6, titled Ramos Environmental Services, Inc. Health and Safety Plan. The Training Plan is a component of the Health and Safety Plan. Personnel training records will be filed at the facility.

SECTION VII – INSPECTION PLAN
Prior to the start of any shift the facility operator will inspect the facility according to the inspection log. The operator will make notations in the inspection log to determine if a component of the log has passed or failed inspection. If a component of the inspection log fails, the operator is to immediately inform their supervisor using the work order form so proper corrective action can be taken. After a failed component has been repaired it will be noted in the inspection log with the date of repair.

See Attachment 7
Daily Inspection Log
Facility Work Order Form

SECTION VIII – CONTINGENCY PLAN
See Attachment 8

SECTION IX – CLOSURE PLAN
See Attachment 9

SECTION X – CERTIFICATIONS
See Attachment 10

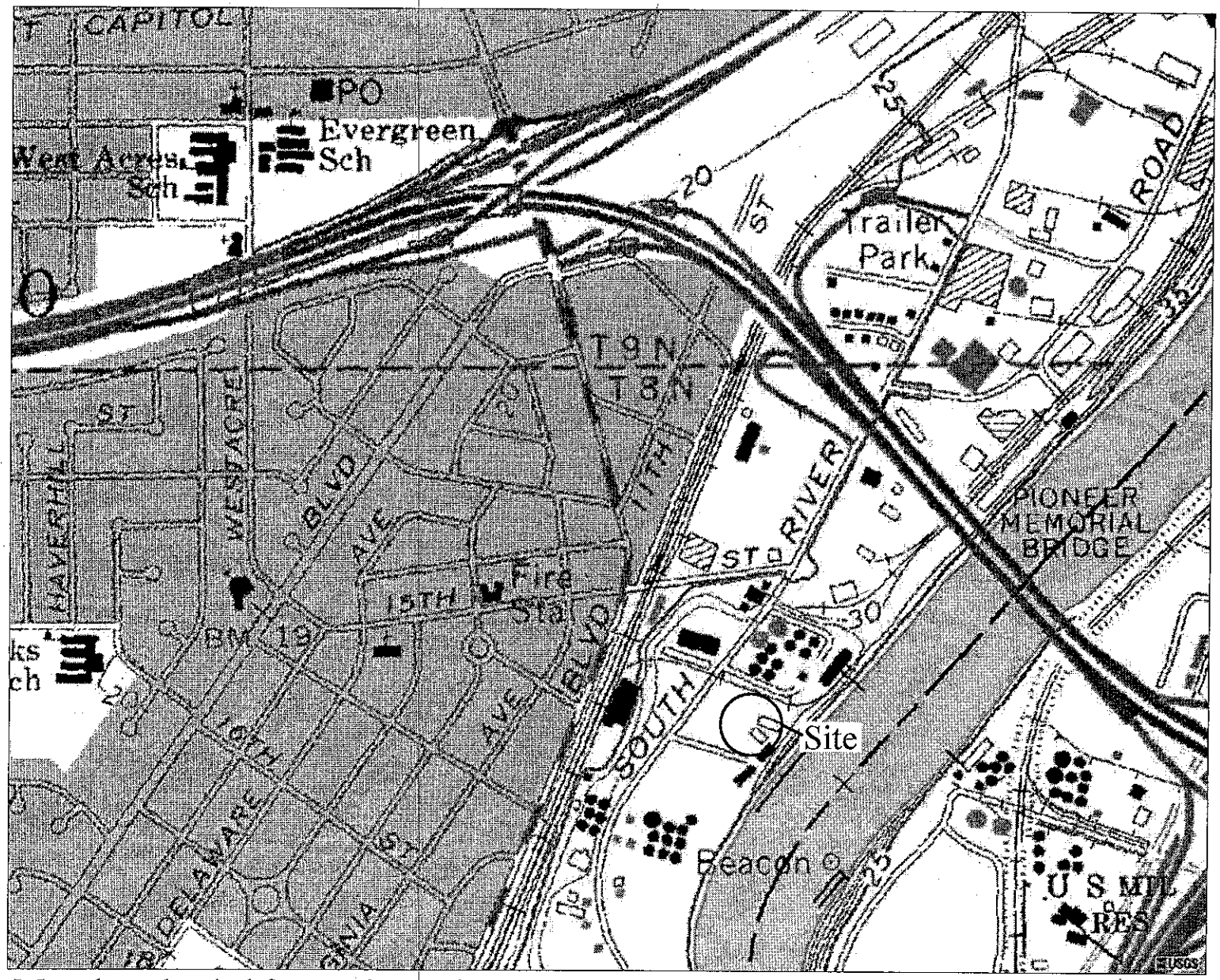
SECTION XI – FINANCIAL RESPONSIBILITY FOR STANDARDIZED PERMIT FACILITIES
A. CLOSURE ASSURANCE – on file with DTSC.
B. LIABILITY INSURANCE – certificate of insurance is in Attachment 11.

1830 Vernon Street, Suite #7 • Roseville, CA 95678 • (916) 786-5262 • Fax (916) 786-5263 •E-mail: earthtec@surewest.net

ATTACHMENT 1

Figure 1 – Location Map

Figure 2 – Site Layout Plan



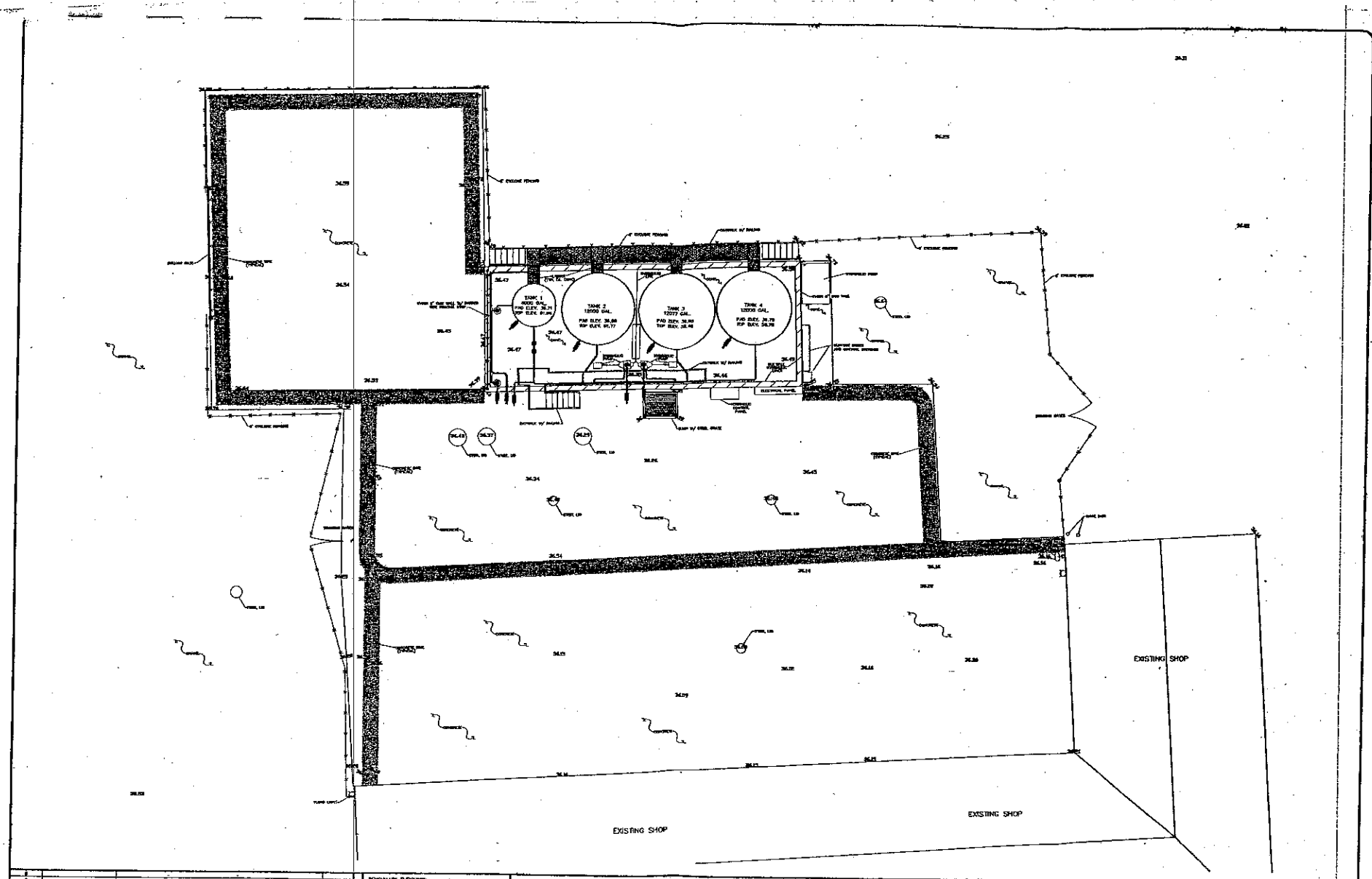
no scale

Map downloaded from Microsoft Terraserver.

EARTHTEC, Inc.
GEOTECHNICAL ENGINEERS • SPECIAL INSPECTORS
GEOLOGICAL AND ENVIRONMENTAL CONSULTANTS

STANDARDIZED PERMIT APPLICATION
RAMOS ENVIRONMENTAL SERVICES
1515 SOUTH RIVER ROAD
WEST SACRAMENTO, CALIFORNIA

FACILITY LOCATION MAP	
PROJECT 308070	AUGUST 2008
ATTACHMENT 1	FIGURE 1



BENCHMARK ELEVATION:

GW Consulting Engineers

Planning
Engineering
Surveying

DRAWN BY: M.LEE
DESIGNED BY:
CHECKED BY: B.M.
SUBMITTED BY:

SCALE:
HORIZONTAL
1" = 20'
VERTICAL
1" = N/A

TOPOGRAPHIC SURVEY OF
HAZARDOUS WASTE STORAGE AREA
FOR
RAMOS ENVIRONMENTAL
YOLO COUNTY CALIFORNIA

FILE NO.
7523-02
SHEET
2
OF
2

ATTACHMENT 2

HAZARDOUS WASTES STORED

RAMOS OIL RECYCLERS
dba: Ramos Environmental Services, Inc.
WASTE ANALYSIS PLAN

SAMPLING AND ANALYSIS OF WASTE

WASTE STREAM INFORMATION

1. Waste Stream Letter:
B

2. Common Name of Hazardous Waste
Oil Water Separator Sludge

ANALYSIS INFORMATION

3. Constituent Analyzed:
8 RCRA Metals

4. Analytical Method Used
EPA Method 6010

5. Detection Limits:
Varies by Metal

6. Purpose of Analysis
Determine Non RCRA Status

SAMPLING PROCEDURE

8. Type of Sample:
Composite

9. Sampling Frequency:
Prior to Profile Approval

10. Sample Location:
Offsite

11. Describe Sampling Procedure:
Prior to profile approval the generator will need to submit an analytical report for the 8 RCRA metals or a Ramos Environmental Services, Inc. employee will go out to the generator's location and pull a composite sample. The sample will be tested at a state certified laboratory for 8 RCRA metals using EPA method 6010.

12. Explanation:
The test is to determine if the material is a RCRA hazardous waste. If it is a RCRA waste it will not be approved at Ramos Environmental Services, Inc.

13. Procedures to verity accuracy or validity of the sample results
Retain samples will be held for no less than 30 days. If required the samples will be run for 8 RCRA at a state certified lab.

SAMPLING AND ANALYSIS OF WASTE

WASTE STREAM INFORMATION

1. Waste Stream Letter:
C

2. Common Name of Hazardous Waste
Unspecified Oil Containing Waste (Oily Water)

ANALYSIS INFORMATION

3. Constituent Analyzed:
pH

4. Analytical Method Used
Standard pH Paper

5. Detection Limits:
N/A

6. Purpose of Analysis
Determine non-RCRA Status

SAMPLING PROCEDURE

8. Type of Sample:
Grab

9. Sampling Frequency:
Every Incoming load

10. Sample Location:
Truck

14. Describe Sampling Procedure:
The waste is homogeneous; therefore only one sample is needed. A sample will be pulled from each truck delivering Unspecified Oil Containing Waste (Oily Water) to Ramos Environmental Services, Inc.; if the sample reads less than 2 or greater than 12.4 the load will be rejected.

15. Explanation:
The test is to determine if the material is a RCRA hazardous waste. If it is a RCRA waste it will not be approved at Ramos Environmental Services, Inc.

16. Procedures to verify accuracy or validity of the sample results
Every quarter a second sample will be pulled and sent to a state certified laboratory and tested for pH.

SAMPLING AND ANALYSIS OF WASTE

WASTE STREAM INFORMATION

1. Waste Stream Letter:
E

2. Common Name of Hazardous Waste
Antifreeze

ANALYSIS INFORMATION

3. Constituent Analyzed:
pH

4. Analytical Method Used
pH test paper

5. Detection Limits:
N/A

6. Purpose of Analysis
Determine waste meets permit conditions

SAMPLING PROCEDURE

8. Type of Sample:
Grab

9. Sampling Frequency:
Every Incoming load

10. Sample Location:
Truck

17. Describe Sampling Procedure:
A Ramos Environmental Services, Inc. employee will pull a sample from each truck. The sample will be tested using standard pH paper.

18. Explanation:
The waste is homogeneous. Therefore, a grab sample will be adequate. The pH of the waste must be greater than 2 and less than 12.4.

19. Procedures to verity accuracy or validity of the sample results
Every quarter a second sample will be pulled and sent to a state certified laboratory and tested for pH.

SAMPLING AND ANALYSIS OF WASTE

WASTE STREAM INFORMATION

1. Waste Stream Letter:
F

2. Common Name of Hazardous Waste
Solids contaminated with Petroleum products

ANALYSIS INFORMATION

3. Constituent Analyzed:
pH and flash point

4. Analytical Method Used
LEL meter & pH paper

5. Detection Limits:
N/A

6. Purpose of Analysis
Determine waste meets permit conditions

SAMPLING PROCEDURE

8. Type of Sample:
Composite

9. Sampling Frequency:
10% of drums from each manifest

10. Sample Location:
Drums

20. Describe Sampling Procedure:
Using an LEL meter a Ramos Environmental Services, Inc. employee will open each drums and test for flammability. PH paper wetted with water will be place on the waste to determine the PH.

21. Explanation:
Drums coming in under manifest will be from the same generator source.

22. Procedures to verity accuracy or validity of the sample results
Every quarter a second sample will be pulled and sent to a state certified laboratory and tested for flash point & pH.

SAMPLING AND ANALYSIS OF WASTE

WASTE STREAM INFORMATION

1. Waste Stream Letter:
G

2. Common Name of Hazardous Waste
Empty containers

ANALYSIS INFORMATION

3. Constituent Analyzed:
None

4. Analytical Method Used
Visual

5. Detection Limits:
N/A

6. Purpose of Analysis
Determine containers are empty

SAMPLING PROCEDURE

8. Type of Sample:
N/A

9. Sampling Frequency:
All containers

10. Sample Location:
Containers

23. Describe Sampling Procedure:
All containers coming in under manifest with state codes 512 and 513 will be inspected visually to determine whether the container is empty

24. Explanation:
The containers are not hazardous if they are empty.

25. Procedures to verify accuracy or validity of the sample results
N/A

UNIT NAME: LOADING/UNLOADING PAD (TRUCK-TO-TRUCK TRANSFER AREA)

I. STORAGE AREA

DIMENSIONS OF CONTAINER STORAGE AREA OR TANK FARM (LENGTH AND WIDTH)	PROCESS CODE	NUMBER OF CONTAINER OR TANKS	TOTAL STORAGE VOLUME	UNIT OF MEASURE
68.5 feet long, by 21 feet wide	S1	2	7,880	G

II. WASTE STORED

Waste Codes		Waste Description	Process Codes	Max. Concentration	Estimated Quantity	Unit of Measure
RCRA	CA					
	133	Waste Antifreeze	S1	999000 mg/l	7100	G
	134	Waste Antifreeze	S1	999000 mg/l	7100	G
	135	Waste Antifreeze	S1	999000 mg/l	7100	G
	343	Waste Antifreeze	S1	999000 mg/l	7100	G
	221	Used Oil	S1	999000 mg/l	7100	G
	222	Oily Sludges	S1	999000 mg/l	7100	G
	491	Oily Sludges	S1	999000 mg/l	7100	G
	241	Oily Sludges	S1	999000 mg/l	7100	G
	223	Oily Water	S1	999000 mg/l	7100	G
	352	Non-RCRA Solids	S1	999000 mg/kg	40,000	lb
	611	Non-RCRA Soils	S1	999000 mg/kg	40,000	lb

III. DESCRIPTION AND LOCATION OF STORAGE UNIT

The loading/unloading pad (truck-to-truck transfer area) is located in the middle of the facility property directly adjacent to and in front of the tank farm. The loading/unloading pad is a rectangular, six (6) inch thick steel rebar-reinforced concrete slab with dimensions of sixty eight and one-half (68½) feet long by twenty one (21) feet wide. The loading pad is enclosed with a six (6) inch high by six (6) inch wide concrete containment berm.

UNIT NAME: SUMP TANK

I. STORAGE AREA

DIMENSIONS OF CONTAINER STORAGE AREA OR TANK FARM (LENGTH AND WIDTH)	PROCESS CODE	NUMBER OF CONTAINER OR TANKS	TOTAL STORAGE VOLUME	UNIT OF MEASURE
16 feet long, by 5 feet wide by 4 feet deep.	S1	1	2,500	G

II. WASTE STORED

Waste Codes		Waste Description	Process Codes	Max. Concentration	Estimated Quantity	Unit of Measure
RCRA	CA					
	223	Oily Water	S1	999000 mg/kg	2300	G
	611	Non RCRA Soils	S1	999000 mg/kg	2300	G
	222	Oily Sludges	S1	999000 mg/kg	2300	G
	491	Oily Sludges	S1	999000 mg/kg	2300	G
	241	Oily Sludges	S1	999000 mg/kg	2300	G

III. DESCRIPTION AND LOCATION OF STORAGE UNIT

The sump tank is located in the middle of the facility property directly in front of the tank farm secondary containment system. The sump tank is a sunken storage tank of 2,500 gallons maximum capacity with rectangular dimensions of sixteen (16) long, by five (5) feet wide, by four (4) feet deep. The sump tank is constructed of pre-cast concrete divided into two chambers.

UNIT NAME: ROLL-OFF SLUDGES/SOLID STORAGE CONTAINERS

I. STORAGE AREA

DIMENSIONS OF CONTAINER STORAGE AREA OR TANK FARM (LENGTH AND WIDTH)	PROCESS CODE	NUMBER OF CONTAINER OR TANKS	TOTAL STORAGE VOLUME	UNIT OF MEASURE
18 feet long, by 8 feet wide, by 4.5 feet high	S1	1	40,000	LB

II. WASTE STORED

Waste Codes		Waste Description	Process Codes	Max. Concentration	Estimated Quantity	Unit of Measure
RCRA	CA					
	352	Non RCRA Solids	S1	999000 mg/kg	40,000	lb
	611	Non RCRA Soils	S1	999000 mg/kg	40,000	lb
	222	Oily Sludges	S1	999000 mg/kg	40,000	lb
	491	Oily Sludges	S1	999000 mg/kg	40,000	lb
	241	Oily Sludges	S1	999000 mg/kg	40,000	lb

III. DESCRIPTION AND LOCATION OF STORAGE UNIT

The DOT-Certified Roll-Off Containers are stored elsewhere on the facility property and only moved onto the loading/unloading pad for purpose of loading and bulking. The loading/unloading pad is located in the middle of the facility property directly adjacent to and in front of the tank farm. The DOT-certified Roll-Off containers are rectangular in shape and constructed of mild steel with an approximate capacity of twenty (20) Cubic Yards.

UNIT NAME: CONTAINER STORAGE AREA

I. STORAGE AREA

DIMENSIONS OF CONTAINER STORAGE AREA OR TANK FARM (LENGTH AND WIDTH)	PROCESS CODE	NUMBER OF CONTAINER OR TANKS	TOTAL STORAGE VOLUME	UNIT OF MEASURE
37 feet long by 31 feet wide.	S1	118	6,490	G

II. WASTE STORED

Waste Codes		Waste Description	Process Codes	Max. Concentration	Estimated Quantity	Unit of Measure
RCRA	CA					
	133	Waste Antifreeze	S1	999000 mg/l	300	G
	134	Waste Antifreeze	S1	999000 mg/l	300	G
	135	Waste Antifreeze	S1	999000 mg/l	300	G
	343	Waste Antifreeze	S1	999000 mg/l	300	G
	221	Used Oil	S1	999000 mg/l	700	G
	222	Oily Sludges	S1	999000 mg/l	300	G
	491	Oily Sludges	S1	999000 mg/l	300	G
	241	Oily Sludges	S1	999000 mg/l	300	G
	223	Oily Water	S1	999000 mg/l	700	G
	352	Non RCRA Solids	S1	999000 mg/kg	40,000	lb
	611	Non RCRA Soils	S1	999000 mg/kg	40,000	lb
	513	Empty Containers Smaller than 30 Gallons	S1	999000 mg/kg	5000	lb
	512	Empty Container Larger than 30 Gallons	S1	999000 mg/kg	5000	lb

III. DESCRIPTION AND LOCATION OF STORAGE UNIT

The container storage area is located in the middle of the facility property directly north of the tank farm. The Container Storage Area is a six (6) inch thick steel rebar-reinforced concrete slab pad with dimensions of thirty seven (37) feet long by thirty one (31) feet wide that is enclosed with a two (2) inch high by six (6) inch wide concrete containment berm.

Table 2
Description of Waste

(1) Waste Stream Letter	(2) Common Name of Hazardous Waste	(3) U.S. EPA Code (22CCR 66261.20 to 66261.126)	(4) California Waste Code (22CCR 66261.126 Appendix XII)	(5) Description of Waste	(6) Process Generating Waste
Example A	Example Fixer	Example D011	Example 541	Example Spent silver-bearing photo and x-ray developing waste solutions.	Example Photo, printing and x-ray developing industry.
A	OIL	N/A	221	CRANKCASE AND LUBRICATING OIL, FUEL CONTAMINATED OILS, MACHINE COOLING OILS, COMPRESSOR & HYDRALIC OILS, NON PCB TRANSFORMER OILS.	VEHICLE MAINTENANCE, TANK REMOVAL AND CLEANING, MACHINE SHOP MAINTENANCE, OIL SPILL CLEAN-UP.
B	OIL/WATER SEPARATION SLUDGE	N/A	222	SLUDGES FROM OIL WATER SEPARATORS	OIL WATER SEPARATOR MAINTENANCE
C	UNSPECIFIED OIL CONTAMINATED WASTE	N/A	223	WATER CONTAMINATED WITH OIL	OIL SPILL CLEAN UP, STORM WATER, TANK RINSATE FROM TANK CLEANING
D	TANK BOTTOM WASTE	N/A	241	SLUDGES FROM TANK BOTTOMS	TANK CLEANING AND REMOVAL
E	ANTIFREEZE	N/A	343	ETHYLENE GLYCOL, PROPOLYNE GLYCOL	VEHICLE MAINTENANCE

Table 3
Physical Properties of Waste

Waste Stream Letter	Common Name of Waste	Specific Gravity	pH	Flash Point
A	Oil	0.5-1.0 GM/ML	2.1-12.4	>100 deg. F
B	Oil Water Separator Sludge	05-1.1 GM/ML	2.1-12.4	>100 deg. F
C	Unspecified Oil Containing Waste (Used Oil)	0.5-1.0 GM/ML	2.1-12.4	>100 deg. F
D	Tank Bottom Waste	0.5-1.2 GM/ML	2.1-12.4	>100 deg. F
E	Antifreeze	0.8-1.4 GM/ML:	2.1-12.4	>100 deg. F
F	Solids Contaminated with Petroleum Products	N/A	2.1-12.4	>200 deg. F
G	Empty Containers	N/A	2.1-12.4	>200 deg. F

Table 4
Hazardous Properties of Waste

Waste Stream Letter	Common Name of Waste	Hazardous Constituents in Waste Stream	Ignitability (22 ccr 66261.21)	Correosivity (22 ccr 66261.22)	Reactibility (22 ccr 66261.23)	Toxicity (22 ccr 66261.24)	Incompatibility with other Waste Streams and Containers
A	Oil	Oil	None	None	None	Orally Toxic as defined by title 22, ccr 666699	None
B	Oil Water Separation Sludge	Oil	None	None	None	Orally Toxic as defined by title 22, ccr 666699	None
C	Unspecified oil containing waste (oily water)	Oil	None	None	None	Orally Toxic as defined by title 22, ccr 666699	None
D	Tank Bottom Waste	Oil	None	None	None	Orally Toxic as defined by title 22, ccr 666699	None
E	Antifreeze	Ethylene Glycol, Propalyne Glycol	None	None	None	Orally Toxic as defined by title 22, ccr 666699	None
F	Solids contaminated w/Petroleum	Petroleum Products	None	None	None	Orally Toxic as defined by title 22, ccr 666699	None
G	Empty Containers	N/A	None	None	None	None	None

Table 5
Sampling and Analysis of Waste

WASTE STREAM INFORMATION

1. Waste Stream Letter: A

2. Common Name of Hazardous Waste: OIL

ANALYSIS INFORMATION

3. Constituent(s) Analyzed: HALOGENS

4. Analytical Method Used: CLOR-D-TECT TEST KIT

5. Detection Limit: 200 MG/L

6. Purpose of Analysis: TO COMPLY WITH 40 CFR 279.44

7. Analysis performed onsite or offsite: ONSITE

SAMPLING PROCEDURE

8. Identify if grab sample or composite sample: GRAB

9. Sampling Frequency: EVERY INCOMING LOAD

10. Sample Location: TRUCK

11. Describe sampling procedure:

A 100 ML SAMPLE WILL BE PULLED DIRECTLY FROM EVERY TRUCK BRINGING OIL IN. THE SAMPLE WILL BE TESTED USING THE CLOR-D-TECT Q 4000 KIT (SEE ATTACHED INSTRUCTION SHEET).

CLOR-D-TECT KITS ARE MANUFACTURED BY: DEXSIL CORPORATION
1 HAMDEN PARK DRIVE
HAMDEN, CT 06517
PHONE: (203) 288-3509

12. Explain rationale for responses to Questions 8 though 11.

THE WASTE IS HOMOGENEOUS, THEREFORE ONLY ONE SAMPLE IS NEEDED. A SAMPLE WILL BE PULLED FROM EACH TRUCK DELIVERING OIL TO RAMOS ENVIRONMENTAL, IF THE SAMPLE READS > 1000 PPM TOTAL HALOGENS THE LOAD WILL BE REJECTED OR REROUTED TO AN ALTERNATIVE FACILITY APPROVED TO TAKE OIL WITH HALOGENS > 1000 PPM.

13. Explain procedure for verifying the accuracy or validity of the sampling results.

EVERY THREE MONTHS A SECOND SAMPLE WILL BE PULLED AND SENT TO AN INDEPENDENT STATE CERTIFIED LAB. THE SAMPLE WILL BE TESTED FOR VOLITIVE HALOGENATED ORGANIC COMPOUNDS USING EPA METHOD # 601.

Table 5 Sampling and Analysis of Waste	
WASTE STREAM INFORMATION	
1. Waste Stream Letter: D	2. Common Name of Hazardous Waste: TANK BOTTOM SLUDGE
ANALYSIS INFORMATION	
3. Constituent(s) Analyzed: HALOGENS	4. Analytical Method Used: CLOR-D-TECT
5. Detection Limit: 200 MG/L	6. Purpose of Analysis: COMPLY WITH 40 CFR 279.44
7. Analysis performed onsite or offsite: ONSITE	
SAMPLING PROCEDURE	
8. Identify if grab sample or composite sample: COMPOSITE	9. Sampling Frequency: EVERY INCOMING LOAD
10. Sample Location: TRUCK	
11. Describe sampling procedure: A 100 ML SAMPLE WILL BE PULLED FROM TRUCK, SAMPLE WILL BE TESTED USING THE CLOR-D-TECT Q4000 KIT.	
12. Explain rationale for responses to Questions 8 though 11. WASTE IS OIL AND OIL RELATED AND MUST BE LESS THAN 1000 PPM TOTAL HALOGENS.	
13. Explain procedure for verifying the accuracy or validity of the sampling results. EVERY SIX MONTHS A DUPLICATE SAMPLE WILL BE SENT TO A STATE CERTIFIED LAB, AND THE RESULTS WILL BE COMPARED.	

Table 6
Treatment Standards (22 CCR Chapter 18)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Waste Stream Letter	Common Name of Hazardous Waste	U.S. EPA and/or California Waste Codes	Applicable LDR Waste Codes or Category (22CCR 66268.29)	Is Waste Liquid or Solid	Designated Treatment Standards (For RCRA wastes 22 CCR 66268.41 through 66268.43 For non-RCRA wastes 22CCR 66268.105 through 66268.113)				
					Constituent	Concentration (mg/L)	Analytical Method Used	Grab or Composite Sample	Technology
Example	Example	Example	Example	Example	Example	Example	Example	Example	Example
A	fixer	D011	D011	Liquid	Silver	5.0	TCLP	Grab	none
		CWC 541	Aqueous wastes with metals.	Liquid	Silver	5.0	WET	Grab	none
A	OIL	N/A	221	LIQUID	N/A	N/A	N/A	N/A	NONE
B	OIL/WATER SEPARATOR SLUDGE	N/A	222	LIQUID/ SLUDGE	N/A	N/A	N/A	N/A	NONE
C	UNSPECIFIED OIL CONTAINING WASTE	N/A	223	LIQUID	N/A	N/A	N/A	N/A	NONE
D	TANK BOTTOM WASTE	N/A	241	LIQUID/ SLUDGE	N/A	N/A	N/A	N/A	NONE
E	ANTIFREZE	N/A	343	LIQUID	N/A	N/A	N/A	N/A	NONE

Notes:
LDR = Land Disposal Restrictions.
RCRA = Resource Conservation Recovery Act of 1972.
non-RCRA = California waste.
mg/l = milligrams per liter.

SAMPLING WORKSHEET

TANK #1 (Antifreeze):		
TPH-Oil	2 samples @ $50.00/ea.	$100.00
CAM 17 Metals	2 samples @ $210.00/ea.	$420.00
Pesticides/PCB's	2 samples @ $100.00/ea.	$200.00
BTEX	2 samples @ $100.00/ea.	$200.00
Non Halogenated Orgnics	2 samples @ $90.00/ea.	$180.00
TANK #2 (Oil):		
Pesticides/PCB's	2 samples @ $100.00/ea.	$200.00
CAM 17 Metals	2 samples @ $210.00/ea.	$420.00
BTEX	2 samples @ $100.00/ea.	$200.00
TANK #3 (Oil):		
Pesticides/PCB's	2 samples @ $100.00/ea.	$200.00
CAM 17 Metals	2 samples @ $210.00/ea.	$420.00
BTEX	2 samples @ $100.00/ea.	$200.00
TANK #4 (Oily Water):		
TPH-Oil	2 samples @ $50.00/ea.	$100.00
Pesticides/PCB's	2 samples @ $100.00/ea.	$200.00
CAM-17 Metals	2 samples @ $210.00/ea.	$420.00
BTEX	2 samples @ $100.00/ea.	$200.00
TANKER TRUCKS (Oily Water)		
TPH-Oil	4 samples @ $50.00/ea.	$200.00
Pesticides/PCB's	4 samples @ $100.00/ea.	$400.00
CAM-17 Metals	4 samples @ $210.00/ea.	$840.00
BTEX	4 samples @ $100.00/ea.	$400.00
ROLL OFF BIN:		
CAM-17 Metals	2 samples @ $210.00/ea.	$420.00
TPH-Oil	2 samples @ $50.00/ea.	$100.00
Pesticides/PCB's	2 samples @ $100.00/ea.	$200.00
BTEX	2 samples @ $100.00/ea.	$200.00

SOIL:		
TPH-Oil	10 samples @ $50.00/ea.	$500.00
Pesticides/PCB's	10 samples @ $100.00/ea.	$1,000.00
CAM-17 Metals	10 samples @ $210.00/ea.	$2,100.00
BTEX	10 samples @ $100.00/ea.	$1,000.00
CONCRETE CORE:		
TPH-Oil	10 samples @ $50.00/ea.	$500.00
Pesticides/PCB's	10 samples @ $100.00/ea.	$1,000.00
CAM-17 Metals	10 samples @ $210.00/ea.	$2,100.00
BTEX	10 samples @ $100.00/ea.	$1,000.00
DRUMS FROM DRUM PAD:		
Antifreeze		
TPH-Oil	1 samples @ $50.00/ea.	$50.00
Pesticides/PCB's	1 samples @ $100.00/ea.	$100.00
CAM-17 Metals	1 samples @ $210.00/ea.	$210.00
Non Halogenated organics	1 samples @ $90.00/ea.	$90.00
Oil:		
Pesticides/PCB's	7 samples @ $50.00/ea.	$350.00
CAM-17 Metals	7 samples @ $210.00/ea.	$1,470.00
BTEX	7 samples @ $100.00/ea.	$700.00
Oily Water:		
TPH-Oil	3 samples @ $50.00/ea.	$150.00
Pesticides/PCB's	3 samples @ $100.00/ea.	$300.00
CAM-17 Metals	3 samples @ $210.00/ea.	$630.00
BTEX	3 samples @ $100.00/ea.	$300.00
Estimated Labor and Materials:		$5000.00

SAMPLING ASSUMPTIONS

1) The tanks will be sampled at two different depths.

2) The tanks will not be wipe sampled after rinsing, they will be shipped to E.C.I. on a hazardous waste manifest.

3) The drum pad will be at capacity with 118 drums. The drums will contain the same materials with the same proportions as the bulk tanks.

4) Analytical prices were taken from Excelchem's standard price sheet (enclosed).

5) The concrete core samples will be used in place of wipe sampling.

SAMPLING SUMMARY

Tank #1	$1,100.00
Tank #2	$820.00
Tank #3	$820.00
Tank #4	$920.00
Tanker Trucks	$1,840.00
Roll off bin	$920.00
Soil	$4,600.00
Concrete Cores	$4,600.00
Drum pad (Antifreeze)	$450.00
Drum pad (Oil)	$2,250.00
Drum pad (Oily Water)	$1,380.00
Labor and Equipment	$5000.00
SAMPLING TOTAL:	**$24,700.00**

ATTACHMENT 3

ENGINEERING CERTIFICATION OF TANK INTEGRITY

LIONAKIS
beyond design.

1919 Nineteenth Street
Sacramento CA 95811
P: 916.558.1900
F: 916.558.1919
www.lionakis.com

Transmittal

Date: 8/21/08

To: Ed Hendrick
Earthtec, Inc.
1830 Vernon Street, Suite 7
Roseville, CA 95678

CC: File

By: Kristin Balukoff, Project Coordinator
for Kerry Volker

Re: Ramos Oil Tanks

File: 28386/ /

Delivery: Overnight 10am

Enclosed:

☐ Shop Dwgs - ☐ Prints - ☐ Samples - ☐ Plans - ☐ Specifications ☐ Other: .....

Qty	Description
1	Schematic Tank Layout Plan and As-Built Tank Elevation
	LG Inspection Visual Inspection Report
	Calculation Sheets

For:

☐ Review - ☐ Approval - ☒ Your Use - ☐ Other

s:\2008\28386 ramos oil tanks\corrospondences\trans 080821 e hendrick.doc

LIONAKIS
beyond design.

1919 Nineteenth Street
Sacramento CA 95811
P: 916.558.1900
F: 916.558.1919
www.lionakis.com

August 21, 2008

John Villanueva
Ramos Environmental Services
1515 South River Road
West Sacramento, CA 95691

Re: Ramos Oil Tanks DTSC Certification (#28386)
1515 South River Road, West Sacramento Facility

Mr. Villanueva:

Pursuant to your request, Lionakis is pleased to present our findings with regards to current structural code compliance of the four (4) storage tanks located on the North Side of the Ramos Oil Facility (see attached figures). It is our understanding that this information will be used to obtain certification with the Department of Toxic Substances Control (DTSC).

Please note that the scope of Lionakis' work was limited to analysis of the existing tank shells, the respective tanks' anchorage to foundation (if any), and structural adequacy of the foundations.

For reference, both vertical and lateral calculations were performed per the Eleventh Edition of the American Petroleum Institute's (API) standard 650 (Welded Steel Tanks for Oil Storage), dated June 2007. Seismic shaking criteria for the site were provided to our office by Earthtec, Inc. Lionakis was to perform vertical and lateral analysis for the tanks in conformance with the 2007 CBC. Due to the special characteristics of steel storage tanks in response to vertical and lateral loads, we determined that an industry standard design document should be used for this application. API 650 is designed to provide the industry with tanks of adequate safety and reasonable economy. API 650 utilizes the same wind and seismic criteria used by the 2007 CBC with modifications accounting for the specific response of tanks to those imparted loads.

In performing our analysis of the tanks the following assumptions were made:

- All storage tanks are constructed using a minimum steel plate thickness of 3/16" on all faces.
- A36 (minimum) grade steel used in construction of all storage tanks.
- Density of all liquids to be stored in storage tanks is not greater than 57.9 pcf.
- Existing foundation slab is 6" thick (minimum), reinforced with #4 at 6" on center each way at mid-depth of slab.
- Assumed Seismic use Group 1 per API 650.
- Existing anchor bolts, where present, are a minimum 1.125" diameter A307 grade, are evenly spaced around the perimeter of the tank, and are embedded such that they can develop a minimum tensile anchorage force of 6,000 pounds in the foundation.

- Minimum allowable soils bearing pressure is equal to 2,000 psf, with a one third increase allowed for transient (i.e., seismic, wind) loading.
- Information presented in the original structural calculations, done by William D. Bevier, S.E., and dated July 9, 1996, is representative of the as-built conditions.
- The effects of openings, valves, etc. have not been considered. Adequacy of piping, ladders, etc., is also outside of the scope of this report.

Per the requirements of API Standard 650, a minimum plate thickness of 3/16" is required for all tank faces. Anchorage may or may not be required, depending on tank geometry and contents. As such, based on the calculations performed (see attached), the as-built conditions observed in the field, and with consideration to the assumptions listed above, Lionakis has the following recommendations and conclusions:

1. Tank 1 (4,000 Gallon Capacity) – Existing Tank shell thickness, anchorage (eight 1.125" diameter evenly spaced A307 anchor bolts) and foundation are acceptable.
2. Tank 2 (12,000 Gallon Capacity) – Existing Tank shell thickness, anchorage (ten 1.125" diameter evenly spaced A307 anchor bolts) and foundation are acceptable.
3. Tank 3 (12,077 Gallon Capacity) – Existing Tank shell thickness and foundation are acceptable. New mechanical anchorage will need to be provided.
4. Tank 4 (12,000 Gallon Capacity) – Existing Tank shell thickness and foundation are acceptable. New mechanical anchorage will need to be provided.

Note that the visual inspection done by LG Inspection (see attached for report) found that, "for the most part tanks 1 thru 4 were in excellent shape." Ultrasonic testing, also performed by LG inspection, indicates that the minimum shell thickness is greater than 3/16" in all examined locations. Therefore, based on the limited available information, it appears that the tanks meet this minimum prescribed requirement.

In summary, both Tanks 1 and 2 are in substantial structural compliance with the requirements of API Standard 650. The shell thickness and foundations of Tanks 3 and 4 are also in substantial structural compliance with API Standard 650; however, new mechanical anchorage of these two tanks to the foundation will be required. The original structural calculations performed by Bill Bevier also indicated that anchorage was required for Tanks 3 and 4. We recommend that a new anchorage system, similar to the type in place at Tank 2, be used to anchor Tanks 3 and 4 to the existing foundation.

Please contact us should you have any questions.

Sincerely,

Kerry J. Volker | SE | SECB | LEED™ AP
Associate Principal

Enclosed:
Schematic Tank Layout Plan and As-Built Tank Elevation
LG Inspection Visual Inspection Report (VT001), dated 8/8/2008
Calculation sheets TC-1 – TC-14

Schematic Tank Layout Plan and As-Built Tank Elevation

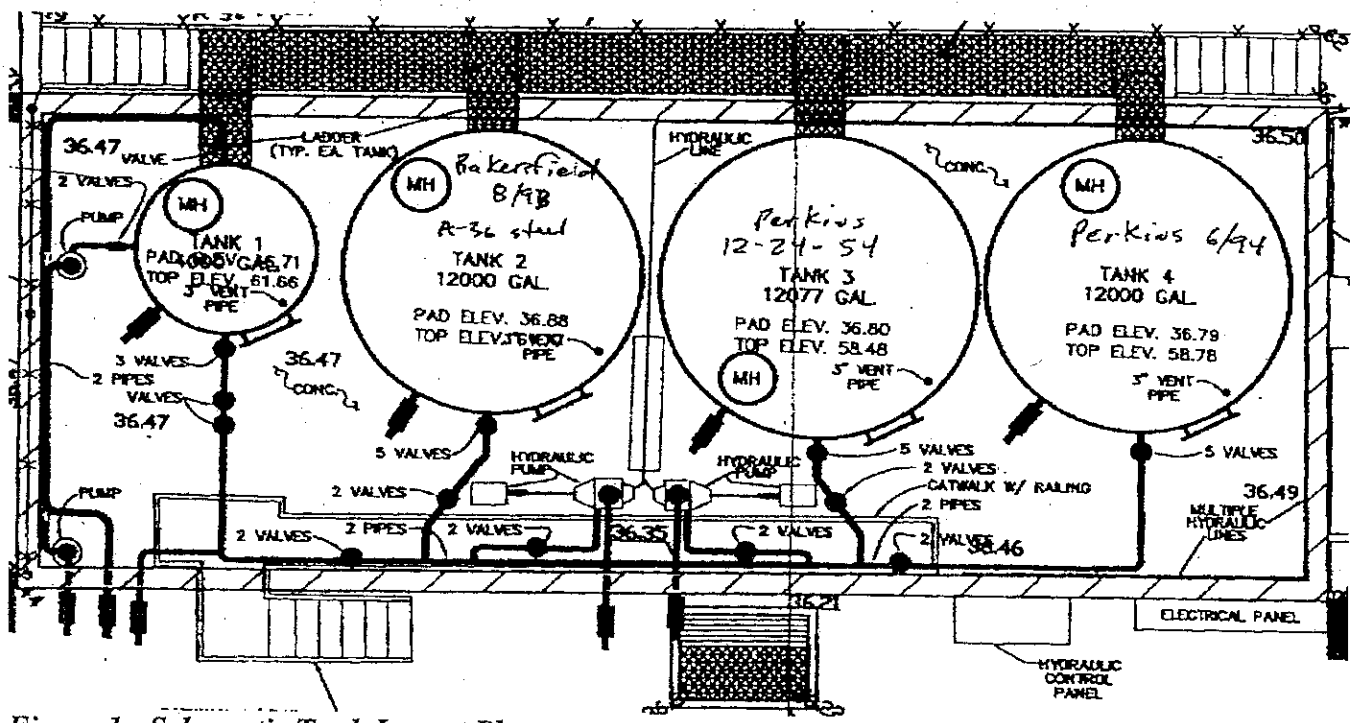


Figure 1 - Schematic Tank Layout Plan

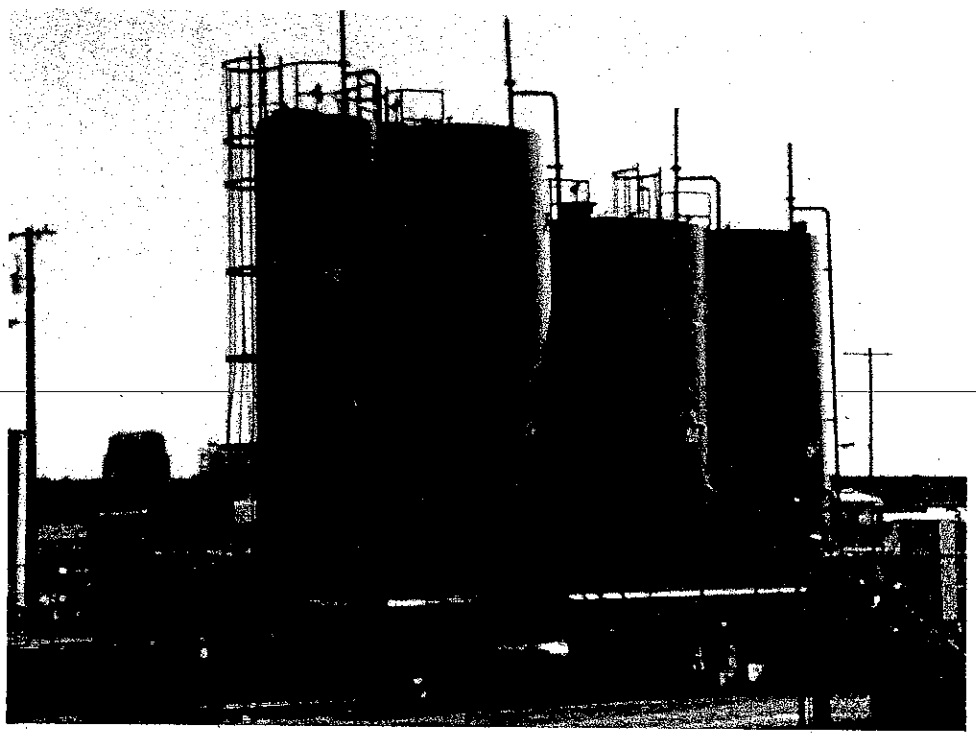


Figure 2 - As-Built Tank Elevation

LG Inspection
P.O. Box 19416, Sacramento, CA 95819-0416
Phone: (916) 2482547 Fax: (916) 3331852
Lornegrimes@gmail.com

VISUAL INSPECTION REPORT
VT001

Project Name Ramos
Job Number Ramos-08-001
Location West Sac
Specification Customer info

Joint Detail

N/A

NDT: Yes RT UT Thickness MT PT OTHER

Type of Inspection VT & UT thickness

WPS: Yes No X Weld# Welding Variables Verified: Yes No Amps: Volts Average of three

Items of Inspection:

1) Reviewed ultrasonic requirements for tank thickness

2) Reviewed visual requirements for tank acceptability.

Summary of Inspection

Performed visual inspection of 4 welded tanks at the West Sacramento plant. Each tank was labeled with contents. 1st tank Anti freezes waste, 2nd tank used oil, 3rd tank used oil, 4th tank oily water.

Visual inspection of each for leaks or corrosion, as well as a protective coating. For the most part tanks 1 thru 4 were in excellent shape, no corrosion or leaks around welds or seams. The coatings were found to be acceptable as well.

The ultrasonic results are attached.

- All items inspected conform to approved plans and specifications
  Inspector's comments:
- All but noted items conform to plans and specifications
- NCR report attached

Time on Site: 5
Travel Time: 1
Mileage: 48

Inspector: Lorne Grimes
Digitally signed by Lorne Grimes
DN: cn=Lorne Grimes, o=LGI, Inc, ou=AWS, email=lornegrimes@gmail.com, c=US
Date: 2008.08.21 10:39:38 -07'00'

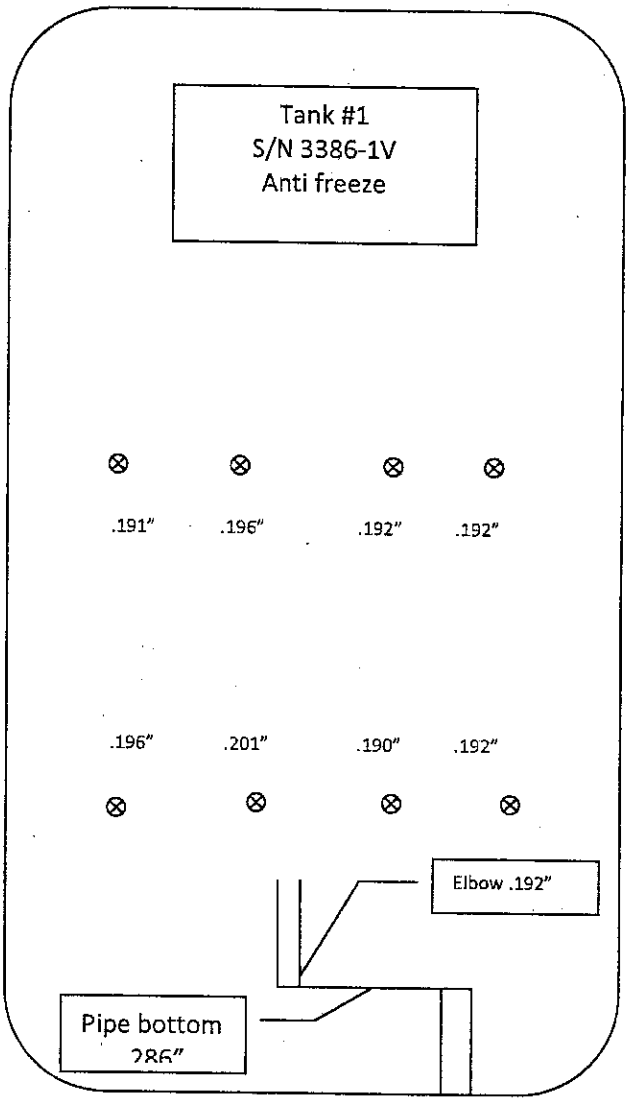
Date: 8-8-08

QA/QC:

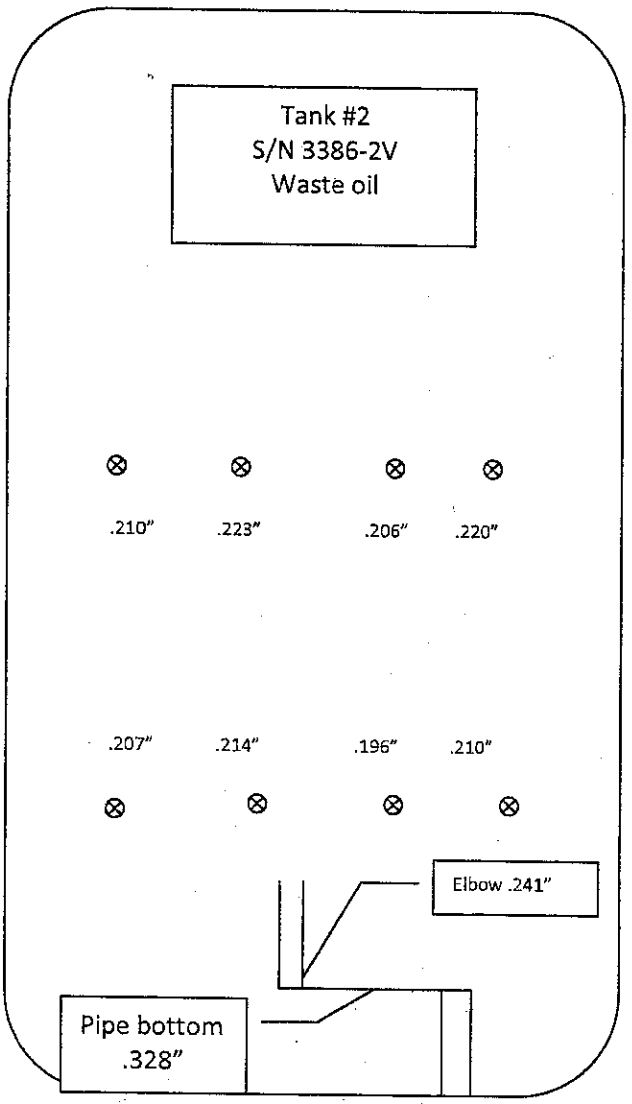
Date:

P.O. Box 19416, Sacramento, CA 95819-0416
Phone: (916) 2482547 Fax: (916) 3331852
Lornegrimes@gmail.com

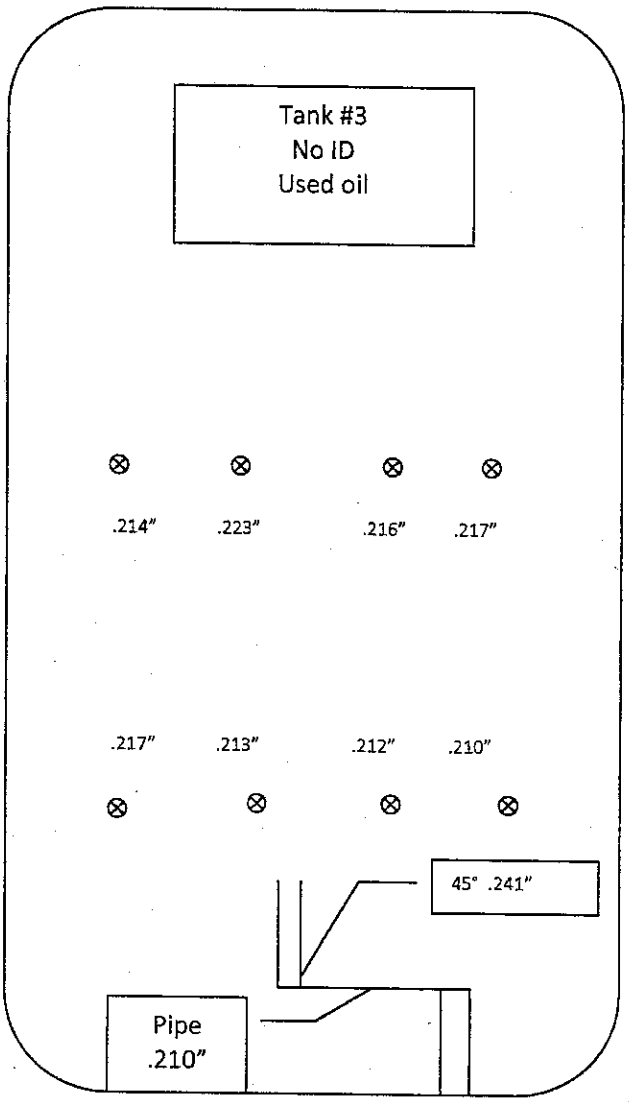
IG Inspection



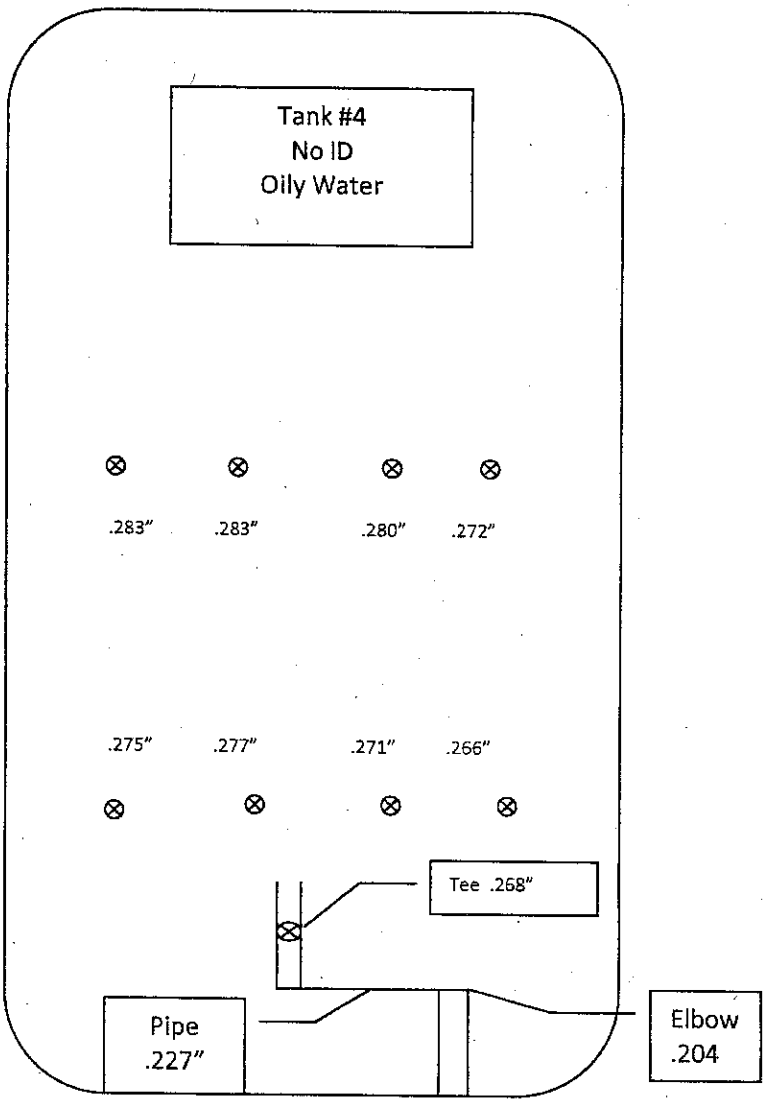
IG Inspection
P.O. Box 19416, Sacramento, CA 95819-0416
Phone: (916) 2482547 Fax: (916) 3331852
Lornegrimes@gmail.com



IG Inspection
P.O. Box 19416, Sacramento, CA 95819-0416
Phone: (916) 2482547 Fax: (916) 3331852
Lornegrimes@gmail.com



IG Inspection
P.O. Box 19416, Sacramento, CA 95819-0416
Phone: (916) 2482547 Fax: (916) 3331852
Lornegrimes@gmail.com

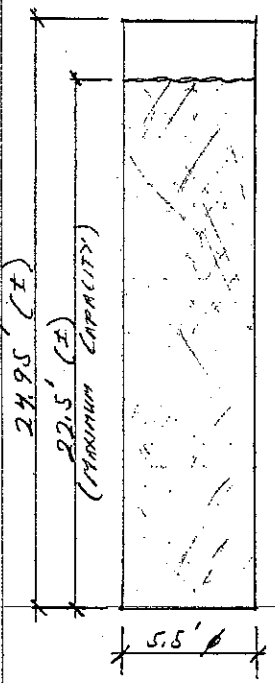


=> Check Shell Thickness

↳ Tank 1 => 4000 Gallon Tank
5.5' Diameter
Tank Height = 61.66 - 36.71 = 24.95'
Stokes Antifreeze

=> Max Height of Fluid
↳ Tank Area = $(5.5^2)(\pi)/4 = 23.76\ ft^2$
4000 Gallons = $534.7\ ft^3$
↳ $534.7/23.76 = 22.5'$ (±)

=> Use $57.9\ \#/ft^3$ for Density of Antifreeze
=> A36 Steel used for Shell (Assume)



Elevation - Tank 1
1/8" = 1'-0"

Minimum Shell Thickness

↳ For API Standard 650
↳ 3/16" Thick Min (Table Value)

$$t_d = \frac{2.6D(H-1)G}{S_d} + CA \quad (CA = 0 \text{ assume})$$

$D = 5.5'$; $H = 22.5'$; $G = 57.9/62.4 = 0.93$

$$= \frac{2.6(5.5)(22.5-1)(0.93)}{23{,}200} = 0.0123\ in \ (< 1/16")$$

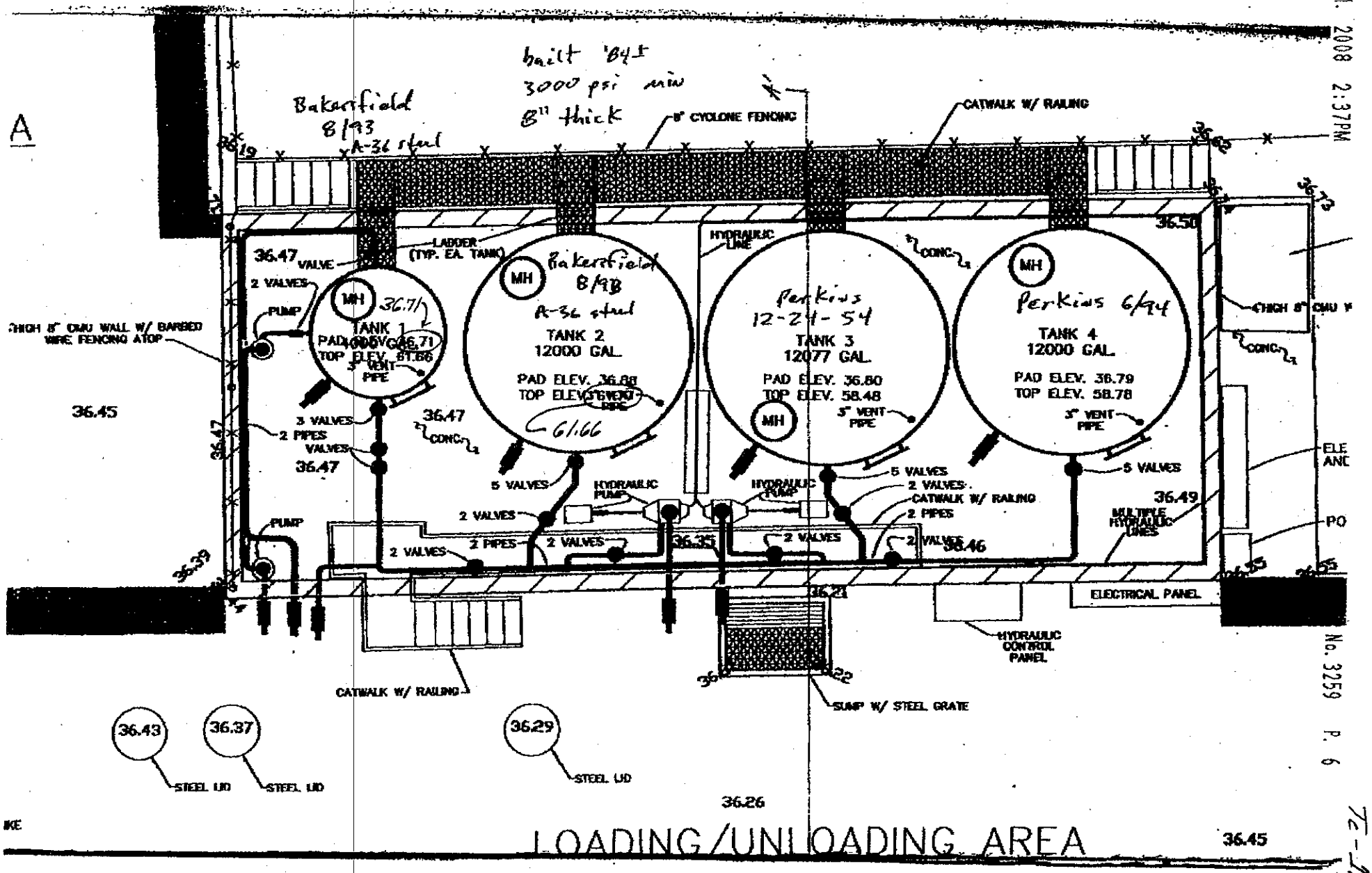
(S_d)

OR

$$t_t = \frac{2.6D(H-1)}{S_t} \quad \Rightarrow S_t = 24{,}900$$

$$= \frac{2.6(5.5)(22.5-1)}{24{,}900} = 0.0119\ in \ (< 1/16")$$

∴ Minimum Thickness = 3/16"



5.5.4 The ring of annular plates shall have a circular outside circumference, but may have a regular polygonal shape inside the tank shell, with the number of sides equal to the number of annular plates. These pieces shall be welded in accordance with 5.1.5.6 and 5.1.5.7, Item b.

5.5.5 In lieu of annular plates, the entire bottom may be butt-welded provided that the requirements for annular plate thickness, welding, materials, and inspection are met for the annular distance specified in 5.5.2.

5.6 SHELL DESIGN

5.6.1 General

5.6.1.1 The required shell thickness shall be the greater of the design shell thickness, including any corrosion allowance, or the hydrostatic test shell thickness, but the shell thickness shall not be less than the following:

Nominal Tank Diameter		Nominal Plate Thickness		07
(m)	(ft)	(mm)	(in.)	
< 15	< 50	5	$^{3}/_{16}$	07
15 to < 36	50 to < 120	6	$^{1}/_{4}$	
36 to 60	120 to 200	8	$^{5}/_{16}$	
> 60	> 200	10	$^{3}/_{8}$	

Notes:
1. Unless otherwise specified by the Purchaser, the nominal tank diameter shall be the centerline diameter of the bottom shell-course plates.
2. Nominal plate thickness refers to the tank shell as constructed. The thicknesses specified are based on erection requirements.
3. When specified by the Purchaser, plate with a minimum nominal thickness of 6 mm may be substituted for $^{1}/_{4}$-in. plate.
4. For diameters less than 15 m (50 ft) but greater than 3.2 m (10.5 ft), the minimum thickness of the lowest shell course only is increased to 6 mm ($^{1}/_{4}$ in.). 07

5.6.1.2 Unless otherwise agreed to by the Purchaser, the shell plates shall have a minimum nominal width of 1800 mm (72 in.). Plates that are to be butt-welded shall be properly squared.

5.6.1.3 The calculated stress for each shell course shall not be greater than the stress permitted for the particular material used for the course. No shell course shall be thinner than the course above it.

5.6.1.4 The tank shell shall be checked for stability against buckling from the design wind speed in accordance with 5.9.7. If required for stability, intermediate girders, increased shell-plate thicknesses, or both shall be used.

5.6.1.5 Isolated radial loads on the tank shell, such as those caused by heavy loads on platforms and elevated walkways between tanks, shall be distributed by rolled structural sections, plate ribs, or built-up members. 07

5.6.2 Allowable Stress

5.6.2.1 The maximum allowable product design stress, S_d, shall be as shown in Table 5-2. The net plate thicknesses—the actual thicknesses less any corrosion allowance—shall be used in the calculation. The design stress basis, S_d, shall be either two-thirds the yield strength or two-fifths the tensile strength, whichever is less.

5.6.2.2 The maximum allowable hydrostatic test stress, S_t, shall be as shown in Table 5-2. The gross plate thicknesses, including any corrosion allowance, shall be used in the calculation. The hydrostatic test basis shall be either three-fourths the yield strength or three-sevenths the tensile strength, whichever is less.

5.6.2.3 Appendix A permits an alternative shell design with a fixed allowable stress of 145 MPa (21,000 lbf/in.^{2}) and a joint efficiency factor of 0.85 or 0.70. This design may only be used for tanks with shell thicknesses less than or equal to 12.5 mm ($^{1}/_{2}$ in.).

5.6.2.4 Structural design stresses shall conform to the allowable working stresses given in 5.10.3.

5.6.3 Calculation of Thickness by the 1-Foot Method

5.6.3.1 The 1-foot method calculates the thicknesses required at design points 0.3 m (1 ft) above the bottom of each shell course. Appendix A permits only this design method. This method shall not be used for tanks larger than 60 m (200 ft) in diameter.

Tc-1c

Table 5-2—Permissible Plate Materials and Allowable Stresses

Plate Specification	Grade	Minimum Yield Strength MPa (psi)	Minimum Tensile Strength MPa (psi)	Product Design Stress S_d MPa (psi)	Hydrostatic Test Stress S_t MPa (psi)
		ASTM Specifications			
A 283M (A 283)	C (C)	205 (30,000)	380 (55,000)	137 (20,000)	154 (22,500)
A 285M (A 285)	C (C)	205 (30,000)	380 (55,000)	137 (20,000)	154 (22,500)
A 131M (A 131)	A, B, CS (A, B, CS)	235 (34,000)	400 (58,000)	157 (22,700)	171 (24,900)
A 36M (A 36)	—	250 (36,000)	400 (58,000)	160 (23,200)	171 (24,900)
A 131M (A 131)	EH 36 (EH 36)	360 (51,000)	490[a] (71,000[a])	196 (28,400)	210 (30,400)
A 573M (A 573)	400 (58)	220 (32,000)	400 (58,000)	147 (21,300)	165 (24,000)
A 573M (A 573)	450 (65)	240 (35,000)	450 (65,000)	160 (23,300)	180 (26,300)
A 573M (A 573)	485 (70)	290 (42,000)	485[a] (70,000[a])	193 (28,000)	208 (30,000)
A 516M (A 516)	380 (55)	205 (30,000)	380 (55,000)	137 (20,000)	154 (22,500)
A 516M (A 516)	415 (60)	220 (32,000)	415 (60,000)	147 (21,300)	165 (24,000)
A 516M (A 516)	450 (65)	240 (35,000)	450 (65,000)	160 (23,300)	180 (26,300)
A 516M (A 516)	485 (70)	260 (38,000)	485 (70,000)	173 (25,300)	195 (28,500)
A 662M (A 662)	B (B)	275 (40,000)	450 (65,000)	180 (26,000)	193 (27,900)
A 662M (A 662)	C (C)	295 (43,000)	485[a] (70,000[a])	194 (28,000)	208 (30,000)
A 537M (A 537)	1 (1)	345 (50,000)	485[a] (70,000[a])	194 (28,000)	208 (30,000)
A 537M (A 537)	2 (2)	415 (60,000)	550[a] (80,000[a])	220 (32,000)	236 (34,300)
A 633M (A 633)	C, D (C, D)	345 (50,000)	485[a] (70,000[a])	194 (28,000)	208 (30,000)
A 678M (A 678)	A (A)	345 (50,000)	485[a] (70,000[a])	194 (28,000)	208 (30,000)
A 678M (A 678)	B (B)	415 (60,000)	550[a] (80,000[a])	220 (32,000)	236 (34,300)
A 737M (A 737)	B (B)	345 (50,000)	485[a] (70,000[a])	194 (28,000)	208 (30,000)
A 841M (A 841)	Class 1 (Class 1)	345 (50,000)	485[a] (70,000[a])	194 (28,000)	208 (30,000)
A 841M (A 841)	Class 2 (Class 2)	415 (60,000)	550[a] (80,000[a])	220 (32,000)	236 (34,300)
		CSA Specifications			
G40.21	260W (38W)	260 (38,000)	410 (60,000)	164 (24,000)	176 (25,700)
G40.21	300W (44W)	300 (44,000)	450 (65,000)	180 (26,000)	193 (27,900)
G40.21	350WT (50WT)	350 (50,000)	480[a] (75,000[a])	192 (28,000)	206 (30,000)
G40.21	350W (50W)	350 (50,000)	450 (65,000)	180 (26,000)	193 (27,900)
		National Standards			
	235	235 (34,000)	365 (52,600)	137 (20,000)	154 (22,500)
	250	250 (36,000)	400 (58,300)	157 (22,700)	171 (25,000)
	275	275 (40,000)	430 (62,600)	167 (24,000)	184 (26,800)
		ISO 630			
E 275	C, D	265 (38,400)	410 (59,500)	164 (23,800)	175 (25,500)
E 355	C, D	345 (50,000)	490[a] (71,000[a])	196 (28,400)	210 (30,400)

[a]By agreement between the Purchaser and the Manufacturer, the tensile strength of these materials may be increased to 515 MPa (75,000 psi) minimum and 620 MPa (90,000 psi) maximum (and to 585 MPa [85,000 psi] minimum and 690 MPa [100,000 psi] maximum for ASTM A 537M, Class 2, and A 678M, Grade B). When this is done, the allowable stresses shall be determined as stated in 5.6.2.1 and 5.6.2.2.

Tc-1D

• **5.6.3.2** The required minimum thickness of shell plates shall be the greater of the values computed by the following formulas:

In SI units:

$$t_d = \frac{4.9D(H-0.3)G}{S_d} + CA$$

$$t_t = \frac{4.9D(H-0.3)}{S_t}$$

where

t_d = design shell thickness, in mm,

t_t = hydrostatic test shell thickness, in mm,

D = nominal tank diameter, in m (see 5.6.1.1, Note 1),

• H = design liquid level, in m,

= height from the bottom of the course under consideration to the top of the shell including the top angle, if any; to the bottom of any overflow that limits the tank filling height; or to any other level specified by the Purchaser, restricted by an internal floating roof, or controlled to allow for seismic wave action,

• G = design specific gravity of the liquid to be stored, as specified by the Purchaser,

• CA = corrosion allowance, in mm, as specified by the Purchaser (see 5.3.2),

S_d = allowable stress for the design condition, in MPa (see 5.6.2.1),

S_t = allowable stress for the hydrostatic test condition, in MPa (see 5.6.2.2).

In US Customary units:

$$t_d = \frac{2.6D(H-1)G}{S_d} + CA$$

ASSUME = 0

$$t_t = \frac{2.6D(H-1)}{S_t}$$

where

t_d = design shell thickness (in.),

t_t = hydrostatic test shell thickness (in.),

D = nominal tank diameter, in ft (see 5.6.1.1, Note 1),

• H = design liquid level, (ft),

= height from the bottom of the course under consideration to the top of the shell including the top angle, if any; to the bottom of any overflow that limits the tank filling height; or to any other level specified by the Purchaser, restricted by an internal floating roof, or controlled to allow for seismic wave action,

• G = design specific gravity of the liquid to be stored, as specified by the Purchaser,

• CA = corrosion allowance, (in.), as specified by the Purchaser (see 5.3.2),

S_d = allowable stress for the design condition, (lbf/in.^{2}) (see 5.6.2.1),

S_t = allowable stress for the hydrostatic test condition, (lbf/in.^{2}) (see 5.6.2.2).

MINIMUM BOTTOM-COURSE THICKNESS

$$t_{1d} = \left(1.06 - \frac{0.463D}{H}\sqrt{\frac{HG}{Sd}}\right)\left(\frac{2.6HDG}{Sd}\right) + CA^{0(\text{ASSUME})}$$

$$= \left(1.06 - \frac{0.463(55)}{22.5}\sqrt{\frac{22.5(0.93)}{23,200}}\right)\left(\frac{2.6(22.5)(55)(.93)}{23,200}\right)$$

$$= 1.056(0.01289) = 0.0136''$$

$$t_{1t} = \left(1.06 - \frac{0.463D}{H}\sqrt{\frac{H}{St}}\right)\left(\frac{2.6HD}{St}\right)$$

$$= \left(1.06 - \frac{0.463(55)}{22.5}\sqrt{\frac{22.5}{24,900}}\right)\left(\frac{2.6(22.5)(55)}{24,900}\right)$$

$$= 1.057(0.0129) = 0.0136''$$

3/16" MINIMUM THICKNESS (TABLE VALUE) CONTROLS

TC-2A

5.6.4 Calculation of Thickness by the Variable-Design-Point Method

Note: This procedure normally provides a reduction in shell-course thicknesses and total material weight, but more important is its potential to permit construction of larger diameter tanks within the maximum plate thickness limitation. For background information, see L.P. Zick and R.V. McGrath, "Design of Large Diameter Cylindrical Shells."[18]

• **5.6.4.1** Design by the variable-design-point method gives shell thicknesses at design points that result in the calculated stresses being relatively close to the actual circumferential shell stresses. This method may only be used when the Purchaser has not specified that the 1-foot method be used and when the following is true:

In SI units:

$$\frac{L}{H} \le \frac{1000}{6}$$

where

L = $(500\,Dt)^{0.5}$, in mm,

D = tank diameter, in m,

t = bottom-course shell thickness, excluding any corrosion allowance, in mm,

H = maximum design liquid level (see 5.6.3.2), in m.

In US Customary units:

$$\frac{L}{H} \le 2$$

=> FOR 3/16 THICK PL
L = √(6(100)(.1875)(5.5)) = 2.42 [illegible]
L/H = 2.42/22.5 = 0.11 ≤ 2.0 O.K

where

L = $(6\,Dt)^{0.5}$, (in.),

D = tank diameter, (ft),

t = bottom-course shell thickness, excluding any corrosion allowance (in.),

H = maximum design liquid level (see 5.6.3.2), (ft).

5.6.4.2 The minimum plate thicknesses for both the design condition and the hydrostatic test condition shall be determined as outlined. Complete, independent calculations shall be made for all of the courses for the design condition, exclusive of any corrosion allowance, and for the hydrostatic test condition. The required shell thickness for each course shall be the greater of the design shell
07 thickness plus any corrosion allowance or the hydrostatic test shell thickness, but the total shell thickness shall not be less than the shell thickness required by 5.6.1.1, 5.6.1.3, and 5.6.1.4. When a greater thickness is used for a shell course, the greater thickness may be used for subsequent calculations of the thicknesses of the shell courses above the course that has the greater thickness, provided the greater thickness is shown as the required design thickness on the Manufacturer's drawing (see W.3).

5.6.4.3 To calculate the bottom-course thicknesses, preliminary values t_{pd} and t_{pt} for the design and hydrostatic test conditions shall first be calculated from the formulas in 5.6.3.2.

5.6.4.4 The bottom-course thicknesses t_{1d} and t_{1t} for the design and hydrostatic test conditions shall be calculated using the following formulas:

In SI units:

$$t_{1d} = \left(1.06 - \frac{0.0696D}{H}\sqrt{\frac{HG}{S_d}}\right)\left(\frac{4.9HDG}{S_d}\right) + CA$$

[18] L.P. Zick and R.V. McGrath, "Design of Large Diameter Cylindrical Shells," *Proceedings*—Division of Refining, American Petroleum Institute, New York, 1968, Volume 48, pp. 1114 – 1140.

In US Customary units:

$$t_{1d} = \left(1.06 - \frac{0.463D}{H}\sqrt{\frac{HG}{S_d}}\right)\left(\frac{2.6HDG}{S_d}\right) + CA$$

Note: For the design condition, t_{1d} need not be greater than t_{pd}.

In SI units:

$$t_{1t} = \left(1.06 - \frac{0.0696D}{H}\sqrt{\frac{H}{S_t}}\right)\left(\frac{4.9HD}{S_t}\right)$$

In US Customary units:

$$t_{1t} = \left(1.06 - \frac{0.463D}{H}\sqrt{\frac{H}{S_t}}\right)\left(\frac{2.6HD}{S_t}\right)$$

Note: For the hydrostatic test condition, t_{1t} need not be greater than t_{pt}.

5.6.4.5 To calculate the second-course thicknesses for both the design condition and the hydrostatic test condition, the value of the following ratio shall be calculated for the bottom course:

$$\frac{h_1}{(rt_1)^{0.5}}$$

where

h_1 = height of the bottom shell course, in mm (in.),

r = nominal tank radius, in mm (in.),

t_1 = calculated thickness of the bottom shell course, less any thickness added for corrosion allowance, in mm (in.), used to calculate t_2 (design). The calculated hydrostatic thickness of the bottom shell course shall be used to calculate t_2 (hydrostatic test).

If the value of the ratio is less than or equal to 1.375:

$$t_2 = t_1$$

If the value of the ratio is greater than or equal to 2.625:

$$t_2 = t_{2a}$$

If the value of the ratio is greater than 1.375 but less than 2.625,:

$$t_2 = t_{2a} + (t_1 - t_{2a})\left[2.1 - \frac{h_1}{1.25(rt_1)^{0.5}}\right]$$

where

t_2 = minimum design thickness of the second shell course excluding any corrosion allowance, in mm (in.),

t_{2a} = thickness of the second shell course, in mm (in.), as calculated for an upper shell course as described in 5.6.4.6 to 5.6.4.8, exclusive of any corrosion allowance. d_n calculating second shell course thickness (t_2) for design case and hydrostatic test case, applicable values of t_{2a} and t_1 shall be used.

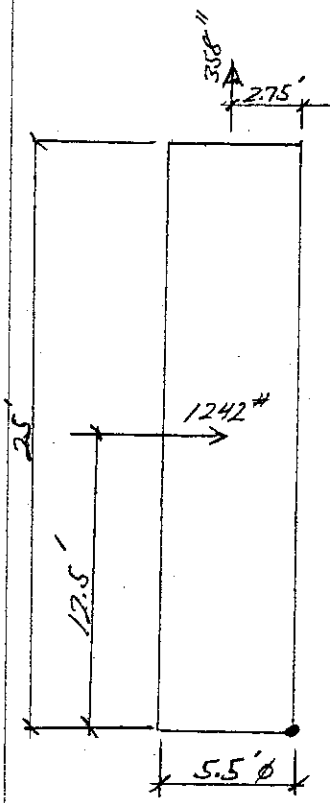
CHECK OVERTURNING / ANCHORAGE

WIND => USE 85 MPH, EXP C CONDITIONS

↳ PER SECTION 5.2.1 (j)

↳ $18(85/120)^2 = 9.03$ PSF $(25 \times 5.5) = 1242^{\#}$ (VERTICAL PROJECTED AREA)

$30(85/120)^2 = 15.05$ PSF $(23.76) = 358^{\#}$



$M_W = 1242(12.5) + 358(2.75) = 16,510$ ft-#

M_{DL} => SHELL WEIGHT (ASSUME 3/16" THICK ℄ FOR SHELL AND ROOF)

=> ROOF = $23.76\,ft^2(3/16)/12 \times 490 = 182^{\#}$

SHELL = $\pi(5.5)(25)(3/16)/12 \times 490 = 3307^{\#}$

$\Sigma = 3489^{\#}$

$\therefore M_{DL} = 3489(5.5/2) = 9595$ ft-#

↳ BY INSPECTION, ANCHORAGE REQUIRED

$\therefore$ PER TABLE 5-21b

↳ $[4 \times M_W/D] - W_2$

$= [4 \times 16,510/5.5] - 3489 = 8519^{\#} = U$

$t_b = U/N = 8519/8 = 1065^{\#}$/BOLT

↑ FIELD OBSERVED CONDITIONS

FOR SHEAR => $(3489 - 358)(0.4) = 1252^{\#} > 1242^{\#}$

↑ COEFFICIENT OF FRICTION

SEISMIC

↳ PER APPENDIX E OF API 650

↳ SEISMIC USE GROUP I

↳ $S_{DS} = 0.603$ (PER EARTHTEC)

$F = AN_{eff}$

↳ $V = \sqrt{V_i^2 + V_c^2}$

$V_i = A_i(W_S + W_f + W_f + W_i)$

$V_c = A_c W_c$

TC-3A

- f. **Seismic (*E*):** Seismic loads determined in accordance with E.1 through E.6 (see Data Sheet, Line 8).
- g. **Snow (*S*):** The ground snow load shall be determined from ASCE 7, Figure 7-1 or Table 7-1 unless the ground snow load that equals or exceeds the value based on a 2% annual probability of being exceeded (50-year mean recurrence interval) is specified by the Purchaser. The design snow load shall be 0.84 times the ground snow load. Alternately, the design snow load shall be determined from the ground snow load in accordance with ASCE 7. The design snow load shall be reported to the Purchaser.
- h. **Stored Liquid (*F*):** The load due to filling the tank to the design liquid level (see 5.6.3.2) with liquid with the design specific gravity specified by the Purchaser.
- i. **Test Pressure (P_t):** As required by F.4.4 or F.7.6.
- j. **Wind (*W*):** The design wind speed (V) shall be 190 km/hr (120 mph), the 3-sec gust design wind speed determined from ASCE 7, Figure 6-1, or the 3-sec gust design wind speed specified by the Purchaser (this specified wind speed shall be for a 3-sec gust based on a 2% annual probability of being exceeded [50-year mean recurrence interval]). The design wind pressure shall be 0.86 kPa $(V/190)^2$, ([18 lbf/ft^2][V/120]^2) on vertical projected areas of cylindrical surfaces and 1.44 kPa $(V/190)^2$, ([30 lbf/ft^2][V/120]^2) uplift (see item 2 below) on horizontal projected areas of conical or doubly curved surfaces, where V is the 3-sec gust wind speed. The 3-sec gust wind speed used shall be reported to the Purchaser.

  1. These design wind pressures are in accordance with ASCE 7 for wind exposure Category C. As an alternative, pressures may be determined in accordance with ASCE 7 (exposure category and importance factor provided by Purchaser) or a national standard for the specific conditions for the tank being designed.

  2. The design uplift pressure on the roof (wind plus internal pressure) need not exceed 1.6 times the design pressure P determined in F.4.1.

  3. Windward and leeward horizontal wind loads on the roof are conservatively equal and opposite and therefore they are not included in the above pressures.

  4. Fastest mile wind speed times 1.2 is approximately equal to 3-sec gust wind speed.

5.2.2 Design Factors

The Purchaser shall state the design metal temperature (based on ambient temperatures), the maximum design temperature, the design specific gravity, the corrosion allowance (if any), and the seismic factors.

5.2.3 External Loads

- a. The Purchaser shall state the magnitude and direction of external loads or restraint, if any, for which the shell or shell connections must be designed. The design for such loadings shall be a matter of agreement between the Purchaser and the Manufacturer.
- b. Unless otherwise specified, seismic design shall be in accordance with Appendix E.
- c. Design for localized wind induced forces on roof components shall be a matter of agreement between the Purchaser and the Manufacturer.
- d. Localized loads resulting from items such as ladders, stairs, platforms, etc., shall be considered.

5.2.4 Protective Measures

The Purchaser shall consider foundations, corrosion allowance, hardness testing, and any other protective measures deemed necessary. For example, for insulated tanks, means to prevent infiltration of water into the insulation shall be specified, especially around penetrations of the insulation and at the roof-to-shell junction.

5.2.5 External Pressure

See Appendix V for the provisions for the design of tanks subject to partial internal vacuum exceeding 0.25 kPa (1 in. of water). Tanks that meet the requirements of this Standard may be subjected to a partial vacuum of 0.25 kPa (1 in. of water), without the need to provide any additional supporting calculations.

5.11 WIND LOAD ON TANKS (OVERTURNING STABILITY)

5.11.1 Wind Pressure

Overturning stability shall be calculated using the wind pressures given in 5.2.1(j).

5.11.2 Unanchored Tanks

Unanchored tanks shall satisfy both of the following uplift criteria:

1. $0.6M_w + M_{Pi} < M_{DL}/1.5$
2. $M_w + 0.4M_{Pi} < (M_{DL} + M_F)/2$

where

M_{Pi} = moment about the shell-to-bottom joint from design internal pressure,

M_w = overturning moment about the shell-to-bottom joint from horizontal plus vertical wind pressure,

M_{DL} = moment about the shell-to-bottom joint from the weight of the shell and roof supported by the shell,

M_F = moment about the shell-to-bottom joint from liquid where weight of liquid is w_a defined in E.2.2 using a specific gravity of 0.7 and a height of one half the design liquid height H, so in SI units, $w_a = 59t_b\sqrt{F_{by}H}$ and in US Customary units $w_a = 4.67t_b\sqrt{F_{by}H}$ (see Figure 5-27).

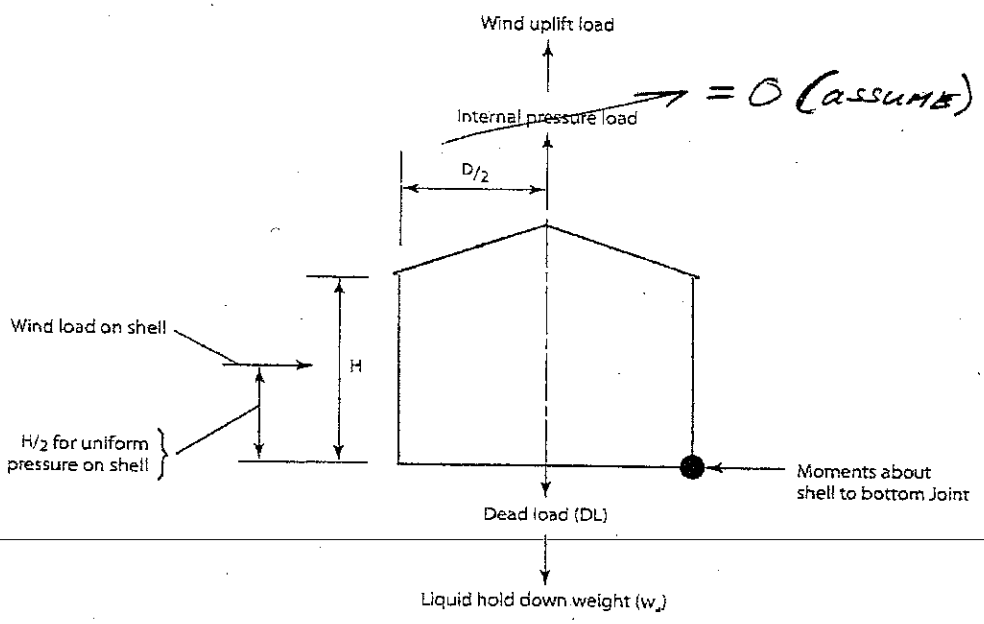


Figure 5-27—Overturning Check for Unanchored Tanks

Table 5-21a—Uplift Loads (SI Units)

Uplift Load Case	Net Uplift Formula, U (N)	Allowable Anchor Bolt Stress (MPa)	Allowable Shell Stress at Anchor Attachment (MPa)
Design Pressure	$[(P - 0.08t_h) \times D^2 \times 0.785] - W_1$	105	140
Test Pressure	$[(P_t - 0.08t_h) \times D^2 \times 0.785] - W_1$	140	170
Failure Pressure[a]	$[(1.5 \times P_f - 0.08t_h) \times D^2 \times 0.785] - W_3$	F_y	F_{by}
Wind Load	$[4 \times M_w/D] - W_2$	$0.8 \times F_y$	170
Seismic Load	$[4 \times M_s/D] - W_2$	$0.8 \times F_y$	170
Design Pressure + Wind	$[(P - 0.08t_h) \times D^2 \times 0.785] + [4 M_w/D] - W_1$	140	170
Design Pressure + Seismic	$[(P - 0.08t_h) \times D^2 \times 0.785] + [4 M_s/D] - W_1$	$0.8 \times F_y$	170

where

D = tank diameter in (m)

F_{by} = minimum yield strength of the bottom shell course (MPa)

P = design pressure in (kPa) (see Appendix F)

P_t = test pressure in (kPa) (see Appendix F)

P_f = failure pressure in (kPa) (see Appendix F)

t_h = roof plate thickness (mm)

M_w = wind moment in (N-m) (see 5.11)

M_s = seismic moment in (N-m) (see Appendix E)

W_1 = dead load of shell minus any corrosion allowance and any dead load other than roof plate acting on the shell minus any corrosion allowance (N)

W_2 = dead load of shell minus any corrosion allowance and any dead load including roof plate acting on the shell minus any corrosion allowance (N)

W_3 = dead load of the shell using as-built thicknesses and any dead load other than roof plate acting on the shell using as-built thicknesses (N)

[a]Failure pressure applies to tanks falling under F.1.3 only. The failure pressure shall be calculated using as-built thicknesses.

Table 5-21b—Uplift Loads (US Customary Units)

Uplift Load Case	Net Uplift Formula, U (lbf)	Allowable Anchor Bolt Stress (lbf/in.^{2})	Allowable Anchor Bolt Stress at Anchor Attachment (lbf/in.^{2})
Design Pressure	$[(P - 8t_h) \times D^2 \times 4.08] - W_1$	15,000	20,000
Test Pressure	$[(P_t - 8t_h) \times D^2 \times 4.08] - W_1$	20,000	25,000
Failure Pressure[a]	$[(1.5 \times P_f - 8t_h) \times D^2 \times 4.08] - W_3$	F_y	F_{by}
Wind Load	$[4 \times M_w/D] - W_2$	$0.8 \times F_y$	25,000
Seismic Load	$[4 \times M_s/D] - W_2$	$0.8 \times F_y$	25,000
Design Pressure + Wind	$[(P - 8t_h) \times D^2 \times 4.08] + [4 M_w/D] - W_1$	20,000	25,000
Design Pressure + Seismic	$[(P - 8t_h) \times D^2 \times 4.08] + [4 M_s/D] - W_1$	$0.8 \times F_y$	25,000

where

D = tank diameter in ft

F_{by} = minimum yield strength of the bottom shell course (psi)

P = design pressure in inches of water column (see Appendix F)

P_t = test pressure in inches of water column (see Appendix F)

P_f = failure pressure in inches of water column (see Appendix F)

t_h = roof plate thickness in inches

M_w = wind moment in ft-lbs (see 5.11)

M_s = seismic moment in ft-lbs (see Appendix E)

W_1 = dead load of shell minus any corrosion allowance and any dead load other than roof plate acting on the shell minus any corrosion allowance (lbf)

W_2 = dead load of shell minus any corrosion allowance and any dead load including roof plate acting on the shell minus any corrosion allowance (lbf)

W_3 = dead load of the shell using as-built thicknesses and any dead load other than roof plate acting on the shell using as-built thicknesses (lbf)

[a]Failure pressure applies to tanks falling under F.1.3 only. The failure pressure shall be calculated using as-built thicknesses.

$A_i = S_{DS}\left(I/R_{wi}\right) = 0.603\,(1/4) = 0.151$ (ASSUME ANCHORED)

$A_c \Rightarrow T_c = K_s\sqrt{D}$

$\hookrightarrow K_s = \dfrac{0.578}{\sqrt{\tanh\left(\frac{3.67H}{D}\right)}} = \dfrac{0.578}{\sqrt{\tanh\left(\frac{3.67(22.5)}{5.5}\right)}} = 0.578$

$\therefore T_c = 0.578\sqrt{5.5} = 1.36$

$T_c \leq T_L = 8\,S_{D1}$ (PER ASCE 7-05)

$\therefore A_c = K S_{D1}\left(1/T_c\right)\left(I/R_{wi}\right)$

$= 1.5(0.50)(1/1.36)(1/2) = 0.28 \neq A_i = 0.151 = A_c$

$\therefore V_i = A_i\left(W_s + W_r + W_f + W_i\right)$

$W_s = 3307^{\#}$ (WEIGHT OF TANK SHELL)

$W_r = 182^{\#}$ (WEIGHT OF TANK ROOF)

$W_f = 182^{\#}$ (WEIGHT OF TANK FLOOR)

$W_i \Rightarrow D/H = 5.5/22.5 = 0.244$

$\therefore W_i' = \left[1 - 0.218\left(D/H\right)\right]W_p$

$W_p = 534.7\,ft^2\,(57.9\,\#/ft^2) = 30,960^{\#}$

$= [1 - 0.218(5.5/22.5)](30,960^{\#})$

$= 29,310^{\#}$

$\therefore V_i' = 0.151(3307 + 182 + 182 + 29,310) = \underline{4981^{\#}}$

$\therefore V_c = A_c W_c W_p$

$\hookrightarrow W_c = 0.230\left(D/H\right)\tanh\left(\frac{3.67H}{D}\right)$

$= 0.230(5.5/22.5)\tanh\left(3.67(22.5/5.5)\right)$

$= 0.056(30,960) = 1734^{\#}$

$V_c = 0.151(1734) = 262^{\#}$

$\therefore V = \sqrt{4981^2 + 262^2} = \underline{4986^{\#}}$

$X_i = \left[0.5 - 0.094\left(D/H\right)\right]H = \left[0.5 - 0.094(5.5/22.5)\right](22.5) = 10.73'$

$$X_c = \left[1.0 - \frac{\cosh\left(\frac{3.67(H)}{D}\right) - 1}{\frac{3.67(H)}{D}\sinh\left(\frac{3.67H}{D}\right)}\right]H$$

E.4.5.2 Convective (Sloshing) Period

The first mode sloshing wave period, in seconds, shall be calculated by Equation E.4.5.2 where K_s is the sloshing period coefficient defined in Equation E.4.5.2-c:

In SI units:

$$T_c = 1.8K_s\sqrt{D} \qquad \text{(E.4.5.2-a)}$$

or, in US Customary units:

$$T_c = K_s\sqrt{D} \qquad \text{(E.4.5.2-b)}$$

$$K_s = \frac{0.578}{\sqrt{\tanh\left(\frac{3.68H}{D}\right)}} \qquad \text{(E.4.5.2-c)}$$

E.4.6 DESIGN SPECTRAL RESPONSE ACCELERATIONS

The design response spectrum for ground supported, flat-bottom tanks is defined by the following parameters:

E.4.6.1 Spectral Acceleration Coefficients

When probabilistic or mapped design methods are utilized, the spectral acceleration parameters for the design response spectrum are given in Equations E.4.6.1-1 through E.4.6.1-5. Unless otherwise specified by the Purchaser, T_L shall be taken as the mapped value found in ASCE 7. For tanks falling in SUG I or SUG II, the mapped value of T_L shall be used to determine convective forces except that a value of T_L equal to 4 seconds shall be permitted to be used to determine the sloshing wave height. For tanks falling in SUG III, the mapped value of T_L shall be used to determine both convective forces and sloshing wave height except that the importance factor, I, shall be set equal to 1.0 in the determination of sloshing wave height. In regions outside the USA, where the regulatory requirements for determining design ground motion differ from the ASCE 7 methods prescribed in this appendix, T_L shall be taken as 4 seconds. 07

For sites where only the peak ground acceleration is defined, substitute S_P for S_0 in Equations E.4.6.1-1 through E.4.6.2-1. The scaling factor, Q, is defined as $^2/_3$ for the ASCE 7 methods. Q may be taken equal to 1.0 unless otherwise defined in the regulatory requirements where ASCE 7 does not apply. Soil amplification coefficients, F_a and F_v; the value of the importance factor, I; and the ASD response modification factors, R_{wi} and R_{wc}, shall be as defined by the local regulatory requirements. If these values are not defined by the regulations, the values in this appendix shall be used. 07

Impulsive spectral acceleration parameter, A_i:

$$A_i = S_{DS}\left(\frac{I}{R_{wi}}\right) = 2.5QF_aS_0\left(\frac{I}{R_{wi}}\right) \qquad \text{(E.4.6.1-1)}$$

However,

$$A_i \geq 0.007 \qquad \text{(E.4.6.1-2)}$$

and, for seismic design categories E and F only,:

$$A_i \geq 0.5S_1\left(\frac{I}{R_{wi}}\right) = 0.875S_P\left(\frac{I}{R_{wi}}\right) \qquad \text{(E.4.6.1-3)}$$

Convective spectral acceleration parameter, A_c:

When, $T_C \leq T_L$

$$A_c = KS_{D1}\left(\frac{1}{T_c}\right)\left(\frac{I}{R_{wc}}\right) = 2.5KQF_vS_0\left(\frac{T_s}{T_c}\right)\left(\frac{I}{R_{wc}}\right) \leq A_i \qquad \text{(E.4.6.1-4)}$$

When, $T_C > T_L$

$$A_c = KS_{D1}\left(\frac{T_L}{T_c^2}\right)\left(\frac{I}{R_{wc}}\right) = 2.5KQF_vS_0\left(\frac{T_sT_L}{T_c^2}\right)\left(\frac{I}{R_{wc}}\right) \leq A_i \qquad \text{(E.4.6.1-5)}$$

07

Tc-4B

E.4.6.2 Site-Specific Response Spectra

07 When site-specific design methods are specified, the seismic parameters shall be defined by Equations E.4.6.2-1 through E.4.6.2-3.

Impulsive spectral acceleration parameter:

$$A_i = 2.5Q\left(\frac{I}{R_{wi}}\right)S_{a0}^{*} \qquad \text{(E.4.6.2-1)}$$

Alternatively, A_i, may be determined using either (1) the impulsive period of the tank system, or (2) assuming the impulsive period = 0.2 sec;

$$A_i = Q\left(\frac{I}{R_{wi}}\right)S_a^{*} \qquad \text{(E.4.6.2-2)}$$

where, S_a^* is the ordinate of the 5% damped, site-specific MCE response spectra at the calculated impulsive period including site
07 soil effects. See E.4.5.1.

Exception:

- Unless otherwise specified by the Purchaser, the value of the impulsive spectral acceleration, S_a^*, for flat-bottom tanks with $H/D \le 0.8$ need not exceed 150%g when the tanks are:
  - self-anchored, or
  - mechanically-anchored tanks that are equipped with traditional anchor bolt and chairs at least 450 mm (18 in.) high and are not otherwise prevented from sliding laterally at least 25 mm (1 in.).

Convective spectral acceleration:

$$A_c = QK\left(\frac{I}{R_{wc}}\right)S_a^{*} \qquad \text{(E.4.6.2-3)}$$

where, S_a^* is the ordinate of the 5% damped, site-specific MCE response spectra at the calculated convective period including site
07 soil effects (see E.4.5.2).

Alternatively, the ordinate of a site-specific spectrum based on the procedures of E.4.2 for 0.5% damping may be used to determine the value S_a^* with K set equal to 1.0.

E.5 Seismic Design Factors

E.5.1 DESIGN FORCES

The equivalent lateral seismic design force shall be determined by the general relationship

$$F = AW_{\text{eff}} \qquad \text{(E.5.1-1)}$$

where

A = lateral acceleration coefficient, %g,

W_{eff} = effective weight.

E.5.1.1 Response Modification Factor

The response modification factor for ground supported, liquid storage tanks designed and detailed to these provisions shall be less than or equal to the values shown in Table E-4.

Table E-4—Response Modification Factors for ASD Methods

Anchorage system	R_{wi} (impulsive)	R_{wc} (convective)
Self-anchored	3.5	2
Mechanically-anchored	4	2

E.5.1.2 Importance Factor

- The importance factor (I) is defined by the SUG and shall be specified by the Purchaser. See E.3 and Table E-5.

Table E-5—Importance Factor (I) and Seismic Use Group Classification

Seismic Use Group	I
I	1.0
II	1.25
III	1.5

E.6 Design

E.6.1 DESIGN LOADS

Ground-supported, flat-bottom tanks, storing liquids shall be designed to resist the seismic forces calculated by considering the effective mass and dynamic liquid pressures in determining the equivalent lateral forces and lateral force distribution. This is the default method for this appendix. The equivalent lateral force base shear shall be determined as defined in the following sections. The seismic base shear shall be defined as the square root of the sum of the squares (SRSS) combination of the impulsive and convective components unless the applicable regulations require direct sum. For the purposes of this appendix, an alternate method using the direct sum of the effects in one direction combined with 40% of the effect in the orthogonal direction is deemed to be equivalent to the SRSS summation.

$$V = \sqrt{V_i^2 + V_c^2} \tag{E.6.1-1}$$

where

$$V_i = A_i(W_s + W_r + W_f + W_i) \tag{E.6.1-2}$$

$$V_c = A_c W_c \tag{E.6.1-3}$$

E.6.1.1 Effective Weight of Product

The effective weights W_i and W_c shall be determined by multiplying the total product weight, W_p, by the ratios W_i/W_p and W_c/W_p, respectively, Equations E.6.1.1-1 through E.6.1.1-3.

When D/H is greater than or equal to 1.333, the effective impulsive weight is defined in Equation E.6.1.1-1:

$$W_i = \frac{\tanh\left(0.866\frac{D}{H}\right)}{0.866\frac{D}{H}} W_p \tag{E.6.1.1-1}$$

When D/H is less than 1.333, the effective impulsive weight is defined in Equation E.6.1.1-2:

$$W_i = \left[1.0 - 0.218\frac{D}{H}\right] W_p \tag{E.6.1.1-2}$$

The effective convective weight is defined in Equation E.6.1.1-3:

$$W_c = 0.230\frac{D}{H}\tanh\left(\frac{3.67H}{D}\right) \quad \text{(E.6.1.1-3)}$$

E.6.1.2 Center of Action for Effective Lateral Forces

The moment arm from the base of the tank to the center of action for the equivalent lateral forces from the liquid is defined by
07 Equations E.6.1.2.1-1 through E.6.1.2.2-3.

The center of action for the impulsive lateral forces for the tank shell, roof and appurtenances is assumed to act through the center of gravity of the component.

E.6.1.2.1 Center of Action for Ringwall Overturning Moment

The ringwall moment, M_{rw}, is the portion of the total overturning moment that acts at the base of the tank shell perimeter. This moment is used to determine loads on a ringwall foundation, the tank anchorage forces, and to check the longitudinal shell compression.

The heights from the bottom of the tank shell to the center of action of the lateral seismic forces applied to W_i and W_c, X_i and X_c, may be determined by multiplying H by the ratios X_i/H and X_c/H, respectively, obtained for the ratio D/H by using Equations E.6.1.2.1-1 through E.6.1.2.1-3.

When D/H is greater than or equal to 1.3333, the height X_i is determined by Equation E.6.1.2.1-1:

$$X_i = 0.375H \quad \text{(E.6.1.2.1-1)}$$

When D/H is less than 1.3333, the height X_i is determined by Equation E.6.1.2.1-2:

$$X_i = \left[0.5 - 0.094\frac{D}{H}\right]H \quad \text{(E.6.1.2.1-2)}$$

The height X_c is determined by Equation E.6.1.2.1-3:

07

$$X_c = \left[1.0 - \frac{\cosh\left(\frac{3.67H}{D}\right) - 1}{\frac{3.67H}{D}\sinh\left(\frac{3.67H}{D}\right)}\right]H \quad \text{(E.6.1.2.1-3)}$$

E.6.1.2.2 Center of Action for Slab Overturning Moment

The "slab" moment, M_s, is the total overturning moment acting across the entire tank base cross-section. This overturning moment is used to design slab and pile cap foundations.

When D/H is greater than or equal to 1.333, the height X_{is} is determined by Equation E.6.1.2.2-1:

$$X_{is} = 0.375\left[1.0 + 1.333\left(\frac{0.866\frac{D}{H}}{\tanh\left(0.866\frac{D}{H}\right)} - 1.0\right)\right]H \quad \text{(E.6.1.2.2-1)}$$

When D/H is less than 1.333, the height X_{is} is determined by Equation E.6.1.2.2-2:

07

$$X_{is} = \left[0.500 - 0.060\frac{D}{H}\right]H \quad \text{(E.6.1.2.2-2)}$$

The height, X_{cs}, is determined by Equation E.6.1.2.2-3:

$$X_{cs} = \left[1.0 - \frac{\cosh\left(\frac{3.67H}{D}\right) - 1.937}{\frac{3.67H}{D}\sinh\left(\frac{3.67H}{D}\right)}\right]H \qquad \text{(E.6.1.2.2-3)}$$ 07

E.6.1.3 Vertical Seismic Effects

- When specified (see Line 12 in the Data Sheet), vertical acceleration effects shall be considered as acting in both upward and downward directions and combined with lateral acceleration effects by the SRSS method unless a direct sum combination is required by the applicable regulations. Vertical acceleration effects for hydrodynamic hoop stresses shall be combined as shown in E.6.1.4. Vertical acceleration effects need not be combined concurrently for determining loads, forces, and resistance to overturning in the tank shell. 07
- The maximum vertical seismic acceleration parameter shall be taken as $0.14S_{DS}$ or greater for the ASCE 7 method unless otherwise specified by the Purchaser. Alternatively, the Purchaser may specify the vertical ground motion acceleration parameter, A_v. The total vertical seismic force shall be:

$$F_v = \pm A_v W_{eff} \qquad \text{(E.6.1.3-1)}$$

Vertical seismic effects shall be considered in the following when specified:

- Shell hoop tensile stresses (see E.6.1.4).
- Shell-membrane compression (see E.6.2.2).
- Anchorage design (see E.6.2.1).
- Fixed roof components (see E.7.5).
- Sliding (see E.7.6).
- Foundation design (see E.6.2.3).

- In regions outside the USA where the regulatory requirements differ from the methods prescribed in this appendix, the vertical acceleration parameter and combination with lateral effects may be applied as defined by the governing regulatory requirements.

E.6.1.4 Dynamic Liquid Hoop Forces

Dynamic hoop tensile stresses due to the seismic motion of the liquid shall be determined by the following formulas:

For $D/H \geq 1.333$:

In SI units:

$$N_i = 21.4A_vGDH\left[\frac{Y}{H} - 0.5\left(\frac{Y}{H}\right)^2\right]\tanh\left(0.866\frac{D}{H}\right) \qquad \text{(E.6.1.4-1a)}$$

or, in US Customary units:

$$N_i = 18A_vGDH\left[\frac{Y}{H} - 0.5\left(\frac{Y}{H}\right)^2\right]\tanh\left(0.866\frac{D}{H}\right) \qquad \text{(E.6.1.4-1b)}$$

For $D/H < 1.33$ and $Y < 0.75D$:

In SI units:

$$N_i = 13.16A_vGD^2\left[\frac{Y}{0.75D} - 0.5\left(\frac{Y}{0.75D}\right)^2\right] \qquad \text{(E.6.1.4-2a)}$$

$$X_L = \left[1.0 - \frac{\cosh\left(\frac{3.67(22.5)}{5.5}\right) - 1}{\frac{3.67(22.5)}{5.5}\sinh\left(\frac{3.67(22.5)}{5.5}\right)}\right] 22.5$$

$= 21'$

$X_{LS} = [0.50 + 0.060(P/H)]H = [0.50 + 0.06(5.5/22.5)](22.5)$

$= 11.58'$

$$X_{CS} = 21' = \left[1 - \frac{\cosh\left(\frac{3.67H}{D}\right) - 1.937}{\frac{3.67(H)}{D}\sinh\left(\frac{3.67H}{D}\right)}\right]H$$

RINGWALL MOMENT (SEE ATTACHED FOR FORMULA)

↳ $M_{RW} = \sqrt{[0.151(29,310 \times 10.73 + 3307 \times 12.5 + 182(25)]^2 + [0.151(1734)(21)]^2}$

$= 54,695$ ft#

SLAB MOMENT (SEE ATTACHED FOR FORMULA)

↳ $M_S = \sqrt{[0.151(29,310 \times 11.58 + 3307(11.25) + 182(25)]^2 + [0.151(1734)(21)]^2}$

$= 57,818$ ft#

VERTICAL SEISMIC EFFECT

↳ $F_V = \pm A_V W_{eff}$

↳ $A_V = 0.14 S_{DS} = 0.14(0.603) = 0.084$ (Assume Full Tank)

$W_{eff} = (3307 + 182 + 182 + 30,960) = 34,631$ #

$\therefore F_V = 0.084(34,631) = 2910$ #

or, in US Customary units:

$$N_i = 11A_iGD^2\left[\frac{Y}{0.75D} - 0.5\left(\frac{Y}{0.75D}\right)^2\right] \quad \text{(E.6.1.4-2b)}$$

For $D/H < 1.333$ and $Y \geq 0.75D$:

In SI units:

$$N_i = 6.6A_iGD^2 \quad \text{(E.6.1.4-3a)}$$

or, in US Customary units:

$$N_i = 5.54A_iGD^2 \quad \text{(E.6.1.4-3b)}$$

For all proportions of D/H:

In SI units:

$$N_c = \frac{33.1A_cC_cSGD^2\cosh\left[\frac{3.68(H-Y)}{D}\right]}{\cosh\left[\frac{3.68H}{D}\right]} \quad \text{(E.6.1.4-4a)}$$

07 or, in US Customary units:

$$N_c = \frac{3.9A_cC_cSGD^2\cosh\left[\frac{3.68(H-Y)}{D}\right]}{\cosh\left[\frac{3.68H}{D}\right]} \quad \text{(E.6.1.4-4b)}$$

07 When the Purchaser specifies that vertical acceleration need not be considered (i.e., $A_v = 0$), the combined hoop stress shall be defined by Equation E.6.1.4-5. The dynamic hoop tensile stress shall be directly combined with the product hydrostatic design stress in determining the total stress.

$$\sigma_T = \sigma_h \pm \sigma_s = \frac{N_h \pm \sqrt{N_i^2 + N_c^2}}{t} \quad \text{(E.6.1.4-5)}$$

07 When vertical acceleration is specified.

$$\sigma_T = \sigma_h \pm \sigma_s = \frac{N_h \pm \sqrt{N_i^2 + N_c^2 + (A_vN_h)^2}}{t} \quad \text{(E.6.1.4-6)}$$

E.6.1.5 Overturning Moment

- The seismic overturning moment at the base of the tank shell shall be the SRSS summation of the impulsive and convective components multiplied by the respective moment arms to the center of action of the forces unless otherwise specified.

Ringwall Moment, M_{rw}:

$$M_{rw} = \sqrt{[A_i(W_iX_i + W_sX_s + W_rX_r)]^2 + [A_c(W_cX_c)]^2} \quad \text{(E.6.1.5-1)}$$

Slab Moment, M_s:

$$M_s = \sqrt{[A_i(W_iX_i + W_sX_s + W_rX_r)]^2 + [A_c(W_cX_c)]^2} \quad \text{(E.6.1.5-2)}$$

ANCHORAGE

IF SELF-ANCHORED

$\hookrightarrow w_a = 7.9 t_a \sqrt{F_y H G_c} \leq 1.28 H G_c$

$\Rightarrow t_a$ - ASSUME 3/16"

$F_y = 36{,}000$

$G_c = G(1 - 0.4A_v)$

$= 0.93(1 - 0.4(0.084)) = 0.90$

$\therefore 7.9(0.1875)\sqrt{36{,}000(22.5)(0.90)} = 1265$ plf

$\leq 1.28(22.5)(55)(0.93) = 147.3$ plf ← CONTROLS

ANCHORAGE RATIO

$\hookrightarrow J = \dfrac{M_{OM}}{D^2(w_t(1-0.4A_v) + w_a)}$

$w_t = \dfrac{W_s}{\pi D} + \cancel{w_{RS}}$ ← ASSUME 0 (CONSERVATIVE)

$= 3307/\pi(55) = 191$ PLF

$J = \dfrac{54{,}695}{55^2(191(1-0.4(0.084)) + 147.3)} = 5.45$

$\therefore$ BECAUSE $J \geq 1.54$, MECHANICAL ANCHORAGE IS REQUIRED

$\hookrightarrow w_{AB} = \left(\dfrac{1.273 M_{OM}}{D^2} - w_t(1-0.4A_v)\right)$

$= \dfrac{1.273(54{,}695)}{55^2} - 191(1-0.4(0.084))$

$= 2117$ PLF

$P_{AB} = w_{AB}(\pi D/n_A)$ ← FIELD OBSERVED CONDITIONS

$= 2117(\pi(55)/8) = 4572$ #/BOLT

1 1/8" ø BOLT (A307) $= 0.75 F_u = 0.75(58) = 43.5$ ksi

$\hookrightarrow R_N = 43.5(1) = 43.5$ ksi (13TH EDITION AISC)

$R_N/\Omega_0 = 43.5/2 = 21.8$ k/BOLT $> 4.6^k$ O.K.

TC-6A

Unless a more rigorous determination is used, the overturning moment at the bottom of each shell ring shall be defined by linear approximation using the following:

1. If the tank is equipped with a fixed roof, the impulsive shear and overturning moment is applied at the top of the shell.
2. The impulsive shear and overturning moment for each shell course is included based on the weight and centroid of each course.
3. The overturning moment due to the liquid is approximated by a linear variation that is equal to the ringwall moment, M_{rw} at the base of the shell to zero at the maximum liquid level. | 07

E.6.1.6 Soil-Structure Interaction

| 07

- If specified by the Purchaser, the effects of soil-structure interaction on the effective damping and period of vibration may be considered for tanks in accordance with ASCE 7 with the following limitations:
  - Tanks shall be equipped with a reinforced concrete ringwall, mat or similar type foundation supported on grade. Soil structure interaction effects for tanks supported on granular berm or pile type foundation are outside the scope of this appendix.
  - The tanks shall be mechanically anchored to the foundation.
  - The value of the base shear and overturning moments for the impulsive mode including the effects of soil-structure interaction shall not be less than 80% of the values determined without consideration of soil-structure interaction.
  - The effective damping factor for the structure-foundation system shall not exceed 20%.

E.6.2 RESISTANCE TO DESIGN LOADS

The allowable stress design (ASD) method is utilized in this appendix. Allowable stresses in structural elements applicable to normal operating conditions may be increased by 33% when the effects of the design earthquake are included unless otherwise specified in this appendix.

E.6.2.1 Anchorage

Resistance to the design overturning (ringwall) moment at the base of the shell may be provided by:

- The weight of the tank shell, weight of roof reaction on shell W_{rs}, and by the weight of a portion of the tank contents adjacent to the shell for unanchored tanks.
- Mechanical anchorage devices.

E.6.2.1.1 Self-Anchored

For self-anchored tanks, a portion of the contents may be used to resist overturning. The anchorage provided is dependent on the assumed width of a bottom annulus uplifted by the overturning moment. The resisting annulus may be a portion of the tank bottom (i.e., $t_a = t_b$) or a separate butt-welded annular ring (i.e., $t_a > t_b$). The resisting force of the annulus that lifts off the foundation shall be determined by Equation E.6.2.1.1-1.

In SI units:

$$w_a = 99 t_a \sqrt{F_y H G_e} \le 1.96\, H D G_e \qquad \text{(E.6.2.1.1-1a)}$$ | 07

or, in US Customary units:

$$w_a = 7.9 t_a \sqrt{F_y H G_e} \le 1.28\, H D G_e \qquad \text{(E.6.2.1.1-1b)}$$ | 07

Equation E.6.2.1.1-1 for w_a applies whether or not a thickened bottom annulus is used.
The tank is self-anchored providing the following conditions are met:

1. The resisting force is adequate for tank stability (i.e., the anchorage ratio, $J \le 1.54$).
2. The maximum width of annulus for determining the resisting force is 3.5% of the tank diameter.
3. The shell compression satisfies E.6.2.2.
4. The required annular plate thickness does not exceed the thickness of the bottom shell course.
5. Piping flexibility requirements are satisfied.

E.6.2.1.1.1 Anchorage Ratio, *J*

$$J = \frac{M_{ov}}{D^2(w_t(1-0.4A_v)+w_a)} \qquad \text{(E.6.2.1.1.1-1)}$$

where

$$w_t = \left[\frac{W_s}{\pi D} + w_{rs}\right] \qquad \text{(E.6.2.1.1.1-2)}$$

Table E-6—Anchorage Ratio Criteria

Anchorage Ratio *J*	Criteria
$J \le 0.785$	No calculated uplift under the design seismic overturning moment. The tank is self-anchored.
$0.785 < J \le 1.54$	Tank is uplifting, but the tank is stable for the design load providing the shell compression requirements are satisfied. Tank is self-anchored.
$J > 1.54$	Tank is not stable and cannot be self-anchored for the design load. Modify the annular plate if $L < 0.035D$ is not controlling or add mechanical anchorage.

E.6.2.1.1.2 Annular Plate Requirements

The thickness of the tank bottom plate provided under the shell may be greater than or equal to the thickness of the general tank floor plate (i.e., $t_a \ge t_b$) with the following restrictions.

Note: In thickening the bottom annulus, the intent is not to force a thickening of the lowest shell course, thereby inducing an abrupt thickness change in the shell, but rather to impose a limit on the bottom annulus thickness based on the shell design.

1. The thickness, t_a, used to calculate w_a in Equation E.6.2.1.1-1b shall not exceed the first shell course thickness, t_s, less the shell corrosion allowance.

2. Nor shall the thickness, t_a, used in Equation E.6.2.1.1-1b exceed the actual thickness of the plate under the shell less the corrosion allowance for tank bottom.

3. When the bottom plate under the shell is thicker than the remainder of the tank bottom (i.e., $t_a > t_b$) the minimum projection of the supplied thicker annular plate inside the tank wall, L_s, shall be equal to or greater than L:

In SI units:

$$L = 0.01723 t_a \sqrt{F_y / HG_e} \le 0.035D \qquad \text{(E.6.2.1.1.2-1a)}$$

or, in US Customary units:

$$L = 0.216 t_a \sqrt{F_y / HG_e} \le 0.035D \qquad \text{(E.6.2.1.1.2-1b)}$$

E.6.2.1.2 Mechanically-Anchored

- If the tank configuration is such that the self-anchored requirements can not be met, the tank must be anchored with mechanical devices such as anchor bolts or straps.

When tanks are anchored, the resisting weight of the product shall not be used to reduce the calculated uplift load on the anchors. The anchors shall be sized to provide for at least the following minimum anchorage resistance:

$$w_{AB} = \left(\frac{1.273 M_{ov}}{D^2} - w_t(1-0.4A_v)\right) \qquad \text{(E.6.2.1.2-1)}$$

TC-6c

plus 0.4 times the uplift, in N/m (lbf/ft^2) of shell circumference, due to design internal pressure. See Appendix R for load combinations. If the ratio of operating pressure to design pressure exceeds 0.4, the Purchaser should consider specifying a higher factor on design. Wind loading need not be considered in combination with seismic loading.

The anchor seismic design load, P_{AB}, is defined in Equation E.6.2.1.2-2:

$$P_{AB} = w_{AB}\left(\frac{\pi D}{n_A}\right) \qquad \text{(E.6.2.1.2-2)}$$

where, n_A is the number of equally-spaced anchors around the tank circumference. P_{AB} shall be increased to account for unequal spacing.

When mechanical anchorage is required, the anchor embedment or attachment to the foundation, the anchor attachment assembly and the attachment to the shell shall be designed for P_A. The anchor attachment design load, P_A, shall be the lesser of the load equal to the minimum specified yield strength multiplied by the as-built cross-sectional area of the anchor or three times P_{AB}.

The maximum allowable stress for the anchorage parts shall not exceed the following values for anchors designed for the seismic loading alone or in combination with other load cases:

- An allowable tensile stress for anchor bolts and straps equal to 80% of the published minimum yield stress.
- For other parts, 133% of the allowable stress in accordance with 5.10.3.
- The maximum allowable design stress in the shell at the anchor attachment shall be limited to 170 MPa (25,000 kPa) with no increase for seismic loading. These stresses can be used in conjunction with other loads for seismic loading when the combined loading governs.

E.6.2.2 Maximum Longitudinal Shell-Membrane Compression Stress

E.6.2.2.1 Shell Compression in Self-Anchored Tanks

The maximum longitudinal shell compression stress at the bottom of the shell when there is no calculated uplift, $J < 0.785$, shall be determined by the formula

In SI units:

$$\sigma_c = \left(w_t(1 + 0.4A_v) + \frac{1.273M_m}{D^2}\right)\frac{1}{1000t_s} \qquad \text{(E.6.2.2.1-1a)}$$

or, in US Customary units:

$$\sigma_c = \left(w_t(1 + 0.4A_v) + \frac{1.273M_m}{D^2}\right)\frac{1}{12t_s} \qquad \text{(E.6.2.2.1-1b)}$$

The maximum longitudinal shell compression stress at the bottom of the shell when there is calculated uplift, $J > 0.785$, shall be determined by the formula:

In SI units:

$$\sigma_c = \left(\frac{w_t(1 + 0.4A_v) + w_a}{0.607 - 0.18667[J]^{2.5}} - w_a\right)\frac{1}{1000t_s} \qquad \text{(E.6.2.2.1-2a)}$$

or, in US Customary units:

$$\sigma_c = \left(\frac{w_t(1 + 0.4A_v) + w_a}{0.607 - 0.18667[J]^{2.5}} - w_a\right)\frac{1}{12t_s} \qquad \text{(E.6.2.2.1-2b)}$$

SLIDING RESISTANCE

$V_s = \mu (W_s + W_r + W_f + W_p)(1 - 0.4A_v)$

$= 0.4(3307 + 182 + 182 + 30,960)(1 - 0.4(0.084))$

$= 13,387^{\#} > 4987^{\#}$ O.K.

1 1/8" ø A307 A.B. O.K.

CHECK SHELL COMPRESSION

$\sigma_L = \left(W_t(1 + 0.4A_v) + \frac{1.273 M_{rN}}{D^2}\right)\frac{1}{12 t_s}$

$= \left(191(1 + 0.4(0.084)) + \frac{1.273(54,695)}{5.5^2}\right)\frac{1}{12(0.1875)}$

$= 1111 psi$

ALLOWABLE STRESS

$\therefore GHD^2/t^2 = 0.93(22.5)(5.5)^2/(0.1875)^2 = 18,005 < 10^6$

$\therefore F_L = 10^6 t_s/(2.5D) + 600\sqrt{GH} < 0.5F_y$

$= 10^6(0.1875)/(2.5 \times 5.5) + 600\sqrt{0.93(22.5)}$

$= 16,381 psi < 0.5(36,000) = 18,000 psi$

$> 1111 psi \therefore$ O.K.

- Seismic design of roof framing and columns shall be made if specified by the Purchaser. The Purchaser shall specify live loads and amount of vertical acceleration to be used in seismic design of the roof members. Columns shall be designed for lateral liquid inertia loads and acceleration as specified by the Purchaser. Seismic beam-column design shall be based upon the primary member allowable stresses set forth in AISC (ASD), increased by one-third for seismic loading.

Internal columns shall be guided or supported to resist lateral loads (remain stable) even if the roof components are not specified to be designed for the seismic loads, including tanks that need not be designed for seismic ground motion in this appendix (see E.1).

E.7.6 SLIDING RESISTANCE

The transfer of the total lateral shear force between the tank and the subgrade shall be considered.

For self-anchored flat-bottom steel tanks, the overall horizontal seismic shear force shall be resisted by friction between the tank bottom and the foundation or subgrade. Self-anchored storage tanks shall be proportioned such that the calculated seismic base shear, V, does not exceed V_s:

The friction coefficient, m, shall not exceed 0.4. Lower values of the friction coefficient should be used if the interface of the bottom to supporting foundation does not justify the friction value above (e.g., leak detection membrane beneath the bottom with a lower friction factor, smooth bottoms, etc.).

$$V_s = \mu(W_s + W_r + W_f + W_p)(1.0 - 0.4A_v) \qquad \text{(E.7.6-1)}$$

No additional lateral anchorage is required for mechanically-anchored steel tanks designed in accordance with this appendix even though small movements of approximately 25 mm (1 in.) are possible.

The lateral shear transfer behavior for special tank configurations (e.g., shovel bottoms, highly crowned tank bottoms, tanks on grillage) can be unique and are beyond the scope of this appendix.

E.7.7 LOCAL SHEAR TRANSFER

Local transfer of the shear from the roof to the shell and the shell of the tank into the base shall be considered. For cylindrical tanks, the peak local tangential shear per unit length shall be calculated by:

$$V_{max} = \frac{2V}{\pi D} \qquad \text{(E.7.7-1)}$$

Tangential shear in flat-bottom steel tanks shall be transferred through the welded connection to the steel bottom. The shear stress in the weld shall not exceed 80% of the weld or base metal yield stress. This transfer mechanism is deemed acceptable for steel tanks designed in accordance with the provisions and $S_{DS} < 1.0g$.

E.7.8 CONNECTIONS WITH ADJACENT STRUCTURES

Equipment, piping, and walkways or other appurtenances attached to the tank or adjacent structures shall be designed to accommodate the elastic displacements of the tank imposed by design seismic forces amplified by a factor of 3.0 plus the amplified displacement of the other structure.

E.7.9 SHELL SUPPORT

Self-anchored tanks resting on concrete ringwalls or slabs shall have a uniformly supported annulus under the shell. The foundation must be supplied to the tolerances required in 7.5.5 in to provide the required uniform support for Items b, c, and d below. Uniform support shall be provided by one of the following methods:

a. Shimming and grouting the annulus,

b. Using fiberboard or other suitable padding

c. Using double butt-welded bottom or annular plates resting directly on the foundation, Annular plates or bottom plates under the shell may utilize back-up bars welds if the foundation is notched to prevent the back-up bar from bearing on the foundation.

07 d. Using closely spaced shims (without structural grout) provided that the localized bearing loads are considered in the tank wall and foundation to prevent local crippling and spalling.

Mechanically-anchored tanks shall be shimmed and grouted.

E.6.2.2.2 Shell Compression in Mechanically-Anchored Tanks

The maximum longitudinal shell compression stress at the bottom of the shell for mechanically-anchored tanks shall be determined by the formula

In SI units:

$$\sigma_c = \left(w_t(1 + 0.4A_v) + \frac{1.273M_{rw}}{D^2}\right)\frac{1}{1000t_s} \qquad \text{(E.6.2.2.2-1a)}$$

or, in US Customary units:

$$\sigma_c = \left(w_t(1 + 0.4A_v) + \frac{1.273M_{rw}}{D^2}\right)\frac{1}{12t_s} \qquad \text{(E.6.2.2.2-1b)}$$

E.6.2.2.3 Allowable Longitudinal Shell-Membrane Compression Stress in Tank Shell

The maximum longitudinal shell compression stress s_c must be less than the seismic allowable stress F_C, which is determined by the following formulas and includes the 33% increase for ASD. These formulas for F_C, consider the effect of internal pressure due to the liquid contents.

When GHD^2/t^2 is greater than or equal to 44 (SI units) (10^6 US Customary units),

In SI units:

$$F_c = 83\,t_s/D \qquad \text{(E.6.2.2.3-1a)}$$

or, in US Customary units:

07 $$F_c = 10^6\,t_s/D \qquad \text{(E.6.2.2.3-1b)}$$

In SI units:

When GHD^2/t^2 is less than 44:

07 $$F_c = 8t_s/(2.5D) + 7.5\sqrt{(GH)} < 0.5F_y \qquad \text{(E.6.2.2.3-2a)}$$

or, in US Customary units:

When GHD^2/t^2 is less than 1×10^6:

07 $$F_c = 10^6\,t_s/(2.5D) + 600\sqrt{(GH)} < 0.5F_y \qquad \text{(E.6.2.2.3-2b)}$$

If the thickness of the bottom shell course calculated to resist the seismic overturning moment is greater than the thickness required for hydrostatic pressure, both excluding any corrosion allowance, then the calculated thickness of each upper shell course for hydrostatic pressure shall be increased in the same proportion, unless a special analysis is made to determine the seismic overturning moment and corresponding stresses at the bottom of each upper shell course (see E.6.1.5).

E.6.2.3 Foundation

Foundations and footings for mechanically-anchored flat-bottom tanks shall be proportioned to resist peak anchor uplift and overturning bearing pressure. Product and soil load directly over the ringwall and footing may be used to resist the maximum anchor uplift on the foundation, provided the ringwall and footing are designed to carry this eccentric loading.

Product load shall not be used to reduce the anchor load.

When vertical seismic accelerations are applicable, the product load directly over the ringwall and footing:

Check Shell Thickness

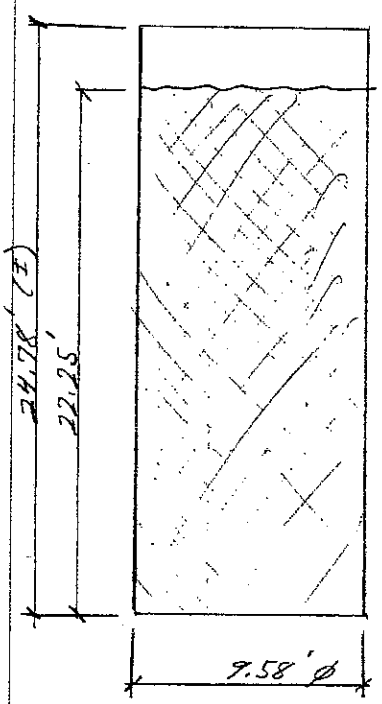
SEE TANK 1 CALCS FOR INFO NOT REPEATED HERE

↳ Tank 2 => 12,000 Gallon Tank
9.58' Diameter (115")
Tank Height = 61.66 - 36.88 = 24.78'
Stores Used Oil

=> Max Height of Fluid
↳ Tank Area = $(9.58)^2(\pi)/4 = 72.08\ ft^2$
12,000 Gallons = $1604.167\ ft^3$
↳ 12,000/72.08 = 22.25' (±)

=> Use 57.9 #/ft³ for Density of Used Oil => SG = 57.9/62.4 = 0.93

=> A36 Steel Used for Shell



Elevation - Tank 2
1/8" = 1'-0"

Minimum Steel Thickness

↳ 3/16" per API 650 Table

$$t_d = \frac{2.6(9.58)(22.25-1)(0.93)}{23,200} = 0.021"$$

$$t_t = \frac{2.6(9.58)(22.25-1)}{24,900} = 0.021"$$

Bottom Course Thickness (Minimum)

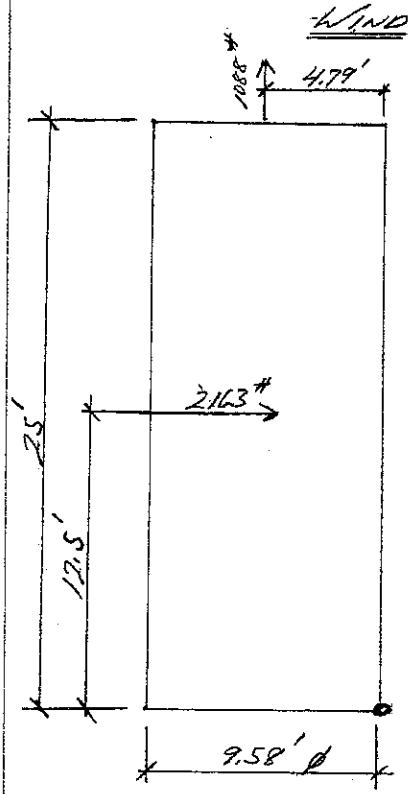
$$t_{1d} = \left(1.06 - \frac{0.463(9.58)}{22.25}\sqrt{\frac{22.25(0.93)}{23,200}}\right)\frac{2.6(22.25)(9.58)(0.93)}{23,200}$$
$$= 0.023"$$

$$t_{1t} = \left(1.06 - \frac{0.463(9.58)}{22.25}\sqrt{\frac{22.25}{24,900}}\right)\frac{2.6(22.25)(9.58)}{24,900}$$
$$= 0.023"$$

3/16" Minimum Thickness (Table Value) Controls.

=> Tanks 3 and 4 Similar

CHECK OVERTURNING/ANCHORAGE



TANK 2 ELEVATION
1/8" = 1'-0"

WIND FORCE => 9.03 PSF (9.58)(25) = 2163#
15.1 PSF (72.08) = 1088#

$M_W = 2163(12.5) + 1088(4.79) = 32,249$ ft-#

M_{DL} => SHELL WEIGHT (ASSUME 3/16" THICK STEEL)
↳ ROOF = 72.08 (0.1875/12)(490) = 552#
SHELL = π(9.58)(25)(0.1875/12)(490) = 5761#
Σ = 6313#

∴ $M_{DL} = 6313(9.58/2) = 30,240$ ft-#

↳ ANCHORAGE REQUIRED BY INSPECTION
↳ [4 × 32,249/9.58] − 6313 = 7152# = U
t/b = 7152/10 = 715#/BOLT
↑ FIELD OBSERVED CONDITIONS

SHEAR => (6313 − 1088)(0.4) = 2090 < 2163#
↳ (2163 − 2090)/10 = 7.3#/BOLT

=> TANK 3 AND 4 ARE SIMILAR TO TANK 2, BUT THEY HAVE A LARGER DIAMETER, AND ARE SHORTER.
↳ PER AVAILABLE INFORMATION, TANKS 3 AND 4 HAVE A HEIGHT OF 22' (±)

=> WHAT IS DIAMETER, IF 2' OF FREE SPACE IS PROVIDED ABOVE MAXIMUM CAPACITY => 1604.17 ft³ / (22−2) = 80.21 ft² = πD²/4
↳ D = 10.1' => SAY 10' DIAMETER

∴ WIND FORCE = 9.03(10)(22) = 1987# → M_W = 1987(11) + 1186(5) = 27,787 ft-#
= 78.53(15.1) = 1186# ↑

M_{DL} => 78.53(0.1875/12)(490) + π(10)(22)(0.1875/12)(490) = 601 + 5292
= 5893# (10/2) = 29,465 ft-# > 27,787 ft-#

=> USING API 650 FORMULA
↳ 0.6(27,787) < 29,465/1.5 = 16,672 < 19,643 O.K.

SHEAR = (5893 − 1186)0.4
= 1883 < 1987# → ANCHORAGE REQUIRED TO RESIST SHEAR

SEISMIC OVERTURNING (TANK 2)

$V = \sqrt{V_i^2 + V_c^2}$

$V_i = 0.151(W_S + W_R + W_f + W_i)$ $\Rightarrow W_S = 5761^{\#}$

$W_R = W_f = 552^{\#}$

$W_i \Rightarrow [1 - 0.218(9.58/22.25)]W_p = 0.906 W_p$

$\hookrightarrow W_p = 1604.17(59.7) = 95,769^{\#}$

$= 86,780^{\#}$

$\therefore V_i = 0.151(5761 + 552 + 552 + 86,780) = 14,140^{\#}$

$V_c = A_c W_c$

$\hookrightarrow W_c = [0.230(9.58/22.25)\tanh(3.67(22.5)/9.58)]W_p$

$= 0.10(95,769) = 9577^{\#}$

$\therefore V_c = 0.151(0.10)(95,769) = 1446^{\#}$

$V = \sqrt{14,140^2 + 1446^2} = \underline{14,214^{\#}}$

FOR OVERTURNING

$X_i = [0.5 - 0.094(9.58/22.25)]22.25 = 10.23'$

$X_c = \left[1 - \frac{\cosh(3.67(22.25)/9.58) - 1}{\frac{3.67(22.25)}{9.58}\sinh\left(\frac{3.67(22.25)}{9.58}\right)}\right] \times 22.25$

$= 19.64'$

$X_{is} = [0.50 + 0.060(9.58/22.25)](22.25) = 11.7'$

$X_{cs} = 19.64'$

VERTICAL SEISMIC EFFECT

(Assume Full Tank)

$\hookrightarrow F_V = 0.084(5761 + 552 + 552 + 86,780) = 7866^{\#}$

RINGWALL MOMENT

↳ $M_{RN} = \sqrt{[0.151[10.23(86,780) + 12.5(5761) + 552(25)]]^2 + [0.151(9577)(19.64)]^2}$
$= 149,727$ ft#

$M_S = \sqrt{[0.151[11.7(86,780) + 12.5(5761) + 552(25)]]^2 + [0.151(9577)(19.64)]^2}$
$= 169,390$ ft#

ANCHORAGE

↳ VERIFY THAT MECHANICAL ANCHORS ARE REQUIRED
↳ $w_a = 7.9(0.1875)\sqrt{36,000(22.25)(0.90)} \leq 1.28(22.25)(9.58)(0.93)$
$= 1258 \leq 254$
↑ CONTROLS

∴ ANCHORAGE RATIO

$J = \dfrac{149,727}{9.58^2(191(1-0.4(0.084)) + 254)}$ $\quad w_2 = 5761/\pi 9.58 = 191$

$J = 3.74 > 1.54$ ∴ ANCHORAGE IS REQUIRED

∴ $w_{AB} = \left(\dfrac{149,727(1.273)}{9.58^2} - 191(1-0.4(0.084))\right)$
$= 1892$ PLF

$P_{AB} = 1892(\pi(9.58)/10) = 5694$ #/BOLT < 21.8 K/BOLT CAPACITY
↑ FIELD OBSERVED # OF BOLTS

SLIDING RESISTANCE

↳ $V_S = 0.4(5761 + 552 + 552 + 95,769) = 41,054\# > 14,214\#$ O.K.

CHECK SHELL COMPRESSION

$\sigma_c = \left(191(1+0.4(0.084)) + \dfrac{1.273(149,727)}{9.58^2}\right)\dfrac{1}{12(0.1875)} = 1016$ psi

$F_c = 10^6(0.1875)/(2.5 \times 9.58) + 400\sqrt{0.93(22.25)} = 10,558 > 1016$ psi O.K.

SEISMIC OVERTURNING (TANKS 3 + 4)

↳ ASSUME SELF ANCHORED => ∴ $A_i = A_c = 0.603(1/3.5) = 0.172$

$V_i = 0.172(5292 + 601 + 601 + 85,330) = 15,794^{\#}$

↳ $W_p = 95,769^{\#}$ (FOR REFERENCE)

$W_c = 11,013$

$V_c = 0.115(95,769)(0.172) = 1894^{\#}$

$V = \sqrt{15,794^2 + 1894^2} = \underline{15,907^{\#}}$

$X_i = 9.06$ $X_c = 17.28$ $X_{is} = 10.6$ $X_{cs} = 17.28$

VERTICAL SEISMIC EFFECT => $F_v = 0.084(5292 + 601 + 601 + 95,769) = 8591^{\#}$

OVERTURNING MOMENTS

$M_{RW} = \sqrt{[0.172[9.06(85,330) + 10(5292) + 25(601)]]^2 + [0.172(11,013)(17.28)]^2}$
$= 148,315 \text{ ft}^{\#}$

$M_S = 170,433 \text{ ft}^{\#}$

$W_a = 1.28(20)(10)(0.93) = 238$ (WALL CONTROL)

ANCHORAGE RATIO

$J = \dfrac{148,315}{10^2(191(1 - 0.4/0.84)) + 238} = 3.5 > 1.54$ ANCHORAGE IS REQUIRED

$W_{tb} = \left(\dfrac{148,315(1.273)}{10^2} - 191(1 - 0.4/0.084)\right) = 1704 \text{ PLF}$

$P_{tb} = 1704(\pi(10)/10) = 5353^{\#}/\text{BOLT} < 21.8^{K}/\text{BOLT}$ CAPACITY
↳ MATCH # OF BOLTS AT TANK 2

SHELL COMP. CHECK

$f_c = 927 \text{ psi} < F_c = 10,088 \text{ psi}$ O.K.

↳ ANCHORAGE WILL NEED TO BE ADDED TO TANKS 3 AND 4 MATCH TANK 2 ANCHORAGE

SLIDING CHECK

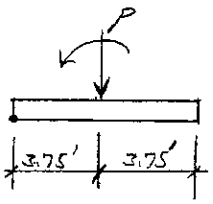
$V_s = 40,905^{\#} > 15,907^{\#}$ O.K.

FOUNDATION / SLAB CHECK

↳ ASSUME 6" SLAB, f'_c = 3,000 psi, REINFORCED W/ #4 BARS AT 6" O.C., E.W., AT MID-DEPTH OF SLAB. ASSUME AN ALLOWABLE BEARING PRESSURE OF 2,000 psf

TANK 1 ⇒ P_{MIN} = 3489#; M_w = 16,510#;
P_{MAX} = 34,631#; M_s = 57,818

↳ TANK AREA = 23.76 ft²
↳ ASSUME 7.5' ϕ SLAB AREA (MATCH ORIGINAL CALC'S)
→ BEARING ⇒ 34,631 / (7.5²) = 616 PSF < 2000 PSF O.K.
→ OVERTURNING

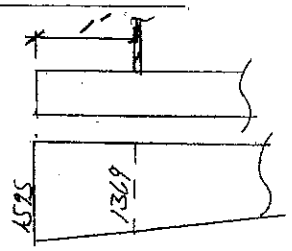


SLAB WEIGHT
↳ 7.5(7.5)(0.5)(150) = 4218#

WIND ⇒ $M_{O/T}$ = 16,510#
M_R = (34891 4218)3.75' = 28,902#
e = (16,510 - 28,902) = 12,392 / 7707 = 1.61'
∴ e_{ℓ} = 3.75 - 1.61 = 2.14' ⇒ $M = Pe$ = 7707(2.14) = 16,493 ft#
↳ 7.5/6 = 1.25 ⇒ OUTSIDE OF KORN
∴ $q = 2P/3bm$ = 2(7707) / (3 × 7.5 × 1.61) = 426 PSF

SEISMIC ⇒ M_R = [34,631 + 7707](3.75) = 157,755#
e = (157,755 - 57,818) / 42,338 = 2.36'
∴ e_{ℓ} 3.75 - 2.36 = 1.39' ← JUST OUTSIDE KORN
∴ q = 2(42,338) / (3 × 7.5 × 2.36) = 1595 PSF < 2000 PSF O.K.

CHECK SLAB



M_u = 1.4(1369)(1)²/2 + 1.4(1482)(2/3) = 2342 ft#
$\phi M_n = \phi A_s f_y (d - a/2)$
$a = A_s f_y / 0.85 f'_c b$ = (0.2 × 2 × 40) / 0.85(3)(12)
= 0.523
ϕM_n = 0.9(2 × 0.2 × 40)(3 - 0.523/2) = 39.4 k-in
= 3287 ft# > 2342 ft# O.K.

Tanks 2, 3, and 4 => Do Envelope

P_{MIN} = 5893#, M_W = 32,249 ft#

P_{MAX} = 102,634#, M_S = 170,433 ft#

Assume 10' ⌀ Slab (Match original calcs)

→ Bearing = 102,634/100 = 1026 psf < 2000 psf O.K.

Overturning => Slab Weight = 10x10x0.5x150 pcf = 7500#

↳ Wind => e_{ℓ} = 32,249/(5893+7500) = 2.41'

↳ 10/6 = 1.67' → outside Kern

$\therefore q = \frac{2(13,393)}{3(10)(2.59)}$ = 345 psf < 2000 psf O.K.

→ Seismic => e_{ℓ} = 170,433/(102,634+7500) = 1.55'

↳ Inside Kern

$q = P/A \pm M/S$

= 110,134/100 ± 170,433/(10³/6)

= 1101 ± 1023 => q_{MIN} = 78 psf (S.I. = 1.06)

q_{MAX} = 2124 psf → 2000 psf

< 2667 psf

1/3 Stress Increase for Lateral

Capitol Engineering Laboratories, Inc.

Materials Testing • Inspection • Crane Certification • Crane Safety Classes

TRANSMITTAL MEMO

PAGE 1 OF 2

TO: EARTHEC

FAX NO: 786-5263

PHONE NO:

FILE NO:

ATTN: PAUL

DATE: 11/7/08

JECT: 1515 S River Rd

e following is transmitted herewith:

Daily Report of 11/4/08

arks:

By: Barry Lotz

Commerce Dr. #200 • Roseville, CA 95678 • (916) 786-2488 • FAX (916) 786-9372

www.capitolengineeringlabs.com • capeng@surewest.net

CAPITOL ENGINEERING LABORATORIES, INC.
631 Commerce Drive, Suite 200 · Roseville, CA 95678 · (916) 786-2488 · FAX (916) 786-9372

JOB REPORT

PAGE: 1 of 1

PROJECT NAME: 1515 S. River Rd. Ranch Environ. FILE NO. 6148

INSPECTOR: Barry anderson DATE: 11-4-08

PERSONS CONTACTED: John Williamson / Paul Ley PERMIT #:

REFERENCE DOCUMENTS: WEATHER: Sunny warm

SERVICE PROVIDED: CONCRETE (INSP/SAMPLE ONLY/PU) ☐ MASONRY ☐ WELDING (SHOP/FIELD) ☐ SOILS ☐

OTHER: ☒ Proof load 1⅛" epoxy anchors

at the Ranch Environmental facility I proof loaded 5 - 1⅛" dia epoxy bolts were installed in out holding tanks #3 + #4. 1⅛" dia bolts were proof loaded to 20,000 lbs without any failure and all 5 bolts passing 20,000 lbs proof load test.
Tank # 3 I tested 1 bolt on South side of tank and 1 bolt on north side.
Tank # 4 I tested 2 bolts on south side of tank and 1 bolt on north side

COMPLIANCE OF WORK: PER SE DIRECTIONS

ATTACHMENTS:

EQUIPMENT/SUPPLIES USED: Hydraulics

NEXT VISIT:

REMARKS:

REVIEWED BY: DATE:

ATTACHMENT 4

FILLING AND EMPTYING TANKS

FILLING AND EMPTYING TANKS AT RAMOS ENVIRONMENTAL

Procedures for Filling and Emptying Tanks

The procedures set forth in this document are to be followed by a trained Ramos Environmental Services (RES) employee (operator) who is going to transfer bulk waste material at RES tank farm.

Beginning of each shift! The daily inspection report will be filled out by operator. (see attachment # 16)

The operator will direct the driver to pull the onto the loading pad at specific location.

The driver will set the parking brake and open the dome to the truck.

The driver will take a sample of the waste product to verify description on the manifest

The operator will double check the level of the RES tank.

The operator will connect the hose to the 3" pipe containment wall valve and connect the opposite end to the external valve on the truck designated by the driver.

The driver and operator both will check the camlock locking arms for a secure fit.

The operator will check the valves in the containment area to make sure that all valves are closed.

The piping system for pump # 1 is color coded white, pump # 2 blue, pump # 3 red.

First, the operator will open the selected pump valve which is closest to the pump.
Second, open the pipe line valve.
Third, open the tank valve at the desired height and check for any leaks.

The operator will ask the truck driver to open the truck's internal valve, external valve, and that dome cover is still open.

The operator will open the valve on the outside of the containment wall.

The driver and operator both will check for leaks as gravity flow is established.

The operator will power up the hydraulic pump system by pushing the green button.

Finally, the operator will engage the pump by slowly pulling the remote lever down from the middle position (neutral) to empty the RES tank while filling truck.
Slowly push the lever up from the neutral position to fill the tank while emptying truck.

When the driver tells the operator the truck is full, the operator will slowly move the remote lever to the neutral position from the down position and continue moving lever

to the up position to reverse the flow.

The operator will close the truck's external valve then loosen the camlock arms to allow air into the hose to clear line.

The operator will hang the hose on a hook, close the containment wall valve, move remote lever to the neutral position, and push the red button to power down.

The driver will close the internal valve and dome cover on the truck.

When a truck has been emptied, the operator will close the valve on the truck and follow the instructions as detailed above.

Vacuum Truck Off Loading Procedure

The procedure will be the same as stated previously except a screening vessel will be inserted between the truck and the tank farm pumps.

The operator will connect 1 hose from the vacuum truck to the top, inlet valve of screening vessel. The operator will connect a second hose from the bottom, outlet valve of the vessel to the containment wall valve that corresponds to the desired pump system and tank.

The operator shall not bypass the screening vessel for any reason as this action would allow the flow of nuts, bolts, rocks and other debris which would cause extensive damage to the pumps.

ATTACHMENT 5

LEAK DETECTION EQUIPMENT

IMPORTANT THINGS TO KEEP IN MIND ABOUT INSTALLING, USING AND MAINTAINING POLLULERT FLUID DETECTION SYSTEMS

A Pollulert System can provide early warning of a hydrocarbon product leak or spill. Such a System does not assure protection against property damage or bodily injury resulting from a leak or spill. Any detection system may fail to warn for a variety of reasons. They include:

1. ...stem cannot sense hydrocarbon product that does not reach its probes. Probes may not warn against leaks caused by carelessness and safety hazards such as improperly installed or maintained Systems or overloaded electrical circuits.
2. Systems may be subject to reduced sensitivity over time. For this reason, the System and its probes should be periodically tested.
3. The audible warning signallers of a System may not alert operators and users if located on the other side of a door or located in a remote part of the building — they may not alert someone who has recently used drugs or has been drinking alcoholic beverages. Audible devices may not be heard by the hearing impaired.
4. Visible signals may not be seen if signallers are installed in direct sunlight or areas of high light intensity.
5. All automatic Pollulert Systems will not operate without electrical power. If power fails, it will not operate until power is restored.
6. Do not attach equipment to the System that is not agency approved or technically compatible with the System. For this reason, it is essential to use Pollulert tested and approved equipment with all Pollulert Systems.

A common cause of an automatic system not functioning is inadequate maintenance. All Pollulert Systems should be tested and maintained by properly trained personnel following written procedures, and as required by applicable laws and regulations. A written rec... ...ntaining all information necessary to verify the proper and safe operation of the Pol... . System should be maintained and permanently retained by the user/operator. Regular testing, inspection and maintenance of a Pollulert System is a necessity.

...UID D... ...TION ...EM, ...N

WARNING: ANY ATTEMPT TO MODIFY OR REWIRE THIS SYSTEM THAT IS NOT CONSISTENT WITH THE MATERIAL PUBLISHED WITHIN THIS MANUAL MAY RESULT IN THE DEVELOPMENT OF DANGEROUS ENERGY LEVELS IN THE HAZARDOUS AREAS. EVIDENCE OF SUCH TAMPERING WILL NULL AND VOID THE EQUIPMENT WARRANTY.

EQUIPMENT WHEN INSTALLED OR USED OR MAINTAINED IMPROPERLY CAN BE DANGEROUS. SAFETY IS THE RESPONSIBILITY OF THE INSTALLER AND THE USER OF THE POLLULERT EQUIPMENT. THE FOLLOWING SAFETY PRECAUTIONS MUST BE OBSERVED AT ALL TIMES:

1. Read and understand this manual and information attached to the Pollulert controller and probes.
2. To avoid bodily injury and property damage, be certain that the control center is located in a non-hazardous (non-flammable) area.
3. Follow the instructions for splicing the probes to the instrumentation wiring. Improperly done splices could allow moisture to enter the wiring, causing improper signals at the control center, resulting in system failure.
4. To avoid personal injury and possible system damage, do not work on system while power is applied to the control center.
5. Use only Pollulert cable for probe wiring, to avoid improper system operation.
6. Do not run instrumentation wiring (between control center and probes) in conduit containing other current-carrying conductors, as dangerous energy levels may appear in the hazardous areas, resulting in property damage.
7. Do not exceed rated load for the relay terminals in the control center, as this will result in failure of the relay.
8. Do not expose the vapor sensor on the vapor probes to liquid hydrocarbons. Vapor sensors will be destroyed if allowed to come in contact with liquid hydrocarbons.
9. Do not allow the vapor sensor on the vapor probes to become immersed in water. Immersion in water for more than a few hours will cause deterioration and eventual failure of the sensor. The initial response of the probe, when the sensor is immersed in water, is a "wet" indication. Continued immersion in water will deteriorate the sensor and eventually the probe will be driven into an "oil" indication. If immersed in water, a 24 hour drying out time is recommended before resetting the vapor alarm threshold. While immersed in water the vapor sensor loses its ability to monitor for the presence of vapors. Evidence of probe sensor damage due to immersion under water will void the warranty.
10. Do not attempt any unauthorized service work in the field on the internal circuitry of the control center. Such service work can materially and adversely affect the intrinsic safety of the system and will void the product warranty.
11. Special care should be taken to insure that all Pollulert installation, operation and maintenance instructions are followed.
12. User should be aware of and adhere to all applicable laws and local codes and ordinances.

WARNING: THE PRODUCT WARRANTY IS NULL AND VOID IF INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS ARE NOT FOLLOWED!!!

Model # CD101W CD101C (CID)

The following probes may be used with the CD101N control unit:

FD221G
FD221G/T
FD241G
FD241S
FD241S-H
FD221T
FD210
FD241P
FD210V
FD221V
FD241R
FD221TJ
FD221TJSP4
FD221SP2/4/6/8/10
FD221SPV2/4/6/8/10
FD200HLM
FD200HLS

TABLE OF CONTENTS

SECTION	1	SYSTEM DESCRIPTION
	1.1	General Description
	1.2	Introduction
	1.3	System Planning
SECTION	2	CONTROL UNIT CD101N
	2.1	General Description
	2.2	Features
	2.3	Specifications
	2.4	Installation
	2.4.1	Mechanical Installation
	2.4.2	Electrical Connections
	2.4.3	Probe Input Connections
	2.4.4	Relay Contracts
SECTION	3	START-UP OPERATION PROCEDURES
	3.1	System Check and Start-Up
	3.1.1	Power
	3.2	Control Operation
	3.2.1	Control Status Indicators
	3.3	Probe Operation
	3.3.1	Probe LED Status
SECTION	4	PROBE MAINTENANCE
	4.1	Introduction
	4.2	Frequency of Maintenance
	4.3	Cleaning

			Page
SECTION	5	TROUBLESHOOTING	10
	5.1	General	10
	5.2	Inspection of Control Unit	10
	5.2.1	Records	10
	5.3	False Alarms	10
	5.4	Probes	11
	5.5	Probe Functionality Check	11
	5.6	Probe Electrical Check	11
	5.7	Instrumentation Cabling	12
	5.7.1	Cable Continuity Check	12
	5.7.2	Cable Shorts	12
	5.7.3	Cable Leakage Check	12
	5.8	Control Center	13
	5.9	FD401 Field Test Set	14
	6	ORDERING INFORMATION	15
	7	SYSTEMS REPAIR	16
	8	WARRANTY	16
	9	APPENDIX	17

SECTION 1

System Description

1.1 GENERAL DESCRIPTION

The purpose of this Pollulert® fluid detection system manual is to instruct the installer and user in the procedures to properly implement an installation. The information presented herein is intended for use by qualified installers and operators at the user's facility.

The Pollulert fluid detection system is a continuous monitoring system comprised of several probe configurations for monitoring hydrocarbon storage sites for leaks or spills.

When installed as instructed herein, the Pollulert equipment is designed to detect hydrocarbons in a hazardous area. Deviation from these instructions or modification of the equipment in any way could result in the development of dangerous energy levels in the hazardous area and could void the warranty. Safety is the responsibility of the people who install and operate the equipment.

1.2 INTRODUCTION

The Pollulert fluid detection system is designed to detect liquid hydrocarbons or hydrocarbon vapors in a variety of applications and environments. The Pollulert sales bulletin presents a good overview of the Pollulert equipment available and should be consulted to determine the best system for each application. If additional information is needed concerning equipment selection, system planning, installation, operation, or maintenance, please contact Pollulert Systems, P.O. Box 706, Indianapolis, Indiana 46206; telephone (317) 261-1442 or 800-343-2126.

1.3 SYSTEM PLANNING

The Pollulert control center may be located up to 4,000 feet from the probes, depending on the number of probes that are attached to the control center. The probe wires are color-coded and wired in parallel to the sensor input terminals of the control center. Routing and termination of the instrumentation cabling between the probe installation and the control center is at the discre-

tion of the installing contracto
cabling in explosion-proof ha
not required. However, the loc
tor should be consulted, as
enforcement of the Nationa
(NEC) varies with geographic

The Pollulert family of probes
for many areas of monitoring
face water, oil separators (se
retention ponds, double-wall
for pipe monitoring. Once a b
of each probe function is gra
applications can be developec
ing discussions are on standa
order probes can be supplied
suit a particular application.

A probe should be located as c
the storage site to be monitore
leaks early.

NOTE: THE CONTROL C
BE LOCATED IN A NON-
AREA.

Hydrocarbon detection is sig
and visual indicators. Therefc
tion of the control would be
tance of the personnel to be al
personnel should observe the
assure that no system fault is

Notification of a hydrocarbon
transmitted any distance fro
connecting data transmission
relay contacts on the control c
contains adjustable probe sen
set to detect a desired thickne
hydrocarbons between ⅛ to
probes—see individual probe

One control unit can monitor
probes. Any combination of gr
water, tank or special applicat
connected to one control as lor
six probes are utilized

STANDARD PROBES		FD210/FD210V/FD221V/FD22ITJ FD221SP2~10 FD221SPV2~10	
No. of Probes	Distance to Farthest Probe	No. of Probes	Distance of Farthest Probe
1	4000 Ft.	1	2000 Ft.
2	4000 Ft.	2	1000 Ft.
3	3000 Ft.	3	1000 Ft.
4	3000 Ft.	4	1000 Ft.
5	2000 Ft.	5	500 Ft.
6	2000 Ft.	6	100 Ft.

NOTE: NO MORE THAN SIX PROBES ARE TO BE USED WITH A SINGLE CD101N CONTROL.

Before starting installation, the following planning must be completed:

- Read and understand manual.
- Prepare all site layouts and wiring drawings.
- Obtain necessary building permits.
- Specify installation to conform to all local codes and practices.

NOTE: IF CABLE OTHER THAN POLLULERT IS USED, WARRANTY IS NULL AND VOID.

SECTION 2

CONTROL UNIT - CD 101N

2.1 GENERAL DESCRIPTION

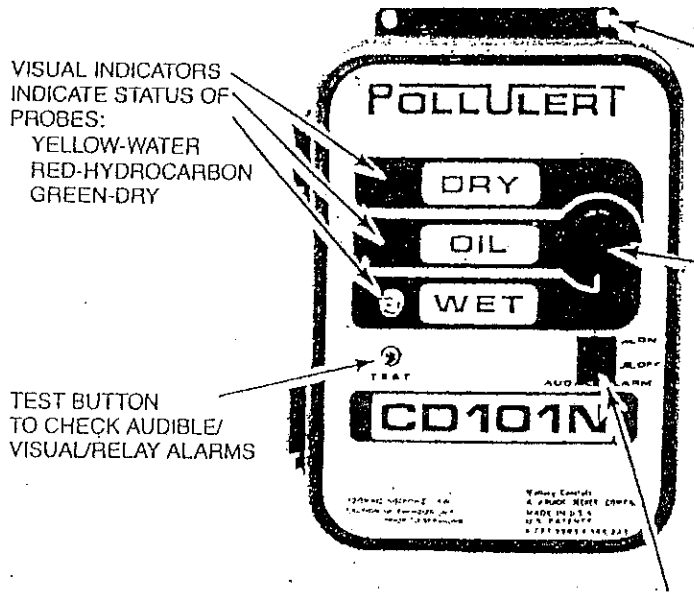
The Pollulert® fluid detection control center is an electronic monitoring system that works on the principle of conduction (liquids) and adsorption (vapors). Typical water (excluding de-ionized water) is a conductive, or polar, fluid. Hydrocarbons are non-conductive, or non-polar substances. The probe circuitry can differentiate between polar or non-polar fluids and provide the appropriate alarms and contact closures at the control center when a non-polar fluid is detected.

· air is non-polar like hydrocarbons, provisions ..ve been made electromechanically to likewise differentiate between air and hydrocarbons. This data is also sent to the electronics in the probe housing and the proper air, water or hydrocarbon signals are sent back to the control center. A push-to-test button internal to the probe housing is also provided to indicate if the probe is in water, hydrocarbon, or air (dry). The respective yellow, red or green Light Emitting Diode (LED) in the probe housing will illuminate when the button is depressed.

For vapor detection, an adsorption sensitive resistor with extremely low power requirements (cold sensor) is utilized. As with the liquid hydrocarbon detection probes, the vapor probes can also differentiate between dry and water, and send the proper dry, water or hydrocarbon (vapor) signals back to the control center.

The probe system uses the fact that hydrocarbons float on water. The probe sensors monitor the fluid conductivity at the air-water interface for a specific probe location. Any hydrocarbon present will displace the water at the air-water interface, causing the probe sensors to be immersed in the hyrdrocarbon. The lack of conductivity in the non-polar hydrocarbon will cause the detector to alarm accordingly.

2.2 FEATURES



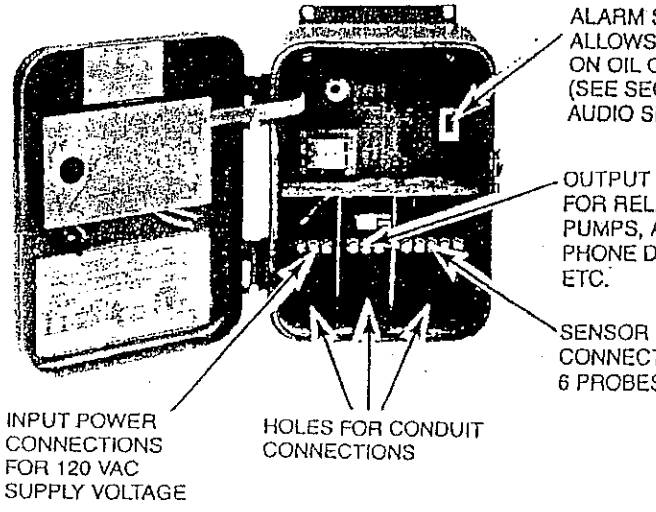


Figure 2.1

2.3 SPECIFICATIONS

ENCLOSURE - 8"H × 6"W × 4"D, with external mounting flange, for indoors only.

SENSOR INPUTS - Up to 6 probes wired in parallel.

CABLE LENGTH - Up to 4,000 feet, depending on number & type of probes used. (See Table, page 2).

VISUAL INDICATORS - Three visual indicators (LEDs) to indicate dry (green), wet (yellow) or hydrocarbon (red).

AUDIO SIGNAL - To indicate hydrocarbon at any probe. Loudness approximately 75db at two feet. 900 Hz audio frequency. (Continuous signal for OIL detect; pulsating signal for WET detect, when properly programmed). External push-on, push-off switch allows disabling of audible signal.

RELAY CONTACTS - One relay with contacts which change state when any probe detects desired medium selected with Alarm Selector switch. Relay also changes state when power removed, for power-down alarming. Factory set for hydrocarbon (6 Amp 120 VAC max.)

TEST BUTTON - Provides check of LED indicators, audible alarm and relay, when depressed.

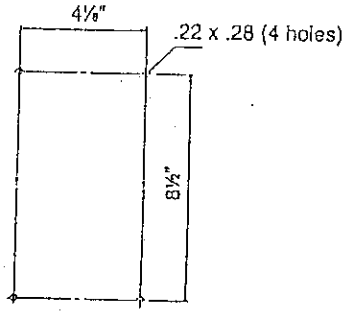
POWER REQUIRED - 120 VAC ± 10%, 60 Hz., 8 Watts.

OPERATING TEMPERATURE RANGE — 0°C to +50°C.

2.4 INSTALLATION

2.4.1 MECHANICAL INSTALLATION

The enclosure that houses the CD101N control is intended for use indoors, only. Mounting flanges allow permanent fastening to walls, panels, posts, etc.



MOUNTING DIMENSIONS

Location of the control should be in an area where personnel responsible for operating the system are located. 120VAC power must be made available and the necessary conduit for wiring installed. The actual control must be located in a non-hazardous area. Consult your local electrical codes.

> A SEPARATE, DEDICATED POWER LINE (IN CONDUIT) IS RECOMMENDED FOR THE CONTROL CENTER, WITH NO MEANS OF DISCONNECTING THE POWER TO THE SYSTEM, OTHER THAN BY THE CIRCUIT BREAKER (OR FUSE) IN THE MAIN POWER DISTRIBUTION PANEL.

2.4.2 ELECTRICAL CONNECTIONS

Read completely and plan wiring runs before making any connections.

> WARNING: DO NOT CONNECT 120VAC UNTIL OTHER CONNECTIONS HAVE BEEN MADE, ALL EQUIPMENT IS IN PLACE, AND FINAL INSPECTION HAS BEEN COMPLETED.

Refer to Figure 2.2 for instructions on removing the protective cover plate prior to wiring.

REMOVAL OF PROTECTIVE COVER

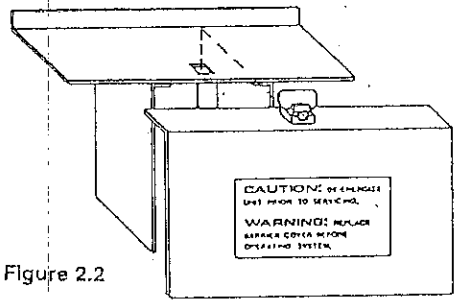


Figure 2.2

TO REMOVE PROTECTIVE COVER, TURN PLASTIC LEVER ON COVER ¼ TURN TO RIGHT OR LEFT, LIFT COVER UP AND OFF. TO REPLACE INSERT COVER IN POSITION MAKING SURE LOCKING KEY SETS INTO MATCHING HOLE ON PARTITION. TURN PLASTIC LEVER ¼ TURN TO RIGHT OR LEFT TO LOCK INTO PLACE.

2.4.3 PROBE INPUT CONNECTIONS

Input connections to the remote probes are made by connecting the instrumentation cable between the electronic control and the probes. Cable may be placed in conduit, directly buried in the ground, or suspended overhead from poles depending upon standard practice at the installation site and local electrical codes.

> NOTE: THE INTRINSICALLY SAFE PROBE WIRING SHALL BE INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, ANSI/NFPA 70, ARTICLE 504-30.

Only one cable is connected to the terminals marked SENSOR INPUT located on the printed circuit board inside the enclosure. Entrance is via the ⅞ inch hole directly underneath the terminal block. The cable may be routed to the hole via ½" metal conduit or openly, with the cable entering the enclosure through a box connector with clamp.

The cable wires are color-coded and the proper lead color should be attached to the appropriately marked terminal (RED, BLK, etc.) The shield or drain wire of the cable should be attached to the terminal marked SHIELD. Use spade terminals provided.

Additional probe cables can be spliced to the cable exiting from the control center (paralleled) by use of junction boxes as shown in Figure 2.3.

It is important that good electrical connections are made at the splices. Use the splice kits provided with the probes. Follow the instructions in the Appendix, Section A, Wire Splice Instructions. Additional splice kits can be ordered, if required. For butt splices, ask for part number 282-40120-01. The splice kit (potting cylinder) can be ordered under part number 511-40073-01.

2.4.4. RELAY CONTACTS

The control center provides a set of relay contacts that can be programmed to change state for an OIL detection or an OIL/WET detection. A slide switch, located internally to the control unit, is used to make the selection (See Figure 2.1). Moving the Alarm Switch to OIL will activate the relay and produce a continuous alarm when oil is detected. Similar switch to the OIL/WET position relay and audible alarm when oil detected. In the OIL/WET position alarm will give a continuous signal pulsating signal for WET. For multiple continuous signal for OIL will always over the pulsating signal for WET.

The relay in the CD101N is energized normal static condition. When an OIL is detected, the relay is de-energized ture allows the relay to be used to shut down alarm via the same relay contacts a detect alarm.

Access to the relay contacts is through marked RELAY OUT on the printed circuit inside the enclosure. Entrance is via ⅞ inch hole located directly beneath the terminal block. Refer to Figure 2.3.

Again the cable may be routed to the terminal metal conduit with the cable entering the closure directly through a box connector your local electrical codes.

> CAUTION: THE RELAY TERMINALS MUST NOT BE USED IN CIRCUITS THAT EXCEED 6 AMP 120 VAC.

The standard setting of the CD101N control ter as shipped from the factory with the Alarm Selector Switch set in the OIL position the majority of installations, the switch will need to be changed.

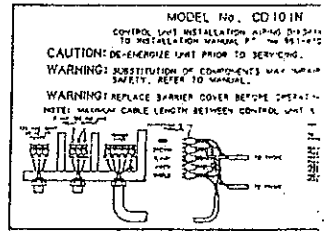


Figure 2.3

SECTION 3

START-UP & OPERATION PROCEDURES

3.1 SYSTEM CHECK AND START-UP

At this point you are ready to check out the system, provided all electrical wiring has been completed and checked.

Be sure that the 120 VAC INPUT has the black and white power leads going to the respective BLK and WHT terminals. Failure to follow this color code could cause the fuse protection to be ineffective.

> CAUTION: THE TERMINAL MARKED "GRN" MUST BE PROPERLY GROUNDED PER NEC CODE TO MAINTAIN THE SAFETY OF THE SYSTEM.

3.1.1 POWER

Turn on power to the unit. One or more of the visual indicators on the front panel should illuminate, indicating that the power is on. (Figure 3.1).

3.2 CONTROL OPERATION

> CAUTION: BEFORE OPERATING THE POLLULERT FLUID DETECTION SYSTEM, ALL INSTALLATION AND SYSTEM CHECK INSTRUCTIONS MUST BE FOLLOWED.

- Alarm Selector Switch should be set as needed.
- Protective barrier cover should be replaced and power applied.

3.2.1 CONTROL STATUS INDICATORS (Figure 3.1)

DRY - If any or all probes attached to the control center are in a dry condition, the green LED on the front panel will illuminate.

WATER - If any or all probes attached to the control center are in a water condition, the yellow LED on the front panel will illuminate.

HYDROCARBON - Likewise if any or all probes attached to the control center are in a hydrocarbon, the red LED on the front panel will illuminate, and the relay will change state. The vapor probe sensors should never be allowed to contact liquid hydrocarbons. The sensor will be destroyed by liquid hydrocarbons.

> NOTE: ONE OR MORE OF THE ABOVE CONDITIONS MAY EXIST AT THE SAME TIME DEPENDING ON THE STATE OF EACH PROBE.

To check the functionality of the system, carefully place each probe into the above conditions and check for the proper indication at the Push-To-Test button inside the probe cap. In the newer model probes, (MD series) the LED should be checked by looking in the clear epoxy view port. No push to test button is installed. Likewise, ascertain the indication at the control panel. Checks can be conducted with the probe out of its respective well in the following manner:

Dry Indication - with the probe float assembly resting on the probe weight assembly, a DRY reading will be displayed.

HYDROCARBON Indication - with the probe float assembly raised at least 2" above the probe weight assembly, a HYDROCARBON reading will be displayed. This is because air, like hydrocarbons, is non-polar or non-conductive.

The probe can be tested for performance by spraying the sensor with Freon® TF solvent from an aerosol can (such as Miller-Stephenson P/N MS-180). The probe will alarm until the Freon evaporates off the sensor.

WATER Indication - with the probe float assembly raised at least 2" above the probe weight assembly and a clip lead hooked across the probe sensors, a WATER reading will be displayed. An alternative to the clip lead would be to moisten the thumb and forefinger and place them across the probe sensors.

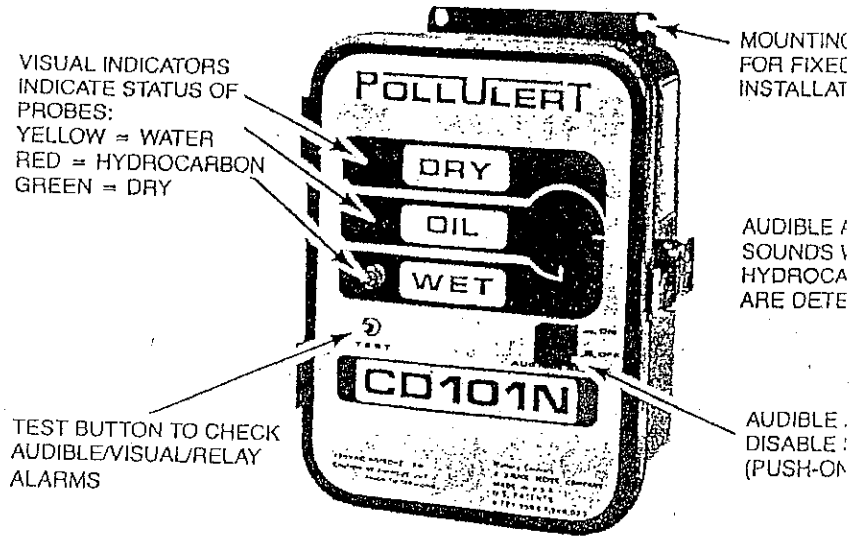


Figure 3.1

> NOTE: THE FD210, FD221TJ, FD210V, AND FD221V PROBES ARE SEALED UNITS, MAKING ACCESS TO THE PROBE SENSORS IMPRACTICAL. THE USE OF WATER AND KEROSENE TO CHECK THE PROBE FUNCTIONALITY WOULD BE MORE DESIRABLE FOR THIS CASE.

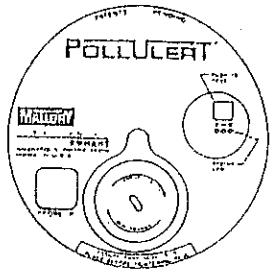
This completes the system check and start-up procedures. If any of these tests do not perform as described, recheck the system wiring. If symptoms persist, replace the control unit and repeat the above tests. The probe(s) can now be replaced and rechecked likewise.

3.3 PROBE OPERATION

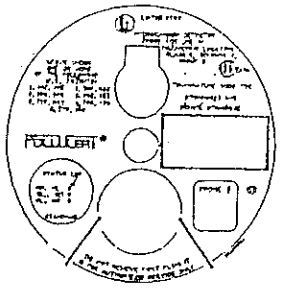
Up to six standard probes can be used with the CD101N control center, with the Light Emitting Diode (LED) status indicators (Figure 3.1) giving the proper DRY, WET or HYDROCARBON displays. One or more of these displays may be lit, depending on the number of probes used and the status of the wells or sumps in which the respective probes are located. To substantiate the status of the wells or sumps in which the respective probes are located, the PUSH TO TEST switch located inside the probe caps may be depressed to obtain a readout of the condition of that particular probe (Figure 3.2, top). LEDs inside the probe cap will give a WATER (yellow LED), HYDROCARBON (red LED) or DRY (gree tion as long as the switch is depre very desirable feature as the indivi not have to be removed to sample well or sump. Access to the interi cap is through a plug on the to assembly (Figure 3.2). Use the driver when removing the plug fror probe assembly. Avoid cross thr plug. If the O-ring is broken or dam with a new O-ring, part number 5 Do not replace plug without an O-r necessary, clean & lubricate NYOGEL 779 or equivalent.

On later model probes (figure 3.: press to test button is needed. Th sponding to the probe status is con is visable through a clear epoxy v port should never be opened. A mo tion strip has been put into the p reduce the possibility of conden inside of the view port. If the vie colored or in anyway damaged so th see the LED's, please contact Pol for assistance.

> NOTE: FAILURE TO OBSERV INSTRUCTIONS COULD V SYSTEM WARRANTY.



TOP VIEW OF PROBE ASSEMBLY
(EARLIER MODEL)



TOP VIEW OF PROBE ASSEMBLY
(LATER MODEL)

Figure 3.2

During normal operation of the Fluid Detection System, one or more of the three status indicators at the control center should illiminated. If ever the WATER, HYDROCARBON, and DRY LED status indicators are all off simultaneously, there is a good chance that the cabling from the control center to the probes has been severed. If such is not the case, then the control center may be at fault and should be returned for repairs.

3.3.1 PROBE LED STATUS

The following table will be useful in the interpretation of the LED status indicators on the control center.

LED STATUS RED	YELLOW	GREEN	INTERPRETATION	ACTION
		X	All probes are all in dry environment (no liquids present).	Normal situation
	X		All probes are all in water or other polar (conductive) liquid.	Normal situation, or secondary alarm (If programmed to alarm on OIL/WET).
X			All probes have detected hydrocarbons or other non-polar (non-conductive) liquids.	Depress switch on individual probe caps to find alarming probe.
X	X		One or more probes are seeing hydrocarbons. Remainder in water.	Depress switch on individual probe caps to find alarming probe or probes.
X		X	One or more probes are seeing hydrocarbons. Remainder are dry.	Depress switch on individual probe caps to find alarming probe or probes.
	X	X	Probe or probes are in water or dry.	Normal situation, or secondary alarm (If programmed to alarm on OIL/WET).
X	X	X	One or more probes are seeing hydrocarbons. Remainder are dry or in water.	Depress switch on individual probe caps to find alarming probe or probes.
NO LED's LIT			System Failure	Refer to "Trouble-shooting", Sec. 11

SECTION 4

PROBE MAINTENANCE

4.1 INTRODUCTION

When installing or servicing the Pollulert® Fluid Detection system probes, it must be kept in mind that the probes are sensitive, delicate devices. Although they can withstand some abuse, the probe caps, their associated flotation components, and the flex-fold cable should be handled with care. This consideration should be given to any delicate instrument.

4.2 FREQUENCY OF MAINTENANCE

The time between maintenance periods is a variable that will depend on the environment in which the probe is operating. In actual field tests, units whose probe sensors were subjected to algae buildup in the water will not have their performance inhibited. It is recommended that the installation be checked every 60 to 90 days visually for severed or damaged wiring. Of more importance is checking the probe site for debris accumulation that may affect the mechanical operation of the flotation system. Sump wells and other containment areas utilizing a probe should be routinely inspected for debris. Accumulations should be removed at that time. The Push-To-Test switch should be depressed on each probe; or the LED's viewed (on later models) to ascertain the probes performance. One of the 3 LEDs should be illuminated when push to test switch is depressed. If none of the LED's is lit, the system should be checked. The access plug at the top of the probe assembly should be checked to ascertain a good seal. Always use the proper screwdriver when removing the plug from the top of the probe assembly. Avoid cross threading of the plug. If the threads are damaged use teflon tape or a PVC compatible sealing compound to seal threads. If the O-ring is broken or damaged, replace with a new O-ring, part number 552-40519-06. DO NOT REPLACE PLUG WITHOUT AN O-RING IN PLACE. If necessary, clean and lubricate O-ring with NYOGEL 779 or equivalent.

Additional splice kits can be ordered, if required. For butt splices, ask for part number 282-40120-01. The splice kit (potting cylinder) can be ordered under part number 511-40073-01.

4.3 CLEANING

Gasoline or diesel fuel, both solvents, can be used to clean less viscous hydrocarbon produ sensors and related flotation pa would be helpful in applying brushing away any residue.

Alochol, hexane, or any other also be used to clean the probe

CAUTION: THESE SOLVEN TREMELY FLAMMABLE. NEAR HEAT, SPARKS FLAME. USE ONLY IN A W LATED AREA AND AVOID OR PROLONGED CONT SKIN OR BREATHING O FOLLOW INSTRUCTIONS THE LABELS FOR ALL SO

The preceding cleaning method the vapor probes. At no time wi the vapor probe sensors be e hydrocarbons.

CAUTION: THE VAPOR P SOR AND HOUSING SHOU CLEANED WITH WATER. ANY OTHER TYPE OF CH LUTIONS MAY PERM DAMAGE THE SENSITIVE SOR AND VOID TH WARRANTY.

SECTION 5

TROUBLESHOOTING

5.1 GENERAL

While all Pollulert® Fluid Detection systems are 100% factory inspected, problems will sometimes occur. The troubleshooting instructions contained in this section are intended for use by personnel who have a basic understanding of electrical circuits. Instructions have been written to assist in isolating the system fault to the control center, instrumentation wiring, or probe. Repairs internal to the control center should be left to the factory authorized service.

> WARNING: ANY ATTEMPTS TO SUBSTITUTE COMPONENTS OR IN ANY WAY REPAIR CIRCUITS INTERNAL TO THE CONTROL CENTER MAY IMPAIR THE SAFETY OF THE SYSTEM AND VOID PRODUCT WARRANTIES.

5.2 INSPECTION OF CONTROL UNIT

It is recommended that Pollulert Systems be routinely inspected to insure they are in good operating condition. The CD101N control unit should be visually inspected at least monthly to insure it is operating properly. To insure that power is applied to the unit, check that one or more of the status LED lights on the front of the unit is illuminated. If the power does not appear to be present, check that the power circuit breaker at the circuit breaker panel is turned on. If this breaker is turned on, check to see if the fuse, located on the lower left circuit board on the inside of the unit, has been blown. If it is blown or circuit breaker will not stay on, contact your Pollulert distributor to determine cause.

To check the operation of the audible alarm, LEDs and the relay, proceed as follows:

a. Insure that the audible alarm disable switch (located on the front panel) is in the ON position.
b. Depress the TEST button on the front panel.
c. Check that all the LEDs light up, the audible alarm sounds and the relay activates. The relay activation can be determined by either an audible click if no accessory is connected to it; or by activation of any accessory connected to the relay.
d. By holding the TEST button down (to give an audible alarm) the audible alarm disable switch can be checked by pushing the switch OFF and then ON.

5.2.1 RECORDS

See Appendix Section C for a sample Inspection Log. Users must also comply with local codes and ordinances which may require that other records be kept.

5.3 FALSE ALARMS

Care must be taken in the initial Pollulert installation and in providing periodic inspection and cleaning of the probe assemblies (refer to Section 4), to avoid the possibility of the control center displaying a false alarm.

The following paragraphs will review and give an insight into how such situations can occur. These situations should be studied carefully as they can give possible clues to service personnel on how to proceed, if the control center and probes all check out okay electrically.

SITUATION A: CONTROL CENTER STATUS LEDs SHOW HYDROCARBON CONDITION, INSPECTION OF ALARMING PROBE SHOWS WATER IN SUMP OR WELL, BUT NO HYDROCARBONS.

If probes are not installed properly in their respective sump well or inspection well, hinderance of the mechanical travel of the flotation assemblies can cause the probe sensors to exit the air/water interface. As air, like hydrocarbons, is a non-polar (non-conductive) medium, it will cause a hydrocarbon alarm. Improperly installed well screen (sections not properly aligned when coupled) may cause the flotation assembly to hang up on the sides of the well screen in a receding water situation. This would cause an alarm.

SITUATION B: CONTROL CENTER STATUS LEDs SHOW HYDROCARBON CONDITION. INSPECTION OF ALARMING PROBE SHOWS WELL OR SUMP IS DRY, WITH NO HYDROCARBONS.

A proprietary electro-mechanical system in the probe flotation assembly prevents alarming of a probe in a "dry" environment (Remember—air is a non-polar medium like a hydrocarbon). For this mechanism to function, the probe flotation system must be allowed to travel freely to its lowest point of travel, where the electromechanical system performs its function. If a silt buildup, debris or other foreign matter is introduced to prevent this free movement to end of travel, the probe will give a hydrocarbon alarm.

> NOTE: ENOUGH EMPHASIS CANNOT BE PLACED ON THE NEED FOR PERIODIC MAINTENANCE ON THIS OR ANY OTHER FIELD INSTALLATION OF AN ELECTRONIC MONITORING SYSTEM. ATTENTION TO SUCH DETAILS WILL RESULT IN AN EFFECTIVE, RELIABLE OPERATING SYSTEM.

5.4 PROBES

The Pollulert® Fluid Detection system probes are active, not passive, units. The detection circuitry and associated logic are encapsulated inside the probe well cap. Connections to the probe circuitry are made via color coded, insulated wires exiting from the top of the well cap. Although the probe circuitry is protected from improper wiring, care should be taken in the probe installation. Never connect or disconnect a probe without first removing the power to the CD101N control center. Care should also be exercised in the probe wiring. Color codes should be adhered to according to the instructions for a specific probe.

5.5 PROBE FUNCTIONALITY CHECK

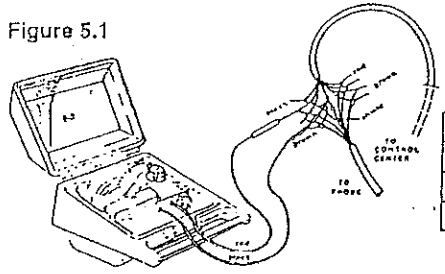
The PUSH TO TEST switch internal to the probe well cap should be depressed every 60 to 90 days to ascertain the fact that the probe is functioning properly. One of the three LEDs should be illuminated, when the button is pressed, at all times. Failure to get a lit LED will indicate the probe is not functioning properly and the system performance should be checked. Further checks can be made, if necessary, by removing the probe from the ground well actually exposing the probe s or hydrocarbon. The PUSH should be depressed under check for proper LED illumine should illuminate for hydroc LED for water and the green l useful tool for checking the pr Field Test Set (Section 5.9).

5.6 PROBE ELECTRICAL

A handy instrument, available stores, is a volt-ohmmeter. I ferred to as a VOM. A VOM l measure resistances and v mended. The Healthkit VOM, used by the factory service referenced in the tests to t voltage readings will be ma (junctions) where the probe c nected to the instrumentation ments will be made with the lead (black with an alligator cl cable shield or drain lead (Figu selector switch should be se volts, DC, or higher. As done above, expose the probe sens hydrocarbon. The respective r ous cable lead junctions sho readings shown in Figure 5.2. ing conditions, a voltage of 8 to present at the red lead as sho no voltage is present at the r ment cable may be severed o is not operating properly. In su to the troubleshooting sectior tion cabling and control center, proper voltages appear at the the black, brown or green lea functioning properly and shou another probe to ascertain its

VOLTAGE CHECK

Figure 5.1



VOLTAGE READIN

PROBE STATUS	BLACK	BROWN
WATER DETECT	10-12 VDC	0 VDC
HYDROCARBON DETECT	0 VDC	10-12 VD
AIR (DRY) DETECT	0 VDC	0 VDC

Figure 5.2

CABLE CONTINUITY CHECK

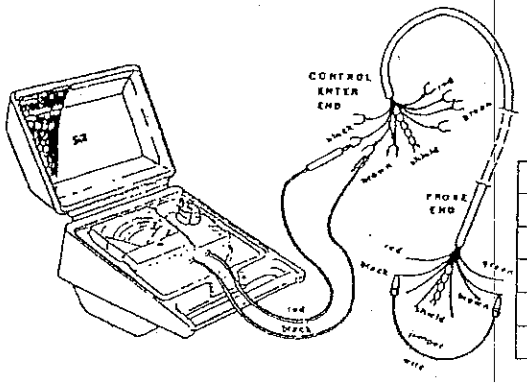


Figure 5.3

V.O.M. LEAKAGE TEST OF CABLE

V.O.M. LEADS	CABLE CONDUCTORS	V.O.M. READING
polarity not important	black to brown	≥ 100 megohms
	red to green	≥ 100 megohms
	black to green	≥ 100 megohms
	brown to red	≥ 100 megohms
	all leads to shield	≥ 100 megohms

Figure 5.4

5.7 INSTRUMENTATION CABLING

The cabling used for the Pollulert® Fluid Detection system contains 4-conductors and an outer shield or drain wire. The conductors are color-coded black, brown, red and green. Connecting cable part number POL304 is used for conduit installations. Use POL314 for direct burial.

5.7.1 CABLE CONTINUITY CHECK

If one (or more) of the cable conductors is suspected of being open, the conductors can be measured in pairs, using a short jumper wire with alligator clips at each end. Before making the resistance measurements, be sure the cable is detached from the control center and the associated probe(s). Figure 5.3 illustrates the black and brown conductors being checked for continuity at the control center end, with the jumper wire attached at the probe end. Resistance should measure under 100 ohms (with a very accurate VOM the reading would be around 22 ohms per thousand feet of cable, but allowances should be made for accuracies of different VOM models). Moving the jumper wire to the red and green lead wires, the same measurement can be made at the other end of the cable, this time placing the VOM across the red and green leads. Using the Heathkit VOM, the range selector would be set to the R x 1 scale in making the above measurements.

5.7.2 CABLE SHORTS

The VOM can also be used to test the cable for shorts to adjacent conductors as well as from the individual conductors to the cable shield or drain wire. Again, before making the test for shorts, be sure that all cable terminations at both ends are removed and the individually terminated ends of the conductors are not touching. Using the Heathkit VOM, the range selector would be set to the R x 1M scale and the readings should be above 100 megohms.

5.7.3 CABLE LEAKAGE CHECK

The VOM can be used to check the cable for leakage, at the same time that the cable is being checked for shorts. Refer to Figure 5.4 for the checks to be made. Again, be sure that all cable terminations at both ends are not touching each other.

In cases where the cable sheathing may have been damaged or cut, moisture seepage into the cable could cause leakage readings of less than 100 megohms to values lower than 100 ohms. Cables with leakages above 1 megohms are still usable, but replacement should be considered as the resistance will get lower with time as the cable deterioration continues.

5.8 CONTROL CENTER

Because of Underwriters Laboratories (UL) approvals for Intrinsic Safety (IS), it is necessary that malfunctioning control centers be returned to the factory for repairs.

WARNING: ANY UNAUTHORIZED SERVICE WORK IN THE FIELD ON THE INTERNAL CIRCUITRY OF THE CONTROL CAN ADVERSELY AFFECT THE INTRINSIC SAFETY OF THE SYSTEM AND VOID PRODUCT WARRANTIES.

However, several simple c
determine if the control u
tioning before returning th
repairs. The same short ju
previous section can be us
center.

First remove the instrume
SENSOR INPUT termina
center. Be sure to remove
unit before attempting this
removed, return power to

Refer now to Figure 5.5, a
wire according to the instr
check that the proper LED
lit. If the control unit does
to the table in Figure 5.
malfunctioning and shoul
factory for repairs.

CONTROL CENTER TESTS			
SENSOR INPUT JUMPER LOCATION	L.E.D. STATUS INDICATOR		
	RED (Hydro-carbon)	YELLOW (Water)	
None	OFF	OFF	
Red to Green	OFF	OFF	
Red to Black	OFF	ON	
Red to Brown	ON	OFF	

Figure 5.5

5.9 FD401 FIELD TEST SET

A versatile instrument for use in the field when installing Pollulert Fluid Detection systems is the model FD401 Field Test Set. This instrument is completely self-contained, operating off its own internal battery power supply (Figure 5.6). It can be used to emulate the CD101N control center to isolate field problems.

The standard probes can be attached to the first five terminals of the test set, following the designated color code.

When powered up, the FD401 PROBE STATUS indicators will give the proper signalling as to the probe sensor environment.

For further information on system testing, refer to the Instruction Booklet supplied with the FD401 Field Test Set.

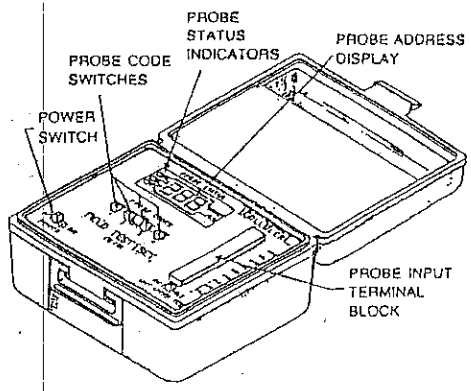


Figure 5.6

SECTION 6

ORDERING INFORMATION

6.1 SPECIFY

1. Model Numbers
2. Quantity
3. Cable Required

SYSTEM GROUP	PART NO.	DESCRIPTION
CONTROL UNIT	CD101N	Electronic Fluid/Vapor Leak System.
PROBES	FD221G	Underground Probe for 2" Well
	FD241G	Underground Probe for 4" Well
	FD241S	Surface Probe for 4" Pipe
	FD221T	Tank Probe for 2" Opening
	FD210	Dry Annulus Space Probe
	FD241P	Piping Trench Probe
	FD210V	Vapor Probe for Dual-Wall Tank
	FD221V	Vapor Probe for 2" Well
	FD241R	DW Piping Probe & Manway Sump Probe
	FD221TJ	Tank Probe for 1-½" Opening (Joor)
	FD241SH	Surface Probe for 4" Pipe (with heater)
	FD200HLM	High Level Probe (Master)
	FD200HLS	High Level Probe (Slave)
	FD221SP2/4/6/8/10	Special Application Probe
	FD221SPV2/4/6/8/10	Special Application Vapor Probe

NOTE: Later model probes will have a "MD" prefix, rather than "FD".

Additional splice kits can be ordered
butt splices, ask for part number 282
splice kit (potting cylinder) can be or
number 511-40073-01:

CABLE	POL304	4-Condu duit Ca
	POL314	4-Condu Burial
ACCESS-ORIES	FD401	Field T
ADAP-TORS	ADP6	6" NPT F to 4" NP
	ADP2	2" NPT F to 4" NP

6.2 ORDER FORM

1. Local Pollulert Distributor

2. Pollulert Systems
P.O. Box 706
Indianapolis, IN 46206
(317) 261-1442
Phone 1-800-343-2126

SECTION 7

SYSTEMS REPAIR

7.1 REPAIRS

For devices in need of repair, contact your local Pollulert® distributor or return to:

Pollulert Systems
Mallory Timers Co.
101 S. Parker Ave.
Indianapolis, IN 46201
(317) 261-1442
300) 343-2126

NOTE: NO GOODS TO BE RETURNED WITHOUT PRIOR POLLULERT SYSTEMS APPROVAL AND RMA NUMBER.

SECTION 8

WARRANTY

Pollulert Systems (SELLER) warrants to BUYER that POLLULERT Fluid Detection Equipment will conform to its pertinent specifications, and that such Equipment will be of good workmanship and material and free of defects if properly installed and used as sold by SELLER. If within 24 months from the date of manufacture as affixed to the Equipment, such Equipment, not having been subject to misuse, alteration, modification, neglect, improper installation or unauthorized repairs nor exposed to an abnormal environment, is shown not to be in conformity or is shown to have failed through faulty workmanship or materials, SELLER's sole and exclusive obligation under this warranty is to repair or replace such Equipment, provided return is made prepaid to SELLER or its designated representative with the following tagged information: (i) the date such Equipment is determined to be nonconforming or defective; and (ii) specifying the apparent nonconformity or defect. No claim will be allowed under this warranty unless BUYER notifies SELLER of such claim within 30 days after BUYER learns of any events giving rise to such claim. BUYER's failure to test, inspect and make a claim within said warranty period shall be conclusive evidence that the Equipment shipped was satisfactory in all respects. The liability of SELLER under the foregoing warranty shall not exceed the price paid by BUYER for the Equipment which gives rise to BUYER's claim. All ced Equipment will become the property of SELLER. The anty provided herein does not cover repair for damages, malfunctions or failures caused by (1) actions of non-SELLER personnel or its unauthorized agents; (2) failure to follow SELLER's installation, operation or maintenance instructions and warnings; or (3) attachment to the Equipment of non-SELLER products or parts. The AFORESAID WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE). EXCEPT OF TITLE. SELLER ASSUMES NO LIABILITY FOR ANY SPECIAL, INDIRECT, CONSEQUENTIAL, INCIDENTAL OR OTHER DAMAGES OF ANY TYPE (INCLUDING, WITHOUT LIMITATION, DAMAGES RELATED TO LOST SALES AND PROFITS, EXCESSIVE OR INCREASED COSTS AND EXPENSES, FIELD RECALL AND RETROFITS COSTS AND EXPENSES, DOWNTIME COSTS AND CLAIMS OF CUSTOMERS OF BUYER FOR SUCH DAMAGES WHETHER OR NOT SELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES) RESULTING FROM THE NONCONFORMING OR DEFECTIVE CONDITION OF ANY EQUIPMENT SOLD BY SELLER TO BUYER HEREUNDER, AND BUYER ASSUMES ALL LIABILITY FOR ALL CONSEQUENCES ARISING OUT OF ITS USE OR SALE OF SUCH EQUIPMENT. THE AFORESAID REMEDY OF BUYER IS EXCLUSIVE AND THIS LIMITATION OF LIABILITY PROVISION SHALL APPLY TO ANY AND ALL CLAIMS OR SUITS BROUGHT AGAINST SELLER BY BUYER, INCLUDING WITHOUT LIMITATION, CLAIMS OR SUITS BASED UPON TORT INCLUDING NEGLIGENCE, BREACH OF CONTRACT, BREACH OF WARRANTY, STRICT LIABILITY, OR ANY OTHER LEGAL THEORY UPON WHICH LIABILITY MAY BE ASSERTED AGAINST SELLER BY BUYER OR OTHERS. FOR CLAIMS OTHER THAN SET FORTH ABOVE, SELLER'S LIABILITY SHALL BE LIMITED TO DIRECT DAMAGES WHICH ARE PROVEN, IN AN AMOUNT NOT TO EXCEED THE PRICE PAID BY BUYER FOR THE EQUIPMENT WHICH GIVES RISE TO BUYER'S OR ITS CUSTOMERS' CLAIM.

BUYER shall not make to its customers any representation or warranty as to the Equipment except as stated above. BUYER shall not alter the Equipment and shall not recommend or knowingly sell the Equipment for any uses except as described herein and in accordance with the written instructions and warnings furnished by SELLER. BUYER shall deliver to its customers at or before the sale all specifications, instructions and warnings furnished by SELLER. BUYER will notify SELLER of any events involving bodily injury or property damage resulting from the use of the EQUIPMENT promptly after BUYER receives notice thereof.

SECTION 9

APPENDIX

NOTICE TO INSTALLERS

PLEASE DRAW A DIAGRAM OF PROBE PLACEMENT IN AREA BELOW:

SECTION A: WIRE SPLICE INSTRUCTIONS

NOTE : FOLLOW THESE INSTRUCTIONS TO SPLICE CABLES . DISCARD INSTRUCTIONS IN SPLICE PACKET AND DO NOT USE CRIMP BOLT AND NUT INCLUDED IN PACKET . READ ALL STEPS BEFORE STARTING .

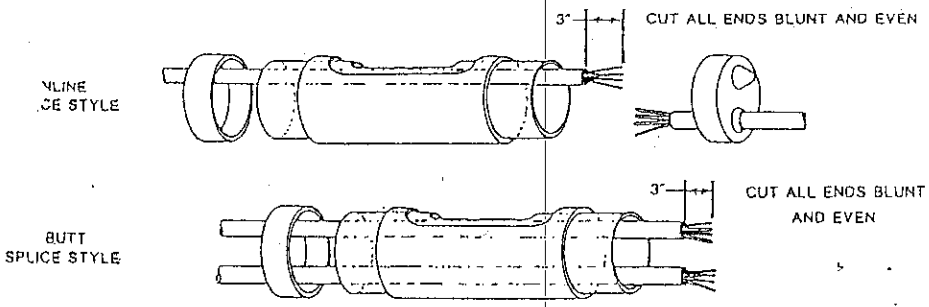
-WARNING-

U.L. REQUIREMENTS AND WARRANTY REQUIREMENTS DICTATE THE USE OF POLLULERT INSTRUMENTATION CABLE AND SPLICING PRACTICES . NON APPROVED INSTRUMENTATION WIRING MATERIAL AND PRACTICES WILL CONSTITUTE A VIOLATION OF ESTABLISHED WARRANTY POLICIES.

STEP 1 : CUT A TIP OFF AN END CAP FOR EACH CABLE TO BE SPLICED . NOTE : DO NOT CUT HOLE LARGER THAN CABLE TO BE SPLICED . WHEN END CAP IS PUSHED ON CABLE IT SHOULD BE TIGHT AROUND CABLE . 2-4 CABLES MAY BE SPLICED IN THIS HOUSING USING APPROPRIATE METHODS ILLUSTRATED BELOW.

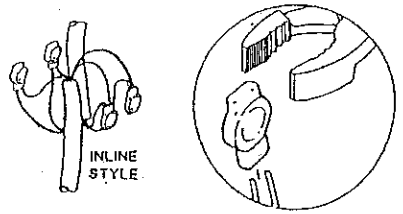
USE SCISSORS OR SHARP KNIFE

STEP 2: SLIDE END CAPS ONTO CABLES AS SHOWN AND PUSH BACK OUT OF THE WAY. REMOVE CABLE JACKET TO EXPOSE 3" OF WIRES. DO NOT STRIP INSULATION FROM WIRE ENDS. SCUFF AND CLEAN CABLE JACKET THAT WILL BE INSIDE THE BARREL.

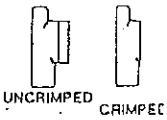


STEP 3 : SLIDE BARREL AND SLEEVE OVER CABLES AND PUSH BACK OUT OF THE WAY .

STEP 4: INSERT WIRES OF THE SAME COLOR INTO BUTT CONNECTOR AND CRIMP WITH PLIERS.



NOTE : TWIST SHIELD WI
SOLID WIRE AND TRIM
INSERTING INTO THE C
BUTT CONNECTOR. MA
WIRES ARE EVEN AND
INSERTED IN BUTT CON



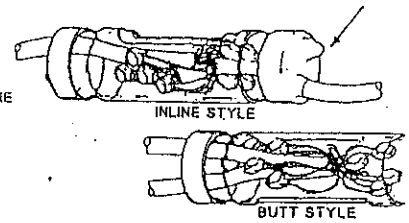
NOTE: MAKE SURE WIRES ARE FULLY INSERTED BEFORE CRIMPING (ADDITIONAL SCOTCHLOK™ CONNECTORS ARE P/N 282-40120-01

NOTE : BOOT MUS
WARD TO B
SEATED O

STEP 5: PLACE BUTT SPLICES IN BARREL SLIDE END CAPS INTO PLACE .

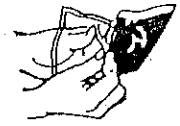
NOTE : PUSH AS MUCH CABLE INTO THE BARREL AS POSSIBLE .

NOTE : FOR THE BUTT STYLE SPLICE LEAVE ONE END CAP OFF AND TWIST SLEEVE AROUND BARREL TO CLOSE SIDE OPENING .



STOP !!! BEFORE CONTINUING , CHECK FUNCTION OF SYSTEM WITH PROBES UNDER

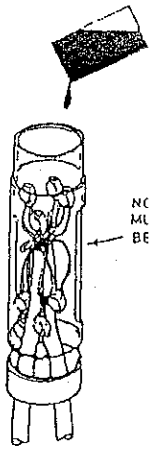
STEP 6:



MIX COMPOUND : WARM "UNIPAK" BRAND CONTAINER TO 16 C (60 F) OR MORE BEFORE MIXING . BREAK CENTER BARRIER BY GRASPING SIDES OF BAGS AND ROLLING THUMBS THROUGH BARRIER .

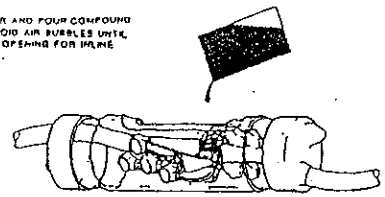
THOROUGHLY MIX BY SQUEEZING COMPOUND BACK AND FORTH 30 TO 40 TIMES . STRIP COMPOUND FROM CORNERS WHILE MIXING .

NOTE : OPTIONAL MIXING , COMPOUND BAG MAY
CUT AND POURED INTO A PAPER CUP
AND MIXED BY STIRRING .



STEP 7 :

SNIP OFF CORNER OF "UNIPAK" CONTAINER AND POUR COMPOUND INTO BARREL , POUR VERY SLOWLY TO AVOID AIR BUBBLES UNTIL BARREL IS COMPLETELY FILLED(THROUGH OPENING FOR INLINE SPLICE , THROUGH END FOR BUTT SPLICE) .

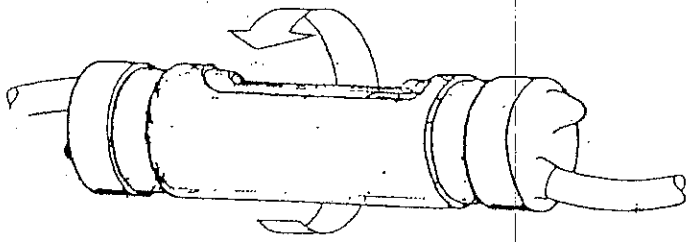


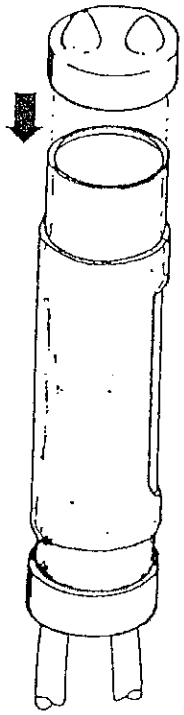
NOTE : MAKE SURE CONTAINER IS LEVEL DURING POURING TO ASSURE CONTAINER IS FILLED .

NOTE : ROCK END TO END AND ROLL SLI
BRING BUBBLES TO THE TOP . TO
NECESSARY

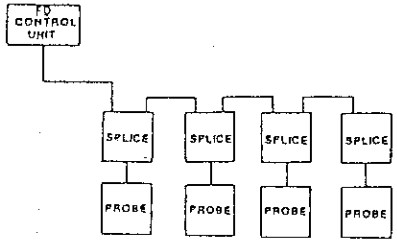
SCOTCHLOK is a trademark of 3M Company

STEP 8: CLOSE BARREL : BY ROTATING SLEEVE FOR INLINE SPLICE, WITH UPPER END CAP FOR BUTT SPLICE. COMPLETED SPLICE MAY BE PLACED IN ITS FINAL LOCATION IMMEDIATELY AFTER COMPLETION OF FILLING OPERATION.





Additional splice kits can be ordered, if required. For butt splices, ask for part number 282-40120-01. The splice kit (potting cylinder) can be ordered under part number 511-40073-01.



SPLICE DIAGRAM

CAUTION VAPOR AND LIQUID MAY CAUSE SENSITIZATION. CONTAINS ISOCYANATE. MAY BE IRRITATING TO THE EYES. AVOID SKIN AND EYE CONTACT. AVOID REPEATED AND PROLONGED BREATHING OF VAPOR. USE ONLY IN WELL VENTILATED AREAS.

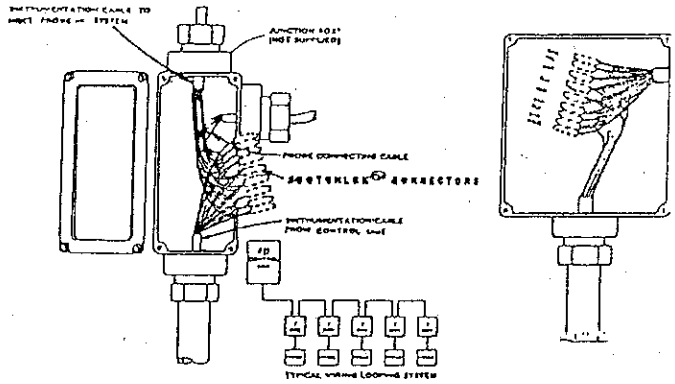
FIRST AID INHALATION-PROVIDE FRESH AIR. IN CASE OF EYE CONTACT - FLUSH EYES WITH PLENTY OF WATER FOR 10 MINUTES AND GET MEDICAL ATTENTION. IF INGESTED - DO NOT INDUCE VOMITING. GET MEDICAL ATTENTION. WASH WITH SOAP AND WATER IN CASE OF SKIN CONTACT.

SECTION B: WIRING INSTRUCTIONS

Splice color to color, using butt connectors supplied with probe. See cl

PROBE CABLE	INSTR. CABLE
Orange	Orange
Yellow	Yellow
White	White
Blue	Blue
Red	Red
Green	Green
Black	Black
Brown	Brown
Shield	Shield

For above grade splices, NEMA 4 Rainproof (or better) junction boxes m



For below grade splices, refer to Appendix, Section A, Wire Splice Instruct

SCOTCHLOK is a traden

SECTION C

POLLULERT SYSTEM INSPECTION LOG

MAKE COPIES OF THIS LOG TO RECORD EQUIPMENT INSPECTIONS.		
DATE INSPECTED	INSPECTORS INITIALS	RESULTS AND NOTES

ATTACHMENT 6

TRAINING PLAN

Ramos Environmental Services, Inc.
HEALTH AND SAFETY PLAN

PREPARED BY
JOHN VILLANUEVA
Ramos Environmental Services, Inc.
2008

SECTION I
TABLE OF CONTENTS

I	**TABLE OF CONTENTS**		
II	**INTRODUCTION**		2
III	**PERSONNEL**		3
	A	FACILITY MANAGER	4
	B	OPERATIONS MANAGER	4
	C	OPERATIONS PERSONNEL	4
	D	OFFICE STAFF	4
IV	**TRAINING**		4
	A	INTRODUCTORY TRAINING	5
	B	ANNUAL TRAINING	5
	C	JOB SPECIFIC TRAINING	5
	D	PROJECT SPECIFIC TRAINING	5
	E	CONFINED SPACE ENTRY	6
V	**HAZARD ASSESSMENT**		6
	A	CHEMICAL HAZARDS	7
	B	PHYSICAL HAZARDS	7
	C	HEAT STRESS AND MONITORING	7
	D	SPECIAL HAZARDS	8
VI	**PERSONAL PROTECTION EQUIPMENT (PPE)**		9
	A	OBJECTIVES	10
	B	LEVELS OF PROTECTION	10
		1) LEVEL A	10
		2) LEVEL B	10
		3) LEVEL C	10
		4) LEVEL D	10
	C	MINIMUM STANDARDS	10
VII	**RESPIRATORY PROTECTION**		11
	A	PURPOSE	12
	B	MEDICAL EVALUATION	12
	C	FIT TESTING	12
	D	SELECTION OF RESPIRATORS	12
	E	MAINTENANCE AND CARE OF RESPIRATORS	12
	F	USE OF RESPIRATORS	12
VII	**MEDICAL SERVEILLANCE PROGRAM**		12
	A	MEDICAL HISTORY QUESTIONNAIRE	13
	B	PHYSICAL EXAMINATIONS	13
	C	MEDICAL RECORDS	13
			13

SECTION II
INTRODUCTION

This health and safety plan encompasses all Ramos Environmental Services, Inc. operations and activities. All Ramos Environmental Services, Inc. employees will be made aware of this plan and given access to it at all times. Failure to comply with the requirements of this plan will result in disciplinary action up to and including termination.

It is the policy of Ramos Environmental Services, Inc. to operate in such a manner as to protect the health and safety of people and the environment which is effected by any and all Ramos Environmental Services, Inc. operations; this includes but is not limited to all Ramos Environmental Services, Inc. employees, subcontractors, customers and the general public.

Employees are required to act in a safe, professional, and responsible manner at all times. Employees are encouraged to review existing health and safety policies and provide input so as to continually improve the work environment.

This health and safety plan describes basic policy and procedures for worker safety. Each project will have its own safety issues and conditions, therefore a site specific plan should be written prior to starting.

This plan is designed to comply with applicable California and Federal OSHA regulations, Ramos Environmental Services, Inc. Health and Safety procedures, EPA and DTSC requirements and NIOSH recommendations. All Ramos Environmental Services, Inc. personnel, authorized visitors, and subcontractor personnel are subject to the requirements and procedures described herein.

SECTION III
PERSONNEL

A. FACILITY MANAGER:

The Ramos Environmental Services, Inc. facility manager is appointed by the company owners. The facility manager is responsible for all Ramos Environmental Services, Inc. operations and personnel. The facility manager is responsible to make sure that all Ramos Environmental Services, Inc. policies and procedures are being followed, and that Ramos Environmental Services, Inc. is operating in accordance with all regulations. The facility manager may accomplish this task by delegating to other competent employees. The facility manager will have a strong working knowledge of applicable regulations, as well as supervisory experience.

B. OPERATIONS MANAGER:

The operations manager works under the direction of the facility manager. The operations manager is responsible for overseeing all Ramos Environmental Services, Inc. daily operations. The operations manager will directly supervise operations employees and ensure all work is done in a safe and professional manner. The operations manager will have previous industry experience either with Ramos Environmental Services, Inc. or similar companies, and good supervisory skills. The operations manager should have a good working knowledge of applicable regulations.

C) OPERATIONS STAFF:

The operations staff includes all Ramos Environmental Services, Inc. technicians, dispatchers, drivers, sales staff, facility operators and other staff that may perform field operations. All operations staff are responsible for knowing and understanding all Ramos Environmental Services, Inc. policies and procedures. Operations staff will report directly to the operations manager. Operations staff will be trained for their specific job duties.

D. OFFICE STAFF:

The office staff will consist of all employees whose jobs do not require field work. The office staff will perform normal office duties and will be required to know and understand all Ramos Environmental Services, Inc. policies and procedures. The office staff will work directly under the facility manager. Office staff will be trained in their specific job duties.

SECTION IV
TRAINING

A. INTRODUCTORY TRAINING:

All new employees for Ramos Environmental Services, Inc. will undergo introductory training, which will include an overview of the health and safety plan, Ramos Environmental Services, Inc. policies, job specific duties and any job specific required training.

Operations staff will be required to undergo 40 hour HAZWOP training (29 CFR 1910.120) within thirty (30) days of their date of hire, if they haven't previously. The HAZWOP training will include regulation, PPE, chemical hazardous, physical hazards, emergency response, and confined space entry. Additional training will be provided as needed for emergency response, confined space entry and other duties or tasks an employee may be asked to perform.

Any Ramos Environmental Services, Inc. employee whose job requires them to operate a forklift will attend a training session in safe forklift operations and material handling, prior to using any forklift.

B. ANNUNAL TRAINING

In accordance with 29 CFR 1910.120, all operations staff will attend an annual eight (8) hour Hazardous Waste Operations (HAZWOP) course within thirty (30) days of the anniversary of there initial HAZWOP training or last update.

C. JOB SPECIFIC TRAINING

1) DRIVER-TECHNICIANS: In addition to the forty (40) hour HAZWOP training, All Ramos Environmental Services, Inc. Driver-Technicians will be required to have a California Commercial Drivers license with hazmat and tanker endorsements. Driver-Technicians will be trained in the safe handling of drums and proper use of drum dollies. Any Driver-Technician that operates a special truck (vacuum truck, pump truck, and roll-off truck) will be trained on that equipment prior to operation. Additional training may be required from time to time for project specific tasks. Driver-Technicians will be given ongoing training during safety meetings.

2) FACILITY OPERATORS: In additions to the forty (40) hour HAZWOP training, facility operators will be trained in the safe operations of the Ramos Environmental Services, Inc. transfer facility. The training will consist of the safe handling of transfer hoses and connections, use of the facility pumps and piping, inspecting the facility for leaks and cracks, pulling samples, and

emergency and spill prevention and remediation procedures. Facility operators will be given ongoing training during safety meetings.

3) OFFICE STAFF: The office staff is not required to have the forty (40) hour HAZWOP training. However, some staff may be given this training as deemed necessary. All office staff will be trained in office safety, including but not limited to fire safety, lifting, and ergonomics. Some office staff members will be trained in proper manifest procedures.

D. PROJECT SPECIFIC TRAINING:

From time to time Ramos Environmental Services, Inc. will engage in specific projects that may require special training. Employees will be given training as required by these projects prior to starting.

E. CONFINED SPACE ENTRY:

All Ramos Environmental Services, Inc. operations staff will be trained in confined space entry, including identifying what is a confined space. If required, employees will be trained on permit required confined space (29 CFR 1910.146) at the level they will be involved.

Entry Supervisor: Responsible for completing the permit, performing the required air monitoring, selecting PPE, and ensuring the overall safe operation of the project.

Entrants: Employees that will enter the confined space. Entrants are required to understand all procedures for safely entering the space, and must be trained in the proper use of all required PPE, and equipment used during the project.

Attendants: Employees who remain outside of the confined space to assist and help monitor the activities of the entrants. The attendants may also act as rescuers in the event of an emergency; therefore they must have training with the appropriate PPE.

ADD SECTION FOR CONTINGENCY PLAN IMPLEMENTATION

SECTION V
HAZARD ASSESSMENT

A. CHEMICAL HAZARDS

Ramos Environmental Services, Inc. employees may come into contact with a number of different chemicals during their normal work day. Employees are trained in the safe handling and management of these chemicals. Ramos Environmental Services, Inc. employees are required to familiarize themselves with any chemical they may be asked to handle. The employees may use any and all references to ensure the safe handling of chemicals. These may include MSD sheets, Hazardous Waste Profile Sheets, Generator Knowledge, or their immediate supervisor.

B. PHYSICAL HAZARDS

Ramos Environmental Services, Inc. employees are required to always be aware of any physical hazards in there work area. Physical hazards may include but are not limited to:

Slip and Trip hazards;
Overhead Objects;
Electrical Devises;
Moving parts or machinery;
Extreme heat or cold (see heat stress);
Biological hazards (insects, animal and plant toxins).

It is the responsibility of each Ramos Environmental Services, Inc. employee to identify, and remove if possible, any physical hazard encountered in the work place. If an employee cannot remove the hazard, then he or she must take appropriate action to protect against the hazard such as using proper PPE.

C. HEAT STRESS AND MONITORING

The Occupational Safety and Health Administration (OSHA) has determined heat stress to be a major safety concern to employees, therefore all Ramos Environmental Services, Inc. employees are required to be trained and understand the causes, signs and symptoms of heat related illnesses. Employees should continually monitor themselves and there coworkers for signs of heat stress, and take precautions to protect themselves from heat related problems.

SIGNS AND SYMPTOMS OF HEAT RELATED PROBLEMS

HEAT EXHAUSTION:

1) Sweating
2) Moist, clammy skin
3) Weakness and fatigue
4) Nausea and vomiting
5) Slightly elevated temperature
6) Disorientation

TREATMENT FOR HEAT EXHAUSTION:

1) Remove the victim from the heat.
2) Apply cool, wet clothes and fan the victim
3) Give fluids if the victim is conscious
4) Seek medical attention if there is no improvement

HEAT STROKE:

1) Hot, dry skin
2) Red or spotted skin
3) Extremely high body temperature
4) Mental confusion
5) Convulsions
6) Loss of consciousness

TREATMENT FOR HEAT STROKE:

1) Remove the victim from the heat.
2) Remove the victim's clothes and apply cool compresses.
3) Seek immediate medical attention as this is a life threatening condition.

Precautions to avoid heat related problems include staying hydrated with plenty of water (caffeinated drinks and alcohol should be avoided), taking breaks when needed, seeking a place to cool down (shade, air conditioned truck or building).

D. SPECIAL HAZARDS:

Special hazards may include things like radiation, trenching and excavating (29 CFR 1926.256), work on water.

Prior to any project inception all special hazards must be identified, and all personnel must be trained and made aware of these hazards.

SECTION VI
PERSONAL PROTECTION EQUIPMENT (PPE)

A. OBJECTIVES

As with all safety measures the use of PPE is to protect an employee from work place hazards.

Prior to the use of personal protective equipment (PPE) all process engineering and safety controls should be implemented. Personal protective equipment (PPE) should be used as a last measure; however there are times that an employee must wear PPE. All Ramos Environmental Services, Inc. operations staff will be trained in the proper use and selection of PPE, and will be required to utilize the correct level of protection for the task they are performing.

B. LEVELS OF PROTECTION

There are four levels of PPE, each having a separate letter designation. Level A is the most protective and level D is the least. It is important to select the appropriate level of protection for the hazards of the work environment.

Factors used to determine proper PPE levels should include:

1) The type and concentration of chemicals encountered
2) Air monitoring levels (oxygen level, LEL)
3) Ambient temperature

1) Level A - protection is a fully encapsulating chemical resistant suite, SCBA (self contained breathing apparatus) or supplied air respirator, steel toed boots.
2) Level B - Chemical protective suite, SCBA or supplied air respirator, steel toed boots
3) Level C - Chemical protective suite and air purifying respirator.
4) Level D - Work uniform, eye protection and steel toed boots

C. MINIMUM STANDARDS

The minimum standard PPE for daily work activities and for working on the Ramos Environmental Services, Inc. facility is level D, however conditions must always be monitored and hazards identified to ensure the correct level of protection is being used.

The applicable standards for protective clothing are as fallows:

Eyewear - ANSI Z87
Footwear - ANSI Z4101
Head protection - ANSI Z89.1

Personal protective clothing will be issued by Ramos Environmental Services, Inc. with the exception of work boots. Ramos Environmental Services, Inc. operations staff are required to purchase and wear ANSI approved work boots when on the job.

VII
RESPIRATORY PROTECTION

A PURPOSE

When engineering controls are not adequate or feasible to reduce potential exposure to toxic gases, vapors and particulates, then it is necessary to use some type of respirator. When used correctly, respirators can either filter out contaminants, preventing them from entering the respiratory system, or supply the user with clean air.

B MEDICAL EVALUATION

In accordance with 29 CFR 1910.134, all employees whose job requires them to wear a respirator, or may require them to wear a respirator, will undergo a physical prior to use. The physical will be administered by a physician or other licensed health care professional of Ramos Environmental Services, Inc.'s choosing. All records will be kept confidential. The medical evaluation will meet all requirements under 29 CFR 1910.134.

C FIT TESTING

Once an employee has been determined to be physically fit for respirator use they will be fit tested with a respirator using OSHA accepted protocol. The employee will be issued a properly fitting APR (air purifying respirator). Employees will be re-fit tested once per year or if conditions change such as facial changes, significant weight loss or gain.

D SELECTION OF RESPIRATORS

Respirators will be selected according to the atmosphere where the employee will be working. Some of the criteria used to select the proper respirator are type and concentration of contaminate, oxygen concentration, and type of work to be performed. Information for selecting proper respirators will be acquired from sources such as air monitoring, MSD sheets, and/or product knowledge by the customer.

E MAINTENANCE AND CARE OF RESPIRATORS

It is the responsibility of each employee to inspect and maintain the respirator that is assigned to them. Respirators should be inspected prior to each use and at a minimum once per month. Respirators should be cleaned after each use, using approved cleaning agents, and put into a protective bag. If a respirator has been damaged or is not working properly it will immediately be taken out of service and sent to a manufacturer authorized repair facility.

F USE OF RESPIRATORS:

Employees who are required to wear a respirator will be trained in their proper use. It will be violation of company policy to use a respirator improperly or to use the inappropriate respirator for the conditions.

VII
MEDICAL SURVEILLANCE

All Ramos Environmental Services, Inc. personnel assigned to handling hazardous waste will be required to undergo a pre-employment and annual medical evaluation. These evaluations will be performed by a licensed physician.

A MEDICAL HISTORY QUESTIONNAIRE

The questionnaire asks specific questions regarding the employee's personal, medical, family, and occupational histories. The questionnaire is designed to provide information and assist the physician in determining the employee's work capabilities.

B PHYSICAL EXAMINATION

The examinations will include recording of the vital signs, vision screening, urinalysis, complete blood count, chemistry panel, pulmonary function testing, audiometric testing, and a baseline PA chest x-ray. The examination will also include EKG and stool specimen samples for employees over the age of 35.

The physician will be advised of any unusual employee exposures to chemical or physical agent to determine if any further testing is necessary.

C MEDICAL RECORDS

Medical records are maintained in confidential files at Ramos Environmental Services, Inc. Employee medical and exposure records are made available to each employee in accordance with Title 8, California Administrative Code, and Section 3204.

The examining physician's statement for employee work clearance is available upon request.

ATTACHMENT 7

INSPECTION PLAN

1. Daily Inspection Log
2. Facility Work Order Form

Daily Inspection Log

Date:			Name:	
Time:				
	PASS	FAIL	Explain any failing marks. What is needed to correct the problem	Date Fixed
Tank # 1				
Leaks				
Streaks				
Cracks in welds				
Tank # 2				
Leaks				
Streaks				
Cracks in welds				
Tank # 3				
Leaks				
Streaks				
Cracks in welds				
Tank # 4				
Leaks				
Streaks				
Cracks in welds				
Pipes & Valves				
Leaks				
Cracks in welds				
Pumps				
Packing tight				
Leaks				
Flanges tight				
pumps running smooth				
Tank Secondary Containment				
Cracks in wall				
Sealant cracked				
Standing oil, water				
Drum Secondary Containment				
Cracks in berm				
Standing oil, water				
Sump Tank				
Cracks in wall				
Material in sump				
Loading / Unloading Pad				
Standing oil, water				
Cracks in pad				
Safety Systems				
Eye Wash				
Safety Shower				
Fire Extinguisher				
Haz Waste Signs				
Gates & Fence				
Overflow Alarm System				
System Working				

DATE: R. E. S. Bulk Receiving & Distributing Log Name:

Time in	Time out	Company	Trk #	ppm	product	in/out	Gallons	Tank #	Manifest #

Ramos Environmental Services Tejuelo Bulk Receiving

Time in	Time out	Company	Trk #	ppm	product	in/out	Gallons	Tank #	Manifest #

Log

Ramos Environmental Services Tank Gage Levels

DATE______________ Name______________

	Tank # 1			*Tank # 2*			*Tank # 3*			*Tank # 4*		
	Feet	Gallons	Trk #	Feet	Gallons	Trk #	Feet	Gallons	Trk #	Feet	Gallons	Trk #
start												
END												
Diff.												
start												
END												
Total												
start												
END												
Total												
start												
END												
Total												
start												
END												
Total												
start												
END												
Total												
start												
END												
Total												
start												
END												
Total												
start												
END												
Total												
start												
END												
Total												
start												
END												
Total												
start												
END												
Total												
start												
END												
Total												

ATTACHMENT 8

CONTINGENCY PLAN

Ramos Environmental Services, Inc.
CONTINGENCY PLAN

PREPARED BY
JOHN VILLANUEVA
Ramos Environmental Services, Inc.
2008

SECTION I
TABLE OF CONTENTS

I	TABLE OF CONTENTS	2
II	REVISION LOG	3
III	SCOPE	4
IV	PURPOSE	4
V	DISTRIBUTION	4
VI	AMENDMENTS OF THE PLAN	5
VII	EMERGECNY COORDINATORS	5
VII	EMERGENCY PHONE NUMBERS	6
VIII	REPONSIBILITIES OF EMERGENCY COORDINATORS	7
IX	EMERGENCY PROCEDURES	7
	a) Illness or Injury	7
	b) Fire	8
	c) Explosion	8
	d) Chemical Spills	8
	e) Natural Disasters	9
	f) Civil Disturbances	9
	g) Bomb Threat	9
X	EVACUATION	9
XI	COMMUNICATION	10
XII	SPILL RESPONSE EQUIPMENT	10
XIII	SPILL REPORTING	10

SECTION II
REVISION LOG

Date:	Revision:	Section:	Initials:

SECTION III
SCOPE

This contingency plan has been prepared for emergency situations arising from the operation of the Ramos Environmental Services, Inc. hazardous waste facility, located at 1515 S. River Rd. West Sacramento CA 95691.

Whenever Ramos Environmental Services, Inc. employees are operating at an off site facility, they will be under contract to the operator of that facility and therefore will be under the control of the Contingency Plan in effect for that facility.

SECTION IV
PURPOSE

The purpose of this contingency plan is to address specific actions to be taken by Ramos Environmental Services, Inc. personnel in the event of an emergency and to address implementation of this contingency plan in cooperation with local and state public safety and environmental agencies. This plan has been prepared to conform to Article 3 of Chapter 14, Title 22 CCR (sections 66264.30 et seq). This plan is a stand alone document for distribution to appropriate agencies and persons who shall be notified as a result of an emergency arising at the Ramos Environmental Services, Inc. facility.

SECTION V
DISTRIBUTION OF THE PLAN

Copies of this plan and any revisions to it will be maintained at Ramos Environmental Services, Inc. facility at all times. This plan will be submitted to each person or organization that may be called upon to provide emergency services at the facility.

SECTION VI
AMENDMENTS OF THE PLAN

The contingency plan shall be reviewed at least once per year, and updated as necessary. The plan shall be immediately amended if necessary whenever:

1) The list of emergency coordinators changes
2) A change in design to the facility
3) A change in the permit or operations plan
4) The plan fails in an emergency or drill
5) Applicable regulations are revised
6) Emergency equipment changes

The revision date of the current plan is typed on the first page of this plan. Every time the plan is updated the date and nature of the revision will be noted in the revision log at the front of this plan. Each time the plan is implemented it will be reviewed to determine its effectiveness and revised if nessisary.

SECTION VII
EMERGENCY COORDINATORS

The emergency coordinators shall be thoroughly familiar with the contingency plan and its implementation. All emergency coordinators will have the authority to implement all aspects of the plan, including calling off site emergency personnel if required. In the event of an emergency at the Ramos Environmental Services, Inc. facility, the emergency coordinator(s) should be contacted immediately. The emergency coordinator(s) should implement the plan immediately upon being notified of an emergency at the facility.

SECTION VIII
EMERGENCY PHONE NUMBERS

Fire Department	911
Police Department	911
Medical Services	911

Emergency Coordinators phone list

John Villanueva:	
Home	(916) 726-8344
Cell	(916) 825-9270
Pager	(916) 855-2604
Joe Ormonde:	
Home	
Cell	(916) 825-5219
Pager	(916) 360-0010
Roger Sifford:	
Home	
Cell	(916) 825-9273
Pager	(916) 855-9802
Kyle Ramos:	
Home	
Cell	(916) 825-9268

SECTION VIII
RESPONSIBILITIES OF EMERGECNY COORDINATORS

The emergency coordinator is responsible for notifying Ramos Environmental Services, Inc. emergency response personnel and external agencies. The coordinator shall include the following information when notifying emergency personnel.

a) Character

The type and concentration of spilled or leaking material. If unknown then the coordinator will state it is an unknown material.

b) Amount

The total volume of materials released and the areas where the material was released (ie: soil, secondary containment).

c) Source

The tank or container that the material spilled from, include the volume left in the tank or container and whether or not the leak has been stopped.

SECTION IX
EMERGENCY PROCEDURES

In the event of an emergency at the Ramos Environmental Services, Inc. facility, the following procedures are to be followed.

a) Illness or Injury

All injuries shall be reported to the employee's immediate supervisor. If an injury is not serious, then first aid may be used and the employee can return to work. If there is any potential of exposure to hazardous or toxic materials or if the extent of the injury of illness cannot be readily and easily determined, the supervisor will contact the emergency coordinator. The emergency coordinator will assess the situation and if required, arrange for medical assistance. If the injury is serious or life threatening, the supervisor or emergency coordinator will call for a paramedic by dialing 911. The emergency coordinator shall accompany the employee to the medical facility.

In event of a chemical exposure the emergency coordinator will identify the chemical and compile the pertinent information from MSD sheets, Waste Profiles forms, and any other source. Decontamination procedures should be implemented

immediately, and all decontamination solutions captured for later disposal as a hazardous waste.

b) Fire

If a fire is discovered by a Ramos Environmental Services, Inc. employee on Ramos Environmental Services, Inc. property or in the immediate vicinity, the emergency coordinator shall be notified immediately. Once notifications have been made, the employee and/or the emergency coordinator shall use the fire fighting equipment on site (ie: fire extinguishers, fire hose) to fight the fire if they can safely do so and have been properly trained.

If a fire is too large or out of control to extinguish the local fire department should be called.

If it is safe to do so all valves should be closed and all pumping operations should stop.

c) Explosion

The first obligation after an explosion is to evaluate injury to yourself and other personnel around the facility. Assist injured personnel with first aid or call for medical assistance if necessary. The emergency coordinator shall be contacted immediately in the event of an explosion at the facility. The emergency coordinator will assess the situation and implement any or all parts of the contingency plan including fire fighting, spill response and control, or if the situation is to large and out of control, the coordinator will call for immediate evacuation of the facility and contact local emergency responders such as fire and police.

d) Chemical Spills

In the event of a chemical spill the first priority is to stop and control the spread of the contamination. The emergency coordinator shall be contacted immediately upon discovery of a spill. All valves and pumps should be turned off immediately and the spill area should be diked using booms which are stored in the supply trailers east of the loading/unloading pad. Every effort must be made to ensure that no materials enter the storm drain or any water way. This should be accomplished by constructing dikes around all inlets to these areas. Once contained the spill should be cleaned using the best management practice available (ie: vacuum truck, absorbent materials), and all spilled materials should be managed as a hazardous waste. If the spilled materials exceed the reportable quantities then the coordinator shall make the proper notifications to the following agencies.

e) Natural Disasters

After any natural disaster, the facility operator shall shut down the facility by closing all valves and shutting down all pumps. The facility should be thoroughly inspected before restarting any operations.

f) Civil Disturbances

In the event of any civil disturbance within or adjacent to the facility, the facility operator must notify the emergency coordinator and start immediate shut down procedures. The emergency coordinator will contact security and the West Sacramento Police Department. The facility should be thoroughly inspected before restarting any operations.

g) Bomb Threat

In the event of a bomb threat the person receiving the call shall contact the emergency coordinator and the facility operator. The emergency Coordinator shall contact the local authority. The local authority will become the on site manger and Ramos Environmental Services, Inc. employees will follow their directions. The facility operator will start shut down procedures immediately upon notification of a bomb threat. The facility should be thoroughly inspected and receive clearance from the local authority before restarting any operations.

SECTION X
EVACUATION

It is the responsibility of the emergency coordinator to order an evacuation if needed. In the event of an evacuation, the facility should be shut down, all pumps turned off and all valves closed prior to leaving if it is safe to do so. All employees and visitors should proceed to the rally location, which is directly across South River Road at the Kinder Morgan Pipeline Pump Station. The emergency coordinator should take a roll call to ensure that all personnel have been successfully evacuated. If any personnel are unaccounted for, the emergency coordinator should inform the incident commander of the missing personnel and their last known location within the facility.

SECTION XI
COMMUNICATION

All communication between the office and the facility operator will be done using cell phones issued to each employee, in addition to the facility intercom system. All emergency coordinators will have company cell phones and pagers for 24 hour access. Communication between the facility and outside responders will be done via land lines or cell phones.

SECTION XII
SPILL RESPONSE EQUIPMENT

As a 24 hour spill response company, Ramos Environmental Services, Inc. keeps on site a large quantity of spill response materials. In addition to the materials, Ramos Environmental Services, Inc. maintains a fleet of vacuum and pump trucks which can be used in the event of a spill.

Spill Response Equipment List:

a) Clay based absorbent
b) Absorbent pads
c) Absorbent Booms
d) UN approved containers and drums
e) Tools (including shovels and brooms)
f) PPE

The spill response equipment is stored on site in trailers just east of the tank farm and in a warehouse adjacent to the tank farm.

SECTION XIII
SPILL REPORTING

All spills of reportable quantity will be reported to the appropriate agencies within eight (8) hours of occurrence. It is the responsibility of the emergency coordinator to report spills.

Ramos Environmental Services, Inc.
FACILITY WORK ORDER

Date: _____.

Requested Work: _____

_____

_____

Priority: _____

Requested By: _____

Repair Completion Date: _____ Approved By: _____

Notes:

PRIORITY LEVELS;

A) MUST BE COMPLETED WITH 24 HOURS
B) MUST BE COMPLETED WITHIN 1 CALENDER WEEK
C) MUST BE COMPLETED WITHINS 10 BUSINESS DAYS
D) MUST BE COMPLETED WITHIN 30 CALENDER DAYS

ATTACHMENT 9

CLOSURE PLAN

CLOSURE PLAN

All drums on the 10 day pad will be transported off site for appropriate disposal. All tanks will be emptied and triple rinsed. The clean tanks will be transported to Schnitzer Steel in Rancho Cordova for recycling. All concrete and masonry will be removed and transported to Chemical Waste Management in Kettleman City, California, for disposal as Non RCRA Hazardous Waste Solids. Confirmation samples will be taken of the existing soil to ensure there is no contamination.

TANK # 1 WORKSHEET

Material: Antifreeze

Volume: 4000 gallons

Dimensions: 8'x 18'

Antifreeze * We are currently being paid $0.10/gallon.	4000 gallons @ no charge	Non Charge
Rinsate disposal	200 gallons @ $0.95/gallon	$190.00
Solids disposal	200 gallons @ $2.10/gallon	$420.00
Liquids Transportation	5 hours @ $85.00/hr.	$425.00
Labor & Equipment		$477.88
Loading & Transporting tank	5 hours @ $125.00/hr.	$625.00
Scrapping at Schnitzer		No Charge
Certification		$4,250.00
TOTAL FOR TANK #1		**$6,087.88**

Prices are per enclosed quote from Continental Excavating dated March 13, 2008.

TANK # 2 WORKSHEET

Material: Used Oil

Volume: 11,280 gallons

Dimensions: 8' x 30'

Used Oil * We are currently being paid $0.95/gallon.	4000 gallons @ no charge	Non Charge
Rinsate disposal	564 gallons @ $0.95/gallon	$535.80
Solids disposal	564 gallons @ $2.10/gallon	$1,184.40
Liquids Transportation	5 hours @ $85.00/hr.	$425.00
Labor & Equipment		$477.88
Loading & Transporting tank	5 hours @ $125.00/hr.	$625.00
Scrapping at Schnitzer		No Charge
Certification		$4,250.00
TOTAL FOR TANK #2		**$7,498.08**

Prices are per enclosed quote from Continental Excavating dated March 13, 2008.

TANK # 3 WORKSHEET

Material: Used Oil

Volume: 12,925 gallons

Dimensions: 10' x 22'

Used Oil * We are currently being paid $0.95/gallon.	11,632.50 gallons @ no charge	Non Charge
Rinsate disposal	646.25 gallons @ $0.95/gallon	$613.94
Solids disposal	646.25 gallons @ $2.10/gallon	$1,357.13
Liquids Transportation	5 hours @ $85.00/hr.	$425.00
Labor & Equipment		$477.88
Loading & Transporting tank	5 hours @ $125.00/hr.	$625.00
Scrapping at Schnitzer		No Charge
Certification		$4,250.00
TOTAL FOR TANK #3		**$10,145.02**

Prices are per enclosed quote from Continental Excavating dated March 13, 2008.

TANK # 4 WORKSHEET

Material: Oily Water

Volume: 11,280 gallons

Dimensions: 8' x 30'

Used Oil	10,152 gallons @ $0.95/gallon	9,644.40
Rinsate disposal	564 gallons @ $0.95/gallon	$535.8
Solids disposal	564 gallons @ $2.10/gallon	$1,184.40
Liquids Transportation	5 hours @ $85.00/hr.	$425.00
Labor & Equipment		$477.88
Loading & Transporting tank	5 hours @ $125.00/hr.	$625.00
Scrapping at Schnitzer		No Charge
Certification		$4,250.00
TOTAL FOR TANK #4		**$17,142.48**

Prices are per enclosed quote from Continental Excavating dated March 13, 2008.

ROLL OFF BIN

Material: Non RCRA Solids

Volume: 10 cubic yards

Disposal	10 yards @ $70.00/yard	$700.00
Transportation	10 hours @ $85.00/hr.	$850.00
Energy surcharge	10%	$155.00
TOTAL FOR Roll Off Bin		**$1,705.00**

DRUMS FROM DRUM PAD

Non RCRA Solids (15 drums)	
Disposal (Chemical Waste Management, Kettlman City)	$750.00
Transportation	$750.00
FLAMMABLE LIQUIDS (15 drums)	
Disposal (General Environmental Management, Rancho Cordova)	$1,725.00
Transportation	$450.00
ANTIFREEZE (15 drums)	
Disposal (Deemeno/kerdoon)	No Charge
Transportation	No Charge
*** We are currently being paid $0.10/gallons picked up at our location.**	
USED OIL (40 drums)	
Disposal (Deemeno/Kerdoon)	No Charge
Transportation	No Charge
*** We are currently being paid $0.95/gallon picked up at our location.**	
OILY WATER (33 drums)	
Disposal (Deemeno/Kerdoon)	$1,776.50
Empty drum recycling	$165.00
Transportation	No charge
*** Transportation charges are included in the disposal fees.**	
CERTIFICATION	$4,250.00
TOTAL:	**$9,806.50**

CLOSURE SAMPLE WORKSHEET

STORAGE TANKS (2 SAMPLES PER TANK)

BTEX (8265)	8 samples @ 65.00/ea.	$520.00
TPH (8015M)	8 samples @ $50.00/ea.	$400.00
CAM 17 (200.7/6010&7471)	8 samples @ $235.00/ea.	$1,880.00
PCB's (8082)	8 samples @ $110.00/ea.	$880.00

CONCRETE SAMPLING

BTEX (8265)	4 samples @ $65.00/ea.	$260.00
TPH (8015M)	4 samples @ $50.00/ea.	$200.00
CAM 17 (200.7/6010&7471)	4 samples @ $235.00/ea.	$940.00
PCB's (8082)	4 samples @ $110.00/ea.	$440.00

DRUM SAMPLING (COMPOSITE SAMPLES)

BTEX (8265)	4 samples @ $65.00/ea.	$260.00
TPH (8015M)	4 samples @ $50.00/ea.	$200.00
CAM 17 (200.7/6010&7417)	4 samples @ $235.00/ea.	$940.00
PCB's (8082)	4 samples @ $110.000/ea.	$440.00

SOIL

BTEX (8265)	6 samples @ $65.00/ea.	$390.00
TPH (8015M)	6 samples @ $50.00/ea.	$300.00
CAM 17 (200.7/6010&7410)	6 samples @ $235.00/ea.	$1,040.00
PCB's (8082)	6 samples @ $110.00/ea.	$660.00

SAMPLE PREPTIATION CHARGES	$1,500.00
LABOR	$1,040.00
TOTAL	**$12,290.00**

Prices were taken from Excelchem Lab's price sheet dated September 10, 2008.

ASSUMPTIONS

1) Rinsate will equal 10% of tank volume

2) Antifreeze price is based on being paid $0.10/gallon now

3) Used Oil price is based on being paid $0.95/gallon now.

4) Oily Water disposal price is based on paying $0.85/gallon now.

5) Labor, Materials, Concrete Removal are from quote from Continental Excavating.

6) Roll off bin is based on one bin being loaded at a time.

SAMPLING ASSUMPTIONS

1) The tanks will be sampled at two different depths

2) Analytical prices were taken from Exelchem's standard price sheet

3) The concrete core samples will be used in place of wipe samples.

CLOSURE COST SUMMARY

Tank # 1	$6,087.88
Tank # 2	$7,498.08
Tank #3	$10,145.02
Tank #4	$17,142.48
Roll Off	$1,705.00
Pad Removal	$32,089.49
Drums	$9,806.50
Sampling	$9,020.00
TOTAL:	**$93,494.45**

ATTACHMENT 10

CERTIFICATIONS

SECURITY

I hereby certify the following:

1. I have read and understood Sections 66264.14 and 66270.14(b)(4), Title 22 of the California Code of Regulations (Security)

2. The security procedures and equipment for my facility will be in compliance with these regulations.

3. I understand that this certification is an integral part of the formal application for a Standardized Permit for my facility and that any falsification is equivalent to a false statement under Health and Safety Code Section 25191 and may be grounds for a permit denial.

_____ _____

Printed Name Signature Date

_____

Facility Address

1830 Vernon Street, Suite #7 • Roseville, CA 95678 • (916) 786-5262 • Fax (916) 786-5263 •E-mail: earthtec@surewest.net

FACILITY LOCATION, SEISMIC AND PRECIPITATION INFORMATION

I hereby certify the following:

1. I have read and understood Sections 66264.25 and 66270.14(b)(11), Title 22, of the California Code of Regulations on Facility location, Seismic and Precipitation Information.

2. I certify that the nearest fault to my facility is the Dunnigan Hills Fault and is approximately 21 miles northwest of my facility.

3. I certify that my facility is not in the 100-year flood plain; otherwise I will provide the information required under section 66270.14(b)(11)(D).

4. I understand that this certification is an integral part of the formal application for a Standardized Permit for my facility and that any falsification is equivalent to a false statement under Health and Safety Code Section 25191 and may be grounds for a permit denial.

_____ _____

Print Name and Title Signature Date

_____

Facility Address

MANIFEST SYSTEM, RECORD KEEPING AND REPORTING

I hereby certify the following:

1. I have read and understood sections 66264.70 through 66264.78, Title 22, of the California Code of Regulations of Manifest System, Record Keeping and Reporting requirements. I will have or prepare, for my facility, the required records and reports to be in compliance with all applicable regulations

2. I certify that a copy of the required records or reports will be maintained at my facility and will be available to local, state or federal agencies upon request. I understand that this certification is an integral part of the formal application for a Standardized Permit for my facility and that any falsification is equivalent to a false statement under Health and Safety Code Section 25191 and may be grounds for a permit denial.

3. My facility is (or is not) an offsite facility. I have sent a notice to generators that may use my facility's services and I have the appropriate permit(s) (section 66264.12(b)). A copy of my notice is kept in my facility.

_____ _____

Print Name and Title Signature Date

_____

Facility Name and Address

PREPAREDNESS AND PREVENTION

I hereby certify the following:

1. I have read and understood Sections 66264.30 through 66264.36, 66264.37, and 66270.14(b) (8) and (b) (9), Title 22 of the California Code of Regulations (Preparedness and Prevention).

2. The procedures and equipment for my facility will be in compliance with these regulations. My facility will be designed, constructed, maintained and operated to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constitutes to air, soil, or surface water which could threaten human health of the environment.

3. I understand that this certification is an integral part of the formal application for a Standardized Permit for my facility and that any falsification is equivalent to a false statement under Health and Safety Code Section 25191 and may be grounds for a permit denial.

_____ _____

Print Name and Title Signature Date

_____

Facility Name and Address

ATTACHMENT 11

INSURANCE CERTIFICATE

CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY) 4/3/2008

PRODUCER
I S
118 Fair Oaks Blvd #100
Fair Oaks, CA 95628
(916) 965-5079

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

RAMOS OIL RECYCLERS, INC., dba
RAMOS ENVIRONMENTAL SERVICES, INC.
1515 S River Drive
West Sacramento, CA 95691

INSURERS AFFORDING COVERAGE	NAIC#
INSURER A: AMERICAN INTERNATIONAL SPECIALTY LINES INS.CO.	
INSURER B: COMMERCE AND INDUSTRY INSURANCE CO.	
INSURER C: AMERICAN INTERNATIONAL SPECIALTY LINES INS.CO.	
INSURER D:	
INSURER E:	

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

ADDL INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
	GENERAL LIABILITY					
	X COMMERCIAL GENERAL LIABILITY				EACH OCCURRENCE	$ 1,000,000
	CLAIMS MADE X OCCUR				DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 50,000
		EG 7527715	04/01/08	04/01/09	MED EXP (Any one person)	$ 5,000
					PERSONAL & ADV INJURY	$ 1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:				GENERAL AGGREGATE	$ 2,000,000
	X POLICY PRO-JECT LOC				PRODUCTS - COMP/OP AGG	$ 2,000,000
	AUTOMOBILE LIABILITY					
	X ANY AUTO				COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
	ALL OWNED AUTOS					
	SCHEDULED AUTOS				BODILY INJURY (Per person)	$
	X HIRED AUTOS	7527714	04/01/08	04/01/09		
	X NON-OWNED AUTOS				BODILY INJURY (Per accident)	$
					PROPERTY DAMAGE (Per accident)	$
	GARAGE LIABILITY					
	ANY AUTO				AUTO ONLY - EA ACCIDENT	$
					OTHER THAN AUTO ONLY: EA ACC	$
					AGG	$
	EXCESS/UMBRELLA LIABILITY					
	X OCCUR CLAIMS MADE				EACH OCCURRENCE	$ 4,000,000
		EGU 7527716	04/01/08	04/01/09	AGGREGATE	$ 4,000,000
	DEDUCTIBLE					$
	RETENTION $					$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY					$
					WC STATU-TORY LIMITS OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED?				E.L. EACH ACCIDENT	$
	yes, describe under SPECIAL PROVISIONS below				E.L. DISEASE - EA EMPLOYEE	$
					E.L. DISEASE - POLICY LIMIT	$
	OTHER					

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

ALL OPERATIONS

CERTIFICATE HOLDER

INFORMATION AND BID PURPOSES ONLY

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 0 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

ACORD 25 (2001/08)

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 4/3/2008

PRODUCER Phone: 916-609-8371 Fax: 916-979-7571
InterWest Insurance Services, Inc.
P.O. Box 255188
Sacramento CA 95865-5188

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED
Ramos Oil Recyclers, Inc.
DBA: Ramos Environmental Services, Inc.
1515 S. River Road
Sacramento CA 95691

INSURERS AFFORDING COVERAGE	NAIC #
INSURER A: USF&G Co.	25887
INSURER B:	
INSURER C:	
INSURER D:	
INSURER E:	

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADD'L INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
		GENERAL LIABILITY					
		☐ COMMERCIAL GENERAL LIABILITY				EACH OCCURRENCE	$
		☐ CLAIMS MADE ☐ OCCUR				DAMAGE TO RENTED PREMISES (Ea occurrence)	$
						MED EXP (Any one person)	$
						PERSONAL & ADV INJURY	$
		GEN'L AGGREGATE LIMIT APPLIES PER:				GENERAL AGGREGATE	$
		☐ POLICY ☐ PRO-JECT ☐ LOC				PRODUCTS - COMP/OP AGG	$
		AUTOMOBILE LIABILITY					
		☐ ANY AUTO				COMBINED SINGLE LIMIT (Ea accident)	$
		☐ ALL OWNED AUTOS				BODILY INJURY (Per person)	$
		☐ SCHEDULED AUTOS				BODILY INJURY (Per accident)	$
		☐ HIRED AUTOS				PROPERTY DAMAGE (Per accident)	$
		☐ NON-OWNED AUTOS					
		GARAGE LIABILITY				AUTO ONLY - EA ACCIDENT	$
		☐ ANY AUTO				OTHER THAN AUTO ONLY: EA ACC	$
						AGG	$
		EXCESS/UMBRELLA LIABILITY				EACH OCCURRENCE	$
		☐ OCCUR ☐ CLAIMS MADE				AGGREGATE	$
		☐ DEDUCTIBLE					$
		☐ RETENTION $					$
A		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY	D224W00202	3/1/2008	3/1/2009	X WC STATU-TORY LIMITS ☐ OTH-ER	
		ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED?				E.L. EACH ACCIDENT	$1,000,000
		If yes, describe under SPECIAL PROVISIONS below				E.L. DISEASE - EA EMPLOYEE	$1,000,000
		OTHER				E.L. DISEASE - POLICY LIMIT	$1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

"10 days notice applies if cancelled for non-payment of premium.
Workers Compensation
In order to maintain consistency of coverage no crossed off wording will be allowed under any circumstances. However, in lieu of 30 day notice, 60 day notice applies except for non payment of premium.
RE: Evidence of Insurance

CERTIFICATE HOLDER

Evidence of Coverage
****
******
********** ** **********

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 60 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

ACORD 25 (2001/08)

IMPORTANT

If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

DISCLAIMER

The Certificate of Insurance on the reverse side of this form does not constitute a contract between the issuing insurer(s), authorized representative or producer, and the certificate holder, nor does it affirmatively or negatively amend, extend or alter the coverage afforded by the policies listed thereon.