1240525

HANFORD EFFLUENT TREATMENT FACILITY(ETF)

AMENDED REPORT

PROJECT NUMBER C-018H

FINAL INDEPENDENT RCRA INFORMATION NEEDS REPORT
AND CERTIFICATION FOR DESIGN IN FULFILLMENT OF
SECTION 01010, 1.7.10.2 OF CONTRACT V-C018HC1-001 REV OE

prepared by

DONALD B. MAUSSHARDT
PROFESSIONAL ENGINEER

OCTOBER 16, 1995

FINAL REPORT

RECEIVED
OCT 10 2016
EDMC

TABLE OF CONTENTS

PAGE No	SECTION	DESCRIPTION
		REPORT COVER SHEET
1		TABLE OF CONTENTS
2	1.0	INTRODUCTION
2	1.1	SYSTEM DESCRIPTION
3	1.2	BASIC OPERATING PHILOSOPHY
3 - 4	1.3	APPROACH EMPLOYED TO CONDUCT THE ASSESSMENT
4	1.4	REFERENCES TO CODES AND STANDARDS
4	1.5	CORROSION PROTECTION
4 - 5	1.6	OPEN ITEMS AND RECOMMENDATIONS
6	2.0	INFORMATION SHEETS ON VESSELS, TANKS AND PACKAGE UNITS
7 - 41	2.1	TANKS AND VESSELS
42 - 51	2.2	VENDOR SUPPLIED UNITS
52	3.0	STRUCTURAL INTEGRITY CERTIFICATION & HAZARD ASSESSMENT
52	3.1	REVIEW OF SEISMIC CALCULATIONS
53 - 54		STRUCTURAL ENGINEERS CERTIFICATION
55 - 58	3.2	HAZARDS ASSESSMENT
59	4.0	SECONDARY CONTAINMENT
59	4.1	SPILL CONTAINMENT IN THE PROCESS AREA
60	4.2	SPILL CONTAINMENT - VERIFICATION TANKS
61	4.3	SPILL CONTAINMENT - SURGE TANK
62	4.4	SPILL CONTAINMENT - SULFURIC ACID STORAGE TANK
62	4.5	SPILL CONTAINMENT - SODIUM HYDROXIDE STORAGE TANK
63	4.6	PRODUCT CHANNEL - BETWEEN THE VERIFICATION TANKS AND THE PROCESS BUILDING
64 - 69	5.0	HANDLING PROCEDURES VERIFICATION
69	5.1	DISCREPANCIES CORRECTIVE PROCEDURES
70 - 71	6.0	TESTING PROCEDURES FOR TIGHTNESS
72	7.0	DESCRIPTION OF LEAK DETECTION SYSTEMS
72 - 74	7.1	LEAK DETECTION-PRIMARY CONTAINMENT
75	7.2	LEAK DETECTION-SECONDARY CONTAINMENT
76	8.0	CERTIFICATION SECTION WAC 173-303-810 13A FOR FINAL RCRA INFORMATION NEEDS REPORT for EFFLUENT TREATMENT FACILITY, CONTRACT V - C018HC1-001 REVISION OE
77	9.0	APPENDIX A-1 Through A-9
78 - 79	9.1	APPENDIX FOR A-9, VOL 2, 1 - 60 AND VOL 3, 61 - 99

RECEIVED OCT 10 2016 EDMC

RCRA INFORMATION NEEDS

1.0 Introduction

1.1 System Description

The Effluent Treatment Facility (ETF) treats low-activity radioactive water containing small amounts of ammonia, inorganics, organics, and particulates. The waste water to be treated consists of the process condensate (PC) from the 242-A Evaporator, the process distillate discharge (PDD) and the ammonia scrubber distillate (ASD) from the PUREX plant, and waste water in the LERF basin which originates from the 242-A Evaporator PC.

The function of the ETF is to reduce those compounds to less than the level regulated by WHC-CM-7-5, and BAT requirements of the United States Department of Energy (DOE) Order 5400.5 and DOE Order 6430.1A.The ETF includes the following Main equipment, Secondary equipment, and Support systems:

Main Treatment Train

- Surge Tank
- Rough Filter
- UV Oxidation System
- pH Adjustment Tank
- H2O2 Decomposer
- Fine Filter
- Degasification System
- Reverse Osmosis System
- Polisher
- Effluent pH Adjustment Tank
- Verification Tank

Secondary Waste generated during treatment are treated with the following equipment

- Secondary Waste Receiving Tank
- Evaporator
- Concentrate Tank
- Thin Film Dryer
- Drum Handling system
- Resin Dewatering System

Supporting systems to the process units

- Chemical Reagent Feed System
- Sump Tank
- Vessel Off-Gas Treatment System
- Utilities

1.2 Basic Operating Philosophy

1.2.1 General

For safe ease of operation, the basic operating philosophy is:

(1) Operation process inputs/outputs will be monitored in the Central Control Room.
(2) Interlocking and sequential control will be provided.
(3) Important process parameters will be controlled and regulated on a continuous basis.
(4) Access to the control system will be classified and controlled for security.

1.2.2 Locations for Operation control

The control system will support operation control from three locations: Central Control Room, Local Control Unit(LCU), and Local Control Panel(LCP)

The central control room operation will be conducted via redundant CRT-based operation control system(OCS) consoles. In case of OCSs failure, the essential operation of the process will be conducted via LCUs supported by displays. Under normal operation the LCUs can be used to assist the operators.

Operation via the LCPs will be performed during preoperation testing and startup and during annual equipment maintenance.

1.3 Approach Employed to conduct the Assessment

This report is organized along the lines of the existing contracts that JGC/ADTECHS hold on the ETF Project. Section 1.7.10.2 RCRA Information Needs is the guiding format for this report. Several of the sections have been responded to separately with the submission of the 100% design documents by ADTECHS. The design diagrams and design calculations have already been submitted to ICF-Kaiser Hanford.

The approach employed to conduct this assessment was to develop fact sheets on each of 33 tanks and/or vessels . In order to cover those long lead items being purchased as package units, we also prepared a summary sheet of the package items showing the specifications, design criteria and vendor-delivered calculations for each unit. Additionally, to ensure compliance with applicable codes and standards, a review of design codes and standards was performed to assure completeness and application to the unit. The supporting specification used in this review was S-1222-005, Rev. 2. The resolution of the tank material selection compatibility to fluids contained that were questioned in the LaQue Corrosion Report has been addressed in the maintenance and operations procedures. The mitigation to accommodate the LaQue findings can be found the

K-ETF Preventive Maintenance Manual(excerpts are found in the Appendix).

The Secondary Containment is covered in a separate section since the function of the secondary systems encompass more than just individual tanks or vessels. A matrix and map was prepared by ADTECHS that describes the location and type of SPC applied in the secondary containment areas.

Separate sections are also presented for Handling Procedures, Testing Procedures for Tightness, and a Description of the Leak Detection System.

Each of the above sections were reviewed for compliance and conformance with the final submitted plans and specification prior to their being turned over to Kaiser Engineers Hanford.

The Professional Engineering certification is enclosed.

1.4 Reference to codes and standards

In our review of the applicable codes and standards, the following documents were used as the key for verification with the codes and standards referred to in the ETF Contract. The primary document used was S-1136-001, Rev. 13. Document List, and S-1222-005,Rev. 2 Applicable Codes and Standards. The Washington Dangerous Waste Regulations WAC Title 173 - Department of Ecology, Chapter 173-303 Dangerous Waste Regulations were controlling in the review of the design. A check was performed on the procurement packages to ensure that the vendors were using the same codes and standards. A copy of the document list and codes and standards will appear in the appendix.

1.5 Corrosion Protection

ADTECHS in the development of the design requirements for this project selected the LaQue Center for Corrosion Technology, Inc. to conduct a Corrosion Review Analysis of the ADTECHS design for the K-ETF project. This company(LaQue) meet the requirements of being certifiable as an NACE Corrosion experts. Under section 15493 para 2.1.5.3.subpara (a) of Contract V-C018HC1-001, REV OE the report as prepared by LaQue was required as the basis for material selection conditions of use, fabrication requirements, maintenance and inspection requirements and they served as the basis for the independent review. A copy of the LaQue report is included in the Appendix.

1.6 Open items and Recommendations

There are no open items that remains for ADTECHS to address for close out of RCRA Information needs report. There is, however, one recommendation that warrants consideration by the operators of this facility. I would recommend that the operators conduct on an annual basis a visual inspection for corrosion inside the Clawson

Tanks. Coupled with this inspection an UT tests should also be preformed to confirm thickness in each tank. At the completion of a campaign or at some interval less than one year, a Clawson tank should be randomly selected for inspection to assure the absence of corrosion. This test should include a visual and UT(Ultra Sound), if evidence of any corrosion is found. The Tanks that should be monitored are: Concentrate Tanks(60J-TK-1A & 1B); Secondary Waste Receiving Tanks(60I-TK-1A &1B); First Stage RO Feed Tank(65C-TK-T).

2.0 Information Sheets on Tanks, Vessels and Package Units

The information was presented in summary form in the original March 1993, RCRA Information Needs Report and covers those items identified in Paragraph 1.7.19.2.1 of the Contract Document V-CO18HC1-001, Rev. OE, Section 01010-53. The resolution of items raised by LaQue in there analysis noted optional corrective steps to close the open items were agreed to by ADTECHS. LaQue Report concerns have inpart been addressed in the Maintenance and Operating procedures developed for operations of the facility. The procedures can be found in the K-ETF Preventative Maintenance Manual. For those units that were repaired or modified this calendar year, it recommended that each unit be carefully inspected to verify the absence of reoccurrence of corrosion following modifications to the tanks. It is recommended by the independent reviewer that at the end of a campaign or at a normal outage, a Clawson tank be randomly selected and opened for inspection to verify the absence of corrosion. If corrosion is found then all tanks should be examined and measured using an approved UT(Ultra sound) to verify thickness. Those tanks in question are the Verification Tanks Roof and support structure(3), Surge Tank(1), and the Clawson Tanks(6).

A copy of the referenced sections that pertain to preventive maintenance for Tanks, protective coatings and other environmental controls is found in the Appendix.

Also included for review is a tabular list of those long-lead items currently undergoing design. The information provided represents a status of the development of the vendor supplied package units. Attached in the appendix are ADTECHS matrix of inspection and acceptance from the vendors.

2.1 Tanks and Vessels

Name:	#1 Surge Tank Equipment Number: 2025E-65A-TK-1
Purpose:	Receiving/storing waste liquid, and pH adjustment to 6 for UV Oxidation system
Conditions:	(1) Combined flow from four primary sources, viz. PDD, ASD, PC, and LERF (2) Secondary streams from downstream process, viz. Polisher, evaporator, dryer, etc.
Construction material:	Type 304 SS (UNS30400) and RMS 63 Interior Finish
Lining Materials:	None
Tank Dimensions:	26' ID x 30'-1" H
Tank capacity:	100,000 gallons
Shell thickness:	3/16"
Pressure controls:	Pressure Indicator & Vacuum Breaker valve
Foundation construction materials:	Concrete ring beam plus concrete slab
Structural support:	Anchor chairs welded to shell
Seams:	Welded
Connections:	Flanged
Corrosion protection:	Type 304 SS is acceptable
Remarks:	Sloped bottom and installed inside secondary containment Area under tank protected with HDPL with drain to secondary containment. The surge tank was damaged during a site test. Resulting damage required replacement of top half of tank. Engineering report and structural certification verified the return to original condition.

Name:	#2 pH Adjustment Tank Equipment No. 2025E-60C-TK-1
Purpose:	To adjust and maintain the process stream pH to 4.0
Conditions:	(1) Inlet flow: 170-171 gpm (2) To provide retention time more than 15 minutes
Construction Material:	Type 304SS and internal surfaces polished to RMS 63
Lining Materials:	none
Tank Dimensions:	10' ID x 8'-2" H
Tank Capacity:	2,600 gallons
Shell thickness:	1/4"
Pressure controls:	Pressure Indicator
Foundation construction materials:	Concrete slab
Structural support:	Saddle support-material 304 SS
Seams:	Welded
Connections:	Flanged
Corrosion protection:	Type 304 SS is acceptable
Remarks:	Equipped with an eductor.
Inspection:	The tank hatch flange interior attachment weld was not ground smooth and finished to RMS 63 surface finish. This area to be inspected after each campaign or quarterly.

Name:	#3 Effluent pH Adjustment Tank Equipment No. 2025E-60-TK-2
Purpose:	To adjust and maintain the process stream pH between 6.5 - 8.5
Conditions:	(1) Inlet flow rate 152 gpm (2) To provide retention time of more than 15 minutes
Construction Material:	Type 304SS (S30400) SA 240, inner surfaces polished to a RMS 63 finish
Lining Materials:	none
Tank Dimensions:	10' ID x 8'-2" H
Tank Capacity:	2,500 gallons
Shell thickness:	1/4"
Pressure controls:	Pressure Indicator
Foundation construction materials:	Concrete Pad on concrete slab
Structural support:	Materials 304SS
Seams:	Welded
Connections:	Flanged
Corrosion protection:	Type 304 SS is acceptable
Remarks:	Equipped with an eductor
Inspection:	As specified in the ADTECHS procedure

Name:	#4 1st RO Feed Tank Equipment No.: 2025E-60F-TK-1
Purpose:	Receiving waste from degasification
Conditions:	(1) Inlet flowrate: 169-171 gpm (2) Recycle waste: 17 gpm
Construction Material:	Type 304 SS (S30400) with internal surfaces finished to RMS 63
Lining Materials:	none
Tank Dimensions:	10' ID x 10'-7" H
Tank Capacity:	4,000 gallons
Shell thickness:	1/4"
Pressure controls:	Pressure Indicator
Foundation construction materials:	Concrete slab
Structural support:	Saddle-material CS, Support material 304 SS
Seams:	Welded
Connections:	Flanged
Corrosion protection:	Type 304 SS with the internal surface finished to RMS 63
Remarks:	none
Inspection:	The tanks hatch flange interior attachment weld was not ground smooth and finished to a 63 RMS finish. This area is to be inspected after each campaign or quarterly

Name:	#5 2nd RO Feed Tank Equipment No.: 2025E-60F-TK-2
Purpose:	Receiving permeate from 1st RO Stage
Conditions:	Inlet flow rate 163 gpm
Construction Material:	Type 304 SS (S30400) with internal surfaces to be finished to RMS 63
Lining Materials:	none
Tank Dimensions:	10' L x 5' W x 5' H
Tank Capacity:	2,000 gallons
Shell thickness:	3/16" with rib stiffeners
Pressure controls:	Pressure Indicator
Foundation construction materials:	Skid on a 6" concrete pad
Structural support:	Saddle material CS, Support material 304SS
Seams:	Welded
Connections:	Flanged
Corrosion protection:	Type 304 SS with interior surface polished to RMS 63
Remarks:	none
Inspection:	The tank hatch flange interior attachment weld was not finished to RMS 63 finish. This area to be inspected after each campaign or quarterly.

(2) Due to the corrosive nature of the fluids stored in the tanks, it is recommended that when the roof structure is being inspected that the floors and walls are visually inspected for possible blistering or loss of adhesion of the protective coatings.

Name:	#7 Concentrate Tanks Equipment No. 2025E-60J-TK- 1A, 1B
Purpose:	Receiving evaporator concentrate
Conditions:	(1) Evaporator concentrate: 0.41-1.14 gpm (2) Evaporator hold-up: 2-5000 gallons (3) To provide some additional capacity to be able to dilute the waste.
Construction Material:	Type 316 SS (S31603) and interior finish to RMS 63
Lining Materials:	None
Tank Dimensions:	10' ID x 12'-6" H (each)
Tank Capacity:	5,000 gallons (each)
Shell thickness:	1/4"
Pressure controls:	Pressure Indicator
Foundation construction materials:	6" Concrete pad
Structural support:	Saddle material CS, Support material CS
Seams:	Welded
Connections:	Flanged
Corrosion protection:	LaQue Corrosion Report recommends Ni-Cr-Mo Alloy(e.g. N06625, N10276) in lieu of S31603
Remarks:	Equipped with an eductor
Inspection:	(1) Tank hatch flange interior attachment weld was not ground smooth and finished to a RMS 63 surface (2) The LaQue Report for selected materials requires that the tank welds be stressed relieved by heat treating. The SS tank shell was not stressed relieved therefore the interior welds be inspected after each campaign for chloride stress corrosion.

Name: #8 92% Sulfuric Acid Storage Tank
Equipment Number: 2025E-65C-TK-1

Purpose: Store 92 Weight Percent Sulfuric Acid

Conditions: (1) Average flowrate to surge tank: 0.42gpm

(2) Regenerant of polisher: 1,075 gal/batch (4 wt % H_2SO_4)

Construction materials: Carbon Steel plus PVDF

Lining Materials: Polyvinylidene Fluoride (PVDF)

Tank Capacity: 7,500 gallon

Tank Dimensions: 10'-4" ID x 16'-4" H

Shell thickness: 3/8"

Pressure controls:

Foundation construction materials: 6" Concrete Pad

Structural support: Saddle-material CS, Support-material CS

Seams: Welded

Connections: Flanged

Corrosion protection: LaQue Corrosion Report recommends Type 316 SS (S13603) material in lieu of CS

Remarks: (1) Install out-door
(2) Equipped with heat trace and insulation

Name:	#9 4% NaOH Solution Tank Equipment No. 2025E-65C-TK-4
Purpose:	Dilute the NaOH from 50% to 4%
Conditions:	(1) Feed rate to secondary waste tank: 0.003-0.09 gpm (2) Regenerant for polisher: 862 gal/batch (4 w %)
Construction Material:	FRP
Lining Materials:	None
Tank Dimensions:	6' ID x 6'-10" H
Tank Capacity:	800 gallons
Shell thickness:	1/4"
Pressure controls:	Continuous vent to atmosphere via Filter (65C-114)
Foundation construction materials:	6" Concrete pad plus skid mounted
Structural support:	Support-material CS
Seams:	FRP
Connections:	FRP Resin and overlap
Corrosion protection:	LaQue Corrosion Report recommends Type 304 SS in lieu of FRP
Remarks:	Equipped with an eductor

Name:	#10 4% H_2SO_4 Solution Tank Equipment No. 2025E-65C-TK-3
Purpose:	Dilute the H_2SO_4 from 92% to 4%
Conditions:	Regenerant for polisher (4 wt % H_2SO_4) 1075 gallons/batch
Construction Material:	FRP
Lining Materials:	None
Tank Dimensions:	5'-6" ID x 6'-3" H
Tank Capacity:	600 gallons
Shell thickness:	1/4"
Pressure controls:	continuous vent via 3/4"-45D-036-155
Foundation construction materials:	Skid on concrete
Structural support:	Support-material CS
Seams:	Resin and overlap
Connections:	Flanged
Corrosion protection:	FRP is acceptable(LaQue)
Remarks:	Equipped with an eductor

Name:	#11 50% NaOH Storage Tank Equipment No. 2025E-65C-TK2
Purpose:	Store 50% NaOH
Conditions:	(1) Average flowrate to secondary waste tank: 0.10 gpm (2) Regenerant of Polisher: 862 gal/batch (4 wt %)
Construction Material:	Type 304 SS, SA 240
Lining Materials:	None
Tank Dimensions:	5' ID x 5'-7" H
Tank Capacity:	5,000 gallons
Shell thickness:	1/4"
Pressure controls:	Continuous vent to atmosphere
Foundation construction materials:	Slab
Structural support:	Support-material CS
Seams:	Welded
Connections:	Flanged
Corrosion protection:	LaQue Corrosion Report recommends low carbon "L" grade material (i.e. S30403)
Remarks:	(1) Install out-door (2) Equipped with heat trace
Inspection:	The tank hatch flange interior weld was not ground smooth and finished to a RMS 63 surface. This area should be inspected after each campaign or quarterly.

Name:	#12 Secondary Waste-Receiving Tanks Equipment No. 2025E-65I-TK-1A, 1B
Purpose:	(1) To receive waste from filter backwash, RO condensate, and resin generator. (2) To adjust pH to around 6.
Conditions:	(1) Receive polisher regeneration waste, 2540 gal/regeneration. (2) Filter backwash, 185 gal/backwash continuous inlet flow, RO concentrate 16.9 gpm
Construction Material:	Type SS304 (S30400) Interior tank surfaces finished to RMS 63
Lining Materials:	None
Tank Dimensions:	14' ID x 18'-7" H
Tank Capacity:	15,000 gallons
Shell thickness:	1/4"
Pressure controls:	Pressure Indicator
Foundation construction materials:	6" concrete pad
Structural support:	Saddle mtl CS, support mtl 304SS
Seams:	Welded
Connections:	Flanged
Corrosion protection:	LaQue Corrosion Report recommends a 6% Mo- containing austenitic Stainless Steel (e.g. S31254, N08367)
Remarks:	Equipped with a eductor
Inspection:	(1) Tank hatch flange interior welds were not ground smooth to a RMS 63 surface. This area to be inspected after each campaign or quarterly. (2) The LaQue report for selected material requires that tank welds be stress relieved by heat treating. The SS Tank shell welds were not stress relieved. The interior tank welds will

be inspected after each campaign or quarterly for chlorine stress corrosion cracking.

Name:	#13 Rough Filter Equipment No. 2025E-60B-FL-1
Purpose:	Rough removal of suspended solids
Conditions:	Fed by stream no. 8 from the surge tank. This stream is characterized by low Cl (<2 ppm) and moderate TDS levels of 2000 ppm.
Construction Material:	Type 304 SS (S30400)
Lining Materials:	None
Tank Dimensions:	3' x5'
Tank Capacity:	N/A
Shell thickness:	3/16"
Pressure controls:	Pressure Indicator, ASME relief valve
Foundation construction materials:	Steel platform tied to 6" concrete pad
Structural support:	Fabricated from angle
Seams:	Welded
Connections:	150 lb. R.F. ANSI flanged
Corrosion protection:	LaQue Corrosion Report recommended Type 316L Stainless Steel
Remarks:	None

Name:	#14 UV Oxidizer Equipment No. 2025E-60D-UV-1A,1B & 2A,2B
Purpose:	Decomposition of organic materials into H_2O and CO_2
Conditions:	Feed to the units is the cooled effluent from the rough filter. It is treated with a solution of 50% H_2O_2 (stream no. 11, pH 6, temperature 100 F) yielding a product containing < 200 ppm H_2O and a pH of 4, which is then conveyed to the pH Adjustment Tank.
Construction Material:	Type 316 SS
Lining Materials:	None
Tank Dimensions:	3' dia x 8' side w/F&D Heads
Tank Capacity:	1200 lbs
Shell thickness:	1/4"
Pressure controls:	Pressure indicator
Foundation construction materials:	6" Concrete Pad
Structural support:	Carbon steel and epoxy painted
Seams:	Welded
Connections:	Flanged- Threaded
Corrosion protection:	Type 316 SS is acceptable
Remarks:	none

Name:	#15 H2O2 Feed Tank Equipment No. 2025E-60D-TK-1
Purpose:	Holds 50% H2O2 solution
Conditions:	Atmospheric
Construction Material:	High density polyethylene(PE)
Lining Materials:	None
Tank Dimensions:	N/A
Tank Capacity:	2,500 gallons
Shell thickness:	Molded
Pressure controls:	Continuous vent to atmosphere
Foundation construction materials:	Vendor supplied on skid tied to concrete floor
Structural support:	Skid
Seams:	1 pc.
Connections:	Quick disconnect & socket- threads
Corrosion protection:	High Density PE is acceptable
Remarks:	None

Name:	#16 H_2O_2 Decomposer Equipment No. 2025E-60D-CO1A, & CO1B
Purpose:	Decomposition of residual H_2O_2 injected by the UV oxidation system
Conditions:	Feed by stream no.13 from the pH Adjustment Tank, which is low in halides(<2 ppm), of moderate TDS (<3000 ppm) and a pH of 4. Discharges is identical to the input except H_2O_2, which is reduced from <200 ppm to <5 ppm.
Construction Material:	Carbon Steel with epoxy coating
Lining Materials:	Epoxy coating
Tank Dimensions:	3' x 10'
Tank Capacity:	2500 gallons
Shell thickness:	1/4"
Pressure controls:	Pressure relief valve
Foundation construction materials:	Skid on 6" concrete pad
Structural support:	Carbon steel skid
Seams:	Welded
Connections:	Flanged
Corrosion protection:	LaQue Corrosion Report recommends S30403 or higher alloy material.
Remarks:	none

Name:	#17 Fine Filter Equipment No. 2025E-60B-FL-2
Purpose:	Final removal of suspended solids
Conditions:	Receives process stream no. 14, the effluent of the H2O2 decomposer. Stream no. 14 has a TDS level ranging from 1650 ppm to 2800 ppm, a chloride level of <2 ppm and a pH of 4
Construction Material:	Type 304 SS (S30400)
Lining Materials:	None
Tank Dimensions:	3' x 5'
Tank Capacity:	174gpm
Shell thickness:	3/16"
Pressure controls:	ASME safety relief valve/pressure indicator
Foundation construction materials:	On steel platform
Structural support:	Fabricated from angle iron shapes
Seams:	Welded
Connections:	150 lb. R.F. ANSI flanged
Corrosion protection:	LaQue Corrosion report recommended using Type 316L SS
Remarks:	none

Name:	#18 Degasification Column Inlet Cooler Equipment No. 2025E-60E-E-1
Purpose:	Removal of dissolved carbonate to reduce the load on reverse osmosis system and polisher
Conditions:	Used to cool stream no. 14 from 140 F to 86F after it passes through the fine filter
Construction Material:	Type 316 SS (S31600)
Lining Materials:	None
Tank Dimensions:	N/A
Tank Capacity:	N/A
Shell thickness:	1"
Pressure controls:	Discharge of coler continuous vent to vessel ventilation system

Foundation construction materials: 6" concrete pad

Structural support:	Skid Mount
Seams:	Welded
Connections:	Tack welded
Corrosion protection:	LaQue Corrosion Report recommends a 6% Mo-containing austenitic Stainless Steel (e.g. S31254, NO8367)
Remarks:	none

Name:	#19 Degasification Column (Induced Draft) Equipment No. 2025E-60E-CO1
Purpose:	Removal of dissolved carbonate to reduce the load on the RO and polisher
Conditions:	Receives stream no.15 which is the same as the outlet of the H2O2 decomposer, but cooled to 86F. Stripping reduces the H2O2 level to <5 ppm. The CO2/CO3 and TDS are further lowered.
Construction Material:	FRP
Lining Materials:	None
Tank Dimensions:	25'H x 6'D
Tank Capacity:	1250 Gallons
Shell thickness:	Head 3/16" base 3/4"
Pressure controls:	Vents to ventilation via degasification blower (60E-D-1)

Foundation construction materials: Skid mounted by vendor

Structural support:	Fibre Glass and Carbon steel pipe supports
Seams:	Resin and overlap
Connections:	Flanged
Corrosion protection:	LaQue Corrosion Report recommended Type 316L SS as preferable.
Remarks:	None

Name:	#20 Polisher Equipment No. 2025E-60G-1X-1X,-1B,-1C
Purpose:	Polishing of the waste water
Conditions:	Receives waste stream no. 17 from the RO units. The waste stream is very low in TDS(15-32 ppm) with very low chloride present (<0.02 ppm). pH is 6.0. Stream temperature is <110F. The polisher uses the 4% H_2SO_4 as a regenerant for cations and 4% NaOH as a regenerant for anions.
Construction Material:	Carbon Steel with Epoxy coating
Lining Materials:	Epoxy coating
Tank Dimensions:	9'-2" x 54"
Tank Capacity:	1075 gals
Shell thickness:	0.3125"
Pressure controls:	Inlet relief valve 100psi
Foundation construction materials:	6" concrete pad
Structural support:	Carbon steel epoxy coated skid
Seams:	Welded
Connections:	Flanged
Corrosion protection:	Epoxy-coated carbon steel is acceptable
Remarks:	none
Inspections:	Because of the extreme range of pH conditions, the interior polisher surfaces will be inspected every 6 months for blistering and lack of adherence

Name:	#21 Feed/Distillate Heat Exchanger Equipment No. 2025E-60I-E-02
Purpose:	Pre-heat the inlet stream no. 30 feed from the secondary waste-receiving tanks to the evaporator and cool the distillate(leading to stream no. 36) from the distillate tank in the evaporator system.
Conditions:	Stream no. 30 has range of 8-17 ppm Cl, pH of 6, Temperature of 86F, and a TDS range of 10,000 to 25,000 ppm.
Construction Material:	Type 316L SS (31603)
Lining Materials:	None
Tank Dimensions:	83" x 34" x 62 1/2"
Tank Capacity:	88.1 cubic feet
Shell thickness:	0.049" wall tubing 2" schedule 10s shell
Pressure controls:	PRV-133, PRV-131
Foundation construction materials:	Skid mounted
Structural support:	Skid mounts
Seams:	Welded
Connections:	Flanged
Corrosion protection:	S31603 is acceptable
Remarks:	none

Name:	#22 Vapor Compressor Inlet Silencer Equipment No. 2025E-60I-C-01A
Purpose:	Reduce pulsations of low pressure steam entering the vapor compressor.
Conditions:	230F, 15psia
Construction Material:	Type 304 SS (30400)
Lining Materials:	None
Tank Dimensions:	3' x 10'
Tank Capacity:	7000 ACFM
Shell thickness:	1/4"
Pressure controls:	PRV-168, PRV-203
Foundation construction materials:	Concrete floor/pad
Structural support:	Angle Iron
Seams:	Welded
Connections:	Flanged
Corrosion protection:	LaQue Corrosion Report recommended a 6% Mo-containing austenitic stainless steel (e.g. S31254, NO8367)
Remarks:	none

Name:	#23 Vapor Compressor Outlet Silencer Equipment No. 2025E-60I-C-01B
Purpose:	Reduces the pulsations of low pressure steam
Conditions:	230F, 75 psia
Construction Material:	Type 304 SS (30400)
Lining Materials:	None
Tank Dimensions:	3' x 10'
Tank Capacity:	7000 ACFM
Shell thickness:	1/4"
Pressure controls:	PRV 168, PRV 203
Foundation construction materials:	Floor mat on concrete slab
Structural support:	Angle Iron
Seams:	Welded
Connections:	Flanged
Corrosion protection:	LaQue Corrosion Report recommended a 6% Mo-containing austenitic stainless steel (e.g. S31254, NO8367)
Remarks:	none

Name:	#24 Evaporator Heater Equipment No. 2025E-60I-E-01
Purpose:	Heats evaporator feed
Conditions:	230F, 75psia
Construction Material:	Type 304 Stainless steel (S30400, shell)
Lining Materials:	None
Tank Dimensions:	17'-6" x 5'-4"
Tank Capacity:	aprox 1000 gal total based on dry wt:10390, wet wt:18100
Shell thickness:	3/16"
Pressure controls:	PRV-168
Foundation construction materials:	Skid mounted
Structural support:	carbon steel skid
Seams:	Welded
Connections:	Flanged
Corrosion protection:	LaQue Corrosion Report recommends Ni-Cr-Mo alloy(NO6625 for the shell-side of the heater.
Remarks:	none

Name:	#25 Entrainment Separator Equipment No. 2025E-60I-DE-01
Purpose:	Vapor from the evaporator passes through the entrainment separator before entering the vapor compressor. This unit removes carryover in the vapor(from the evaporator)
Conditions:	230F, 15 psia
Construction Material:	Type 316L SS
Lining Materials:	None
Tank Dimensions:	9' x 42"dia
Tank Capacity:	63 gallons
Shell thickness:	3/10"
Pressure controls:	PRV-168
Foundation construction materials:	Skid mounted
Structural support:	angle iron
Seams:	welded
Connections:	Flanged
Corrosion protection:	LaQue Corrosion Report recommended a 6% Mo-containing austenitic stainless steel (e.g S31254, N)8367; or Ni-Cr-Mo alloy (e.g. NO6625, N10276).
Remarks:	none

Name:	#26 Anti-Foam Tank Equipment No. 2025E-60I-TK-04
Purpose:	Prevents foaming inside vapor body
Conditions:	Ambient temperature
Construction Material:	High density polyethylene(PE)
Lining Materials:	None
Tank Dimensions:	34" x 23"
Tank Capacity:	50 gallons
Shell thickness:	1/8"
Pressure controls:	Atmospheric
Foundation construction materials:	Skid mounted
Structural support:	skid
Seams:	none
Connections:	Flanged
Corrosion protection:	High density PE is acceptable
Remarks:	none

Name:	#27 Thin-Film Dryer Equipment No. 2025E-60J-D-01
Purpose:	Produces dry powder waste
Conditions:	Primary feed to the dryer is stream no. 33 from the concentrate tanks. This is a pH 4 liquid of high TDS(<400,000 ppm). The dryer is heated by the 370F steam from the boiler. Products from the dryer include a distillate and a powder waste.
Construction Material:	Alloy 625 (NO6625)
Lining Materials:	None
Tank Dimensions:	26 3/4" OD x 8'-1"
Tank Capacity:	Heating surface 43 sq ft
Shell thickness:	N/A
Pressure controls:	Vented via spray condensor to vessel ventilation blower (2025E-60J-F-1)

Foundation construction materials: Skid mounted

Structural support:	Structural steel skid
Seams:	Welded
Connections:	Welded
Corrosion protection:	LaQue Corrosion Report recommends a Ni-Cr-Mo alloy, such as N10276(or similar)
Remarks:	None

Name:	#28 Spray Condenser Equipment No. 2025E-60J-DE-01
Purpose:	Condenses water vapor from the thin film dryer.
Conditions:	0.8 GPM, 210F
Construction Material:	Type 316L SS (S31603).
Lining Materials:	None
Tank Dimensions:	18" x 7'- 8 15/16"
Tank Capacity:	100 gals
Shell thickness:	3/16"
Pressure controls:	Automatic control plug valve
Foundation construction materials:	Skid mounted
Structural support:	Skid mounted
Seams:	Welded
Connections:	Welded
Corrosion protection:	LaQue Corrosion Report recommends a 6% Mo-containing austenitic SS(e.g. S31254, NO8367) or a Ni-Cr-Mo alloy (e.g. NO6625, N10276).
Remarks:	None

Name:	#29 Sump Tank Equipment No. 2025E-20B-TK-1, -2
Purpose:	Receiving liquid waste from tanks/equipment prior to sending it to the main treatment train.
Conditions:	Receiving waste water irregulary
Construction Material:	Type SS304 and interior finish to RMS 63
Lining Materials:	None
Tank Dimensions:	60"L x 60"W x 94" H
Tank Capacity:	800 gallons
Shell thickness:	3/16"
Pressure controls:	Vented to vessel ventilation system via line 1 1/2"-45D-017-155
Foundation construction materials:	In ground concrete slab and wall enclosed system
Structural support:	Reinforced concrete
Seams:	Welded
Connections:	Flanged
Corrosion protection:	LaQue Corrosion Report recommends a 6% Mo-containing austenitic stainless steel (e.g. S31254, NO8367).
Remarks:	None

Name:	#30 Distillate Condenser Equipment No. 2025E-60J-CND-1
Purpose:	Cools the spray condenser water which is used to condense dryer water vapor.
Conditions:	250F, atmospheric
Construction Material:	Type 304SS
Lining Materials:	None
Tank Dimensions:	38sq ft, 8 5/8"OD shell 48"long
Tank Capacity:	32 gpm in tubes
Shell thickness:	0.277 inches
Pressure controls:	Continuous vent to V.O.C. system through vent cooler (2025-60J-F-01

Foundation construction materials: Skid mounted on concrete slab

Structural support:	Skid mount
Seams:	Welded
Connections:	Flanged
Corrosion protection:	Type 304SS is acceptable
Remarks:	none

Name:	#31 Powder Hopper Equipment No. 2025E-60J-H-1
Purpose:	Collects radioactive particulate and feeds it into collection drums.
Conditions:	Ambiant conditions
Construction Material:	Type 304SS
Lining Materials:	None
Tank Dimensions:	Cone top 24"dia, 47 1/2"h, base 8"dia
Tank Capacity:	33 gallons
Shell thickness:	3/16" per ASME Code
Pressure controls:	Stream control valve, auto, plug.
Foundation construction materials:	Skid mounted
Structural support:	Skid mount
Seams:	Welded
Connections:	Welded
Corrosion protection:	Type 316L SS is an acceptable alternative
Remarks:	none

Name:	#32 UV Inlet Cooler(Plate Frame Heat Exchanger) Equipment No. 2025E-60B-E-1
Purpose:	Cools process water entering the UV Oxidizer.
Conditions:	140F, 150 psia
Construction Material:	Type 316L SS
Lining Materials:	None
Tank Dimensions:	270.4 Sq ft.
Tank Capacity:	3,506,000 BTU
Shell thickness:	1"
Pressure controls:	Pressure instrument PSV 60B011
Foundation construction materials:	On metal frame skid
Structural support:	skid mount
Seams:	Welded
Connections:	Tack welded and pressed
Corrosion protection:	Not covered in LaQue Corrosion Report
Remarks:	none

Name:	#33 Vent Cooler Equipment No. 2025E-60J-E-01
Purpose:	Cools the air coming off the spray condenser to remove liquid water.
Conditions:	250F, atmospheric
Construction Material:	Carbon steel(H-2-89924) & Stainless Steel(H-2-88989)
Lining Materials:	None
Tank Dimensions:	15.70 sq ft.
Tank Capacity:	10 cfm
Shell thickness:	Am Std SSCF 05024, 0.065" thick
Pressure controls:	continous vent through V.O.G. system
Foundation construction materials:	angle iron
Structural support:	Skid mounted
Seams:	Welded
Connections:	Welded
Corrosion protection:	CS and SS are acceptable
Remarks:	none

2.2 Vendor Supplied Units

For each of the long-lead vendor supplied units for the ETF facility, the units listed below are the long lead package units that are to be supplied by vendors. Condition were imposed upon the suppliers for material and structural integrity analysis. Secondly the materials specified appear to be compatible to the waste materials to be treated in the operable units..

List of procured units(package treatment)

Main System

Rough Filters
UV Oxidation & H2O2 Decomposer
pH Adjustment Tanks
Degasification System
Reverse Osmosis System
Polishers

Secondary System

Evaporator System
Dryer System
Drum Handling System
Resin Dewatering System

Each of the procurement packages were reviewed to verify that the design conditions were included as a part of the procurement. While several of the packaged units have been recently procured, presented in the attached table are the referenced specification used with each package unit. Where the vendors have provided information on the design or calculations we have so noted. It is also noted that much of the equipment is "off the shelf" and has been qualified via other applications in similar environments. The table presented in the appendix summarizes ADTECHS verification of the design and references the resolution of nonconformances with the final design of the package units.

Following the interim review in April 1995 for the K-ETF project, the reviewer noted that the structural calculations for Polishers was missing from the files. ADTECHS has responded and included a copy of the calculations in the Appendix.

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
ROUGH FILTERS	Pall Power Generation	R-135A-001	3		V-135A-001-301	
		S-1131-004	0		V-135A-001-302	
		S-1222-003	0		V-135A-001-303	
		S-1222-006	2		V-135A-001-304	
		S-1222-007	1		V-135A-001-305	
		S-135A-001	1			
		S-1370-101	0			
		S-1380-101	2			
		S-1510-003	2			
		S-1510-006	3			
		S-1510-007	2			
		S-SECT 01650	OD			
		S-SECT 01730	OB			
		S-SECT 05120	OE			
		S-SECT 09805	OE			
		S-SECT 13440	CE			
		S-SECT 15491	OE			
		S-SECT 15493	OE			

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
UV OXIDATION & H202 DECOMPOSER	Peroxidation Systems, Inc.	R-135A-002	1		V-135A-002-300	
		S-1131-004	0		V-135A-002-302	
		S-1222-003	0		V-135A-002-307	
		S-1222-006	1		V-135A-002-340	
		S-1222-007	1		V-135A-002-341	
		S-135A-002	0			
		S-1370-101	1			
		S-1380-101	1			
		S-1510-003	0			
		S-1510-005	1			
		S-1510-007	1			
		S-SECT 01650	1			
		S-SECT 01730	1			
		S-SECT 05120	1			
		S-SECT 09805	1			
		S-SECT 13440	1			
		S-SECT 15491	1			
		S-SECT 15493	1			
		S-SECT 15493	OE			

Unit	Vendor Name	Specification Reference	Rev. Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
ph ADJUSTMENTS TANKS	Clawson tank Co.	R-1354-001	1		V-1354-001-301	
		R-135A-005	3		V-1354-001-302	
		S-1131-004	0		V-1354-001-303	
		S-1222-003	1		V-1354-001-304	
		S-1222-006	2		V-1354-001-315	
		S-1222-007	2		V-1354-001-316	
		S-1312-001	1		V-1354-001-317	
		S-1351-001	0		V-1354-001-318	
		S-1354-001	0		V-1354-001-319	
		S-1370-101	3			
		S-1380-101	2			
		S-1510-003	2			
		S-1510-006	3			
		S-1510-007	2			
DEGASIFICATION SYSTEM	McCormack Div. ARI Technologies, Inc.	H-2-88978	1			
		R-135A-007	1		V-1354-007-301	
		S-1134-004	0		V-1354-007-302	
		S-1222-003	1		V-1354-007-303	

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
		S-1222-004	1		V-1354-007-304	
		S-1222-004	1		V-1354-007-305	
		S-1222-006	2		V-1354-007-306	
		S-1222-007	1		V-1354-007-307	
		S-1312-001	1		V-1354-007-308	
		S-135A-007	0			
		S-1370-101	3			
		S-1380-101	2			
		S-1510-003	2			
		S-1510-006	3			
		S-1510-007	2			
		S-SECT 13440	OE			
		S-SECT 16400	OB			
REVERSE OSMOSIS SYSTEM	Zenon Environmental Systems	R-135A-003	1			
		S-1131-004			V-135A-003-301	
		S-1222-003			V-135A-003-302	
		S-1222-006				
		S-1222-007				

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
		S-135A-003	0		V-135A-006-303	
		S-1370-101	0		V-135A-006-304	
		S-1380-101	1		V-135A-006-305	
		S-1510-003	1			
POLISHERS	Indeck Power Equipment	R-135A-006	1			
		S-1131-004	0			
		S-1222-003	0			
		S-1222-006	1			
		S-1222-007	1			
		S-135A-006	0			
		S-1370-101	1			
		S-1380-101	1			
		S-1510-003	0			
		S-1510-006	1			
		S-1510-007	1			
		S-SECT 01650	0			
		S-SECT 01730	0			
		S-SECT 05120	0			
		S-SECT 09805	0			

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
EVAPORATOR SYSTEM	Resources Conservation Company	DCN-1	0			
		R-135A-004	2		V-135A-004-303	
		R-135A-004	2		THROUGH	
		S-1131-004	0		V-135A-005-364	
		S-1222-003	1			
		S-1222-006	1			
		S-1222-007	1			
		S-135A-004	2			
		S-1370-101	1			
		S-1380-101	1			
		S-1510-006	1			
		S-1510-007	1			
		S-SECT 01650	OE			
		S-SECT 01730	0			
		S-SECT 05120	OE			
		S-SECT 09805	OE			
		S-SECT 13440	OE			
		S-SECT 15491	OE			
		S-SECT 15493	OE			

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc
DRYER SYSTEM	LCI Corporation	S-1131-004	0			
		S-1222-003	1			
		S-1222-006	1			
		S-1222-007	1			
		S-135A-005	1			
		S-1370-101	1			
		S-1380-101	1			
		S-1510-003	0			
		S-1510-006	1			
		S-1510-007	1			
		S-SECT. 01650	OE			
		S-SECT. 01730	0			
		S-SECT. 05120	OE			
		S-SECT. 09805	OE			
		S-SECT. 13440	OE			
		S-SECT. 15491	OE			
		S-SECT. 15493	OE			

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
DRUM HANDLING SYSTEM	Pacific Nuclear Systems	H-2-88989	1		135Z-002-310	
		H-2-88990	0		135Z-002-370	
		H-2-89006	1		135Z-002-371	
		H-2-89008	0		135Z-002-375	
		H-2-89009	0		135Z-002-376	
		H-2-89128	0			
		R-135Z-002	1			
		S-1131-004	0			
		S-1222-003	0			
		S-1222-004	0			
		S-1222-006	1			
		S-1222-007	1			
		S-1312-001	0			
		S-135Z-001	1			
		S-135Z-002	1			
		S-1370-101	2			
		S-1370-102	1			
		S-1372-001	0			
		S-1372-002	0			

Unit	Vendor Name	Specification Reference	Rev Complete	Vendor Design	Provided Drawings	Vendor Design Calc.
		S-1380-101	1			
		S-1510-006	2			
		S-1510-007	1			
		S-SECT. 13440	OE			
RESIN DEWATERING	TTI Engineering	S-135A-008	0			
		S-1222-006	1			
		S-1131-004	0			
		S-1370-101	2			
		S-1380-101	1			
		S-1510-006	2			
		SECTION 13440	OE			
		H-2-88990	0			
		S-1312-001	0			

3.0 Structural Integrity Certification and Hazard Assessment

3.1 Introduction

The Structural Integrity report was provided by an outside independent structural engineer(TECHKNOW, INC. Mr. John Schmidt, P.E., S.E. Appendix #35) for the original design certification of the Tanks and equipment. At the time of the initial review several pieces of the vendor supplied equipment were not ordered. On March 11, 1993 the independent reviewer received the Interoffice memorandum #554 prepared by Ed Hartsock indicating that all calculation will be supplied. (copy of the letter is located in the appendix) A copy of Mr. Hartsock's close out memo on the vendor items is also included in the Appendix.

A preliminary review of the files identified that the following calculation for seismic qualifications for vendor items had been prepared.

Package Unit	Specification
Rough Filters	V-135A-001-302-REV 5
UV Oxidation/H202 Decomposer	V-135A-002-012
pH Adjustment Tanks	C-1354-001
Degasification System	V-135A-007-201 REV 1
Reverse Osmosis System	V-135A-003-017 REV 1
Polishers	V-135A-006-
Evaporator System	V-135A-004-044 REV 1
Dryer System	V-135A-005-043
Drum Handling System	V-135A-002-010
Resin Dewatering System	Portable unit

Damage to Surge Tank during Acceptance Testing

A separate report was prepared to address the repair to the damage to the Surge Tank that occurred on March 20, 1995 . The report is included in the appendix for reference purposes at this time. The tank, supports and all repairs were to be certified by an independent qualified structural engineer. The certification is included in the appendix.

TECHKNOW, INC
Engineers and Management Consultants

STRUCTURAL ENGINEERS CERTIFICATION

March 19, 1993

Project No. 212
File No. 6410

Mr. Donald B. Mausshardt, P.E.
7705 Falstaff Road
McLean, VA 22102

Re: 242-A Evaporator/Purex Plant
Process Condensate Treatment Facility
Structural Integrity Analysis - Independent Design Review

Dear Mr. Mausshardt:

In accordance with WAC 173-303-810 13, I, as a Licensed Structural Engineer in the State of Illinois, have reviewed the design calculations and drawings for the tanks, vessels and secondary containment listed below. My review was limited to verification of assumptions, methodology and reasonableness of results. I did not attempt to verify the correctness of mathematical computations.

My review was limited to the following documents:

1. a) Structural Design Calculations.
   Document No. C-13G1-001, Revision 0, sheets 1-70, 97-127, 130-131, 136-140.

   b) Supplemental Caluculations in Response to Review
   Sixteen sheets transmitted by E. Hartsock, Adtechs, on 3-16-93.
   Three sheets transmitted by E. Hartsock, Adtechs, on 3-17-93.
   Five sheets transmitted by E. Hartsock, Adtechs, on 3-18-93.

2. Drawings.

Drawing No.	Revision
H-2-89063	1
H-2-89064	1
H-2-89065	1
H-2-89066	1
H-2-89067	1

H-2-89068, Sheet 1 of 2	1
H-2-89068, Sheet 2 of 2	0
H-2-89069	1
H-2-89070	1
H-2-89071	1
H-2-89072	1
H-2-89073	1
H-2-89074	1
H-2-89076	1
H-2-89077	1
H-2-89078	1
H-2-89108	1
H-2-89109	1
H-2-89114	1
H-2-89115	1
H-2-89116	1
H-2-89119, Sheet 1 of 2	1
H-2-89119, Sheet 2 of 2	0
H-2-89120, Sheet 1 of 2	1
H-2-89120, Sheet 2 of 2	0
H-2-89121	1
H-2-89124, Sheet 1 of 2	1
H-2-89124, Sheet 2 of 2	0
H-2-89125, Sheet 1 of 2	1
H-2-89125, Sheet 2 of 2	0

The information provided me demonstrates the tanks and vessels have sufficient structural integrity for the materials placed in them. The design is adequate to ensure sufficient structural strength to meet design seismic events for Richland, WA for the vessels, tanks and secondary containment in accordance with the Uniform Building Code.

Very truly yours,

John E. Schmidt, P.E., S.E.
Principal Structural Engineer

STATE OF ILLINOIS
JOHN E. SCHMIDT
081-004894
LICENSED PROFESSIONAL ENGINEER

Date 3/19/93
License Expires 11/94

3.2 Hazards Assessment

3.2.1 Introduction

The Hazards Assessment Document (Specification S-12HO-001) was reviewed for its completeness and inclusion of major RCRA related issues.

3.2.2 Hazard Concerns

The major issues covered in the hazard assessment are summarized below.

(1) The influent waste stream are mixed wastes containing hazardous materials at low concentrations.

(2) The chemical source term consists of tanks containing sulfuric acid, sodium hydroxide, and hydrogen peroxide. Low concentrations of volatile organic compounds(VOCs) are part of the source term and will be converted to hydrogen, oxygen and carbon dioxide by UV oxidation and H2O2.

(3) The operations area has a separate HVAC system from that of the ETF process area. During normal operations, the ETF ventilation systems are designed to maintain a greater negative pressure in the Radiologically Controlled Area(RCA) than in the Non-RCA areas. This will minimize gaseous environmental releases from the ETF into the operations area as a result of door openings. The ETF will utilize charcoal and HEPA filters to minimize the discharge of contaminants.

(4) Liquid releases will be controlled and sampled prior to authorized discharges. The ETF will use test tanks that will retain processed liquids until liquids are verified to meet discharge limits.

(5) The ETF employs designs that mitigate the severity of accidents or transients through the use of physical barriers such as dams, berm, drip pans enclosures, tents, and other barriers.

(6) The ETF employs instrumentation, monitoring, computer and communication systems to provide automatic shutdown controls, proper monitoring of system operation, interlocks, and communications to safely operate and maintain the facility.

A summary of the postulated hazard events and their potential consequences is presented in the attached table. The postulated hazard events have a very low probability of occurrence. Even so the analysis of the possible sequences, potential consequences, preventive features and mitigating features were fully addressed and commensurate with the 100% design documents.

3.2.3 References:

V-CO18HC1-001	Design Construction Specification ETF
H-2-88970	Process Flow Diagram
H-2-88970	Material Balance DB1
H-2-88971	Material Balance DB2
H-2-88973	Material Balance DB3
S-1223-001	System Description

Table 3-1 RCRA-Related Hazards Identification and Assessment

Event	Possible Sequence	Potential Consequences	Preventive Features	Mitigating Features
Liquid Spill	Equipment in operation Pressure bound. ri.s fail, & residual liquid spills.	Personnel exposure	Bldg confinement training, use of berm/dams.	Relatively low operate pressure with exception of RO system
Corrosive Materials Cause Equip. Failure	Equip./piping failure occurs & containment is lost	Personnel exposure	Equip. materials selection, proper maintenance.	Early detection by inspection and/or monitors
Seismic Activity	Earthquake occurs & support facilities are disrupted; system equipment containment is lost.	Personnel exposure Equipment loss	Bldg acts as confinement.	Low energy (Pressure & Temp) systems
Containment Component Is Subject To Stress and/or Vibration	Stress/vibration causes fatigue and containment is lost.	Personnel exposure	Materials selection Planned maintenance	Early detection by inspect and/or monitors
Misrouting of Process Flow	Faulty design allows misrouting, overflow, etc.	Personnel exposure Environmental release	MCS fail safe; alarms & interlocks.	Tank level alarms; redundancy, operator training
Faulty Fabrication/ Installation	Fabrication/ installation is faulty and component fails	Personnel exposure; environmental release	QA; inspection, planned maintenance	Early detection by inspect/ monitors

Table 3-1 Continued

Chemical Reaction of Reagents	NaOH & H2SO4 can react violently when mixed	Personnel injury; Equipment loss	Maintain separation of chemicals; color coding; training; opns procedures.	Metering and pH monitors
Exposure to Chemicals (VOCs)	Loss of ventilation system	Personnel injury	Design, inspection, and maintenance	Low conc. UV oxidizer converts VOC to H2,O2 and CO2
Chemical Vent System Fails	Room fills with corrosive vapors	Occupational injury	Non RCA ventilation system; redundancy of vital equipment	Very low concentration
Chemical Spills or Sprays	Personnel come in contact with chemicals.	Occupational injury Environ. release	Training; compliance with operating & maintenance procedures; use of berm and dams	Spill prevention plan; containment structure Shower/eye wash.
Chemically Induced Overpressure	Personnel come in contact with chemicals and VOCs	Occupational injury. Environmental release	Building contain; negative pressure maintained	Limited use of unstable chemicals Low conc.

4.0 Secondary Containment

Liquid process wastes containing radioactive or other hazardous materials are collected and monitored near the source of generation before batch transfer through pipe lines and tank transfer to the liquid waste treatment process area takes place. These wastes are collected in storage tanks. The waste storage tanks and transfer lines are designed and constructed so that any leakage is detected and contained before reaching the environment.

The secondary containment system consists of the diked and drained concrete floor including the process areas and adjacent support areas designed to retain the capacity of the largest single vessel in the respective containment area. In addition, individual containment areas surround the surge, verification, external storage tanks and exterior product trench between the Verification Tanks and Process Building. As part of the containment system, a multi-layered coats of special protective coating were applied to the concrete surfaces to assure containment of any spilled materials or liquids. The specific coating are summarized in the Matrix "G' found in the Appendix. Additionally, selected product descriptions are found in the Specification S-1131-103 revised, 09805 and 07900(Joint Sealers).

4.1 Spill Containment in the Process Area

The spill containment design is recorded in document number C-13G1-001 and references drawing number H-2-89077. The capacity of the largest single vessel, in accordance with the Code of Federal Regulations, forms the basis for design. The largest vessels in the process area are the two secondary waste receiving tanks (2025E-601-TK-1A & 1B) each having a capacity of 15,000 gallons or 2005 cubic feet. The containment area consists of the process area of 12,000 cubic feet. The net containment area calculation is based on 80% of the area being occupied by equipment, and provides for 2400 cubic feet compared to the 2005 cubic feet requirement. This is a very conservative assumption since the clear floor area is closer to 50% of the gross area. The reinforced concrete floor is finished in accordance with the American Concrete Institute specification 301-89. The floor is uniformly sloped to the floor drains at 1/8 inch per foot. Spills in the process area flow to the drains and are collected in sumps and pumped to the surge tank thereby clearing the process area. All concrete and masonry surfaces in the process secondary containment area are painted with multiple coats. Initially the protective coats included a clear sealer, a prime coat(in some areas the prime coat also served as the vapor sealer) and a final top coat(s) depending upon conditions. Those initial applications have been documented in the March 10, 1994 letter from Mr. M. Yoshii, Project Manager to Kaiser Engineers Hanford(Letter No. L-JHO/KEH-737). In September 1995, ADTECHS provided a copy Titled MATRIX G, Secondary Containment Coatings System that noted the final products used including the recommended repair materials if required. A copy of this matrix "G" is found in the appendix.

For the equipment pads, the primer coat consists of Ameron NU-Klad 105A, the second coat Ameron Nu-Klad 114A and the finish coat of Ameron NU-Klad 120A.

The process floor area received a combination of application and repairs during construction and prior to turn over. The combination of applications has afforded multiple layers of protection. The materials used included the following products: Fill cracks with Ameron NU-KLAD 750A and NU-KLAD 114A, fill construction joints with NU-KLAD 750A, Fill voids with Wall-NU, Stress tape, Steel Coat Monomid, Steel coat Colortop. A map describing location and type of materials is shown in the appendix.

With in the process areas there are several separate containment areas for package units and for the Tanks 65C TK-3,4. These tanks have there own diked areas to contain a spill. This area is also alarmed and tied to the operations center. The package units that came with drip pans have been configured in such a manner to drain to the collection trenches inside the process area.

This application protects, facilitates cleaning minor seeps, leaks and spills along with providing a measure of environmental protection. Horizontal concrete floor control joints are sealed with a barrier to prevent leakage from the containment area.(see drawings H2-89071 and H2-89067, Details A, B, and C)

4.2 Spill Containment - Verification Tanks

Three verification tanks (2025E-60H-TK-1A, 1B & 1C), are located apart from and on the north side of the processing facility, each with capacities of 670,000 gallons are surrounded by a secondary containment system. Design criteria for the volume to be contained is based upon containing 110% of one tank, or 98,516 cubic feet (737,000 gallons). The containment area, portrayed by drawing number H-2-89068, is a 236 by 88 foot rectangle, bounded by an 8 foot reinforced dike. The floor of the containment area is also reinforced concrete. The available volume to contain the design volume is 109,660 cubic feet, which subtracts the area occupied by the tanks, leaving a volume well in excess of the minimum design objective. The Verification Tank ring beam and floor joints are cast in place with Waterstop RX-101. The dike floor experienced a cracking problem which was repaired following an approved procedure developed by ADTECHS. The floor area of the Verification dike was treated with a variety of SPC material(Sikaflex 1A) joint sealer, and then given two coats of Wasser - McLuster to address the cracking problem. This was not successful and ADTECHS then contacted General Polymers to develop a new compatible repair to assure the coverage of the cracks to prevent possible migration to the soil column. The materials used to provide the final coat were: Wasser - McLuster, General Polymers 3450, Epothane Primer, General Polymers 4994, Kobathane Membrane and General polymers 4991 Top Coat. The walls of the Verification dike were treated with Columbia Clear Seal for Walls. Detailed information on the

location and materials used is found in the appendix. A maintenance and operation procedure was prepared to address an annual inspection and repairs, if required.

The secondary containment area directly under the Verification Tanks has a high density poly liner sealed to the inner surface of the ring beam structure which supports the Verification Tanks. A PVC pipe through the ring beam will allow any leakage to be discharge into the Verification Tank dike structure for monitoring and disposal. The documentation supporting the design can be found in drawings H-2-89068, H-2-89070(see detail #3), H-2-88985(line # 60H-021,60H-022, 60H-023).

There is a scupper drain system and sump pump located in the foundation of the containment area which is manually activated to evacuate natural precipitation.The drain is normally closed. A detection/alarm system is located in the drain sump to signal the accumulation of fluid. The drain must be physically inspected and the contents surveyed by plant personnel before the evacuation pump can be activated to clear nonhazardous and nontoxic fluid from the containment area. Should hazardous or toxic fluid be discovered, plant personnel follow operating procedures dealing with the safe removal of such material.

4.3 Spill Containment - Surge Tank

The surge tank (2025E-65A-TK-1) is located outside the facility on a reinforced concrete foundation. The secondary containment area shares part of the southern wall of the main processing plant. The tank has a capacity of 100,000 gallons and stores waste liquid from the 242-A Evaporator/Purex plant waste streams. The tank is surrounded by a 3300 square foot containment area defined by a 9.5 foot reinforced concrete dike. The volume available to contain 100,000 gallons, plus 10%, or 14706 cubic feet is less than 31,350 cubic feet, available for containment. The floor, wall and dike joints are primed and sealed with the a variety of products including Waterstop RX-101, Sikaflex IA Joint sealer, Steelcote Monomid Primer, Steelcote Wall-NU, Steelcote Tile-X-3000, General polymers 3450, Primer, General Polymers 4994, Kobathane, General Polymers 3744 and Epoxy plus General Polymers Flouroestomer over expansion joints. The map and specific data on the products can be found in the appendix.

The secondary containment directly under the surge tank has a high density poly liner sealed to the inner surface of the ring beam structure which supports the surge tank. Drawings H-2-89070(detail #4) and H-2-88985 describe the layout of the PVC drain pipe for monitoring the secondary area under the surge tank.

The are no drains incorporated in the base of the containment area since fluids collected would be returned to the Surge tank. The surge tank containment area coating performance objectives are to seal off contaminated fluid from seeping out of the area and providing a surface that can be cleaned and decontaminated in a

safe and environmentally compliant way when dealing with seeps, leaks and spills of a minor nature.

4.4 Spill Containment - Sulfuric Acid Storage Tank

The H2SO4 storage tank (2025E-65C-TK-1) is located outside the facility adjacent to the south wall. A portion of the south wall is incorporated in the 20 by 24 foot containment area. The tank sits on a 6" high concrete pad on a reinforced concrete floor surrounded by a 4 foot reinforced concrete dike. The volume to be contained is 7,500 gallons plus 10% as a design objective or 1,100 cubic feet. The volume available for containment is 1,920 cubic feet, a satisfactory volume. The joints in the dike, the union with the facility south wall and the floor joints are water sealed with a cast in place Waterstop RX-101 and other cast in place water stop materials at horizontal and vertical joints(wall and floor). Final repairs to the protective coating included the addition of following materials to prevent breaching of the secondary containment: The wall dike and floor are coated with epoxy paint to seal and provide environmental safeguards when remediating seeps, leaks or minor spills. Materials used included; General Polymers 3577 LU Primer, 3552 Base Coat, Flex-Grid, 3552 Secondary Base Coat and 3740 Top Coat(2 coats) over steel coat products.

No drains are incorporated in the secondary containment area.

4.5 Spill Containment - Sodium Hydroxide Storage Tank

The NaOH storage tank (2025E-65C-TK-2) is adjacent to the H2SO4 storage tank, also the south wall. The tank capacity is 5,000 gallons with the design objective 110% of this quantity or 736 cubic feet. The containment area is a 20 by 16 foot rectangle. The tank sits on a reinforced concrete floor and is bounded by a 4 foot reinforced concrete dike for an available volume of 1,280 cubic feet which will satisfactorily contain the design objective. The joints throughout the dike, wall and floor were initially sealed with Waterstop RX-101 and other cast in place water stop materials. The concrete containment area when final repairs were completed, painted with General Polymers Coatings similar to the sulfuric acid tank dikes. The General Polymers Materials were applied over the previously applied Steelcote Products. No drain is incorporated in this secondary containment area.

A map that describes the location of the coating materials and those material applied can be found in the Appendix. A review of selected Noncompliance reports and there resolution were checked to confirm that the NCR's had been closed.

4.6 Product Channel - Between the Verification Tanks and Process Building

A open concrete channel was constructed between the Verification Tank Dike and the Process building. The objective of this channel was to contain and possible spills due to a break in the transfer pipes. The channel was constructed with reinforced concrete and was inspected by ADTECHS to verify that it was free of cracks or visible defects. The specification followed was S-1131-103 and Drawing H-2-89069. Calculation of the volume of the trench(7,100 cubic feet) in comparison to the volume of the pipe volume demonstrated that any spill would be contained with in the trench. To provide further protection the trench was treated with Columbia Water Seal. In the event of a failure the trench would discharge back into the sump of the Process Building.

5.0 Handling Procedures Verification

An examination of the ADTECHS Inspection and Test Plan S-1510-005 revealed that a broad inspection and certification program was initiated to require the suppliers and on-site personnel to inspect the tanks and ancillary equipment during manufacturing, shipping and receipt at the site. Specific sections of ADTECHS plan are noted and referenced below:

Weld Breaks S-1510-005

Inspection instructions II-001, Revision 1. (pages 1-12); and required inspections and tests imposed by contract, codes and standards.

Cracks S-1510-005

Inspection instruction II-008 pp 12, 13, II-002, instruction for visual inspection of welds. Section on cracks pg. 19; and required inspections and tests imposed by contract, codes and standards.

The write up section on cracks has been combined with the write up for weld breaks.

Procedural Control:

Adtechs required and its vendors and sub contractors to develop , approve and implemented the required ASME NQA-1-1989 quality assurance program. Adtechs staff periodically audited the vendors and subcontractors administration of their plans and issued, or caused to be issued, non conformance reports, trended non conformance reports and issued several corrective action reports.

The piping, vendor equipment and tank systems were individually hydro and fill tested as reported in the QA inspectors reports. During the required ATP tests complete piping systems, tanks and vendor equipment was verified and found to be liquid tight.

The KEH/Adtechs D/C contract required that five percent of each pipe fitter welder's B31.3 welds successfully passed a radiographic test and that the required sample population of the total weld population passed their required radiographically test.

The field fabricated and repaired tanks (Verification Tanks and Surge Tank) welding program were subjected to a similar inspection and testing programs to verify that they met requirements.

The results of the NQA-1 program together the results of the radiographic tests and the ATP tests have been submitted to ICF-KH by Adtechs were found to be acceptable.

Punctures S-1510-006

Note no specific reference however each item was inspected visually.

Procedural Controls:

Adtechs and its equipment vendors and sub contractors developed, approved, implemented and maintained inspection procedures for receiving, installing, repairing , inspecting and testing of equipment, tanks (including lining/coating systems and piping systems for punctures.

Tank Vents:

Adtechs following the damage to the surge tank during an operational test, identified that the tank was subjected to a negative pressure condition in excess of design standards. The tank shell and roof were sucked inward several feet and the tank shell was ultimately breached.

Adtechs in accordance the prime contract with ICF-KH Section 01010 paragraph 1.7.10.2.1, requires pressurization controls and more specifically that the tank will not collapse or fail. Additionally contract section 15493, paragraph 2.1.5.4.b requires over-pressurization and vacuum prevention devices be installed.

Adtechs performed a calculation titled Tank Vent Valve Evaluation calculation No C-13G1-003, the tanks addressed were the Concentrated Waste Tanks, the Secondary Receiving Waste Tanks and the Surge Tank.

The roof of the Secondary Waste Receiving Tanks were reinforced (see DCN 3538) by addition of structural shapes welded to the tank roof. The Surge Tank vacuum breaker valve was added and set so that the internal tank pressure would not exceed 1 psi.

Damaged and Repaired Tanks:

The two tanks that were damaged and were subsequently repaired on site were the De-gasification Column(cracked flange was repaired) and the Surge Tank. The surge tank shell suffered major damage (breached) during testing and were successfully repaired at the site. The Surge Tank repair operation has been fully documented and is part of this report (refer to appendix) demonstrating compliance with the required programs.

Testing for Punctures:

The individual pieces of equipment and tanks were fill tested and hydro tested. Finally systems and process trains comprised of the tanks, equipment and piping systems were tested during manufacture, construction and finally during the ATP testing program. The systems and process trains passed these tests for leak tightness and integrity demonstrating the absence of punctures.

Scrapes of Protective Coatings S-1510-005

Inspection instruction II-003, Revision 1. Instruction for visual inspection of surfaces as per code SSPC-SP-89, and required inspections and tests imposed by contract, codes and standards.

The Scrapes of protective coatings sections write up has been combined with the section on corrosion.

Corrosion S-1510-006 and S-1510-005

Attachment A vendor Inspection of painting and Surfaces and required inspection and tests imposed by contract, codes and standards.

Procedural Controls:

Adtechs its vendors and sub contractors developed, approved, implemented and maintained the required application, inspection, testing and acceptance procedures. These reports were noted by the RCRA reviewer and will be included in the Adtechs inspectors files.

Modified and Repaired Tanks:

Specific areas of interest are the tanks fabricated by Clawson, (Secondary Waste Receiving Tanks, Concentrate Tanks, 1 st RO Tank and 50 % NaOH Tank) refer to DCN 3544, the Surge Tank repair (interior finish restoration) program and the Verification Tank roof plate sealing and coating program refer to DCN 3546.

RCRA Reviewer Activities:

The RCRA reviewer has on several occasions requested additional information regarding the Clawson Tank manway modification program requirements for interior finishes and stress reliving of welding of various tanks.

The RCRA receiver has on several occasions requested additional information regarding the efficacy of the sealing methodology for the interior Verification tank roof plate joints and supporting structure.

The RCRA reviewer noted that Adtechs has used a Washington State certified independent structural engineer to certify that the surge tank was returned to its pre-damaged structural condition.

Clawson Tank Manway Modification Program:

The Adtechs field construction and inspection staff removed and replaced the Clawson horizontal manway hatch cover assemblies which were leaking with a new type of manway hatch cover. Adtechs staff initially had difficulty stating that the new modified assembly met the interior finish requirements for the manway and hatch cover surface. Adtechs personnel has stated that the manway flange weld was not ground smooth and finished to the required RMS 63 surface for tanks containing radioactive materials as recommended by the NACE design and corrosion expert, LaQue.

Furthermore the D/C specification for tanks requires that they be designed by a NACE corrosion expert. LaQue complied and provided a review of Adtechs design and material selections. Several Clawson stainless steel tank shells were not stress relived (shell and roof welds) as required by LAQUE (pages 16, 23, 58 and 59) when using the selected materials, S030400 and S31603 plate to prevent localized chloride stress corrosion cracking at the tank shell weld.

Adtechs responded to the RCRA reviewers comments concerning the lack of vendor and Adtechs weld stress reliving records (for vendor shop and for field welds) for the concentrate tanks and the secondary waste receiving tanks. The Adtechs response is in a letter to the RCRA reviewer dated 10/10/95, Re: Clawson Tank Modifications (Modifications) refer to appendix.

It should be pointed out that LaQue final admonishment regarding material selection (pages 58 and 59) for the subject tanks whose welds were not stress relived as recommended should be carefully monitored since the existing non stress relived weld are a source of early trouble. Quoting LaQue "Without proper stress relief heat-treatment, the tensile stress inherent in such a repair welds could further enhance the risk of, for example, stress corrosion cracking under the conductive environmental conditions; and so forth."

Using the LaQue report specifically pages 58 and 59 the RCRA reviewer concludes that the existing non stress relived tank welds are equivalent to the non stress relived repair welds cited on the report pages 58 and 59.

Therefore the RCRA Reviewer concludes that since the tanks welds were not stress relived that the tanks has an increased risk of early corrosion failure particularly from localized attack by stress corrosion cracking.

In light of this conclusion the RCRA advisor strongly recommends that the affected tanks be frequently and carefully monitored by the maintenance and operation contractor. To this end a recommended

schedule for inspection is offered below.

The recommend inspection program is that periodically during the operation and maintenance of the plant that all of these tanks interior weld surfaces receive more frequent inspections of a comprehensive nature including UT.

Surge Tank Interior Surface Finish:

The surge tank surfaces were inspected and accepted prior to the breaching of the tank. The top half of the tank was replaced, this section was polished in Seattle, Wa. and the weld joining area and the remaining tank interior surface was inspected and polished in the field to the required RMS surface finish. The tanks interior surface was restored to is pre-damaged condition.

Verification Tank Roof and Support Structure Sealing Program:

The three verification tanks plate roof assemblies and supporting structures could not be adequately sealed to prevent corrosion damage as originally installed. When the tanks were opened after final acceptance testing operations and it was observed that the selected epoxy coating did not prevent corrosion (rusting) at the interior roof and supporting structure. The tanks were manufacture in accordance with the specified API 650 code. The plate roof structure was seal welded on the top of the overlapped plate. The tanks interior plate joint was not sealed, these overlapping plate surfaces were recently subject to corrosion. A number of modifications to seal these surfaces were explored. An acceptable alternative was selected and that was to sand blast the surfaces, repaint with epoxy and caulk the interior plate joints and selected roof structure with a durable and strong bonding caulk.

It is the RCRA reviews recommendation that the three verification tanks maintenance plan shall be upgraded so that the interior roof plate joint and supporting roof structure of the tanks be inspected for continuing corrosion quarterly or after a campaign by the maintenance and operations staff.

Carbon Steel Process Piping:

The carbon steel process piping and associated pipe hangers and supports were coated with an epoxy special protective coating to minimize the effects of corrosion. The carbon steel piping and support systems are to be periodically inspected for signs of corrosion, with appropriate repairs and coating restoration undertaken as needed.

Process Equipment Supporting Structures:

The carbon steel structures and platforms which support process equipment and piping systems have been coated with epoxy to minimize the effect of corrosion. The structures and platforms are to be frequently inspected for signs of corrosion, with appropriate

repairs and coating restorations undertaken as needed.

Structural Damage	S-1510-005 S-1510-007	Inspection and test plan. Specification for Non-Conformance Control.

The tanks, vessels, piping systems and supporting systems were inspected and verified by Adtechs and its sub contractors upon receipt, installation of individual pieces. And finally during construction hydro testing, construction turnover and during the various acceptance testing programs.

The RCRA reviewer has visited the site numerous times, observed the installation and acceptance testing programs, based on these reviews and programs/procedures in place, the RCRA advisor noted that structural damage was being identified and repaired.

5.1 Discrepancies

ADTECHS has addressed this issue under the Specification for Non-conformance Control. The reference document is Specification S-1510-007 and S-1131-103, Section 01400 which addresses the procedures for Identification, Control, and Resolution of Non-conformance Items. The documentation and follow up to closure of the issues are presented in the specification.

During the course of the project and based upon Adtechs NCR logs it was observed that approximately two hundred NCR'S were written. A number of these NCR'S were written for primary and secondary containment items.

Specific NCR'S of interest were written for the Surge Tank repair, the Clawson Tank horizontal manway modification program, the reinforcing of the Secondary Containment Waste Receiving Tank roof and the caulking and sealing of the Verification Tanks inner roof plate joints and supporting structure.

A number of other NCR'S were written for concrete cracking and repair, the application and condition of various special protective coatings application systems.

6.0 Testing Procedures for Tightness

A review of the 100% documents in support of assuring that the equipment including tanks and vessels conform to tightness and demonstrate that they are leak tight are covered in Specification S-1510-005, Inspection and Test Plan. ADTECH's developed procedures and specifications that requires the performance of hydrostatic, and pressure testing of all equipment both at the point of manufacturing and at the site when installed. Additionally, this testing will include performance tests to assure system operability and tightness.

For package systems, supplied by vendors, the Specification S-1510-006 will apply. This inspection requires that the vendor, witnessed by the Engineer(ADTECHS) to perform a Hydrostatic Test, a Mechanical test(Running) and a Performance test to assure meeting the specification. All of this will be performed at the vendors location prior to shipment to the field site. Specific inspection hold points and scope of inspections are found in Attachment A of S-1510-005.

For on site installation, the procedures for Inspection and Testing apply and require again the verification of tightness. This procedure will also apply to all ancillary equipment. Specification S-1510-005, Section II 007, Revision 1 addresses the onsite inspection and test program.

Onsite inspection program:

The RCRA Reviewer observed the successful operation and completion of the Final Acceptance Test of the Main Treatment Train and the Secondary Treatment Train. The plant is in a normal operation mode including fluid temperature and pressures.

The surge tank and piping on the roof of the tank were damaged during testing and their leak tightness will be demonstrated as part of their repair in an amendment to this report. The testing has been completed and documented in the appendix to this report.

After the completion of ATP 501 and 502 the RCRA Reviewer, reviewed the packages sections for the control and documentation of the plants primary containment systems for tightness. These packages were found to document that plant equipment and piping systems provide the required tightness.

The RCRA Reviewer was present during ATP 501 & 502 and visually examined all of the plants fluid systems for liquid tightness several times during the tests. Minor leakage/seepage was discovered during these examinations at various Clawson manway hatch covers. The manways and hatch covers have been modified and successfully tested and inspected to verify the absence of leaks.

Furthermore the RCRA Reviewer, reviewed a number of the completed ATP packages for adequacy of treatment of leak tightness and concluded that leak tightness for the packages that were reviewed had been adequately addressed. Following the repairs to tanks ATP 703 was successfully completed and witnessed by both ICF-Kaiser and Westinghouse.

It should be noted that the responsible ICF-KH authorized inspector has accepted all of the ATP test package which are used to demonstrate liquid tightness of the primary containment systems.

7.0 DESCRIPTION OF LEAK DETECTION SYSTEMS

7.1 Leak Detection-Primary Containment

The primary leak detection system must be able to detect the failure of the primary tank/vessel containment structure. This will be accomplished by a combination of the on-line Monitor and Control System(MCS), operator visual observation, periodic maintenance to prescribed procedures and appropriate training on the responses to alarm conditions.

The operating state of major equipment items such as pumps, blowers, tanks, etc. will be monitored through operator control stations(OCS's) of the MCS. Operating process parameters such as pressure, temperature, flowrate, level in the tank/vessel, etc can be monitored through OCSs.

An alarm system will be installed to annunciate the upset of the system to the operator. The operator will be required to take some action when an alarm is annunciated. In the central control room an alarm in the plant will be displayed on the CRT display. Also, in the central control room, important alarms will be individually displayed on the separately installed alarm display window. Every alarm will be displayed on the OCS. Also, the event printer of the MCS will print out the occurrence and nonoccurrence of alarms. Process data, such as liquid level, will be stored in the MCS historical file. Interlocks will be provided to prevent the lowering of the performance of systems, equipment, tank and vessel damage, and personal accidents, misroutings, etc. due to abnormalities of operating conditions.

Tanks and pumps will normally be monitored and controlled using the OCSs in the control room. In the case of OCS failure, the tanks and pumps can be controlled using the LCU display in the process area. Some system components will be duplicated in consideration of risk versus reliability. For example, the MCS I/O card servicing the sump tank level will be redundant to retain maintainability.

Table 7.1 below identifies the tanks and vessels that will be monitored/controlled by the MCS. Associated with the tanks and vessels are field devices to be utilized, device applications, and the function to be performed.

Table 7.1 Leak Detection, Primary Containment via MCS and Moniotrs

Tank Name	Device Category	Applications	Function
Surge	Level switch	Moisture detection	Alarm
NaOH Storage	Level switch	Moisture detection	Alarm
92% H2SO4 Storage	Level switch	Moisture detection	Alarm
H2O2 Feed System	Level switch	Moisture detection	Alarm
Sump Tank 2 Secondary Cont.	Level switch	Moisture detection	Alarm
Sump Tank 1 Secondary Cont.	Level switch	Moisture detection	Alarm
4% Solution	Level switch	Moisture detection	Alarm
Second-waste Receiving TK A	Level transmitter	Level indicator/ control	Alarm/ pump start
Second-waste Receiving TK B	Level transmitter	Level indicator/ control	Alarm/ pump start
Concentrate A	Level transmitter	Level indicator/ control	Alarm/ pump start
Concentrate B	Level transmitter	Level indicator/ control	Alarm/ pump start
Verification A	Level Switch	High level switch	Alarm
Verification B	Level Switch	High level switch	Alarm
Verification C	Level Switch	High level switch	Alarm

On Site Inspection Program:

The RCRA reviewer observed the successful operation and completion of the final acceptance test of the Main Treatment Train (ATP 501) and the Secondary Treatment Train (ATP 502). These ATP's were reviewed and do provide a valid way of testing the projects leak detection system during normal operation. The plant was in a normal operating mode including fluid temperatures and pressures.

Additionally the level switches and transmitters shown in table 7.1 leak detection were tested and documented in other ATP packages.

A number of these alarms including the chemical tank alarm LAH-20B-015, ATP No 100 were demonstrated for the RCRA Reviewer in the K-ETF control room with the test result appearing on the screen of the Monitor and Control System (MCS). This demonstrated the remote operation and indication of the leak detection and alarm system. At a later date the MCS leak detection system audible alarm system function was demonstrated for the RCRA reviewer.

Signed off copies of the applicable ATP test pages were collected and reviewed and are noted as report attachment in the appendix. These document also form the basis for the review of the adequacy of the leak detection system.

The method to test the leak detection system for the RCRA reviewer was to charge the sump with water and observer the alarm signal on the MCS screen. The water was then removed and the alarm signal was cleared from the MCS screen.

It should be noted that the responsible ICF-KH authorized inspector has accepted all of the ATP test packages which are used to demonstrate the functionality of the primary containment systems leak detection system.

7.2 Leak Detection-Secondary Containment

The secondary systems outside the building have monitors located in their respective sumps of the secondary containment unit to monitor for moisture. Like wise the secondary units located inside the building for the tank noted (60D-TK1) has a moisture monitor to warn of a possible accumulation in the sump in secondary containment. On the floor of the main operations building at each sump in the floor there is a moisture monitor to advise of moisture accumulation. These features coupled with the level warning indicators associated with the tanks and vessels will alarm if a sudden loss occurs.

CERTIFICATION SECTION WAC 173-303-810-13A FOR FINAL RCRA INFORMATION NEEDS REPORT for EFFLUENT TREATMENT FACILITY CONTRACT V-C018HCL-001, REVISION OE

CERTIFICATION

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

Signed _____
Donald B. Mausshardt, P. E.

Date 10 · 20 · 95

DONALD BRUCE MAUSSHARDT
STATE OF WASHINGTON
0029996
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES: 6 · 30 · 97

Final RCRA Information Needs Report
K-ETF Project

APPENDIX

A-1. ADTECHS Contract for ETF Project No V-C018HCI-001, REV OE Section 01010, Paragraph 1.7.10.2 (8 pages)

A-2. Final Report K-ETF Tank and Vessel Corrosion Review, LaQue Center for Corrosion Technology, August 1993, with appendices

A-3. ADTECHS Permitting Report, Project C-018H, dated October 15, 1995. Text and Matrix 37 pages

Matrix A Design Definition- Primary Containment
Matrix B Design Definition- Secondary Containment
Matrix C Assessment of Containment Foundations
Matrix D Integrity of Primary Containment
Matrix E Integrity of Secondary Containment
Matrix F Tank System Alarm and Setpoints
Matrix G Secondary Containment Coating Systems

A-4 Excerpts from ATP 501 and ATP 502 (12 Pages)

A-5 T. Burke to DBM site RCRA inspection activities - system tightness, April 1, 1995 (2 pages)

A-6 Report, Leak Detection Systems - Testing, from ETF Operations Manager to T. Burke, April 11, 1995 (15 pages)

A-7 Data Sheets from the K-ETF Preventative Maintenance Manual, Prepared by ADTECHS

A-8 Location Map of SPC Coatings applied to Secondary Containment in the K-ETF Project. Dated October 10, 1995

A-9 List of miscellaneous Reports, Letters and notes gathered during the report preparation and inspection records in support of the RCRA Information Needs Report.
VOL 2, Documents 1 - 60 AND VOL 3, Documents 61 - 99

APPENDIX FOR ITEM No A-9

DOC DES TO FROM DATE No PGS

1 ADT 1183 4/05/95 PG 2
2 ADT 1177 03/30/95 PG 1
3 ADT NCR F-166 02/21/95 PG 9
4 DBM 02/24/95 PG 2
5 DBM 02/19/95 PG 4
6 DBM 02/14/95 PG 3
7 DBM 02/14/95 PG 1
8 GAK 01/30/95 PG 1
9 DBM 01/27/95 PG 2
10 ADT IOM 1106 PG 1
11 RDC DBM 01/10/95 PG 3
12 ADD 1 01/09/95 PG 20
13 DBM 01/03/95 PG 2
14 DBM 12/22/94 PG 2
15 CRACK 12/20/94 PG 42
16 GK DBM 12/12/94 PG 2
17 DBM RPC 12/11/94 PG 1
18 DBM GK 12/11/94 PG 2
19 EH/GK DBM WOODS 12/09/94 PG 1
20 RPC GK 12/09/94 PG 1
21 BEACON 12/02/95 PG 2
22 DBM GK 11/23/94 PG 2
23 DBM RPC 11/13/94 PG 2
24 DBM RPC 11/28/94 PG 2
25 BEACON 11/09/94 PG 1
26 EXHIBIT G EH PG 4 27
27 NOT USED
28 KEH 978 07/29/94 PG 7
29 SPC DEMO MTG 11/24/93 PG 16
30 AMERON WOOD 12/15/93 PG 1
31 KEH 554 11/09/93 PG 24
32 KEH 510 10/21/93 PG 30
33 KEH 532 10/12/93 PG 4
34 KEH 396 07/16/93 PG 2
35 DBM EH INITIAL RCRA RPT 03/19/93 PG 70
36 S-1131-103-09805 R4 PG 14
37 NCR F-182 R1 PG 10
38 ADT INSP. INSTRUCTIONS II - 108 PG 6
39 F-178 R1 PG 1
40 GK/EH DM 09/12 /95 PG 1
41 ADD #2 09/15/95 PG 61
42 DCN V-3008 05/24/95 PG 3
43 NCR F-158 R1 PG 8
44 NCR F-159 PG 7
45 NCR F-168 PG 5
46 NCR F-163 PG 9
47 NCR F-179 PG 4
48 NCR F-177 R1 PG 3

APPENDIX FOR ITEM No A-9 CONTINUED

49 OPEN NCR LOG 05/11/95 PG 5
50 DBM GK 10/02/95 PG 2
51 DBM EH 08/23/95 PG 1
52 DBM GK 10/05/95 PG 2
53 GK DBM 10/03/95 PG 1
54 ADT DBM 08/03/95 PG 2
55 TWB DBM 08/18/95 PG 2
56 ADT IOM 1197 04/20/95 PG 1
57 ADT DBM 08/03/95 PG 2
58 ADT IOM 09/07/95 PG 4
59 DBM DRS 06/09/95 PG2
60 S-1354-001 R1 PG 28
61 S-1351-001 R 2 PG 50
62 GK DBM STAINLESS DATA PG 2
63 TWB DBM 08/16/95 PG 2
64 S-1225-001 R1 PG 23
65 S-1225-001 R3 PG 22
66 DBM MTG NOTES 08/31/95 PG 2
67 ADT DBM 10/10/95 PG 2
68 DCN 3535 PG 5
69 DCN 3538 PG 2
70 TWB DBM 03/17/95 PG 1
71 TWB DBM 08/16/95 PG 4
72 TWB DBM 10/04/95 PG 2
73A MB DBM 06/20/95 PG 4
74A TWB DBM 07/24/95 PG 6
73 DBM LMM 02/28/95 PG 2
74 LMM DBM 03/02/95 PG 6
75 S-1223-003 R5 PG 61
76 DBM DS 08/02/95 PG 2
77 TWB DBM 08/01/95 PG 2
78 DBM DS 08/17/95 PG 3
79 C-13G-002 R2 SURGE PG 3
80 NCR F-170 R1 PG 4
81 KH 1347 07/27/95 PG 5
82 KH 1375 08/23/95 PG 1
83 KH 1301 06/07/95 PG 1
84 ADT IOM #002 09/11/95 PG 4
85 NCR P 1354-001-A-20 REV 2 PG 14
86 FINAL TANK CLOSEOUT FORMS PG 6
87 ADT 09/12/95 DBM PG 7
88 ADT DAILY INSPEC. FORM 10/03/95 PG 1
89 C-13G1-004 R 0 PG 3
90 C-13G-003 PG 3
91 TWB DBM 06/14/95 PG 2
92 TWB JC 06/15/95 PG 4
93 KH 1284 05/30/95 PG 2
94 K-ETF PM LOG 06/02/95 SPC 023 PG 1
95 TWB DBM 08/16/95 PG 6
96 ADT 0432 09/03/93 PG 1
97 JGC 0330 05/13/93 PG 2
98 KEH 0737 03/10/94 PF 15
99 KEH 0606 12/20/93 PG 28