SECTION D

PROCESS DESCRIPTION

Revision 0
February 2021
SECTION D - PROCESS INFORMATION

TABLE OF CONTENTS

1.0 Introduction..................................................................................................................1
2.0 Process Flow................................................................................................................1
3.0 Waste Management Units.............................................................................................1
   3.1 Tank Systems.........................................................................................................1
      3.1.1 Tank Management Practices.............................................................................2
      3.1.2 Description........................................................................................................2
      3.1.3 Description of Off-loading Systems to the Tanks.............................................2
      3.1.4 Level Indicators and Controls........................................................................2
      3.1.5 Safety Cutoff.....................................................................................................3
      3.1.6 Pressure Controls.............................................................................................3
      3.1.7 Secondary Containment and Detection of Releases.........................................3
      3.1.8 Leak Detection System....................................................................................4
      3.1.9 Tank System Inspections.................................................................................4
   3.2 Response to Leaks or Spills and Disposition of Leaking or Unfit-for-use Tank Systems..................................................................................................................4
      3.2.1 Spill Response..................................................................................................4
      3.2.2 Tank and Secondary Containment System Repair or Closure............................5
      3.2.3 Certification of Major Repairs.........................................................................5
   3.3 Containers..............................................................................................................6
      3.3.1 Description of Containers..............................................................................6
      3.3.2 Condition of Containers................................................................................6
      3.3.3 Container/Waste Compatibility ......................................................................6
      3.3.4 Container Management Practices.................................................................6
      3.3.5 Inspections.......................................................................................................7
      3.3.6 Containment.....................................................................................................7

FIGURES:

FIGURE D-1  PROCESS FLOW SCHEMATIC ................................................................. 9
FIGURE D-2  TANK CONTAINMENT AND TRUCK OFF-LOAD PLAN......................... 11
FIGURE D-3  TANK CONTAINMENT AND TRUCK OFF-LOAD SECTIONS.................. 12
FIGURE D-4  PIPING AND INSTRUMENTATION DRAWING................................... 13

LIST OF ATTACHMENTS:

ATTACHMENT D-1  RCRA CONSTRUCTION CERTIFICATION
SECTION D - PROCESS INFORMATION

1.0 INTRODUCTION

The Systech Tulsa facility receives hazardous waste for the preparation of fuel quality waste (FQW) to be combusted in the CPCC cement kilns. The Systech facility consists of a secondary containment and two storage tanks, a covered truck off-loading area that can hold two tanker trucks and ~ 20 drums, and a laboratory/office building. The Systech tank farm and truck off-loading area are situated within the CPCC cement plant on property owned by Systech.

The Systech Tulsa facility has the following waste storage and/or treatment systems that are regulated under the RCRA regulations at 40 CFR 264:

- Two 180,000-gallon storage tanks (S02) that are also considered as Treatment Units (T04) due to the agitation system installed with each tank;
- A container storage area (S01) limited to storage of 13,100 gallons of waste that is located in the Truck Off-loading Area, an 80 by 39 foot bermed concrete slab. This includes as many as two (2) 6,000-gallon tanker trucks and other smaller containers totaling 1,100 gallons may be in the off-loading area.

The demarcation between Systech and CPCC ownership of the piping running from the tank farm to the kilns is the property line separating the Systech and CPCC properties, which is at least 50 feet from the edge of the tank farm and truck off-loading area.

2.0 PROCESS FLOW

The Systech Tulsa operations receive bulk tanker trucks of liquid hazardous waste, which have been sampled, tested, and off-loaded into one of two storage tanks where the various received volumes are mixed by top-mounted agitators. After the tanks are mixed and tested to demonstrate they meet the requirements to be burned, the blended FQW is pumped to either or both of the two CPCC cement kilns to be combusted as fuel for energy recovery in the manufacture of Portland cement. Piping is also provided to allow the FQW to be recirculated back to the tank used to feed the kiln(s) in the event of an automatic waste flow cut-off to the kiln(s). Tanker trailers may be stored within the truck off-loading area, in addition to drums of site-generated hazardous wastes. Figure D-1, Process Flow Schematic represents the flow of materials through the facility.

3.0 WASTE MANAGEMENT UNITS

This section describes the tank system and container storage area. Engineering drawings and figures presented in Figures D-2, D-3, and D-4, illustrate the features of each waste management area. Figure A-2, Site Map, in Attachment D-1 of this document shows the general layout of the buildings and the off-loading and storage areas within the CPCC and Systech facilities.

3.1 Tank Systems

Tank systems provide storage capacity for wastes delivered in trucks before they are used as FQW in the manufacture of cement. Truck off-loading usually occurs during the day shift five days a week, while the cement kilns operate twenty-four hours a day, seven days a week. The tanks are sized to be able to supply sufficient fuel over the weekend when the kiln continues to operate. The tanks are also used to blend the wastes to prepare a consistent fuel for the kilns.
The facility has one tank farm, shown on Figure A-2, Site Map, in Attachment D-1 of this document which includes the two storage tanks. Each tank has a design capacity of 180,000 gallons (32-foot diameter, 30-foot high), for a total permitted tank storage capacity of 360,000 gallons. Most of the wastes stored in the tanks are generated off-site, but some of the wastewaters are collected on-site from containment areas. The off-site wastes include liquid and sludge waste fuels.

Attachment D-1 to this document contains a copy of the design assessment for the tank systems along with a copy of the certification of the tank systems installation.

For any future tank system installations, Systech will ensure that proper handling procedures are adhered to in order to prevent damage to the new tank system during installation. Prior to placing a new tank system or component in use, an independent, qualified, installation inspector or a qualified Professional Engineer, either of whom is trained and experienced in the proper installation of tanks systems or components, must inspect the system for the presence of weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, or other structural damage or inadequate construction/installation. All discrepancies will be remedied before the tank system is placed in use.

All new tanks and ancillary equipment are tested for tightness prior to being placed in use. If a tank system is found not to be tight, all repairs necessary to remedy the leak(s) in the system must be performed prior to the tank system being covered, enclosed, or placed into use.

3.1.1 Tank Management Practices

The permitted tanks are used to receive off-site shipments of liquid waste fuels from bulk trucks and are used to blend the various liquid waste fuels to prepare a consistent fuel for the kiln. The fuel in the tanks can be transferred to the other tank for blending or pumped directly to the kiln for use as fuel. Operations are both manual with manual valves and manual start/stop of pumps, and automatic valves and start/stop for pumps.

Hazardous wastes or treatment reagents are not placed in the tank system if they could cause the tank, its ancillary equipment, or the containment system to rupture, leak, corrode, or otherwise fail.

3.1.2 Description

Each tank is an aboveground, vertical, cylindrical tank with a flat bottom and a top deck. All of the tanks are constructed of mild steel and meet or exceed the minimum requirements of API 620. Ancillary equipment is supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.

3.1.3 Description of Off-loading Systems to the Tanks

The off-loading system for the tanks includes two truck off-loading stations and two transfer pumps to unload the trucks. The system is operated manually with all manual valves and manual start for the pumps.

The bulk truck off-loading stations are located at the truck pad. These stations operate independently allowing two trucks to be off-loaded at a time.

3.1.4 Level Indicators and Controls

Each tank uses a mechanical or electrical device for level measurements. Each tank has a high-level alarm to alert the employees of a high level situation and prevent the tank from overflowing. An audible
alarm horn is located in the bulk truck off-loading areas. The tank system also has a high high-level control that shuts off the unloading pumps to prevent overflow.

### 3.1.5 Safety Cutoff

This system is designed to prevent overfilling the tanks. Emergency stop buttons located at the facility immediately stop all transfer pumps. In addition, the tank system high high-level sensors also shut off all transfer pumps.

### 3.1.6 Pressure Controls

Each tank is equipped with an in-line pressure/vacuum relief valve that vents to either of the cement kilns where working and breathing losses are controlled in the kilns’ combustion chambers. Each tank is also equipped with an emergency pressure/vacuum release vent set per API 620 standards to prevent damage to the tanks. The emergency vent releases to the atmosphere. Process vent controls are addressed in Section L of this application.

### 3.1.7 Secondary Containment and Detection of Releases

Figure D-2, Tank Containment and Truck Off-load Plan, and Figure D-3, Tank Containment and Truck Off-load Sections, show that the secondary containment for the tanks is designed to contain liquids. The area is constructed of reinforced concrete with any cracks or gaps sealed. The concrete is compatible with the waste stored. The concrete secondary containment system acts as a liner external to the tank in compliance with 40 CFR 264.193(d).

The containment area is generally sloped at a 1% incline toward a sump within the tank dike. According to NOAA Atlas 14, Volume 8, Version 2, Midwestern States, the 25-year, 24-hour precipitation is 6.51 – 7.00 inches for the Tulsa area. The rainfall value used in the calculations found in Attachment D-3 to Attachment D-1 of this document is 7.1 inches which is the value used in the prior application.

Per the dimensions shown on the Site Plan and Tank Section drawings in Figures D-2 and D-3, the total gross available containment within the tank farm is 323,001 gallons. Allowing for displacement by the 25-year, 24-hour storm event and the presence of the equipment within the dike wall, the net available secondary containment capacity is 185,646 gallons, which is more than the largest tank volume of 180,470 gallons. Details of these calculations along with the tank construction certification are included in Attachment D-1 to this document.

The top of the dike wall is at least 2.0 feet above natural grade to prevent run-on into the tank dike area.

Precipitation collected in the containment area drains to a sump and is pumped by a sump pump to one of three stormwater tanks located in the adjacent secondary containment area. The sump pump is operated manually.

Small leaks of waste fuels are cleaned up within 24 hours or in as timely a manner as possible after detection. The collected materials are placed back into the fuel. If a major release of waste fuels occurs, the majority of material would be pumped into a storage tank, and the remainder would be cleaned up as a small spill.

Figures D-2, D-3, and D-4 show that all off-loading and tank transfer equipment and piping are located within secondary containment areas. The only hazardous waste equipment not within the secondary containment area are the burn lines and return line to and from the kilns, and above-ground welded flanges, welded joints, and welded connections that are inspected daily for leaks.
3.1.8 Leak Detection System

The FQW storage tanks are provided with a leak detection system that is designed and operated so that it will detect failure of the primary containment structure in compliance with 40 C FR 264.193(c)(3). The tank walls are visible to inspection. The tank floors consist of a double bottom with the lower plate made of pebble or checker plate. The interstitial space between the plates created by the pebble or checker pattern allows any leakage to run to one of the inspection ports at the side of the tank. Both bottoms are sloped from the center of the tank down to the side walls to assure any leakage will run to the inspection ports.

3.1.9 Tank System Inspections

Pursuant to the requirements of 40 CFR 264.195, Systech will follow their schedule and procedures for inspecting overfill controls. In addition, Systech will:

- Inspect at least once each operating day the following:
  - the data gathered from monitoring and leak detection equipment.
  - Above ground portions of the tank system, if any, to detect corrosion or releases of waste.
  - The construction materials and the area immediately surrounding the externally accessible portion of the tank system, including the secondary containment system (e.g., dikes) to detect erosion or signs of releases of hazardous waste (e.g., wet spots, dead vegetation).
- Ancillary equipment that is not provided with secondary containment, as described in 264.193(f)(1) through (4), will be inspected at least once each operating day.

Inspections are documented as required by 40 CFR 264.15(d) as described in Section J of this application.

3.2 Response to Leaks or Spills and Disposition of Leaking or Unfit-for-use Tank Systems

3.2.1 Spill Response

Systech will remove from service any tank system or secondary containment system that has a leak or spill or that becomes unfit for use. In any of these cases, Systech will ensure that the following actions take place:

- The flow of hazardous waste into the tank system or secondary containment system is stopped. The system is then inspected to determine the cause of the release.
- If the release was from the tank system, the facility removes as much of the waste as necessary to prevent any further releases and to allow inspection and repair of the tank system.
- If the release is to the secondary containment system, all released materials are removed to prevent any harm to human health and the environment.
- The Site Manager or designee conducts a visual inspection of the release area to determine whether there is a potential for migration of the leak or spill to soils or surface water. Following removal of the released material, an inspection is conducted to ensure that any visible contamination of the soil or surface water has been removed and properly disposed.
- Any release to the environment above the Reportable Quantity (RQ) will be reported to ODEQ within 24 hours of its detection. Exceptions to this requirement include:
hazardous waste leak or spill is less than or equal to a quantity of one pound; and

- it is immediately contained and cleaned up.

Within 30 days of detecting a release to the environment above the RQ, a written report containing the following information will be submitted to ODEQ, unless the agency instructs otherwise. The written report will include:

- The likely route of migration of the release;
- Characteristics of the surrounding soil;
- Results of any monitoring or sampling conducted in connection with the release, if this information is available. If this information is not available at this time, it will be submitted when it becomes available;
- Proximity of down-gradient drinking water, surface water, and populated areas; and
- A description of the response actions taken or planned.

3.2.2 Tank and Secondary Containment System Repair or Closure

Before the tank and/or ancillary equipment can be returned to service following a spill or release, the tanks and/or ancillary equipment will be repaired in accordance with 40 CFR §264.196(e) and the secondary containment will be decontaminated. In the event these requirements cannot be satisfied, the leaking tank system will be closed in accordance with 40 CFR §264.197. Major repairs will be certified by an independent, qualified, professional engineer prior to returning the tank system into service as described in Section 3.2.3 below. The requirements of 40 CFR §264.196(e) are the following:

- If the cause of the release was a spill that did not damage the integrity of the tank system, the tank system may be returned to service as soon as the released waste is removed and repairs, if necessary, are made.

- If the cause of the release was a leak from the primary tank system into the secondary containment system, the primary tank system must be repaired prior to returning the tank system to service.

- If the source of the release was a leak to the environment from a component of a tank system without secondary containment, then the component of the system from which the leak occurred will be provided with secondary containment that satisfies the requirements of 40 CFR §264.193, unless the source of the leak is an aboveground portion of a tank system that can be inspected visually.

- If the source is an aboveground component that can be inspected visually, the component must be repaired and may be returned to service without secondary containment as long as the appropriate certifications by an independent, qualified, professional engineer are obtained.

- If a component is replaced to comply with these requirements, that component must satisfy the requirements for new tank systems or components in 40 CFR §264.193.

- If a leak has occurred in any portion of a tank system component that is not readily accessible for visual inspection (e.g., the bottom of an inground or on-ground tank) the entire component must be provided with secondary containment in accordance with 40 CFR §264.193 prior to being returned to use.

3.2.3 Certification of Major Repairs

If the facility has repaired a tank system in accordance with the above requirements of Section 3.2.2 and the repair has been extensive (e.g., installation of an internal liner or the repair of a ruptured primary
containment or secondary containment vessel), the tank system will not be returned to service unless the certification has been obtained by an independent professional engineer in accordance with 40 CFR §270.11(d)(1) that the repaired system is capable of handling hazardous. This certification will be submitted to ODEQ within seven days after returning the tank system into service.

3.3 Containers

A maximum of 13,100 gallons of containerized waste may be stored within the truck off-loading area. This volume is based on storing two (2) 6,000-gallon tank trailers in addition to a maximum amount of 1,100 gallons stored in non-bulk containers.

3.3.1 Description of Containers

The Systech Tulsa facility receives off-site waste in bulk tank containers that are temporarily stored until the waste is transferred to the storage tanks. Site-generated wastes may be stored in new, used, or reconditioned non-bulk containers meeting Department of Transportation (DOT) specifications in the container storage area. These containers meet the requirements of 49 CFR, Part 178, Subpart L - Non-bulk Performance-oriented Packaging Standards. These standards incorporate specifications for container dimensions and materials of construction.

3.3.2 Condition of Containers

Containers in storage are inspected weekly to ensure that they are in good condition and not leaking. If the container is observed to not be in good condition or if it begins to leak, the contained waste is transferred to a container that is in good condition, or the liquid hazardous waste may be off-loaded into the storage tanks.

3.3.3 Container/Waste Compatibility

Although incompatible wastes are not received or generated at the site, should this occur, Systech will ensure that they will manage incompatible waste in accordance with the requirements of 40 CFR 177 as described below:

- Systech will not place incompatible wastes, or incompatible waste and materials in the same container.
- Systech will not place RCRA hazardous waste in unwashed containers that previously held incompatible wastes or material.
- Systech will separate containers of incompatible wastes using such means as a berm, or a secondary containment pallet, or other means to prevent the commingling of incompatible waste in the event of spills/releases of wastes.

3.3.4 Container Management Practices

Systech will manage containers in a manner designed to prevent the spills/releases of material, or fires, as well as responding to spills or releases and will provide a means to store and inspect containers as described in this section:

- All containers of hazardous waste in the truck off-loading area remain closed during storage, except when it is necessary to add or remove waste from that container.
All containers of hazardous waste in the truck off-loading area are opened, handled, and stored in manner that will not cause the container to rupture or leak.

Containers holding ignitable or reactive waste will be located at least 50 feet from the property boundary. Precautions will be taken to prevent accidental ignition or reaction of ignitable or reactive waste. No Smoking Signs are posted in the waste storage area.

**Aisle Spacing**

Aisle spacing in the container storage area conforms to National Fire Protection Association (NFPA), federal, and state requirements. Tankers and the non-bulk containers are stored with at least 2-foot aisle spacing on each side to allow access to the bulk containers. Non-bulk containers of site-generated wastes are stored on pallets with container labels facing the aisles. Adequate space is provided to prevent the tank trucks from damaging the non-bulk containers that may be stored within the area.

**Marking and Labeling**

All non-bulk site-generated waste containers are marked and labeled in accordance with all applicable ODEQ and DOT regulations. The labels attached to the non-bulk site-generated waste containers have the words “Hazardous Waste” and the date accumulation began in that container. Before shipping the site-generated waste containers, a label meeting the 49 CFR 172.304 labeling requirements is affixed. The bulk containers (tankers) are not required to be labeled while in storage, but the container must be properly placarded and the shipping papers (i.e., hazardous waste manifest) are readily available to identify the contents of the bulk container.

**3.3.5 Inspections**

All containers are visually inspected upon receipt to verify that they are in good condition and leak-free. The containers are inspected at least weekly. The contents of a damaged or leaking container are processed, immediately transferred to a container in good condition, or placed in an overpack container. In addition, the condition of the container storage area is inspected for evidence of leaks or spills, or deterioration of the containment system caused by corrosion or other factors such as cracks or gaps in the containment. Inspections are documented as required by 40 CFR 264.15(d) as described in Section J of this application.

**3.3.6 Containment**

Figure A-2 of Attachment D-1, Site Map, shows the location of the truck off-loading area adjacent to and on the west side of the tank storage area. The truck off-load area is located at least 50 feet from the Systech property line since the area manages ignitable wastes.

Figure D-2, Tank Containment and Truck Off-Load, Plan, and Figure D-3, Truck Containment and Truck Off-load Sections, show that the truck off-load area is a curved, concrete containment area. The area is under roof to minimize the amount of precipitation collected within this area. The perimeter curbing and raised approach aprons prevent run-on into this container storage area.

The permitted capacity for this area is 13,100 gallons of container storage. Typically, this area may be used to store two 6,000-gallon tankers plus twenty 55-gallon drums. However, if two tankers are not being stored in the area, additional non-bulk containers may be stored that continue to meet the volume limits and storage and aisle spacing requirements.
The containment system has been designed and constructed of concrete that is free of cracks or gaps and is sufficiently impervious to contain leaks, spills, and accumulated precipitation until the collected material is detected and removed. The truck off-load area is sloped to drain and remove liquids resulting from spills, leaks, or precipitation and to provide adequate secondary containment for the largest container (6,000 gallons) plus allowance for accumulated precipitation. See Attachment D-4 of Attachment D-1 of this document for calculation of the available secondary containment in this container storage area.

Any waste leakage or spills are cleaned up within 24 hours after detection or in as timely a manner as possible consistent with the procedures identified in the site’s Contingency Plan in Section G.
FIGURE D-1 PROCESS FLOW SCHEMATIC
FIGURE D-2  TANK CONTAINMENT AND TRUCK OFF-LOAD PLAN
FIGURE D-3  TANK CONTAINMENT AND TRUCK OFF-LOAD SECTIONS
FIGURE D-4  PIPING AND INSTRUMENTATION DRAWING
NOTES:
1. TANK LEAK DETECTION
   A. ABOVE TANK BOTTOM DETECTION BY VISUAL MEANS
   B. TANK BOTTOM TO CONSIST OF TWO SEPARATE PLATES EXTENDING BEYOND THE TANK SHELL W/ SPACERS BETWEEN PLATES.
   PLATE EDGES INCLDED LEAK TRAP AND OBSERVATION WELLS FOR THE SPACE BETWEEN THE
   THE PLATES PLACED AROUND THE PERIMETER OF THE UPPER BOTTOM PLATE.
ATTACHMENT D-1      RCRA CONSTRUCTION CERTIFICATION

NOTE: All references to Lafarge Building Materials Inc. in the following document shall now refer to Central Plains Cement Company.
January 27, 2012

Ms. Terri Kanouse  
Director of Support Services  
Systech Environmental Corporation  
3085 Woodman Dr.  
Dayton, OH 45420

RE: New Tank System Certification of Construction - Systech Environmental, Tulsa, OK  
Hazardous Waste Permit 00025452; EPA I.D. Number: OKD000025452

Dear Terri:

As part of the construction of the new Fuel Quality Waste (FQW) system at the existing Lafarge cement plant in Tulsa, Oklahoma, a new FQW storage tank and feed system has been constructed at Systech’s Tulsa, Oklahoma facility. FQW from the Systech operation will be delivered to the two cement kilns within the Lafarge cement manufacturing process. The new FQW facility includes two (2) 180,000-gallon tanks and the associated pumping system to deliver FQW to the burner pipes of the two cement kilns, and the associated truck unloading facilities.

Systech has retained Schreiber, Yonley & Associates (SYA) to complete the RCRA new tank system certification for the new tank system. This report covers the equipment and system up to the Systech property line; a separate report for the portion of the system located on the Lafarge property is provided under separate cover. The tank assessment and certification has been completed in accordance with the provisions of 40 CFR 264.192. The P.E. stamped certification report is enclosed with this letter.

I, Robert J. Schreiber, Jr., P.E, an Oklahoma Registered Professional Engineer, hereby certify that the facility has been constructed or modified in compliance with the Permit.

Sincerely,

SCHREIBER, YONLEY & ASSOCIATES

Robert J. Schreiber, Jr., P.E.  
President

GSK:bah
Enclosure
X:\LPG\TUL\110249 - Engineering Certification\Systech coverletter.doc
RESOURCE CONSERVATION AND RECOVERY ACT
40 CFR PART 265, SUBPART J
TANK SYSTEM CONSTRUCTION CERTIFICATION
FOR
SYSTECH ENVIRONMENTAL CORPORATION
TULSA, OKLAHOMA

JANUARY 27, 2012

Prepared for:

SYSTECH ENVIRONMENTAL CORPORATION
3085 WOODMAN DR.
DAYTON, OHIO 45420

Project No. 110249
# TABLE OF CONTENTS

PROFESSIONAL ENGINEERING CERTIFICATION ................................................................. ii

1.0 INTRODUCTION .............................................................................................................. 1

2.0 SCOPE ........................................................................................................................ 1

3.0 REGULATORY REFERENCE .......................................................................................... 1

4.0 DESIGN REVIEW (40 CFR 264.192(A)) ................................................................. 2
   4.1 Design Standards (40 CFR 264.192(a)(1)) ................................................................. 2
   4.2 Hazardous Waste Characteristics (40 CFR 264.192(a)(2)) ...................................... 2
   4.3 Soil and Water Contact (40 CFR 264.192(a)(3)) .................................................... 2
   4.4 Vehicular Traffic Issues (40 CFR 264.192(a)(4)) .................................................... 3
   4.5 Design Considerations (40 CFR 264.192(a)(5)) .................................................... 3
      4.5.1 Tank Foundation Design (40 CFR 264.192(a)(5)(i)) ........................................ 3
      4.5.2 Tank Anchoring Systems (40 CFR 264.192(a)(5)(ii)) ..................................... 3
      4.5.3 Frost Heave Calculations (40 CFR 264.192(a)(5)(iii)) .................................... 4

5.0 INSTALLATION REVIEW (40 CFR 264.192(B)) ....................................................... 4

6.0 UNDERGROUND TANK BACKFILLING PROVISIONS (40 CFR 264.192(C)) .... 4

7.0 TANK TIGHTNESS TESTING (40 CFR 264.192(D)) ................................................ 4

8.0 ANCILLARY EQUIPMENT PROTECTION (40 CFR 264.192(E)) ............................ 4

9.0 TANK SYSTEM CORROSION PROTECTION (40 CFR 264.192(F)) ....................... 5

10.0 TANK DESIGN AND INSTALLATION CERTIFICATION (40 CFR 264.192(G)).. 5

## APPENDICES

APPENDIX A FACILITY MAPS
APPENDIX B REGULATORY REFERENCES
APPENDIX C PREVIOUS TANK FARM ASSESSMENT AND CERTIFICATION
APPENDIX D TANK TIGHTNESS TEST RECORD
APPENDIX E PIPING SYSTEM TIGHTNESS TEST RECORDS
APPENDIX F TANK AS-BUILT DRAWINGS
STATEMENT OF CERTIFICATION

I certify that I have examined the design and installation of liquid fuel quality waste (FQW) systems located at the Systech Environmental facility in Tulsa, Oklahoma. My duty was to provide an engineering assessment of these systems as they relate to the applicable engineering guidance for such systems. Based on the information provided and the assessment performed herein, I certify this system was designed and constructed in accordance with the stated engineering guidance documents. Where the design and construction were not completed in accordance with the applicable engineering guidance, appropriate ongoing testing and evaluations have been added. Therefore, based on the attached assessment, the FQW system is safe to operate in its intended use.

The information and engineering assessment presented in this report are the result of field investigations, a representative data search, and sound engineering practices and judgment. Additionally, this assessment is made solely on the information collected and reported to Schreiber, Yonley & Associates (SYA) by either verbal accounts, existing reports, or existing design and construction documents.

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

January 27, 2023
Date

[Signature]

[Seal]

Schreiber, Yonley & Associates
Company

16252 Westwoods Business Park Drive, Ellisville MO 63021
Address
1.0 INTRODUCTION

Lafarge Building Materials, Inc., (Lafarge) owns and operates a cement manufacturing facility located in Tulsa, Oklahoma. Appendix A contains maps of the facility location. This facility uses various fuel materials as part of its cement manufacturing process. The company desires to also be able to use fuel quality waste (FQW) as one of the fuels. Systech Environmental Corporation (Systech) has constructed a FQW tank system on property that Systech owns within the Lafarge cement plant to be able to receive, prepare, and transfer the FQW to the Lafarge cement kilns. The FQW is transported to the facility in tanker trucks. Once on-site and approved for unloading, the FQW in these containers is transferred to storage tanks for eventual use as fuel for the cement kilns. The unloading and blending facility operates two (2) 180,000-gallon storage tanks for the management of FQW.

Since these new tank systems are intended to manage material classified as hazardous wastes, as defined in 40 CFR Part 261, Identification and Listing of Hazardous Waste, a certification of the new tank systems must be performed under the requirements of the Resource Conservation and Recovery Act (RCRA). Both the Systech and Lafarge facilities are permitted as treatment, storage, and disposal facilities (TSDF), as defined in 40 CFR Part 264. Therefore, the tank certification requirements are located in Subpart J, Tank System, of this part. This report addresses only that equipment located within the Systech property boundaries; a similar report for the ancillary equipment located within the Lafarge property boundaries is provided under separate cover. The Systech property line extends approximately 50 feet to the south, east and west of the storage areas, plus north of the tank farm in order to incorporate the new Systech office building. The new tank system and the transfer piping are considered new units, and the applicable certification is found in 40 CFR 264.192.

2.0 SCOPE

Systech has retained Schreiber, Yonley & Associates (SYA) to complete a RCRA new tank system certification for the new tank system and piping as described above. The tank construction assessment and certification has been completed in accordance with the provisions of 40 CFR 264.192 only.

3.0 REGULATORY REFERENCE

This tank system certification is based on the permitted regulations in place at the time of certification and as detailed in 40 CFR 264.192. A copy of the applicable text is included in Appendix B. Specifically, the assessment includes:

- a description and review of the design criteria used for the new tank system;
- a review of the hazardous waste characteristics in reference to the tank system’s materials of construction;
- an assessment of any corrosion potential for the tank system due to contact with soil or water;
- a review of vehicular traffic patterns that could damage any of the tank system components; and
• an assessment of other design considerations specifically included in the regulation.

4.0 DESIGN REVIEW (40 CFR 264.192(a))

The following sections provide the detail of the various tank assessment and certification areas reviewed.

4.1 Design Standards (40 CFR 264.192(a)(1))

The new FQW tanks are designed and is maintained in accordance with the provisions of American Petroleum Institute (API) Design and Construction of Large, Welded, Low-Pressure Storage Tanks (API Standard 620), Eleventh Edition (2008). The two (2) 180,000–gallon tanks’ design specifications were developed by Service and Technology Corporation and the tanks were constructed by ATEC Steel, Baxter Springs, Kansas.

The ancillary piping systems were designed in accordance with the specifications of the ASME Code B31.3, Process Piping (ASME B31.3), Revised 2002. The individual components of ancillary piping system such as valves, flanges, etc. are designed in accordance with various design standards and are included on the system drawings and certifications maintained at the facility and within the ASME specifications.

4.2 Hazardous Waste Characteristics (40 CFR 264.192(a)(2))

The FQW material is a mixture of organic compounds that have a high heat value, making them ideal for use as a fuel for the process. These materials primarily comprise organic solvents and oils taken from various industrial facilities. A typical component profile for the FQW can be found in the facility’s Resource Conservation and Recovery Act Permit Application. Included in Appendix C is the original Tank Design Certification, in which Appendix E of that document lists the typical FQW composition.

In accordance with data found in Table 23-2, Detailed Corrosion Data on Construction Materials, of Perry’s Chemical Engineering Handbook, Sixth Edition, and the National Association of Corrosion Engineers (NACE), Corrosion Data Survey – Metals Section, the materials of construction for the tank and ancillary equipment (various grades of carbon steel) are found to be compatible with the organic constituents typically found in the FQW. For all significant FQW materials available in the table and at the expected maximum temperature range of the tank, the expected corrosion rate was found to be <0.02 inches per year. As a precaution, thickness testing of the tank shell is performed annually to confirm that the specified corrosion allowance is maintained.

4.3 Soil and Water Contact (40 CFR 264.192(a)(3))

The tanks are designed and constructed within concrete containment structures to eliminate any contact with the soil. Additionally the tanks are elevated above the containment floor by approximately 18 inches. As detailed in the RCRA Part B permit and in accordance with 40 CFR 264.193(c)(4), any accumulated precipitation within the
containment structures will be removed within twenty-four (24) hours, or as quickly as reasonably possible. Therefore, any accumulated water will not result in an accelerated tank corrosion rate.

All ancillary equipment associated with the modification of the new tank system is located above ground in overhead pipe racks above the level of any accumulated precipitation. Therefore, soil and water contact is not likely and will not result in an accelerated equipment corrosion rate.

In addition, a proper coating is maintained on all portions of the tank systems to further inhibit corrosion.

4.4 **Vehicular Traffic Issues (40 CFR 264.192(a)(4))**

SYA reviewed the tank system design and construction to determine whether current traffic patterns could pose a danger to any above ground portion of the tank systems. SYA has determined that where the pipeline crosses vehicular traffic patterns, the piping system is elevated such as to minimize any potential damage. The pipe rack is sloped to drain back to the tank farm from the kiln burner floor causing the pipes to be about 15 feet above grade near the tank farm where truck traffic will normally pass under the pipe rack, rising to about 20 feet above grade where near the kiln. These heights are believed to be adequate to prevent damage by traffic.

4.5 **Design Considerations (40 CFR 264.192(a)(5))**

The following are additional design considerations that were reviewed in order to complete the RCRA tank system certification. Drawings showing the various design items are included in the facility record.

4.5.1 **Tank Foundation Design (40 CFR 264.192(a)(5)(i))**

The concrete tank foundation design was completed by Tank Consultants, Inc. The initial design of the agitator structural steel support on each tank was completed by Tank Consultants, Inc. which included a design where the structural steel was supported on the tank pedestal and attached to the tank. When the detailed tank construction drawings were developed, the tank manufacturer, ATEC Steel, modified this design to shorten the steel support by about 3 feet so that the steel was not supported on the tank pedestal foundation. The as-built drawing with the revised design has been stamped. revised structural steel design calculations are included in Appendix F.

4.5.2 **Tank Anchoring Systems (40 CFR 264.192(a)(5)(ii))**

The anchoring system design was incorporated into the steel tank support structure by ATEC Steel.
4.5.3 **Frost Heave Calculations (40 CFR 264.192(a)(5)(iii))**

The tank foundations are built on bed rock. The EST Geotechnical Engineering Services Report dated April 9, 2010, section 6.5, included the following statement regarding frost heave:

“To provide frost heave protection, reduce the amount of shrink/swell potential, and provide adequate confinement of the bearing materials, footings should be located at least 2.0 feet below final outside grade. Formed continuous footings should have a minimum width of 18 inches. Earth formed continuous footings should have a minimum width of 18 inches. Isolated column footings should have a minimum width of 30 inches.”

5.0 **INSTALLATION REVIEW (40 CFR 264.192(b))**

SYA completed a visual review of the tank systems, as specified in the regulation. As guidance, SYA utilized inspection records to complete the review of the tank systems. SYA found the applicable tank systems to be free of weld breaks, punctures, damage to protective coatings, cracks, corrosion, structural damage, and inadequate construction/installation.

6.0 **UNDERGROUND TANK BACKFILLING PROVISIONS (40 CFR 264.192(c))**

No portions of the tank system or ancillary equipment are located underground, so backfilling provisions are not required. No other underground components are present in the new tank systems being reviewed and certified by this report.

7.0 **TANK TIGHTNESS TESTING (40 CFR 264.192(d))**

The new storage tanks are designed for an operating pressure of 2 psi as shown in the drawings in the Attachment C previous tank design certification. Appropriate pressure test records for the tanks are included in Appendix D.

8.0 **ANCILLARY EQUIPMENT PROTECTION (40 CFR 264.192(e))**

As detailed in the tank system inspection records located in the engineering certification completed by SYA, the ancillary equipment was found to be adequately supported and protected from damage. In addition, the piping systems are designed and anchored to minimize system vibration and thermal expansion/contraction. The piping systems were designed and installed in accordance with the provisions of ASME B31.3. The entire piping system is designed, constructed, tested and therefore certified to a maximum operating pressure of 150 psi. Appropriate pressure test records for the ancillary piping systems are included in Appendix D. The piping was tested by pressuring up the system using the applicable pumps, then the pressure was augmented using compressed air to achieve the system test pressure.
9.0 **TANK SYSTEM CORROSION PROTECTION (40 CFR 264.192(f))**

As stated in Section 4.3, the tank systems are not expected to contact soil or water in a manner that will accelerate the corrosion rate. Therefore, only minimal corrosion protection is required. The piping systems and tanks are protected with a protective paint/coating.

10.0 **TANK DESIGN AND INSTALLATION CERTIFICATION (40 CFR 264.192(g))**

Systech will maintain this RCRA certification and all other written statements by those who have designed and constructed the above described tank system. Specifically, the following table describes the entity responsible for the various system designs and construction activities.

<table>
<thead>
<tr>
<th>Description</th>
<th>Design / Construction</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Piping Systems</td>
<td>Design</td>
<td>Equipment Pro</td>
</tr>
<tr>
<td>Storage Tanks</td>
<td>Design</td>
<td>Tank Consultants, Inc.</td>
</tr>
<tr>
<td>Foundation Design</td>
<td>Design</td>
<td>Tank Consultants, Inc.</td>
</tr>
<tr>
<td>Storage Tanks</td>
<td>Construction</td>
<td>ATEC Steel</td>
</tr>
<tr>
<td>Operational Process Control Design</td>
<td>Design/Construction</td>
<td>Equipment Pro</td>
</tr>
<tr>
<td>Process Piping Systems</td>
<td>Construction</td>
<td>Hawk Construction Company</td>
</tr>
<tr>
<td>Storage Tank Erection</td>
<td>Construction</td>
<td>Hawk Construction Company</td>
</tr>
<tr>
<td>Electrical / Instrument Installation</td>
<td>Construction</td>
<td>Hawk Construction Company</td>
</tr>
</tbody>
</table>
APPENDIX A

FACILITY MAPS
APPENDIX B

REGULATORY REFERENCES
§264.192 Design and installation of new tank systems or components

(a) Owners or operators of new tank systems or components must obtain and submit to the Regional Administrator, at time of submittal of part B information, a written assessment, reviewed and certified by a qualified Professional Engineer, in accordance with §270.11(d) of this chapter, attesting that the tank system has sufficient structural integrity and is acceptable for the storing and treating of hazardous waste. The assessment must show that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the tank system has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail. This assessment, which will be used by the Regional Administrator to review and approve or disapprove the acceptability of the tank system design, must include, at a minimum, the following information:

(1) Design standard(s) according to which tank(s) and/or the ancillary equipment are constructed;

(2) Hazardous characteristics of the waste(s) to be handled;

(3) For new tank systems or components in which the external shell of a metal tank or any external metal component of the tank system will be in contact with the soil or with water, a determination by a corrosion expert of:

(i) Factors affecting the potential for corrosion, including but not limited to:

(A) Soil moisture content;

(B) Soil pH;

(C) Soil sulfides level;

(D) Soil resistivity;

(E) Structure to soil potential;

(F) Influence of nearby underground metal structures (e.g., piping);

(G) Existence of stray electric current;

(H) Existing corrosion-protection measures (e.g., coating, cathodic protection), and

(ii) The type and degree of external corrosion protection that are needed to ensure the integrity of the tank system during the use of the tank system or component, consisting of one or more of the following:
(A) Corrosion-resistant materials of construction such as special alloys, fiberglass reinforced plastic, etc.;

(B) Corrosion-resistant coating (such as epoxy, fiberglass, etc.) with cathodic protection (e.g., impressed current or sacrificial anodes); and

(C) Electrical isolation devices such as insulating joints, flanges, etc.

[Note: The practices described in the National Association of Corrosion Engineers (NACE) standard, “Recommended Practice (RP-02-85)-Control of External Corrosion on Metallic Buried, Partially Buried, or Submerged Liquid Storage Systems,” and the American Petroleum Institute (API) Publication 1632, “Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems,” may be used, where applicable, as guidelines in providing corrosion protection for tank systems.]

(4) For underground tank system components that are likely to be adversely affected by vehicular traffic, a determination of design or operational measures that will protect the tank system against potential damage; and

(5) Design considerations to ensure that:

(i) Tank foundations will maintain the load of a full tank;

(ii) Tank systems will be anchored to prevent flotation or dislodgment where the tank system is placed in a saturated zone, or is located within a seismic fault zone subject to the standards of §264.18(a); and

(iii) Tank systems will withstand the effects of frost heave.

(b) The owner or operator of a new tank system must ensure that proper handling procedures are adhered to in order to prevent damage to the system during installation. Prior to covering, enclosing, or placing a new tank system or component in use, an independent, qualified, installation inspector or a qualified Professional Engineer, either of whom is trained and experienced in the proper installation of tanks systems or components, must inspect the system for the presence of any of the following items:

(1) Weld breaks;

(2) Punctures;

(3) Scraps of protective coatings;

(4) Cracks;

(5) Corrosion;

(6) Other structural damage or inadequate construction/installation.
All discrepancies must be remedied before the tank system is covered, enclosed, or placed in use.

(c) New tank systems or components that are placed underground and that are backfilled must be provided with a backfill material that is a noncorrosive, porous, homogeneous substance and that is installed so that the backfill is placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported.

(d) All new tanks and ancillary equipment must be tested for tightness prior to being covered, enclosed, or placed in use. If a tank system is found not to be tight, all repairs necessary to remedy the leak(s) in the system must be performed prior to the tank system being covered, enclosed, or placed into use.

(e) Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.


(f) The owner or operator must provide the type and degree of corrosion protection recommended by an independent corrosion expert, based on the information provided under paragraph (a)(3) of this section, or other corrosion protection if the Regional Administrator believes other corrosion protection is necessary to ensure the integrity of the tank system during use of the tank system. The installation of a corrosion protection system that is field fabricated must be supervised by an independent corrosion expert to ensure proper installation.

(g) The owner or operator must obtain and keep on file at the facility written statements by those persons required to certify the design of the tank system and supervise the installation of the tank system in accordance with the requirements of paragraphs (b) through (f) of this section, that attest that the tank system was properly designed and installed and that repairs, pursuant to paragraphs (b) and (d) of this section, were performed. These written statements must also include the certification statement as required in §270.11(d) of this chapter.

APPENDIX C

PREVIOUS NEW TANK SPECIFICATION AND CERTIFICATION
RESOURCE CONSERVATION AND RECOVERY ACT
40 CFR PART 264, SUBPART J
NEW TANK SPECIFICATION CERTIFICATION
FOR
SYSTECH ENVIRONMENTAL CORP.
TULSA, OKLAHOMA

JUNE 30, 2009

PREPARED FOR:

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ELLISVILLE, MO 63021

PROJECT NO. 080141
TABLE OF CONTENTS

PROFESSIONAL ENGINEERING CERTIFICATION............................................................. ii

1.0 INTRODUCTION.............................................................................................................. 1

2.0 SCOPE .......................................................................................................................... 1

3.0 REGULATORY REFERENCE ..................................................................................... 1

4.0 DESIGN REVIEW (40 CFR 264.192(A)) ................................................................. 2
  4.1 Design Standards (40 CFR 264.192(a)(1)) ............................................................... 2
  4.2 Hazardous Waste Characteristics (40 CFR 264.192(a)(2)) ................................. 2
  4.3 Soil and Water Contact (40 CFR 264.192(a)(3)) .................................................... 3
  4.4 Vehicular Traffic Issues (40 CFR 264.192(a)(4)) .................................................... 3
  4.5 Design Considerations (40 CFR 264.192(a)(5)) .................................................... 3
    4.5.1 Tank Foundation Design (40 CFR 264.192(a)(5)(i)) .................................... 3
    4.5.2 Tank Anchoring Systems (40 CFR 264.192(a)(5)(ii)) ................................. 3
    4.5.3 Frost Heave Calculations (40 CFR 264.192(a)(5)(iii)) .............................. 3

APPENDICES

APPENDIX A FACILITY MAP
APPENDIX B TANK SYSTEM DRAWINGS
APPENDIX C REGULATORY REFERENCE
APPENDIX D SERVICE & TECHNOLOGY CORPORATION DESIGN SPECIFICATIONS
APPENDIX E HAZARDOUS WASTE CONSTITUENT DATA
PROFESSIONAL ENGINEERING CERTIFICATION

Based on the information provided and documented in this report and in accordance with the provisions of 40 CFR 264.192, I certify that the new tank system specifications as described herein are adequate to manage the materials to be stored and processed in it. I also certify that, based on the information provided, the specified materials of construction are compatible with the wastes to be stored and processed in the system and that adequate corrosion protection has been specified for the tank systems.

I certify under penalty of law that this document and all attachments were prepared under my direction and supervision according to 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 and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

______________________________
Robert J. Schreiber, Jr., P.E., Q.E.P.
Oklahoma Registration PE-17697


**1.0 INTRODUCTION**

Systech Environmental Corporation (Systech) will own and operate a fuels blending facility within the Lafarge Building Materials, Inc. (Lafarge) cement manufacturing facility located in Tulsa, Oklahoma. Appendix A contains a map of the facility location. This facility is proposing to use fuel quality waste (FQW) as part of the Lafarge cement manufacturing process. The FQW is transported to the facility in tanker trucks. Once on site and approved for unloading, the FQW is transferred to storage tanks for eventual feeding to the cement kilns as a fuel. Systech is proposing to operate a system for unloading, transfer, and storage of FQW in a system to include two (2) 180,000-gallons storage tanks and associated equipment.

In addition to the tank units, ancillary equipment such as process piping, vent piping, pumps, and monitoring equipment will be designed and installed. A schematic of the FQW system is included in Appendix B. The secondary containment calculations for the tank system are also included in Appendix B.

Since these new tank systems are to manage material classified as hazardous wastes, as defined in 40 CFR Part 261, Identification and Listing of Hazardous Waste, a certification of the tank system must be performed under the requirements of the Resource Conservation and Recovery Act (RCRA). The Tulsa facility is to be permitted as a treatment, storage, and disposal facility (TSDF), as defined in 40 CFR Part 264; therefore, the tank certification requirements are located in Subpart J, Tank System, of this part. The identified tank systems are new units, and the application certification is found in 40 CFR 264.192.

**2.0 SCOPE**

Lafarge and Systech have retained Schreiber, Yonley & Associates (SYA) to complete a RCRA new tank system design specification certification for the new tank system described above. This assessment and certification does not extend to any existing tank system already in place at the facility. The tank assessment and certification is completed in accordance with the provisions of 40 CFR 264.192 only.

At this time, the design of the tank system is not complete but the standards to which the tank system will be designed have been developed. Therefore, in order to meet the requirements of §264.192, the following certifications will be completed.

- This design specification certification.
- The final design certification.
- Construction and installation certification prior to placing the tank system in service.

**3.0 REGULATORY REFERENCE**

This tank system certification is based on the regulations in place at the time of construction and as found in 40 CFR 264.192. A copy of the applicable text is included in Appendix C. Specifically, the assessment includes:

- a description and review of the design criteria used for the new tank system;
• a review of the hazardous waste characteristics in reference to the tank system’s materials of construction;
• an assessment of any corrosion potential for the tank system due to contact with soil or water;
• a review of vehicular traffic patterns that could damage any of the tank system components; and
• an assessment of other design considerations specifically included in the regulation.

4.0 DESIGN REVIEW (40 CFR 264.192(a))

The following sections provide the detail of the various tank assessment and certification areas reviewed.

4.1 Design Standards (40 CFR 264.192(a)(1))

The tanks’ design has been specified as being in accordance with the American Petroleum Institute (API) Standard 620, Design and Construction of Large, Welded, Low-Pressure Storage Tanks, Eleventh Edition, February 2008. The design specifications have been provided by Service and Technology Corporation and are included in Appendix D.

The ancillary piping systems will be designed in accordance with the specifications of the American Society of Mechanical Engineers (ASME) Code B31.3, Process, Piping, Revised 2002.

4.2 Hazardous Waste Characteristics (40 CFR 264.192(a)(2))

The FQW material is a mixture of organic compounds that have a high heat value, making them ideal for use as a fuel for the process. These materials primarily comprise organic solvents, coatings, resins and oils taken from various industrial facilities. A typical component profile for the FQW was taken from the facility’s Resource Conservation and Recovery Act Permit Application and is included in Appendix E of this certification. FQW must not exhibit the characteristic of corrosivity or reactivity.

In accordance with data found in Table 23-3, Detailed Corrosion Data on Construction Materials, of Perry’s Chemical Engineering Handbook, Fifth Edition, the materials of construction for the tanks and ancillary equipment (carbon steel) is found to be compatible with the organic constituents typically found in the FQW. For all significant FQW materials available in the table and at the expected maximum temperature range of the tank, the expected corrosion rate was found to be <0.02 inch per year.

As a precaution, pH testing of the FQW is performed to ensure that the FQW remains within the permitted limitations and therefore compatible with these materials of construction to minimize any corrosion.
4.3 **Soil and Water Contact (40 CFR 264.192(a)(3))**

The new tank system has been designed for the tanks to sit on an elevated concrete pad within a concrete containment structure that eliminates any contact with the soil (as shown on the drawings in Appendix B). In accordance with 40 CFR 264.193(c)(4), any accumulated precipitation within the containment structure will be removed with twenty-four (24) hours of discovery or in as timely a manner as possible. Therefore, any accumulated water will not result in an accelerated tank corrosion rate.

All ancillary equipment in the tank system is to be located above the ground in pipe racks above the level of any accumulated precipitation. Therefore, soil and water contact is not likely and will not result in an accelerated equipment corrosion rate.

In addition, proper coating has been specified on all portions of the tank system to further inhibit corrosion. The specification for the tank coating is included in Appendix D.

4.4 **Vehicular Traffic Issues (40 CFR 264.192(a)(4))**

No portion of the new tank system is located underground.

4.5 **Design Considerations (40 CFR 264.192(a)(5))**

The following are additional design considerations that were reviewed in order to complete the RCRA tank system certification.

4.5.1 **Tank Foundation Design (40 CFR 264.192(a)(5)(i))**

The tank foundation design calculations are to be included in the final design certification. The foundation specifications are included in Appendix D.

4.5.2 **Tank Anchoring Systems (40 CFR 264.192(a)(5)(ii))**

The anchoring system design standard is included in Appendix D. The seismic considerations are included in Appendix D. The anchoring system design will be included in the final design certification.

4.5.3 **Frost Heave Calculations (40 CFR 264.192(a)(5)(iii))**

Frost heave calculations will be completed and included with the final design certification for the tank system.
APPENDIX B

TANK SYSTEM DRAWINGS
FIGURE D–3 TANK CONTAINMENT AND TRUCK OFF-LOAD SECTIONS
Tank Dike Secondary Containment Calculations

**Gross Volume of Tank Dike** plus 2 sumps (assumes no sloped floor):

- Two sumps = 4’ x 4’ x 5’ x 3 = 240 cu. ft = 1,197 gallons
- Dike inside width = 55 feet
- Dike inside length = 149 feet (each FQW tank = 65 feet plus 19 feet for stormwater tanks)
- Dike maximum depth = (5’-2.9”) feet = 5.24 feet
- Total Volume (without deducting sloped floor) = (55 x 149 x 5.24) + 160 cu. ft. = 43,182 cu. ft. = 323,001 gallons

**Less displacement:**

Sloped floor at FQW tanks (floor slopes at .25” per foot from adjacent corners to each sump forming 2 triangular wedges within each half of the dike area).

The volume of the concrete wedges can be estimated using the volume of a pyramid formula (area of base times height divided by 3) as follows:

- Elevation at 3 corners other than sump in each half = 1.24 feet above sump elevation
- The volume of the 4 concrete wedges = ½ of the volume of a slab 110 ft by 130 ft by 1.24 ft less ½ the volume of a pyramid 110 ft by 130 ft by 1.24 ft.
  
  \[
  \frac{((110 \times 130 \times 1.24) - (110 \times 130 \times 1.24 \div 3))}{2} = 5,910.7 \text{ cubic feet} = 44,212 \text{ gallons}
  \]

Sloped floor at stormwater tanks:

- Length = 19 feet
- Width = 55 feet
- Slope elevation = 5.25 feet – 4 feet = 1.25 feet
- Volume of concrete wedge = 19 x 55 x 1.25 x .5 = 653 cu. ft. = 4,885 gallons

Two FQW tank pads:

- Tank base diameter = 34 feet
- Tank pad height = 1.5 foot above sump elevation (ignores portion of pad within the wedges)
- Tank Base displacement volume = \(2 \times 1.5 \times \pi \times 34 \times 34 / 4 = 2,723.8 \text{ cu. ft.} = 20,374 \text{ gallons}\)

**Base of 1 FQW tank** (the other is assumed to be the leaking tank):
- Tank diameter = 32.0 feet
- Height of tank within containment zone = \((5.24 - 1.5) = 3.74 \text{ feet}\)
- Volume of bottom of tank = \(3.74 \times \pi \times 32 \times 32 / 4 = 3,007.9 \text{ cu. ft.} = 22,499 \text{ gallons}\)

**Base of 2 stormwater tanks (assume flat bottom on the floor)**:
- Tank diameter = 12 feet
- Average height of tank within containment zone = \((4 + 75\% \text{ of } 1.25) = 4.9 \text{ feet}\)
- Volume of bottom of tanks = \(4.9 \times \pi \times 12 \times 12 / 4 \times 2 = 1,108 \text{ cu. ft.} = 8,290 \text{ gallons}\)

**Two divider walls (assume top is level)**:
- Divider walls width = 8 inches = 0.67 feet
- Divider walls length = 55 feet
- Top of divider walls above sump elevation = 18 inches
- Volume of divider walls = \(2 \times 0.67 \times 55 \times 1.5 = 110 \text{ cu ft} = 827 \text{ gal.}\)

**Rainwater Volume**
- 24-hour, 25-year precipitation = 7.1 inches
- Volume = \(55 \times 149 \times 7.1 / 12 = 4,8494 \text{ cubic feet} = 36,268 \text{ gallons}\)

**Net secondary containment**
- Volume = \(323,001 - 44,212 - 4,885 - 20,374 - 22,499 - 8,290 - 827 - 36,268 = 185,646 \text{ gallons}\)

**Volume of largest tank**
- Tank diam. = 32 feet
- Tank height = 30 feet
- Tank volume = \(\pi \times 32 \times 32 / 4 \times 30 = 24,127 \text{ cubic feet} = 180,470 \text{ gallons}\)

**Adequacy Determination**
- Since available containment of 185,646 gallons > 180,470 gallons tank volume, dike dimensions provide adequate secondary containment.
APPENDIX C

REGULATORY REFERENCES
§ 264.192 Design and installation of new tank systems or components.

(a) Owners or operators of new tank systems or components must obtain and submit to the Regional Administrator, at time of submittal of part B information, a written assessment, reviewed and certified by a qualified Professional Engineer, in accordance with §270.11(d) of this chapter, attesting that the tank system has sufficient structural integrity and is acceptable for the storing and treating of hazardous waste. The assessment must show that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the tank system has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail. This assessment, which will be used by the Regional Administrator to review and approve or disapprove the acceptability of the tank system design, must include, at a minimum, the following information:

1. Design standard(s) according to which tank(s) and/or the ancillary equipment are constructed;

2. Hazardous characteristics of the waste(s) to be handled;

3. For new tank systems or components in which the external shell of a metal tank or any external metal component of the tank system will be in contact with the soil or with water, a determination by a corrosion expert of:
   
   (i) Factors affecting the potential for corrosion, including but not limited to:
      
      (A) Soil moisture content;
      
      (B) Soil pH;
      
      (C) Soil sulfides level;
      
      (D) Soil resistivity;
      
      (E) Structure to soil potential;
      
      (F) Influence of nearby underground metal structures (e.g., piping);
      
      (G) Existence of stray electric current;
      
      (H) Existing corrosion-protection measures (e.g., coating, cathodic protection), and

   (ii) The type and degree of external corrosion protection that are needed to ensure the integrity of the tank system during the use of the tank system or component, consisting of one or more of the following:
(A) Corrosion-resistant materials of construction such as special alloys, fiberglass reinforced plastic, etc.;

(B) Corrosion-resistant coating (such as epoxy, fiberglass, etc.) with cathodic protection (e.g., impressed current or sacrificial anodes); and

(C) Electrical isolation devices such as insulating joints, flanges, etc.

[Note: The practices described in the National Association of Corrosion Engineers (NACE) standard, “Recommended Practice (RP–02–85)—Control of External Corrosion on Metallic Buried, Partially Buried, or Submerged Liquid Storage Systems,” and the American Petroleum Institute (API) Publication 1632, “Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems,” may be used, where applicable, as guidelines in providing corrosion protection for tank systems.]

(4) For underground tank system components that are likely to be adversely affected by vehicular traffic, a determination of design or operational measures that will protect the tank system against potential damage; and

(5) Design considerations to ensure that:

   (i) Tank foundations will maintain the load of a full tank;

   (ii) Tank systems will be anchored to prevent flotation or dislodgment where the tank system is placed in a saturated zone, or is located within a seismic fault zone subject to the standards of §264.18(a); and

   (iii) Tank systems will withstand the effects of frost heave.

(b) The owner or operator of a new tank system must ensure that proper handling procedures are adhered to in order to prevent damage to the system during installation. Prior to covering, enclosing, or placing a new tank system or component in use, an independent, qualified, installation inspector or a qualified Professional Engineer, either of whom is trained and experienced in the proper installation of tanks systems or components, must inspect the system for the presence of any of the following items:

   (1) Weld breaks;

   (2) Punctures;

   (3) Scrapes of protective coatings;

   (4) Cracks;

   (5) Corrosion;

   (6) Other structural damage or inadequate construction/installation.

All discrepancies must be remedied before the tank system is covered, enclosed, or placed in use.
(c) New tank systems or components that are placed underground and that are backfilled must be provided with a backfill material that is a noncorrosive, porous, homogeneous substance and that is installed so that the backfill is placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported.

(d) All new tanks and ancillary equipment must be tested for tightness prior to being covered, enclosed, or placed in use. If a tank system is found not to be tight, all repairs necessary to remedy the leak(s) in the system must be performed prior to the tank system being covered, enclosed, or placed into use.

(e) Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.


(f) The owner or operator must provide the type and degree of corrosion protection recommended by an independent corrosion expert, based on the information provided under paragraph (a)(3) of this section, or other corrosion protection if the Regional Administrator believes other corrosion protection is necessary to ensure the integrity of the tank system during use of the tank system. The installation of a corrosion protection system that is field fabricated must be supervised by an independent corrosion expert to ensure proper installation.

(g) The owner or operator must obtain and keep on file at the facility written statements by those persons required to certify the design of the tank system and supervise the installation of the tank system in accordance with the requirements of paragraphs (b) through (f) of this section, that attest that the tank system was properly designed and installed and that repairs, pursuant to paragraphs (b) and (d) of this section, were performed. These written statements must also include the certification statement as required in §270.11(d) of this chapter.

APPENDIX D

SERVICE & TECHNOLOGY CORPORATION
TANK SPECIFICATIONS AND STANDARDS
Report of Findings, Specifications and Standards

DATE: May 7, 2009
SUBJECT: Tank System Design Factors, STC Project #09064
CUSTOMER: Systech Environmental Corporation
LOCATION: LaFarge North America – Tulsa Plant

SCOPE:
Submittal of a report to Systech Environmental Corporation (Systech) with a list of the industry established engineering design standards appropriate for establishing the design criteria for the proposed Fuel Tank Additions for LaFarge (Tulsa), as specified by Systech and listed herein.

CLARIFICATIONS:
1. The tank system is to be designed in accordance with API Standard 620. The tanks described in this standard are designed for metal temperatures not greater than 250 F and with pressures in their gas or vapor spaces not more than 15 pounds per square inch gauge.
2. Basic design wind speed is assumed to be 90 mph, per IBC 2006 or ASCE7-05.
3. In addition to the design criteria submitted to STC by Systech, STC has added “Containments plan” and “Wind speed design” to the list of criteria and evaluated the governing design standard appropriate for each.

OBservations and Comments
4. Geotechnical borings data and reports will be required for determining the design allowables of the area soils.
5. Calculations for determining truck containment area depths have yet to be completed at this time.
6. It is advised that vertical steel X-bracing be integrated in the side walls of the truck covered structure and bracing be revised/added in the End Elevation View (End & Side Elevations, Systech Dwg. No. 11-05P04, entitled “Proposed Burn Tank Additions Truck Cover Elevations).”
7. Weak roof to seam construction is not allowed for API 620 design.
8. The Tulsa Containment Volume Calculations (2 sheets) were confirmed as correct following verbal communication between STC and Systech.

SUBMITTED BY: Doug Bouredeaux
Service & Technology Corporation

**SUMMARY:**

<table>
<thead>
<tr>
<th>Concrete</th>
<th>Engineering design standards appropriate for establishing the design criteria</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Design Standards concerning</td>
<td>ACI 318-08, ASTM C150 &amp; C13</td>
<td>4000 psi min. 28 day strength, Type I/II</td>
</tr>
<tr>
<td>Details</td>
<td>ACI 318-08 AND ACI SP-66</td>
<td>Per ASTM A615, Grade 60</td>
</tr>
<tr>
<td>Seismic considerations</td>
<td>SEU/ASCE 7-05 and SEU/ASCE 7-05 (most severe)</td>
<td></td>
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<tr>
<td>Local and/or state building codes</td>
<td>IBC 2006 AND ANY LOCAL/STATE</td>
<td>VSCIA safety code for a cement plant</td>
</tr>
<tr>
<td>Loadings</td>
<td>ACI 318-08 AND ACI SP-66</td>
<td>For dead, live, wind and seismic</td>
</tr>
<tr>
<td>Bearing strength of soil</td>
<td>IBC 2006 AND GEOTECH INFO.</td>
<td>Based on allowable soil type</td>
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<tr>
<td>Adequate to support full weight of tank</td>
<td>GEOTECH REPORT CRITERIA</td>
<td>Based on allowable soil type</td>
</tr>
<tr>
<td>Water stop standards</td>
<td>NSF CERTIFIED TO SUIT LIQUIDS</td>
<td>Based on solvent resistant material</td>
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<tr>
<td>Anti-cracking</td>
<td>ACI 318-08</td>
<td>Provide min. temp. &amp; shrinkage Resif.</td>
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<tr>
<td>Anchoring to prevent floating</td>
<td>ACI 318-08, Appendix D</td>
<td>Anchors to resist twice buoyancy force</td>
</tr>
<tr>
<td>Tank pad and equipment pedestals</td>
<td>ACI 318-08</td>
<td>Chapter 15, Paragraph 15.7-tanks</td>
</tr>
<tr>
<td>Containment Plan</td>
<td>Title 40, CFR Section 112</td>
<td>EPA, per SPCC Plan for storage tanks</td>
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**Tank System**

<table>
<thead>
<tr>
<th>Basic Design Standards concerning</th>
<th>API 620 Section 3.1.10</th>
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<tbody>
<tr>
<td>Roof type</td>
<td>API 620 Section 3.1.10 &amp; 3.12</td>
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<td>Weak roof to steam construction</td>
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<tr>
<td>Welding standards</td>
<td>API 620 Section 4.4. ASME Sec IX</td>
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<tr>
<td>Numbers, size, and placement of openings</td>
<td>API 620 Sections 3.14 &amp; 3.20</td>
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<tr>
<td>Nozzle design</td>
<td>API 620 Section 3.14 &amp; 3.20</td>
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<td>Agitator support</td>
<td>API 620 Section 3.16</td>
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<tr>
<td>Leak detection</td>
<td>API 306</td>
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<tr>
<td>External coating</td>
<td>PIP CTIE 1000 &amp; CTSE 1000</td>
</tr>
<tr>
<td>Surface selection</td>
<td>Industry Standard Practice</td>
</tr>
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<td>Pressure/vacuum/emergency vent sizing standards</td>
<td>NFPA 30, API 2000</td>
</tr>
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<td>Pressure controls</td>
<td>NFPA 30, API 2000</td>
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<td>API 620 Ap. N, API 650 Section 3.3.10</td>
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<td>API 650 Section 2.1.10</td>
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**Piping System**

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<tr>
<th>Standard sizes and grades</th>
<th>ASME 331.3</th>
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<tr>
<td>Pipe support strength standards</td>
<td>MSS SP-58</td>
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<tr>
<td>Pipe support spacing standards</td>
<td>ASME 331.3</td>
</tr>
<tr>
<td>Welding standards</td>
<td>ASME 331.3 Table 326.1</td>
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<tr>
<td>Flange and gasket standards</td>
<td>ASME 331.3 Table 326.1</td>
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<tr>
<td>Equipment anchoring standards</td>
<td>ACI 318-08, APPENDIX D</td>
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**Tank Cover / Enclosure System**

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<td>Metal building standards</td>
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<tr>
<td>Electrical</td>
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<tr>
<td>Class I, Division 1</td>
<td>NFPA 30, API 500</td>
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<td>Lights levels</td>
<td>DoEIA 1926.54</td>
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<td>Tank venting</td>
<td>API 653, NFPA 30, API 2000</td>
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APPENDIX E

HAZARDOUS WASTE CONSTITUENT DATA
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<th>Compound</th>
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<td>Ethanol</td>
<td>64-17-5</td>
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<tr>
<td>Acetonitrile</td>
<td>75-05-8</td>
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<tr>
<td>Acetone</td>
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<td>Isopropanol</td>
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<td>Ethyl Ether</td>
<td>60-29-7</td>
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<td>Pentane</td>
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<td>Methylene Chloride</td>
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<td>Methyl Ethyl Ketone</td>
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<td>sec-Butanol</td>
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<td>Ethyl acetate</td>
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<td>Tetrahydrofuran</td>
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<td>Hexanes</td>
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<td>Isobutanol</td>
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<td>Isopropyl Acetate</td>
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<td>Cyclohexane</td>
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<td>Trichloroethylene</td>
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<td>Propyl acetate</td>
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<td>Octanes</td>
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<td>Propylene glycol methyl ether acetate</td>
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<td>Methyl isoAmyl Ketone</td>
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<td>Ethyl benzene</td>
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<td>Xylenes</td>
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<td>n-Methyl-2-pyrrolidone</td>
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<td>Aliphatics /Aromatics</td>
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¹Organic data from 2007 analysis of FQW from Systech Fredonia, Kansas.
Typical FQW Analysis (Non-Organic Constituents)\(^1\)

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<th>Parameter</th>
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<tr>
<td>Chlorine (%)</td>
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</tr>
<tr>
<td>Arsenic (ppm)</td>
<td>27.1</td>
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<tr>
<td>Beryllium (ppm)</td>
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<tr>
<td>Cadmium (ppm)</td>
<td>6.1</td>
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<tr>
<td>Chromium (ppm)</td>
<td>61.6</td>
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<tr>
<td>Lead (ppm)</td>
<td>114.1</td>
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<tr>
<td>Mercury (ppm)</td>
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\(^1\)Metals data is the 2008 average of the FQW in Fredonia, Kansas.
SYSTECH ENVIRONMENTAL CORP.

BURN TANK ADDITION
LAFARGE CEMENT PLANT
TULSA, OK

NEW TANKS #1 & #2

April 19, 2010
## STORAGE TANK DATA SHEET

**TCI Services, Incorporated**

### SERVICE
- **BURN TANK**
- **Nominal Capacity 180,485 gal**
- **Working Capacity 150,000 gal**
- **Pumping Rate In N/A gpm**
- **Pumping Rate Out N/A gpm**
- **Heating Coils: None**
- **Bottom Sump: Fixed Roof**
- **Internal Floating Roof (Steel)**
- **External Floating Roof**
- **Manufacturer: Roof Supported by Mud Support Structure**
- **Design Capacity: 2,000 psig**
- **Test Pressure: 2,500 psig**
- **Specific Gravity: 1.00**
- **Operating Temperature: 180 deg F**
- **Vapor Pressure: 0.00 psi**
- **M.O.T. (per API-620 Fig. 4-11): -16 deg F**
- **Corrosion Allowance: 0 in.**
- **Leak Detection: API-620**
- **Lethal Contaminants: Norox Gas**
- **Wind Speed: 90 MPH**
- **Explosion Pressure: 8.00 in./hr.**
- **Earthquake Zone: NGC 7**
- **SITE CLASS D**
- **Total Snow Load: 10.00 lb./ft**
- **Radiography: Full**
- **Structural Bolting: A-325 Galv.**
- **Heat Treat Required: No**

### Materials
- **Shear: A-35**
- **Roof: A-36**
- **Bottom: A-36**
- **Manway gaskets: Non asbestos**
- **Nozzles: A-106-B**
- **Flanges: A-105**
- **Fittings: A-105**
- **Reinforcing Plates: A-36**
- **Pipe: A-106-B**
- **Stainless Steel: S31600**
- **Studs: A-193-87**
- **Nuts: A-194-2H**
- **Miscellaneous Construction Details**
  - **Bottom Plate Thickness:**
  - **0.250 inch**
  - **Seams: Lap**
  - **Top Plate: Double Bottom Plate**
  - **Roof Plate Thickness:**
  - **0.250 inch**
  - **Intermed:**
  - **2,250 inch**
  - **Lap Welded: Compression Ring at intersection**
  - **Nozzle Projection Required**
  - **Per API-650**
  - **Insulation Thickness:**
  - **N/A**
  - **316 Stainless Steel**

### Appurtenances
- **API-650**
- **API-620**
- **NACE MR-01-75**
- **Client**

**REMARKS**
- **Minimum Design Temperature:**
- **Full 15 F per API-620 Section 4.2.5**
- **UT Noodle to Shell & Roof Inspection welds:**
- **Seam Attached Tank Drawings**
- **Hydrotest plus Pneumatic Test at 2.50 psig**
- **Vendor to complete all Data**

**REVISION NO:**
- **0**

**PREP: BY DATE:**
- **R. Davis 04/19/10**

**AUTH: BY DATE:**
CONCRETE AND REINFORCING STEEL NOTES

1. ALL CONCRETE SHALL CONFORM TO LATEST ACI STANDARD 318 "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE".

2. FOUNDATION DESIGN IS BASED ON RECOMMENDATIONS PROVIDED BY EST. GEOTECHNICAL ENGINEERING REPORT 4/9/70.

3. ALL CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH THE RECOMMENDATIONS SPECIFIED THEREIN.

4. REINFORCING STEEL SHALL BE A.S.T.M. A-615, GRADE 60 AND SHALL BE FREE FROM LOOSE FLAKEY RUST, MUD, OIL OR OTHER COATINGS THAT WILL DESTROY THE BOND. ALL BARS SHALL BE DEFORMED UNLESS NOTED.

5. WELDED WIRE FABRIC SHALL CONFORM TO A.S.T.M. A-853 AND A-82 LATEST EDITIONS AND A.C.I.

6. PRECAST EXPANSION JOINT MATERIAL SHALL CONFORM TO A.S.T.M. (175) LATEST EDITION.

7. GROUT SHALL BE HIGH-STRENGTH (MIN. 5000 PSI IN 28 DAYS) AND BE NON-SHRINKING. RUBBAGE CONCRETE SURFACES TO BE GROUTED SHALL FIRST BE SCRAPPED.

8. ALL ANCHOR BOLTS SHALL BE A.S.T.M. A-36 WITH ONE (1) HEAVY HEX NUT ON O.D. A.S.T.M. A-307 & ONE (1) PLAIN WASHER.

9. MINIMUM DISTANCE FROM EDGE OF BAR TO FACE OF CONCRETE SHALL BE 3 INCHES WHERE COVERED AGAINST EARTH AND 1 INCH WHERE FORMED.

10. ALL EXPOSED EDGES SHALL HAVE A 45 DEGREE DAMAHER UNLESS NOTED OTHERWISE ON THE DESIGN DRAWINGS.

11. ALL FLAT FLOOR SLAB SHALL HAVE A STEEL TROLLE FINISH SMOOTH, LEVEL, AND TRUE.

12. CONSTRUCTION JOINTS SHALL BE 2-3/4" DEEP SAW CUTOFF OR KEYED CONSTRUCTION JOINT IN SLABS ON GRADE. SAW CUTS MUST BE MADE WITHIN 12 HOURS AFTER POUR.

13. REINFORCING BAR SPACERS SHALL BE CLASS B SPACER, UNLESS NOTED OTHERWISE ON THE DRAWINGS. ALL TOP REINFORCING SPACES OF STEMMWALLS AND GR AdEBEAMS SHALL OCCUR WITHIN THE MODELS 1/3 SPAN. ALL BOTTOM REINFORCING SPACES OF STEMMWALLS AND GRAdEBEAMS SHALL OCCUR WITHIN A DISTANCE OF 1/4 ON EITHER SIDE OF SUPPORT.

14. UNLESS NOTED OTHERWISE, ALL OPENINGS OVER 4 IN DIAMETER IN SLABS OR GRADE BEAMS SHALL HAVE TWO (2) RIBBARS PLACED ALONG EACH OF THE FOUR SIDES AND SHALL EXTEND 24" PAST THE EDGE OF THE OPENING.

15. THE CONTRACTOR SHALL SUPPORT AND ANCHOR ALL REINFORCEMENT IN ACCORDANCE WITH ACI 318.

16. ALL BACKFILL SHALL BE COMPACTED TO 98% PROCTOR DENSITY PER A.S.T.M. D-698 WITH +4/-3% MOISTURE CONTENT FROM OptIum.

17. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO START OF CONSTRUCTION.

18. BOTTOM OF FOUNDATION SHALL BE PLACED A MINIMUM OF 42" BELOW THE LOWEST EXTERIOR GRADE ELEVATION FOR FROST PROTECTION.

19. FOUNDATION DESIGN IS BASED ON 2500 PSF ALLOWABLE SOIL BEARING PRESSURE.

SIXTEEN (16) 1-1/4" ANCHOR BOLTS REQUIRED EQUALLY SPACED AROUND TANK.
CONCRETE AND REINFORCING STEEL NOTES

1. ALL CONCRETE SHALL CONFORM TO LATEST AGA STANDARD 316 ‘BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE’.
2. FOUNDATION DESIGN IS BASED ON RECOMMENDATIONS PROVIDED BY EST. GEOTECHNICAL ENGINEERING REPORT 4/5/70.
3. ALL CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH THE RECOMMENDATIONS SPECIFIED THEREIN.

CONCRETE SHALL BE TYPE 1 OR 1A AND SHALL HAVE A MINIMUM COMPRSSION STRENGTH OF 4000 PSI IN 28 DAYS FOR FOOTINGS AND SLABS ON GRADE.

4. REINFORCING STEEL SHALL BE A.S.T.M. A-615, GRADE 60 AND SHALL BE FREE FROM LODGE FLAKES, RUST, MUD, OIL OR OTHER COATINGS THAT WILL DESTROY THE BOND. ALL BARS SHALL BE DEFORMED UNLESS NOTED.

5. WELD WIRE FABRIC SHALL CONFORM TO A.S.T.M. A-185 AND A-82 LATEST EDITIONS AND A.C.I.

6. PREFORMED EXPANSION JOINT MATERIAL SHALL CONFORM TO A.S.T.M. D-703 LATEST EDITION.

7. GROUT SHALL BE HIGH-STRENGTH (MIN. 5000 PSI IN 28 DAYS) AND BE NON-SHRINKING. ROUGH CONCRETE SURFACES TO BE GROUTED SHALL FIRST BE SCARRIED.

8. ALL ANCHOR BOLTS SHALL BE A.S.T.M. A-36 WITH ONE (1) HEX NUT PER A.S.T.M. A-307 AND ONE (1) PLAIN WASHER.

9. MINIMUM DISTANCE FORM EDGE OF BAR TO FACE OF CONCRETE SHALL BE 3" WHERE POURED AGAINST EARTH AND 2" WHERE FORMED.

10. ALL EXPOSED EDGES SHALL HAVE A 1" 45 DEGREE CHAMFER UNLESS NOTED OTHERWISE ON THE DESIGN DRAWINGS.

11. ALL FLAT FLOOR SLAB SHALL HAVE A STEEL TROWEL FINISH SMOOTH, LEVEL AND TRUE.

12. CONSTRUCTION JOINTS SHALL BE 2-3/4" DEEP SAW CUT OR KEYED CONSTRUCTION JOINT IN SLABS ON GRADE. SAW CUTS MUST BE MADE WITHIN 12 HOURS AFTER POUR.

13. REINFORCING BAR SPIECES SHALL BE CLASS B SPIECE, UNLESS NOTED OTHERWISE ON THE DRAWINGS. ALL TOP REINFORCING SPIECE OF STEMMWALLS AND GABEDECKS SHALL OCCUR WITHIN THE MIDDLE 1/3 SPAN. ALL BOTTOM REINFORCING SPIECE OF STEMMWALLS AND GABEDECKS SHALL OCCUR WITHIN A DISTANCE OF 1/4 ON EITHER SIDE OF SUPPORT.

14. UNLESS NOTED OTHERWISE, ALL OPENINGS OVER 6" IN DIAMETER IN SLABS OR GRADE BEAMS SHALL HAVE TWO #5 REBARS PLACED ALONG EACH OF THE FOUR SIDES AND SHALL EXTEND 24" PAST THE EDGE OF THE OPENING.

15. THE CONTRACTOR SHALL SUPPORT AND ANCHOR ALL REINFORCEMENT IN ACCORDANCE WITH ACI 318.

16. ALL BACKFILL SHALL BE COMPACTED TO 98% STD PROCTOR DENSITY PER ASTM D-698 WITH +/- 3% MOISTURE CONTENT FROM OPTIMUM.

17. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO START OF CONSTRUCTION.

18. BOTTOM OF FOUNDATION SHALL BE PLACED A MINIMUM OF 2" BELOW THE LOWER EXTERIOR GRADE ELEVATION FOR FROST PROTECTION.

19. FOUNDATION DESIGN IS BASED ON 2500 PSF ALLOWABLE SOIL BEARING PRESSURE.

NOTE: THE FOUNDATION MUST BEAR ON ROCK AT THE SAME ELEVATION ALL AROUND.

Sixteen (16), 1-1/4" anchor bolts required equally spaced around tank.
Certification Statement for Written Assessment for the Design of the Tank System

I attest that I am an independent, qualified, registered professional engineer.

I have reviewed the design of Tanks 1 and 2 and I attest in writing that the tank system has sufficient structural integrity and is acceptable for the storing of hazardous waste.

The design shows that the foundation, structural support, seams, connections, and pressure controls are adequately designed and that the tank system has sufficient structural strength, compatibility with the waste(s) to be stored or treated and corrosion protection to ensure it will not collapse, rupture or fail.

The design includes, at a minimum, the following information:

(1) Design standards according to which the tank is constructed,

(2) Design considerations to ensure that:

(a) Tank foundation will maintain the load of a full tank, and
(b) Tank system will withstand the effects of frost heave.

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

Ron Davis, P.E.
4/19/10
Attachment D-3

Tank Dike Secondary Containment Calculations

Gross Volume of Tank Dike plus 2 sumps (assumes no sloped floor):
- Two sumps = 4’ x 4’ x 5’ x 3 = 240 cu. ft = 1,197 gallons
- Dike inside width = 55 feet
- Dike inside length = 149 feet (each FQW tank = 65 feet plus 19 feet for stormwater tanks)
- Dike maximum depth = (5’-2.9”) feet = 5.24 feet
- Total Volume (without deducting sloped floor) = (55 x 149 x 5.24) + 160 cu. ft. = 43,182 cu. ft. = 323,001 gallons

Less displacement:
Sloped floor at FQW tanks (floor slopes at .25” per foot from adjacent corners to each sump forming 2 triangular wedges within each half of the dike area).
The volume of the concrete wedges can be estimated using the volume of a pyramid formula (area of base times height divided by 3) as follows:
- Elevation at 3 corners other than sump in each half = 1.24 feet above sump elevation
- The volume of the 4 concrete wedges = ½ of the volume of a slab 110 ft by 130 ft by 1.24 ft less ½ the volume of a pyramid 110 ft by 130 ft by 1.24 ft.
\[
\frac{(110 \times 130 \times 1.24) - (110 \times 130 \times 1.24 \div 3)}{2} = 5,910.7 \text{ cubic feet} = 44,212 \text{ gallons}
\]

Sloped floor at stormwater tanks:
- Length = 19 feet
- Width = 55 feet
- Slope elevation = 5.25 feet – 4 feet = 1.25 feet
- Volume of concrete wedge = 19 x 55 x 1.25 x .5 = 653 cu. ft. = 4,885 gallons

Two FQW tank pads:
- Tank base diameter = 34 feet
- Tank pad height = 1.5 foot above sump elevation (ignores portion of pad within the wedges)
Tank Base displacement volume = 2 x 1.5 x π x 34 x 34 / 4 = 2,723.8 cu. ft. = 20,374 gallons

Base of 1 FQW tank (the other is assumed to be the leaking tank):
- Tank diameter = 32.0 feet
- Height of tank within containment zone = (5.24 – 1.5) = 3.74 feet
- Volume of bottom of tank = 3.74 x π x 32 x 32 / 4 = 3,007.9 cu. ft. = 22,499 gallons

Base of 2 stormwater tanks (assume flat bottom on the floor):
- Tank diameter = 12 feet
- Average height of tank within containment zone = (4 + 75% of 1.25) = 4.9 feet
- Volume of bottom of tanks = 4.9 x π x 12 x 12 / 4 x 2 = 1,108 cu. ft. = 8,290 gallons

Two divider walls (assume top is level):
- Divider walls width = 8 inches = .67 feet
- Divider walls length = 55 feet
- Top of divider walls above sump elevation = 18 inches
- Volume of divider walls = 2 x .67 x 55 x 1.5 = 110 cu ft = 827 gal.

Rainwater Volume
- 24-hour, 25-year precipitation = 7.1 inches
- Volume = 55 x 149 x 7.1 / 12 = 4,8494 cubic feet = 36,268 gallons

Net secondary containment
- Volume = 323,001 – 44,212 - 4,885 – 20,374 – 22,499 – 8,290 - 827 – 36,268 = 185,646 gallons

Volume of largest tank
- Tank diam. = 32 feet
- Tank height = 30 feet
- Tank volume = pi x 32 x 32 /4 x 30 = 24,127 cubic feet = 180,470 gallons

Adequacy Determination
- Since available containment of 185,646 gallons > 180,470 gallons tank volume, dike dimensions provide adequate secondary containment.
Attachment D-4

Container Storage Area Secondary Containment Calculations

**Gross Volume of Truck Off-loading Area and Dike** plus 1 sump (assumes no sloped floor):

- One sump = 4 x 4 x 5 = 80 cu. ft = 598 gallons
- Containment inside width = 39 feet
- Containment inside length (from top of roll-over berms at each end) = 80 feet
- Rollover berm height above sump = 10” = 0.83 feet
- Total Volume (without allowing for sloped floor) = [39 x 80 x 0.83] + 80 cu. ft. = 2,670 cu. ft. = 19,971 gallons

**Less displacement:**

Two sloped floors:

- Elevation change = 0.83 feet
- Volume of 1 wedge = 39 x 40 x 0.83 x 0.5 = 647 cu. ft. = 4,840 gallons
- Volume of 2 wedges = 2 x 4,840 gallons = 9,680 gallons

**Bollards:**

- Base of each bollard = 6-in. diameter = 0.196 sq. feet
- Volume within containment = 8 x 0.196 x .834 = 130 cu. ft. = 10 gallons

**Pump/grinder pads (2):**

- Pump stands sit on the floor. Assume minimal displacement.

**Precipitation** (since the off-loading area is under roof with walls extending down about 30% of the distance from the roof edge on the side walls, some precipitation can enter the containment area. Assume that 10% of the maximum precipitation can still enter the area.):

- 24-hour, 25-year storm = 7.1 inches = 0.59 feet
- Volume of rainwater = 0.59 x 39 x 80 x 0.1 = 184 cu. ft. = 1,377 gallons

**Non-bulk container storage** – Base of 20 55-gallon drums. This is conservative since the drums are stored on pallets, but for this calculation, assume they are sitting on the floor:

- Drum diameter = 23 inches = 1.92 feet
- Depth in containment – since drums are spread along the wall, assume they are all at the midpoint of the containment depth = 0.83 / 2 = 0.41 ft
• 1.92 x 1.92 π / 4 x 0.41 x 20 = 23.7 cu. ft. = 177 gallons

**Net secondary containment**

• Volume = 19,971 – 9,680 – 10 – 1,377 – 177 = 8,727 gallons

**Volume of largest container or 10% of permitted capacity**

• Tanker maximum volume = 6,000 gallons
• 10% of permitted capacity = 10% x 13,100 gallons = 1,310 gallons
• Containment must be able to hold 6,000 gallons

**Adequacy Determination**

• Since available containment of 8,727 gallons > 6,000 gallons tanker volume, dike dimensions provide adequate secondary containment.
APPENDIX D

TANK TIGHTNESS TEST RECORDS
**ATEC Steel Fabrication & Construction, LLC.**
1000 West 5th Street – Baxter Springs, KS. 66713
Phone: 620-856-3486 Fax: 620-856-5197
www.atecsteel.com

**HYDROSTATIC-PNEUMATIC TEST DATA SHEET**

<table>
<thead>
<tr>
<th>COMPONENT NO. :</th>
<th>API 620 New Tank</th>
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</thead>
<tbody>
<tr>
<td>MANUFACTURED FOR:</td>
<td>Systech Environmental</td>
</tr>
<tr>
<td>TANK NUMBER:</td>
<td>TK-1</td>
</tr>
<tr>
<td>JOB NO.:</td>
<td>1104-573</td>
</tr>
<tr>
<td>P.O. NO.:</td>
<td>18304</td>
</tr>
</tbody>
</table>

**TANK DATA**

- Tank Diameter and Height: 32'-0" x 30'-0"
- Shell Height to Roof: 30'-0"
- Design Liquid Level: 30'-0"
- Interior Design Pressure: 2 PSI (65.40" WC)
- Exterior Design Pressure: .03125 PSI (.865" WC)
- Max. In Flow Rate: ---
- Max. Out Flow Rate: ---

**TEST DATA**

1) Hydrostatic-Pneumatic Design Pressure Test: 2.50 PSI (69.25" WC)
   Held Time
2) Hydrostatic Test: Atmospheric
   Held Time
3) Over Pressure Pneumatic Test:
   - Initial ½ MDP Test Pressure: N/A
   - 1 Hour Hold Time Pressure: N/A
   Held Time
4) Partial Vacuum Test Pressure: N/A
   Held Time
5) Final Design Empty Pressure Pneumatic Test:
   2 PSI (55.40" WC)
   Held Time

**DATE:** 11-13-11  **BY:** Doug Woodlum

**WITNESSED BY:** Jacob Cornwall
**NOZZLE TEST REPORT FORM**

**CLIENT:**

**EQUIPMENT PRO**

**JOB #:** 1104-573

**LOCATION:**

TULSA, OK

**TANK #:** TK-1

**TANK SIZE:** 32' - 0" x 30' - 0"

**DATE:** 9/13/2011

**CLIENT PROJECT NUMBER:** 18304

**TYPE OF TESTS:**

AT = REINFORCEMENT PAD LEAK TEST AIR

VT = VISUAL INSPECTION

PT = PENETRENT TEST

MT = MAGNETIC PARTICALE TEST

---

**SHELL NOZZLES AND MANWAYS**

<table>
<thead>
<tr>
<th>Nozzle Number &amp; Size</th>
<th>A = Accept R = Reject</th>
<th>Test Type (See Above)</th>
<th>Test Operator Initials</th>
<th>ATEC Initials</th>
<th>Client Initials</th>
<th>Date of Test</th>
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<td>J - 4&quot; 150# RFSO</td>
<td>A</td>
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**COMMENTS:**
<table>
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<tr>
<th>IN SCOPE</th>
<th>YES/NO</th>
<th>BOTTOM/ANNULAR PLATE</th>
<th>CLIENT Initial</th>
<th>Date Accepted</th>
<th>Tester's Initial</th>
<th>Superintendent Initial</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>CONFIRM TANK ORIENTATION WITH CLIENT SITE REP PRIOR TO TANK CONSTRUCTION HAVE CLIENT SIGN OR INITIAL ATEC'S TANK ORIENTATION DRAWING #2B</td>
<td>W</td>
<td>10-10-11</td>
<td>JC</td>
<td>JC</td>
<td></td>
<td></td>
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<tr>
<td>X</td>
<td>Survey foundation and record results on foundation survey form. If tank sits on earthen foundation survey foundation after each additional ring is hung.</td>
<td>VT</td>
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<tr>
<td>X</td>
<td>Confirm anchor bolt CORD, PROJECTION and BOLT CIRCLE per ATEC Drawing #2A prior to installing tank bottom.</td>
<td>AT</td>
<td>BOTTOM IS 2-PASS</td>
<td></td>
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<tr>
<td>X</td>
<td>Vacuum box test SECONDARY bottom welds per ATEC Q. C. Procedure No. 1.037 - Vacuum Box Testing.</td>
<td>VB</td>
<td>BOTTOM IS 2-PASS</td>
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<tr>
<td>X</td>
<td>Air test the completed corner weld and PRIMARY bottom per ATEC Q. C. Procedure No. 1.054 Pneumatic Testing of Shell to Bottom Weld.</td>
<td>AT</td>
<td>BOTTOM IS 2-PASS</td>
<td></td>
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<tr>
<td>X</td>
<td>Leak test the inside corner weld before welding the outside. Test per ATEC Q. C. Procedure No. 1.030 PT Procedure.</td>
<td>PT</td>
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<tr>
<td>X</td>
<td>Visually inspect all completed welds.</td>
<td>VT</td>
<td></td>
<td></td>
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<tr>
<td>X</td>
<td>Record welder ID on bottom seams with paint stick and record on bottom stretch-out drawing. DWG #5D.</td>
<td>VT</td>
<td></td>
<td></td>
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<tr>
<td>X</td>
<td>Record Welder ID on corner weld with paint stick and record on shell stretch-out drawing. DWG #5D.</td>
<td>VT</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>X</td>
<td>Vacuum box test striker plates, pipe stand base plates, wear plates, and other miscellaneous plates seal welded to the bottom</td>
<td>VB</td>
<td></td>
<td></td>
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<tr>
<td>YES/NO SHELL</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>X</td>
<td>Visually inspect vertical seams and horizontal seams to ensure the welds are free from underfill, excessive reinforcement/undercut and slag.</td>
<td>VT</td>
<td></td>
<td></td>
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<tr>
<td>X</td>
<td>Record Welder ID on shell stretch-out drawing DWG #6C.</td>
<td>VT</td>
<td></td>
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<tr>
<td>X</td>
<td>Radiograph shell seams as required by the shell stretch-out drawing and record radiographs on stretch-out drawing. DWG #6E.</td>
<td>VT/RT</td>
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<td>X</td>
<td>Visually inspect all shell permanent attachments.</td>
<td>VT</td>
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<tr>
<td>X</td>
<td>Hydrostatic test.</td>
<td>VT</td>
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<tr>
<td>X</td>
<td>Confirm with client which shell nozzles will require blinding by ATEC and where water source is. Provide this information to ATEC's tool house so that a hydro kit (blinds, valves, &amp; hoses) can be sent to the site. Should a water pump be required it is the responsibility of the client not ATEC!!!</td>
<td></td>
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</tr>
<tr>
<td>IN SCOPE</td>
<td>CLIENT Initial</td>
<td>Date Accepted</td>
<td>Tester's Initial</td>
<td>Superintendent Initial</td>
<td>Notes</td>
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<tr>
<td>Hydro-pneumatic test.</td>
<td></td>
<td>11-14-11</td>
<td>JC</td>
<td>JC</td>
<td>VT This test will be conducted by ATEC's General Superintendent Doug Woollums utilizing ATEC's Hydro-pneumatic Test Procedure (Number 1.040). Completed Hydro-pneumatic Test Report shall be returned to the assigned ATEC project manager.</td>
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<td>YES NO FITTINGS/NOZZLES</td>
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<td>X Visually inspect completed nozzle welds</td>
<td>11-10-11</td>
<td>JC</td>
<td>VT</td>
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<td>X Solution film test nozzle pad plates at 15 psig</td>
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<td>JC</td>
<td>VT</td>
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<td>YES NO FIXED ROOF</td>
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<td>X Visually inspect completed welds</td>
<td>11-15-11</td>
<td>JC</td>
<td>VT</td>
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<tr>
<td>X Vacuum box test welds at 2-5 psig</td>
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<td>JC</td>
<td>VT</td>
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<tr>
<td>X Check plumbness of all roof columns. Must be plumb within 1/200 of height</td>
<td>n A</td>
<td>n A</td>
<td>n A</td>
<td>VT</td>
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<tr>
<td>YES NO STRUCTURAL/STAIRS/PLATFORMS/CAGE LADDERS</td>
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<tr>
<td>X Visually inspect completed welds - repair galvanizing.</td>
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<td>JC</td>
<td>VT</td>
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**HYDROSTATIC-PNEUMATIC TEST DATA SHEET**

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<tr>
<th>COMPONENT NO.</th>
<th>API 620 New Tank</th>
<th>JOB NO.:</th>
<th>1104-573</th>
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<td>MANUFACTURED FOR</td>
<td>Systech Environmental</td>
<td>P.O. NO.:</td>
<td>18304</td>
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<tr>
<td>TANK NUMBER:</td>
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**TANK DATA**

- Tank Diameter and Height: 32'-0" x 30'-0"
- Shell Height to Roof: 30'-0"
- Design Liquid Level: 30'-0"
- Interior Design Pressure: 2 PSI (55.40" WC)
- Exterior Design Pressure: .03125 PSI (.865" WC)
- Max. In Flow Rate: ---
- Max. Out Flow Rate: ---

**TEST DATA**

1) Hydrostatic-Pneumatic Design Pressure Test: 2.50 PSI (69.25" WC) Held Time
2) Hydrostatic Test: Atmospheric Held Time
3) Over Pressure Pneumatic Test: N/A Held Time
   - Initial ½ MDP Test Pressure: N/A Held Time
   - 1 Hour Hold Time Pressure: N/A Held Time
4) Partial Vacuum Test Pressure: N/A Held Time
5) Final Design Empty Pressure Pneumatic Test: 2 PSI (55.40" WC) Held Time

**DATE:** 11-13-11

**BY:** Doug Waillius

**WITNESSED BY:** Jacob Cornwall
## NOZZLE TEST REPORT FORM

**CLIENT:**

**EQUIPMENT PRO**

**JOB #:**

1104-573

**LOCATION:**

**TULSA, OK**

**TANK #:**

TK-2

**TANK SIZE:**

32' - 0" x 30' - 0"

**DATE:**

9/13/2011

**CLIENT PROJECT NUMBER:**

18304

**TYPE OF TESTS:**

AT = REINFORCEMENT PAD LEAK TEST AIR  
VT = VISUAL INSPECTION  
PT = PENETRENT TEST  
MT = MAGNETIC PARTICALE TEST

### SHELL NOZZLES AND MANWAYS

<table>
<thead>
<tr>
<th>Nozzle Number &amp; Size</th>
<th>A = Accept R = Reject</th>
<th>Test Type (See Above)</th>
<th>Test Operator Initials</th>
<th>ATEC Initials</th>
<th>Client Initials</th>
<th>Date of Test</th>
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<tbody>
<tr>
<td>J - 4&quot; 150# RFSO</td>
<td>A</td>
<td>AT/VT</td>
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<td></td>
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<td>K - 36&quot; SHELL MANWAY</td>
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<td>AT/VT</td>
<td>J C</td>
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<td>11-9-11</td>
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<td>L - 48&quot; SHELL MANWAY</td>
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<td>J C</td>
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<td>J C</td>
<td></td>
<td></td>
<td>11-9-11</td>
</tr>
<tr>
<td>O2 - 4&quot; 150# RFSO</td>
<td>A</td>
<td>AT/VT</td>
<td>J C</td>
<td></td>
<td></td>
<td>11-9-11</td>
</tr>
<tr>
<td>P - 4&quot; 150# RFSO</td>
<td>A</td>
<td>AT/VT</td>
<td>J C</td>
<td></td>
<td></td>
<td>11-9-11</td>
</tr>
<tr>
<td>R1 - 4&quot; 150# RFSO</td>
<td>A</td>
<td>AT/VT</td>
<td>J C</td>
<td></td>
<td></td>
<td>11-9-11</td>
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<tr>
<td>R2 - 4&quot; 150# RFSO</td>
<td>A</td>
<td>AT/VT</td>
<td>J C</td>
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<tr>
<td>S - 3&quot; 150# RFSO</td>
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<td>AT/VT</td>
<td>J C</td>
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<tr>
<td>W - 1&quot; 3000# CPLG</td>
<td>A</td>
<td>AT/VT</td>
<td>J C</td>
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<td>A</td>
<td>AT/VT</td>
<td>J C</td>
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<tr>
<td>LD2 - 1/2&quot; 3000# CPLG</td>
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<td>AT/VT</td>
<td>J C</td>
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<tr>
<td>LD3 - 1/2&quot; 3000# CPLG</td>
<td>A</td>
<td>AT/VT</td>
<td>J C</td>
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<td>11-9-11</td>
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<tr>
<td>LD4 - 1/2&quot; 3000# CPLG</td>
<td>A</td>
<td>AT/VT</td>
<td>J C</td>
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**COMMENTS:**

(Blank space for comments, but there are none in this document.)
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<tr>
<th>IN SCOPE</th>
<th>CLIENT Initial</th>
<th>Date Accepted</th>
<th>Tester's Initial</th>
<th>Superintendent Initial</th>
<th>Notes</th>
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<td>MCR</td>
<td>10-15-11</td>
<td>JC</td>
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<td><strong>NO</strong></td>
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<td><strong>X</strong></td>
<td></td>
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</table>

**CONFIRM TANK ORIENTATION WITH CLIENT SITE REP PRIOR TO TANK CONSTRUCTION HAVE CLIENT SIGN OR INITIAL ATEC'S TANK ORIENTATION DRAWING #3C.**

**Survey foundation and record results on foundation survey form. If tank sits on earthen foundation survey foundation after each additional ring is hung.**

**Confirm anchor bolt CORD, PROJECTION and BOLT CIRCLE per ATEC Drawing #2B prior to installing tank bottom.**

**Vacuum box test SECONDARY bottom welds per ATEC Q. C. Procedure No. 1.037 - Vacuum Box Testing.**

**Air test the completed corner weld and PRIMARY bottom per ATEC Q. C. Procedure No. 1.054 Pneumatic Testing of Shell to Bottom Weld.**

**Leak test the inside corner weld before welding the outside Test per ATEC Q. C. Procedure No. 1.030 PT Procedure.**

**Visually inspect all completed welds.**

**Record welder ID on bottom seams with paint stick and record on bottom stretch-out drawing. DWG #5E.**

**Record Welder ID on corner weld with paint stick and record on shell stretch-out drawing. DWG #5E.**

**Vacuum box test striker plates, pipe stand base plates, wear plates, and other miscellaneous plates seal welded to the bottom.**

**VISUALLY INSPECT VERTICAL SEAMS AND HORIZONTAL SEAMS TO ENSURE THE WELDS ARE FREE FROM UNDERFILL, EXCESSIVE REINFORCEMENT/UNDERCUT AND SLAG.**

**Record Welder ID on shell stretch-out drawing DWG #6D.**

**Radiograph shell seams as required by the shell stretch-out drawing and record radiographs on stretch-out drawing. DWG #6F.**

**Visually inspect all shell permanent attachments.**

**Hydrostatic test.**

---

*Confirm with client which shell nozzles will require blinding by ATEC and where water source is. Provide this information to ATEC's tool house so that a hydro kit (blinds, valves, & hoses) can be sent to the site. Should a water pump be required it is the responsibility of the client not ATEC!!!
<table>
<thead>
<tr>
<th>IN SCOPE</th>
<th>CLIENT Initial</th>
<th>Date Accepted</th>
<th>Tester Initial</th>
<th>Superintendent Initial</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hydro-pneumatic test.</td>
<td>11-13-11</td>
<td>JC</td>
<td></td>
<td>VT</td>
</tr>
<tr>
<td>YES NO</td>
<td>Fittings/Nozzles</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>X</td>
<td>Visually inspect completed nozzle welds</td>
<td>11-9-11</td>
<td>JC</td>
<td></td>
<td>VT</td>
</tr>
<tr>
<td>X</td>
<td>Solution film test nozzle pad plates at 15 psig</td>
<td>11-9-11</td>
<td>JC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>YES NO</td>
<td>Fixed Roof</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Visually inspect completed welds</td>
<td>11-12-11</td>
<td>JC</td>
<td></td>
<td>VT</td>
</tr>
<tr>
<td>X</td>
<td>Vacuum box test welds at 2-5 psig</td>
<td>11-9-11</td>
<td>JC</td>
<td></td>
<td>VT</td>
</tr>
<tr>
<td>X</td>
<td>Check plumbness of all roof columns. Must be plumb within 3/200 of height</td>
<td>11-9-11</td>
<td>JC</td>
<td></td>
<td>VT</td>
</tr>
<tr>
<td>YES NO</td>
<td>Structural/Stairs/Platforms/Cage Ladders</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Visually inspect completed welds - repair galvanizing</td>
<td>11-13-11</td>
<td>JC</td>
<td></td>
<td>VT</td>
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</tbody>
</table>

This test will be conducted by ATEC's General Superintendent Doug Woollums utilizing ATEC's Hydro-pneumatic Test Procedure (Number 1.040). Completed Hydro-pneumatic Test Report shall be returned to the assigned ATEC project manager.
APPENDIX E

PIPING SYSTEM TIGHTNESS TEST RECORDS
PRESSURE TEST RECORD

TEST NUMBER ____________________________ PAGE 1 OF ______

SYSTEM DESCRIPTION: Back Piping 1000' Run From
Tank Farm to Burner Floor

TYPE OF TEST: ☐ HYDRO ☐ PNEUMATIC ☐ OTHER

TEST PRESSURE: ___________ psig TEST MEDIUM: ___________

FLOW DIAGRAM NUMBER: N/A FLOW DIAG. TEST PRESSURE ___________

<table>
<thead>
<tr>
<th>LINE NO.</th>
<th>SHEET NO.</th>
<th>FROM</th>
<th>TO</th>
<th>REFERENCE DWGS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 1/2&quot; Fuel Lines Tk 1</td>
<td>Tk 1</td>
<td>Tank Farm</td>
<td>Burner Floor</td>
<td></td>
</tr>
<tr>
<td>2 1/2&quot; Fuel Lines Tk 2</td>
<td>Tk 2</td>
<td>Tank Farm</td>
<td>Burner Floor</td>
<td></td>
</tr>
<tr>
<td>3&quot; Return Line Tk 1; Tk 2</td>
<td>Tk 1; Tk 2</td>
<td>Tank Farm</td>
<td>Burner Floor</td>
<td></td>
</tr>
<tr>
<td>1&quot; Vent Line Tk 1; Tk 2</td>
<td>Tk 1; Tk 2</td>
<td>Tank Farm</td>
<td>Burner Floor</td>
<td></td>
</tr>
</tbody>
</table>

Test of Hydro was completed Dec. 7, 2011 and held for 24 hours at 475 psig.
Wayne Rhoades checked pressure and walk the lines with Forrest Jones.
SYSTEM DESCRIPTION: **ALL 4" LINES IN TANK FARM TO TRUCK UNLOAD AREA**

TYPE OF TEST: ☑ HYDRO ☐ PNEUMATIC ☐ OTHER

TEST PRESSURE: 150 p.s.i.  TEST MEDIUM: 

FLOW DIAGRAM NUMBER:  FLOW DIAG. TEST PRESSURE

<table>
<thead>
<tr>
<th>LINE NO.</th>
<th>SHEET NO.</th>
<th>FROM</th>
<th>TO</th>
<th>REFERENCE DWGS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot; BYPASS LINES FROM TANK 1 TO TANK 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TO Suction LINES OF MOTORS 1, 2, &amp; 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4&quot; LINES OFF BYPASS TO TRUCK UNLOAD DISCHARGE</td>
<td></td>
<td></td>
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</tbody>
</table>

**TESTING OF 4" PIPING COMPLETED JAN. 25, 2012 AND HELD 12 HOURS @ 150 p.s.i. USING KILN PUMPS FOR PRESSURE.**
APPENDIX F

TANK AS-BUILT DRAWINGS
**SHELL NOZZLE LIST**

<table>
<thead>
<tr>
<th>WK</th>
<th>QTY</th>
<th>SIZE</th>
<th>RATING</th>
<th>TYPE</th>
<th>ELEVATION</th>
<th>SHELF MAT</th>
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<tr>
<td>B</td>
<td>4</td>
<td>N/A</td>
<td>N/A</td>
<td>24&quot;</td>
<td>30&quot;</td>
<td>180/165°</td>
<td>FIRE NOZZLE 11C</td>
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<tr>
<td>R</td>
<td>1</td>
<td>39&quot;</td>
<td>350#</td>
<td>3&quot;</td>
<td>24&quot;/25°</td>
<td>156/165°</td>
<td>SHELL MANWAY 15A</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>45°</td>
<td>350#</td>
<td>3&quot;</td>
<td>18&quot;/25°</td>
<td>36°</td>
<td>SHELL MANWAY 15G</td>
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<tr>
<td>N-1</td>
<td>1</td>
<td>1&quot;</td>
<td>300#</td>
<td>3&quot;</td>
<td>21°/23°</td>
<td>156°</td>
<td>SIMPLE PORT 11D</td>
</tr>
<tr>
<td>N-2</td>
<td>1</td>
<td>1&quot;</td>
<td>300#</td>
<td>3&quot;</td>
<td>15°/17°</td>
<td>36°</td>
<td>SIMPLE PORT 11D</td>
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<tr>
<td>N-3</td>
<td>1</td>
<td>1&quot;</td>
<td>300#</td>
<td>3&quot;</td>
<td>11°/13°</td>
<td>21°/23°</td>
<td>SIMPLE PORT 11D</td>
</tr>
<tr>
<td>O-1</td>
<td>1</td>
<td>2&quot;</td>
<td>155#</td>
<td>3°</td>
<td>2&quot;/4&quot;/5&quot;</td>
<td>21°/23°</td>
<td>FILL 11E</td>
</tr>
<tr>
<td>O-2</td>
<td>1</td>
<td>2&quot;</td>
<td>155#</td>
<td>3°</td>
<td>2&quot;/4&quot;/5&quot;</td>
<td>21°/23°</td>
<td>FILL 11E</td>
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<td>R-1</td>
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<td>1&quot;</td>
<td>150#</td>
<td>3°</td>
<td>15°/17°</td>
<td>36°</td>
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<td>1&quot;</td>
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<td>3°</td>
<td>15°/17°</td>
<td>36°</td>
<td>OUTLET 11G</td>
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<tr>
<td>T-1</td>
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<td>1&quot;</td>
<td>150#</td>
<td>3°</td>
<td>15°/17°</td>
<td>36°</td>
<td>RETURN 11F</td>
</tr>
<tr>
<td>V</td>
<td>1</td>
<td>1&quot;</td>
<td>300#</td>
<td>3°</td>
<td>156°</td>
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<td>TEMPERATURE PROBE 11H</td>
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**ROOF NOZZLE LIST**

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<th>PLAN RADIUS</th>
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<td>C</td>
<td>1</td>
<td>150#</td>
<td>XP</td>
<td>15'-10&quot;/90°</td>
<td>15'-15&quot;/10°</td>
<td>FIRE WET 12A</td>
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<td>F</td>
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<td>XP</td>
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<td>12'-11/18°</td>
<td>12A</td>
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<tr>
<td>G</td>
<td>1</td>
<td>150#</td>
<td>XP</td>
<td>15'-10&quot;/90°</td>
<td>15'-15&quot;/10°</td>
<td>FIRE WET 12B</td>
</tr>
<tr>
<td>H</td>
<td>1</td>
<td>150#</td>
<td>XP</td>
<td>15'-10&quot;/180°</td>
<td>15'-15&quot;/10°</td>
<td>FIRE WET 12B</td>
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<tr>
<td>I</td>
<td>1</td>
<td>150#</td>
<td>XP</td>
<td>15'-10&quot;/180°</td>
<td>15'-15&quot;/10°</td>
<td>FIRE WET 12B</td>
</tr>
<tr>
<td>J</td>
<td>1</td>
<td>150#</td>
<td>XP</td>
<td>15'-10&quot;/180°</td>
<td>15'-15&quot;/10°</td>
<td>FIRE WET 12B</td>
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**NOTES:**
1. ARC LENGTHS LISTED ARE GIVEN TO NEAREST 90° CENTERLINE
2. ARC LENGTHS BASED ON THE OUTSIDE RADIUS OF SHELL RING 1 = 16'-0 1/2" (16.0417')
3. ARC LENGTHS GIVEN AS +(POSITIVE) ARE CLOCKWISE FROM CENTERLINE
4. ARC LENGTHS GIVEN AS -(NEGATIVE) ARE COUNTER CLOCKWISE FROM CENTERLINE

---

**TK-1**

**DRAWING TITLE:** TANK ORIENTATION

**CUSTOMER:** EQUIPMENT PRO

**CITY:** TULSA  
**STATE:** OK

**SCALE:** 1"=20'-0"

**DRAWN BY:**  
**CHECKED BY:**  
**DATE:** 10/20/11

**REVISIONS:**

A

**AS-BUILT**

**B**

**AS-BUILT**

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