JUL 2 1998
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ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 618236

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Technical Process 2E LWPF	TWRS Equipment Engineering	N/A
5. Proj./Prog./Dept./Div.:	**6. Design Authority/ Design Agent/Cog. Engr.:**	**7. Purchase Order No.:**
242-A Evaporator	Chris E. Jensen	N/A
8. Originator Remarks:		**9. Equip./Component No.:**
This transmittal contains the 5 year integrity assessment of the 242-A Evaporator report.		N/A
		10. System/Bldg./Facility: 242-A
11. Receiver Remarks: 11A. Design Baseline Document? [ ] Yes [X] No		**12. Major Assm. Dwg. No.:** N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: June 29, 1998

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	HNF-2905		0	1998 Interim 242-A Evaporator Tank System Integrity Assessment Report	ESQ	1	1	

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION
(See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
1	1	Design Authority	JM Galioto	6-30-98	S6-72	1	1	Neal J. Sullivan	NJ Sullivan	7-1-98	S6-72
1	1	Design Agent	JM Galioto	6-30-98							
1	1	Cog.Eng. Thomas M. Galioto	JM Galioto	6-30-98							
1	1	Cog. Mgr. Richard J. Nicklas	RJ Nicklas FOR	7/1/98	T3-01						
1	1	QA M. J. Warn	MJ Warn	6-30-98							
1	1	Safety M. W. Clayton	MW Clayton	6-30-98							
1	1	Env. D. L. Flyckt	DL Flyckt	6-30-98							

18.	19.	20.	21. DOE APPROVAL (if required) Ctrl. No.
Chris E. Jensen 29 June 98		NJ Sullivan FOR Richard J. Nicklas JM Galioto 7-2-98	[ ] Approved [ ] Approved w/comments [ ] Disapproved w/comments
Signature of EDT Originator Date	Authorized Representative for Receiving Organization Date	Design Authority/ Cognizant Manager Date	

BD-7400-172-2 (05/96) GEF097

1998 242-A Interim Evaporator Tank System Integrity Assessment Report

Chris E. Jensen
Lockheed Martin Hanford Co., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

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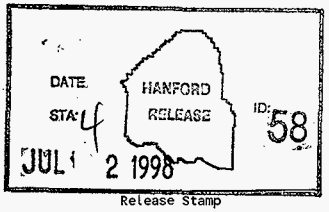
Key Words: Integrity Assessment, Inspection, NDE, Leak Test

Abstract: This report provides the results of the 242-A Evaporator five year integrity assessment.

Release Approval 7/2/98
Date



Release Stamp

Approved for Public Release

1998 INTERIM
242-A EVAPORATOR TANK SYSTEM
INTEGRITY ASSESSMENT REPORT

Table of Contents

1.0 INTRODUCTION

1.1 General Comments

This Integrity Assessment Report (IAR) is prepared by Fluor Daniel Northwest (FDNW) under contract to Lockheed-Martin Hanford Company (LMHC) for Waste Management Hanford (WMH), the 242-A Evaporator (facility) operations contractor for Fluor Daniel Hanford, and the U.S. Department of Energy, the system owner. The contract specifies that FDNW perform an interim (5 year) integrity assessment of the facility and prepare a written IAR in accordance with Washington Administrative Code (WAC) 173-303-640(2).

The WAC 173-303 defines a treatment, storage, or disposal (TSD) facility tank system as the "dangerous waste storage or treatment tank and its ancillary equipment and containment." This integrity assessment evaluates the two tank systems at the facility: the evaporator vessel, C-A-1 (also called the vapor-liquid separator), and the condensate collection tank, TK-C-100. This IAR evaluates the 242-A facility tank systems up to, but not including, the last valve or flanged connection inside the facility perimeter. The initial integrity assessment performed on the facility (Appendix A: Reference 13) evaluated certain subsystems not directly in contact with dangerous waste, such as the steam condensate and used raw water subsystems, to provide technical information. These subsystems were not evaluated in this IAR.

The last major upgrade to the facility was project B-534. The facility modifications, as a result of project B-534, were evaluated in the 1993 facility interim integrity assessment. Since that time, the following upgrades have occurred in the facility:

- Installation of a process condensate recycle system.
- Installation of a package steam boiler to provide steam for the facility. The package boiler is not within the scope of the facility TSD.

- Rerouting of the steam condensate and used raw water systems to the treated effluent disposal facility (TEDF). Steam condensate and used raw water are not dangerous wastes.

1.2 System Description

The purpose of the 242-A Evaporator is to reduce the volume of dangerous waste requiring interim storage in underground double shell tanks (DST) for eventual treatment and disposal. The waste volume reduction is achieved via evaporative concentration. The facility is designed and equipment selected to maintain a set boil-off rate of 2.65 liters/second (40 gallon/minute) at a feed rate of 4.4 to 7.6 liters/second (70-120 gallons/minute), yielding a waste volume reduction factor ranging from 35 percent to 60 percent. The facility has seven operational subsystems that are described as follows:

1. **Evaporator Process and Slurry Subsystem**: The evaporator and process slurry subsystem circulates the waste feed through the evaporator and the reboiler vessels, boiling off water vapor and concentrating the waste into a slurry. The water vapor is routed through the vapor condenser subsystem and the concentrated slurry is sent to a double shell tank. The evaporator vessel and the associated recirculation loop/reboiler are a dangerous waste storage tank system subject to the tank requirements of WAC 173-303.

2. **Vapor Condenser Subsystem**: The vapor condenser (VC) subsystem includes the three condensers operated within the facility. They condense the water vapor from the evaporator to form the process condensate (PC). The PC goes through the PC subsystem. The uncondensed vapors and non-condensable gases are filtered and monitored for radioactive contamination prior to discharge to the atmosphere through the vessel vent subsystem. The vapor condenser subsystem is ancillary equipment associated with the condensate collection tank which is a dangerous waste storage tank system subject to the tank requirements of WAC 173-303.

3. Vessel Vent Subsystem (NON-DANGEROUS WASTE SUBSYSTEM): The vessel vent (VV) subsystem contains a series of high-efficiency particulate air (HEPA) filters, de-entrainment pads, radiation monitoring system, and various heating and ventilating equipment. Uncondensed vapors and non-condensable gases that have been passed through the VC subsystem are filtered and vented to the atmosphere through this subsystem.

4. Process Condensate Subsystem: The PC subsystem receives the condensed water vapors (process condensate) from the vapor condenser subsystem. The process condensate drains into the condensate collection tank, TK-C-100, and is transferred to the liquid effluent retention facility (LERF). If additional decontamination is necessary prior to transferring process condensate to the LERF, the process condensate may be sent through the IX-D-1 ion exchange column to reduce the cesium (Cs) and strontium (Sr) content of the PC. However, use of the IX-D-1 is not anticipated for the duration of the life expectancy of the facility. The process condensate subsystem is continuously monitored for radioactive contamination by the RC-3 radiation monitor. In the event of radioactive contamination above the RC-3 monitoring/diversion system activation setpoint, the process condensate is automatically diverted back to the TK-C-100 condensate catch tank or the 241-AW-102 feed tank. The condensate collection tank is a dangerous waste storage tank system subject to the tank requirements of WAC 173-303.

5. Steam Condensate Subsystem (NON-DANGEROUS WASTE SUBSYSTEM): The steam condensate subsystem routes steam condensed in the reboiler to the TEDF. The steam condensate subsystem has an in-line radiation monitor, RC-1, which continuously monitors for excessive radioactive contamination. In the event of radiation detection in the system, the steam condensate discharge will be stopped through the SC-501 pipeline from the facility and diverted to the 241-AW-102 feed tank.

6. Raw Water Disposal Subsystem (NON-DANGEROUS WASTE SUBSYSTEM): The raw water disposal subsystem discharges raw water used as the coolant for the condensers to TEDF. The raw water disposal subsystem is continuously monitored for radioactive contamination with the RC-2 radiation monitor. In the event of radioactive contamination above the RC-2 monitoring system activation setpoint, an alarm sounds and the system is manually shut down.

7. Building and Secondary Containment Subsystem: This subsystem includes the evaporator building structure and the associated sump and drain systems. The operating area is a poured-in-place concrete structure divided into six specific rooms. Those portions of the structure that may come in contact with the waste solutions are coated with a chemically resistant acrylic coating or lined with stainless steel catch pans.

The facility rooms have drains which route spills away from occupied areas. The sump drains from a 10 inch overflow line to the 241-AW-102 feed tank. Drains from areas containing low activity process condensate, drain through a 6 inch line directly to the 241-AW-102 feed tank. A third drain line to the 241-AW-102 feed tank is used to quickly drain the evaporator vessel in an emergency.

1.2.1 Operating Parameters: Operating parameters for the 242-A Evaporator include the pressures and temperatures listed in Appendix G: Table G-1. The system temperatures and pressures were calculated from the appropriate process flow and operational data sheet design parameters for the components listed in this Appendix.

1.3 Scope

The scope of this integrity assessment is based on the recommendations in the original integrity assessment report. The major tasks associated with this integrity assessment include:

a. Nondestructive examination (NDE) of selected locations and components
b. Leak test of the evaporator/reboiler system and the condensate collection tank

c. Visual walkdown of the facility for signs of degradation
d. Review of operating logs and occurrence reports for events which may have caused degradation to the vessels
e. Review of original integrity assessment documentation to determine baseline status
f. Review of national codes and standards and DOE Orders to determine if there are significant new or revised requirements related to integrity of existing facilities.

This integrity assessment is limited to those vessels and piping within the facility which contain dangerous waste solutions. It does not include transfer piping or systems which do not contain dangerous waste. This IAR is certified by an Independent Qualified Registered Professional Engineer (IQRPE).

1.4 Comments on Certification

Paragraph 3.0 contains a certification on the accuracy of the information presented in this report. The certificate is signed and sealed by an Independent Qualified Registered Professional Engineer (IQRPE) in accordance with WAC 173-303-640(2).

2.0 ASSESSMENT

The integrity of the tank system described above, paragraph 1.2, is adequate to prevent failure caused by corrosion or by structural loads imposed by the system's intended service. See Appendix A, (1), (7), and (13) for a complete description of the system and intended service. The conclusions presented are based on performed system leak tests, walkdowns, ultrasonic tests, and a review of the applicable codes, standards, design, and construction documents, in addition to the previous interim integrity assessment. The following paragraphs (2.1 - 2.5) discuss specific considerations to ensure the facility's tank system complies with the requirements of WAC 173-303-640(2).

2.1 Codes and Standards

Because the systems at the facility which handle dangerous waste have not undergone any significant modifications or revisions to the tank system, an in depth review of the applicable codes and standards was not performed for this IAR. The review and evaluation of the codes and standards performed for the 1993 IAR is sufficient for this report.

2.2 Waste Characterization

The 242-A Evaporator facility receives and treats Washington State dangerous waste (categorized as "Extremely Hazardous Waste" by the RCRA Part A permit application) (Appendix A: Reference 7). The generation of this waste is the result of past Hanford defense production operations. These wastes are feed stock to the 242-A Evaporator. The process condensate produced by evaporation is categorized as a "Dangerous Waste" and is essentially water with only trace contaminants.

The chemistry associated with the various process waste streams in the facility (e.g., evaporator feed, double shell slurry feed, process condensate, cooling water, and steam condensate) are classified as dangerous waste streams. The current chemical composition of these waste streams is the same as those reported in the facility's baseline integrity assessment. Therefore, the waste characterization evaluation of the streams that was performed for the 1993 IAR is still valid for this IAR. (See Appendix G: Table G-4 for bulk chemistry.)

2.3 Tank System Age

Construction of the 242-A Evaporator was completed in 1977 at which time it became operational. The facility's original design life was ten years (Appendix A: Reference 1). The TK-C-100 Condensate Catch Tank was fabricated in 1951 as part of another project; however, this catch tank was never used on that project. The tank was upgraded in 1977 to be consistent with the 242-A Evaporator facility design standards and installed in the 242-A facility. As a result of Project B-534, some facility components were upgraded or replaced. These components were evaluated in

the last 242-A facility integrity assessment (Appendix A: Reference 13) and not identified for special evaluation for this integrity assessment.

Those components that were affected by Project B-534 are noted here for historical record. They include:

Components	Year
E-C-1 Primary Condenser	1990
P-B-1 Pump	1990
P-B-2 Bottoms Pump	1990
Miscellaneous Process Piping	1990

The 242-A Evaporator is conveniently described by seven subsystems according to the function or process of each subsystem as described below. Four of the subsystems store, transport or treat Washington State dangerous wastes, the other three subsystems do not.

2.4 Potential for Corrosion Failure

The conclusion of this IAR concerning corrosion failure is that the facility is in good condition and can continue operation. This conclusion is based on ultrasonic testing data of various systems, and a comparison of this data with similar data for the 1993 integrity assessment. The technical support for this conclusion is that the types of dangerous wastes currently available for processing in the facility have not changed since the facility became operational in 1977. Ultrasonic tests made of the wall thicknesses for the evaporator/reboiler loop, condensate catch tank (TK-C-100), and process condensate condensers made in 1993 and 1998, are essentially the same, and are within the margin of error of the testing equipment. This indicates that there has been no measurable or noticeable deterioration of the tank system's integrity. See Appendix E for comparison of the two sets of UT data.

Also, a corrosion evaluation, based on the UT data for this integrity assessment, verified that the chemistry of the waste streams introduced to the facility have had a minimal effect on the equipment. Therefore, the conclusions concerning corrosion failure that were arrived at in the 1993 IAR remain valid for this report.

The following are general comments concerning corrosion failure:

- The materials of construction, system design, and protective coatings for the 242-A facility tank system provide adequate corrosion protection and compatibility with Hanford defense wastes and the process streams generated within the facility. The wall thicknesses of the equipment and piping are above the "T-nom" thickness minus the mill tolerance which is the minimum thickness expected during original construction (see Appendix E: E-1). This is consistent with the results of the 1993 IAR.

- The 242-A Evaporator corrosion protection program consists of materials, methods of construction, and control the process chemistry for the liquid waste environments. The facility components and piping are constructed primarily of austenitic stainless steels and low alloy carbon steels. Gaskets at component and piping connections are chemically resistant non-metallics. Each subsystem was designed for specific operating parameters and material/environment compatibilities.

- Based on the corrosion evaluation, it is recommended that all accessible equipment and grid points that were tested in for the 1993 integrity assessment be tested during the next integrity assessment. That will provide for a more extensive corrosion rate evaluation, and a more exhaustive evaluation can be made to establish the remaining equipment life (see Appendix E).

2.5 Leak Test and System Walkdown

Hydrostatic leak tests were performed on the C-100 Condensate Catch Tank and the Evaporator/Reboiler loop. The criteria for acceptable leak tests of these systems was "no detectable leaks" over a 24 hour period.

The leak test data and walkdown inspection results were reviewed and sign off by the 242-A Facility Cognizant Engineer and Quality Assurance representative. Final disposition of the condensate catch tank and evaporator/reboiler loop is: "System and components are

acceptable based on the inspection results. No further evaluation is required."

2.5.1 C-100 Condensate Catch Tank Leak Test: This leak test was conducted with the same criteria as the 1993 integrity assessment (Appendix A: Reference 13). This test was conducted in accordance with process memo LW98-026 (Appendix D: D-1). The leak test duration was 24 hours and the result was that the system passed the test on the first attempt.

2.5.2 Evaporator/Reboiler Loop Leak Test: The leak test for the evaporator/reboiler loop was conducted in accordance with process memo LW98-44 (Appendix D: D-3). The leak test duration for this system was 28 hours. The evaporator/reboiler loop was filled with 27,507 gallons of water as measured on the LIC-CA1 liquid level indicator. Liquid level measurement readings of the loop were taken every hour during the test. The liquid level varied from plus 5 gallons to minus 11 gallons from the initial liquid level in the loop. These variations are within the operating range of the level measuring equipment and the minor temperature fluctuations in the system. Readings were taken on tank 241-AW-102, the evaporator drain tank, before and after the test. During the leak test, seal water for the recirculation pump, P-B-1, was routed to Tank 241-AW-102. This accounts for the liquid level increase in Tank 241-AW-102.

2.5.3 Visual Inspection of Evaporator/Reboiler Room Concrete Coating: During the visual inspection of the evaporator/reboiler equipment in the evaporator/reboiler room, an inspection of the secondary containment concrete and special protective coating (floor and partial wall) was performed. There were no signs of deterioration or wear of the protective coating (see Appendix D: D-2 and D-3).

However, the corrosion evaluation performed had one concern about the concrete coating that may come in contact with the waste. That concern is that the coating material is not recommended for immersion services and may not be suitable for this application. The current material being used is a chemically resistant acrylic coating (Carboline D3358 primer and Carboline D3359 topcoat). It is recommended that

several concrete coating/lining manufactures (e.g., Ameron, Standard, Plasite, Koch) be consulted for recommendations on the optimum concrete lining for this service (see Appendix E).

2.6 Future Integrity Assessments

2.6.1 Future Integrity Assessment Frequency: The 1993 IAR established a repeat integrity assessment frequency of five years/8,000 hours of operation between interim integrity assessments. The basis for the five year/8,000 hour frequency is that the 242-A Evaporator has an inherent corrosion protection, stringent operational controls, and aggressive preventative programs in place.

Based upon the findings of this IAR, it is recommended that the next facility integrity assessment is performed be no later than July 15, 2008 (ten years after submittal of this IAR.) The basis for this recommendation is that the results of the ultrasonic testing is the "minimum remaining life" for all the equipment tested is greater than 20 years (see Appendix E: E-1). This is with the exception of the E-C-1 condenser, which has a minimum projected remaining life of greater than 13 years. The remaining life estimates are based on the minimum measured thickness (in 1993 or 1998), the average corrosion rate and the nominal Thickness minus the Mill Tolerance thickness. When this thickness is approached, an actual minimum thickness, based on the design pressure and applicable codes can be determined.

In the event of significant off-normal events, such as earthquakes or major process upsets, procedures and mechanisms are in place through the DOE Order system to ensure orderly shut down and complete review of facility integrity prior to restart.

2.6.2 Future Integrity Assessment Scope: The scope of future integrity assessments should include the process subsystems assessed by this report. In addition to WAC

dangerous waste requirements, future integrity assessments should include:

- Complete visual walkdown of the facility and components for the types of degradation identified in paragraph 2.4 of this IAR[1].
- Repeat leak tests of evaporator/reboiler loop and condensate catch tank in accordance with an IQRPE approved leak test plan.
- Repeat ultrasonic testing for wall thickness of components using the same locations and grids to the maximum extent possible[1]. This data should be compared with the data included in previous IARs and this IAR for trends.
- Review of significant changes (if any) in national consensus codes and standards and DOE Orders for design and construction of this facility.
- Review of off-normal operational events.

[1] Consideration should be given to the cost/benefit of repeat UT and visual inspections for locations where accessibility and as low as reasonably achievable dose rates may be prohibitive.

3.0 INTEGRITY ASSESSMENT CERTIFICATION

"I have reviewed this document and believe the inspections, tests, and analyses described herein are sufficient for assessment of the tank system integrity in accordance with Washington Administrative Code Section 173-303-640(2)."

"I certify under penalty of law, that I have personally examined, and am familiar with, the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

6-22-98
Date

Sherman R. Tifft
Fluor Daniel Northwest, Inc.
Registered Professional Engineer
Washington State PE Registration #18708
Expiration Date: May 22, 1999

(Original signed and sealed 6-22-98)

ATTACHMENTS

Appendix A (REFERENCES)

REFERENCES

1. HNF-SD-WM-SAR-023, Rev. 2-D, "242-A Evaporator Safety Analysis Report."

2. State of Washington, Washington Administrative Code, Chapter 173-303, "Dangerous Waste Regulations", January, 1989.

3. WHC-SD-WM-WP-056, Rev. 1, "242-A Evaporator/Reboiler System Evaluation."

4. DOE-RL, Hanford Plant Standard, SDC-4.1, Rev. (1972), "Standard Arch-Civil Design Criteria."

5. DOE-RL, Hanford Plant Standard, SDC-4.1, Rev. 11, "Standard Arch-Civil Design Criteria."

6. RHO-SD-WM-TI-003, Rev. 0, "Compilation of Basis Letters and Communications Referenced in 242-A Evaporator/Crystallizer Specifications."

7. DOE/RL, 1997a, "242-A Dangerous Waste Permit Application", DOE/RL-90-42, Rev. 1, 1997, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

8. Internal Memo #23460-90-105, P. C. Ohl to J. E. Geary, 8/22/90, "Operating Parameter Calculations & References."

9. Operating Procedure TO-600-040, current revision, "242-A Evaporator-Crystallizer Operation."

10. Double Shell Tank Operating Specification Document, OSD-T-151-00007, current revision.

11. HNF-SD-WM-SEL-028, Rev. 1, "Safety Equipment List 242-A Evaporator."

12. HNF-2331, Rev. 0, "1998 Interim 242-A Evaporator Tank System Integrity Assessment Plan."

13. WHC-SD-WM-ER-124, Rev. 1, "242-A Evaporator-Crystallizer Tank System Integrity Assessment Report"

14. WHC-SD-WM-WP-019, Rev. 0, "Data Package for 242-A Evaporator/Crystallizer Tank System Integrity Assessment Report"

15. LW98-026, Process Memo, "TK-100 Leak Test Instructions," dated March 27, 1998.

16. LW98-044, Process Memo, "242A Evaporator Vessel Integrity Test/Boiler Test," dated May 12, 1998.

17. EL-98-00009/W (Generic Work Item), "242-A C-100/C-A-1 Tank Integrity Assessment," January 7, 1998.

Appendix B (WASTE CHARACTERIZATION)

WASTE CHARACTERISTICS

The 242-A Evaporator receives and treats mixed waste, which is dangerous waste combined with radioactive components, from the double-shell tanks. The dangerous waste portion is categorized as an "Extremely Hazardous Waste" by the Washington State Resource Conservation and Recovery Act (RCRA) program. The facility treats the waste by evaporation, separating it into concentrated slurry and dilute process condensate. Both of these streams are also Washington State RCRA dangerous wastes. The Steam Condensate, Raw Water, and Non-Condensable Gases generated by the evaporator process, through subsystems 3, 5, and 6 (paragraph 1.2 of this report), are not Washington State dangerous wastes.

Evaporator Feed Composition

The 242-A Evaporator receives a mixed blend of feed from tanks throughout the double-shell tank system via the Evaporator Feed Tank, 241-AW-102. The feed contains liquid waste from chemical processing operations, facility deactivations, and miscellaneous facility and laboratory discharges. The largest portion of wastes are non-radioactive aqueous salts. The feeds are highly alkaline (pH>12) and the primary chemical compounds are sodium compounds of hydroxide, nitrite, nitrate, aluminate, carbonate and sulfate. The feed may also contain minor amounts of organic material (<7g/L). The approximate maximum concentrations of the most abundant salts and ammonia are noted in Table B-1, below

The chemical composition of the evaporator feed will vary from run to run and can range from essentially water to saturated solution.

The principal radionuclides in evaporator feed are Cs-137, and Sr-90. Minor and trace quantities of other radionuclides are also present. Similar to the chemical constituents, the concentrations or radionuclides in the feed varies as a function of source and blending.

Table B-1: Chemical Composition of Evaporator Feed

COMPOUND	MAXIMUM CONCENTRATION (M)
NaOH	3.9
$NaNO_3$	2.8
$NaNO_2$	1.8
$NaAlO_2$	1.8
$NaCO_3$	0.7
Na_2SO_4	0.2
Na_3PO_4	0.5
NH_3	0.11
NaF	0.07

Slurry Compositions

Prior to the previous 242-A Evaporator integrity assessment, slurry waste was concentrated to three basic forms. These forms were Dilute Double-Shell Slurry Feed (DDSSF), Double-Shell Slurry Feed (DSSF), and Double-Shell Slurry (DSS). Concentration is performed at the 242-A Evaporator in passes, each pass assumes 50% water removal from the feed solution. DSS is slurry that has been concentrated past the sodium aluminate saturation boundary where massive crystallization/precipitation occurs. DSSF is concentrated slurry which is one pass away from becoming DSS. Due to tank farm requirements imposed prior to the previous integrity assessment, the sodium aluminate boundary is no longer the controlling factor for target slurry concentrations, but is typically driven by specific gravity (SpG) limits. Therefore, the terms DDSSF, DSSF, and DSS will not be used. Instead, the product will be referred to as concentrated slurry. The maximum concentration of the concentrated slurry is shown in Table B-2.

Table B-2: Chemical Composition of Concentrated Slurry

COMPOUND	MAXIMUM CONCENTRATION (M)
NaOH	5.5
$NaNO_3$	5.0
$NaNO_2$	2.5
$NaAlO_2$	2.5
$NaCO_3$	1.2
Na_2SO_4	0.3
Na_3PO_4	0.1
NH_3	0.15
NaF	0.6

Appendix C (DRAWING LIST)

Table C-1: Applicable Drawing List

NO.	P&ID DRAWING TITLE	DRAWING NUMBER
1	Drawing Index	H-2-98970
2	Process Condensate System	H-2-98990, Sht. 1 (Rev. 8, dated 10/96)
3	Steam Condensate System	H-2-98993, (Rev. 11, dated 9/97)
4	Used Raw Water System	H-2-98994, (Rev. 8, dated 10/97)
5	Drain System	H-2-98995, Sht. 1, (Rev. 10, dated 10/97)
6	Drain System	H-2-98995, Sht. 2, (Rev. 4, dated 3/95)
7	Evaporator Recir. System	H-2-98988, Sht. 1, (Rev. 4, dated 11/96)
8	Evaporator Recir. System	H-2-98988, Sht. 2, (Rev. 4, dated 10/96)
9	Vacuum Condenser System	H-2-98999, Sht. 1, (Rev. 10, dated 8/96)
10	Vessel Vent System	H-2-98998, Sht. 1, (Rev. 10, dated 6/95)

Appendix D (SUPPORTING DOCUMENTATION)

D-1: TK-C-100 Leak Test Instructions

PROCESS MEMO

PM# LW98-026 Page 1 of 6
EXPIRATION DATE: N/A

FROM: 200 Area Liquid Waste Processing Facilities Engineering
PHONE: 373-4894 S6-72
DATE: March 27, 1998
SUBJECT: TK-C-100 Leak Test Instructions

To: Shift Operations Managers

R. R. Bloom	S6-71
D. L. Flyckt	S6-71
J. L. Foster	S6-71
J. E. Geary	S6-71
R. J. Nicklas	S6-72
J. M. Petty	S6-71
R. M. Gordon	S7-55
N. J. Sullivan	S6-72
B. H. Von Bargen	S6-72
D. J. Williams	S7-41
R. A. Wahlquist	S6-72
M. A. Bowman	S6-72
D. A. Selle	S6-74
C. E. Jensen	R1-56
S. R. Tifft	B7-41
Process Memo File	2025EA/D3
200 Area LWPF RCC	2025EA/D5

This Process Memo provides Leak Test instructions for the TK-C-100 as part of the 242-A Integrity Assessment. This test is being conducted under the overview of an Independent Qualified Registered Professional Engineer (IQRPE). It is not necessary for State inspectors to witness the test, nor is it necessary to notify the State of the date and time of the test. Results of the leak test will be reported to the Washington State Department of Ecology with the final submittal of the 242-A Integrity Assessment.

The external portions of the components, piping, flanges and valves will be examined for evidence of leaks in accordance with the guidelines of ASME Section XI, Division 1, class 3 (1989), IWA-5240 "Visual Examination" (VT-2), and IWD-5000 "System Pressure Tests Visual Examination methods" (VT-2).

If any leaks are observed, follow-up engineering analysis shall be conducted to identify the type and extent of repairs required.

This test will encompass a fill to just below the High level alarm of the TK-C-100 tank as read on instrument WFIC-C100. The level will be filled to 65% as read on WFIC-C100 per TO-600-190 section 5.3, "Overflow TK-C-100 during shutdown". The following steps will not be performed in TO-600-190, 5.3.1, 5.3.2, 5.3.6, 5.3.8, 5.3.10-5.3.13. This procedure is designed to overflow TK-C-100, however, for this leak test it is only necessary to fill the tank to the 65% level. Perform steps 5.3.3, 5.3.4, 5.3.5, 5.3.7, and 5.3.9 ensuring that the level is only filled to 65% as read on WFIC-C100, NOT OVERFLOW.

This level will be maintained for a 24 hour hold period. The tank level at the start of the 24 hour hold period will be recorded and the tank level will be monitored every hour on WFIC-C100 and recorded on Data Sheet #1.

System operator shall call QC at the start of the 24 hour hold time. (This call is to provide QC with an independent verification of 24 hour hold start time.)

Every four hours the tank will be walked down to determine if leaks are visible or whether liquid is accumulating on the floor of the condenser room, on the pipes, or equipment, and the results will be recorded on Data Sheet #2.

Small erratic up and down variations of liquid level can be due to expansion and contraction due to temperature changes, this would not be a cause for concern. However, a slow steady downward trend in level is more likely to be indicative of a leak.

If the water level begins to drop noticeably meeting the criteria established below, notify the 242-A cognizant engineer so an evaluation of the situation can be made. The engineer shall decide if continuing with the leak test is appropriate.

Leak Criteria:

Decreasing trend in TK-C-100 as read on WFIC-C100 level of 1% or more during the 24 hour hold period

and

Any visual evidence of a leak discovered during an inspection of the tank and condenser room floor. Operations shall inspect the TK-C-100 tank every four hours during the hold period.

If no leak is visually verified and level is decreasing, a boundary valve check shall be made to verify integrity and determine if valves are leaking. Vessel may be filled to the 65% level as read on WFIC-C100 as long as the volume added does not exceed 500 gallons (approximately three and one half inches).

After a minimum of 24 hours, the QC inspector shall inspect the exposed portions of the TK-C-100 tank and connecting piping. The inspector shall examine external accessible areas of the tank paying particular attention to the welds, joints, and seams. The visual examination will also be performed of the pipe surfaces next to structural supports for evidence of wear caused by vibration. The bottom side of the tank with the associated drain line will also be visually verified to have no leaks. Operations and QC inspectors will fill out Data Sheet #3 with visual inspection results.

After the completion of the visual examination and condensate drain line inspection, the 242-A cognizant engineer shall review the observations and accept or reject the results as identified by signature on data sheet #3.

The acceptance criteria for this test are NO DETECTABLE LEAKS.

Concurrence	Completed
JM Jabbott Cognizant Engineer	David A. Sill 5-11-98 Operations Manager or Delegate Date
M R Sullo FOR RJ Wickas Cognizant Engineering Manager or Delegate	
David A. Sill Operations Manager or Delegate	
Date 3-31-98	Thomas Jabbott 5-12-98 Cognizant Engineer Date

PMH LW98-026 PAGE 4 OF 6

WS Dabling W.S. Dabling

DATA SHEET #1

TK-C-100 TANK LEVEL INSPECTION

	DATE	TIME	TANK LEVEL WFIC-C100	RECORDED BY
	4-28-98	0800	65.2	WS Dabling
	4-28-98	0900	65.2	WS Dabling
	4-28-98	1000	65.2	WS Dabling
	4-28-98	1100	65.2	WS Dabling
	4-28-98	1200	65.2	WS Dabling
	4-28-98	1300	65.2	WS Dabling
	4-28-98	1400	65.2	WS Dabling
	4-28-98	1500	65.2	WS Dabling
	4-28-98	1600	65.2	WS Dabling
	4-28-98	1700	65.2	WS Dabling
	4-28-98	1800	65.2	WS Dabling
	428-98	1900	65.3	SC Burt
	42898	2000	65.3	SC Burt
	42898	2100	65.3	SC Burt
	428-98	2200	65.3	SC Burt
	42898	2300	65.3	SC Burt
*	42898	0000	65.3	SC Burt
*	42898	0100	65.3	SC Burt
*	42898	0200	65.3	SC Burt
*	42898	0300	65.3	SC Burt
*	42898	0400	65.3	SC Burt
*	42898	0500	65.2	SC Burt
*	42898	0600	65.2	SC Burt
*	42898	0700	65.2	WS Dabling
*	~~4-28-98 - 0800~~ 4-28-98 - 0800		65.2	WS Dabling

NOTE: All DATES WITH AN "*" IN FRONT SHOULD be 4-29-98.

PMH LW98-026 PAGE 5 of 6

DATA SHEET #2

TK-C-100 4 HOUR VISUAL INSPECTION

DATE	TIME	OBSERVATION	RECORDED BY
4-28-98	1200	OK	JB
4-28-98	400	OK	JB
4-28-98	2000	OK	SCB
4-29-98	00:00	OK	SCB
4-29-98	0400	OK	SCB
4-29-98	0800	OK	JB

DATA SHEET #3

TK-C-100 TANK LEAK TEST VT

Time and Date when vessel was Filled: 1051 4-27-98 WS

Time and Date when inspection began: 0800 - 4-28-98 WS

(1) Shell of tank:

NO LEAKS

(2) Connections to tank:

(2.1) To P-C-100 isolation valve:

NO LEAKS

(2.2) To Tank Drain Valve:

NO LEAKS

Operations: 0845 M.S. Ashley 4-29-98 J. Bimson 4-29-98

QC Inspectors: M.F. Bailey SR. 4-29-98

Comments:

✓ System and components are acceptable based on the inspection results. No further evaluation is required.

____ System and components require further evaluation. Reference:

242-A Cognizant Engineer: J.M. Jam Date: 4/30/98

Quality Assurance: M.J. Jam Date: 4/30/98.

D-2: Inspection and Test Personnel Certification

To: Certification File

cc:

INSPECTION AND TEST PERSONNEL CERTIFICATION LETTER

This letter certifies that DAVID H. POYNTER, payroll number 88783, has successfully met the qualification requirements as specified in WHC-CM-4-5, *Quality Assurance Qualifications and Instructions* manual. Refer to attached *QA Inspection Personnel Qualification Checklist* for basis of certification.

Mr. Poynter is hereby certified to perform Mechanical inspections as a Level II inspector for Babcock & Wilcox Hanford Company (Company Name).

THIS CERTIFICATION IS VALID FOR 3 (No.) YEARS THRU 10/99 (Mo./Yr.)

(Signature of Certifier) 10/8/96 (Date)

B&W QA Manager
(Title of Certifier)

A-6000-796 (09/96)

INSPECTION PERSONNEL QUALIFICATION CHECKLIST

Company Name Duke Engineering & Services Northwest

Name DAVID H. POYNTER Payroll No. 88783

QA Inspection Discipline MECHANICAL Level II

EDUCATION, TRAINING, AND EXPERIENCE BACKGROUND

Education Level	Training	Experience
☒ High School (GED)	*> 24 hrs	**> 3 yrs
☐ Two Year College		
☐ Four Year College		

Documented Total Number of Hours/Years in Applicable QA Inspection Discipline

* Includes 2 hours of refresher training.
** Previously certified.

Verified By: D.R. Gregory Date 10/08/96

QUALIFICATION EXAMINATION RESULTS

Test Section	No. Questions	Administered By		Date
General	75	Dan R. Gregory (Print)	D.R. Gregory (Sign)	10/08/96
Practical	N/A	(Print)	(Sign)	
Specific	N/A	(Print)	(Sign)	

Minimum Points Passing: 80%

OTHER

Visual Acuity Examination

Verified By: D.R. Gregory Date: 10/08/96

Annual Reevaluations

Verified By: D.R. Gregory Date: 10/08/96

I have reviewed the above qualifications and determined the candidate meets the Qualification requirements of a Level II in accordance with WHC-CM-4-5.

D.R. Gregory
Level II Signature

10/08/96
Date

This Qualification is valid for 3 (No.) years through 10/99 (Month/Year).

A-6000-800 (09/95)

D-3: Evaporator Vessel Integrity Test/Boiler Test

PROCESS MEMO

PM# LW98-44 Page 1 of 10
EXPIRATION DATE: 10/1/98

From: 200 Area Liquid Waste Processing Facilities Process Engineering
Phone: 373-4894/373-1151
Date: May 12, 1998
Subject: 242A Evaporator Vessel Integrity Test/Boiler Test

To: Shift Operations Managers

B. D. Biddle	S6-74
R. R. Bloom	S6-71
D. L. Flyckt	S6-71
J. L. Foster	S6-74
T. M. Galioto	S6-72
J. E. Geary	S6-71
R. M. Gordon	S7-55
M. D. Guthrie	S6-72
C. E. Jensen	R1-56
E. Q. Le	S6-72
R. Mabry	S6-71
R. S. Nicholson	S5-05
R. J. Nicklas	S6-72
J. M. Petty	S6 74
N. J. Sullivan	S6-72
S. R. Tifft	B7-41
B. H. Von Bargen	S6-72
D. J. Williams	S7-41
Process Memo File	2025EA/D3
200 Area LWPF RCC	2025EA/D5
East Tank Farms Shift Office	S5-04

BACKGROUND

This Process Memo provides Leak Test instructions for the Evaporator Recirculation Loop as part of the 242-A Integrity Assessment and Boiler test. The Vessel Integrity Test is being conducted under the overview of an Independent Qualified Registered Professional Engineer (IQRPE). It is not necessary for state inspectors to witness the Integrity Test nor is it necessary to notify the state of the date and time of the test. Results of the Integrity Test will be documented in the final 242-A Integrity Assessment Report (IAR), which will be retained in the 242A Evaporator Regulatory File.

The external portions of the components, piping, flanges, welds and valves will be examined for evidence of leaks. The walkdowns will be performed by PFP Level III Mechanical Inspectors.

If any leaks are observed, follow-up engineering analysis shall be conducted to identify the type and extent of repairs required.

Water will be the process solution used in the Evaporator Vessel CA1 for testing. Integrity testing will be performed after the CA1 Vessel is filled. At the completion of the integrity test, the JCI Package Boilers will be tested to verify adequate boiler capacity. After both tests are complete, the Evaporator vessel will be dumped to 102-AW. The corresponding East Tank Farms operational support has been specified in PM# [redacted].

Total waste generation to tank farms is anticipated as follows (1 week estimated testing period):

CA1 vessel fill (27500 gal)	=	27500 gal
PB1 seal water (7d*.5 in/day*2750)	=	9600 gal
[redacted]	=	[redacted]
Total waste generation to tank farms	=	[redacted] gal ([redacted] in)

NOTE - TK-102-AW is limited to receive not more than 150,000 gallons from FY98 Evaporator Activities (Integrity Assessment + Boiler Test + Cold Run).

INSTRUCTIONS

1.0 Perform initial valve/electrical lineups/verification per TO-600-010 *Perform Initial Valving Verification for 242-A Evaporator* and TO-600-015 *Perform Initial Electrical Verification for 242-A Evaporator*.

Completed: _____ 5/31/98
SOM Signature Date

2.0 Install CA1 vessel dump valve locking screws to prevent inadvertent loss of vessel contents during integrity assessment.

Completed: _____ 5/31/98
SOM Signature Date

3.0 Perform prestart operations per TO-600-025 *Perform 242-A Evaporator System Status Check and Prestart Operation for Training.*

    conf. W. Harris
    3.1 Notify Tank Farm SOM of upcoming PB-1 Seal Water flow to 102-AW.

    3.2 Composite samplers do not require startup.

Completed: [signature] / 5/31/98
SOM Signature — Date

4.0 Switch Seal Water System from filtered raw water to process condensate per TO-600-210 *Operate PB-1 and PB-2 Seal Water Filter System*, as C-100 levels permit. The goal is to maximize the available volume in TK-C-100 for the Boiler Test.

Completed: [signature] / 6/1/98
SOM Signature — Date

5.0 Fill Vessel with raw water from slurry flush line using HV-CA1-2 per TO-650-140 *Flush 242-A Evaporator Vessel and Recirculation Loop*, TASK 5.1 to a level of 27,400 - 27,500 gallons as read on either LIC-CA1-1 or LIC-CA1-2. Whichever indicator is used to determine the initial level must be used throughout the Integrity Test and circled on Data Sheet #1.

    5.1 Do Not Start PB-1 during the Integrity Assessment.

Completed: [signature] / 6-1-98
SOM Signature — Date

6.0 INTEGRITY ASSESSMENT

    6.1 HOLD PERIOD

This level will be maintained for a *minimum* 24 hour hold period. The vessel level at the start of the 24 hour hold period will be recorded and the vessel level will be monitored every hour on either LIC-CA1-1 or LIC-CA1-2, whichever was circled on Data Sheet #1 from step 5.0 above, and then recorded on data sheet #1.

The liquid level should remain constant throughout the 24 hour hold period, and no additional liquid should be required to maintain the level. Small, erratic, up and down variations in liquid level indication may be due to expansion and contraction due to temperature changes- this would not be cause for concern. However, a slow steady downward trend in level is more likely to be indicative of a leak.

If the liquid level begins to drop noticeably, notify the 242-A cognizant engineer so an evaluation of the situation may be performed. The cognizant engineer shall decide whether to continue with the leak test. If either criteria listed in section 6.2 is met, the 24 hour hold period shall be terminated and the cognizant engineer notified.

6.2 ABORT CRITERIA

6.2.1 Three successive hourly increases in the sump level totalling 1 inch or more, or, a cumulative level rise in the sump of 2 inches or more over the entire 24 hour hold period.

6.2.2 Any visual evidence of a leak as viewed through the lead glass windows of the pump room. Visual observations will be conducted every four hours during the hold period. Results will be recorded on the C-A-1 four hour visual inspection data sheet #2.

6.3 CONDUCT VISUAL EXAMINATION FOR LEAKS

After a minimum of 24 hour hold time, a PRMC-Level-I Mechanical Inspector shall inspect the exposed sections of the 242A Evaporator Vessel and Reboiler and all connecting piping, flanges, welds, fittings and valves for signs of leakage. Also, inspect the SPC floor coating for signs of deterioration or wear. This information is recorded on Data sheet #3.

6.4 ACCEPTANCE CRITERIA

The acceptance criteria for this test is NO Detectable Leaks.

6.5 After completion of the visual examination the cognizant engineer shall review the observations and accept or reject the results (check appropriate blank an design attached data sheet).

Subsequently, the QC Inspector shall present the inspection results to QA. If QA, QC, and 242A Operations agree that no leaks have been detected, proceed with this Process Memo.

7.0 After Integ'ity Assessment field activities are completed, reduce the level in the vessel.

✓7.1 Notify Tank Farms SOM of intentions to empty a portion of CA1 to 102AW.

7.2 Perform a partial drawdown of CA1 to 102AW by opening HV-CA1-1 and monitoring until the CA1 level reaches 24,500 +/- 2,000 gal as read on LI-CA1-1 for LIC-DA1-2.

Completed: [signature] / 6-3-98
SOM Signature Date

8.0 Perform TO-600-035 *Start Up 242-A Evaporator for Training* for Boiler Test.

8.1 Establish vessel vacuum at 60 TORR.

8.2 Deentrainer spray startup is optional.

8.3 NO slurrying out to 106-AW.

8.4 Record values on the Boiler Test Data Sheet during reboiler steam flow startup and in 5% increments as read on FIC-FA-1 during operation until 100% open.

8.5 Continue Boiler Test by attempting to maximize steam flow through the reboiler, as condensate pressure allows.

Note: Use HV-FA-12 as a source of makeup water in the vessel as needed to obtain maximum boil-off.

Note: If necessary, LC-100 may be reduced using valve LV-FA-10 to 102-AW. Do not drain more than 5,000 gal. This option is only a backup to using the Process Condensate Recycle System for LC-100 drawdown.

8.8 Terminate test after maximum boil-off is reached.

Completed: David A. Sulle, 6/4/98
SOM Signature Date

9.0 Shutdown Evaporator per TO-600-065 *Shutdown 242-A Evaporator for Training* and perform a controlled dump to 102-AW.

Note: Remove dump valve locking screws.

9.2 Notify Tank Farm SOM prior to beginning the controlled dump.

9.3 Do not transfer any liquid through the slurry line.

Completed: [signature], 6-4-98
SOM Signature Date

MISCELLANEOUS

Filter changes/cleaning - FH-filters and sockfilter changeout/cleaning should be conducted prior to swing shift.

FC-4 and FC-5 filters shall be changed per TO-600-180. Cleaning and switching the seal water sock filters is to be performed per TO-600-210.

OSR Rounds - OSR rounds shall be performed during the Boiler Test/Integrity Assessment.

Concurrence	
Cognizant Engineer	5-27-98 Date
Cog. Manager/Delegate	5/28/98 Date
SO Manager/Delegate	5/27/98 Date

Completed by:	
SO Manager	6/5/98 Date
Cognizant Engineer	6/5/98 Date

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DATA SHEET #1

EVAPORATOR VESSEL/RECIRCULATION LOOP LEVEL INSPECTION

DATE	TIME	LEVEL LIC-CA1-1/LIC-CA1-2	RECORDED BY
start → 6/1/98	0430	27,507	[illegible]
6/1/98	0530	27,507	[illegible]
6-1-98	0630	27,511	SCB
6-1-98	0730	27510	SCB
6-1-98	0830	27513	SCB
6-1-98	0930	27510	SCB
6-1-98	1030	27512	SCB
6-1-98	1130	27510	SCB
6-1-98	1230	27507	SCB
6-1-98	1330	27505	SCB
6-1-98	1430	27503	SCB
6-1-98	1530	27498	SCB
6-1-98	1630	27498	SCB
6-1-98	1730	27499	SCB
6-1-98	1830	27499	ALH
6-1-98	1930	27499	ALH
6-1-98	2030	27499	ALH
6-1-98	2130	27497	ALH
6-1-98	2230	27496	ALH
6-1-98	2330	27498	ALH
6-2-98	0030	27497	ALH
6-2-98	0130	27498	ALH
6-2-98	0230	27501	[illegible]
6-2-98	0330	27500	ALH
6-2-98	0430	27503	ALH
6-2-98	0530	27504	[illegible]
6-2-98	0630	27505	[illegible]
6-2-98	0730	27509	[illegible]

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DATA SHEET #2

EVAP VESSEL/RECIRCULATION LOOP 4 HOUR VISUAL INSPECTION

DATE	TIME	OBSERVATION	RECORDED BY
6/1/98	0930	No Leaks	SRB
6/1/98	1230	NO leaks	SRB
6/1/98	1630	no Leaks	SRB
6/1/98	2030	No leaks	KEJ
6/2/98	0030	No leaks	KEJ
6/2/98	0430	No leaks	KEJ
6/2/98	0830	No leaks	WJT

DATA SHEET #3

EVAPORATOR VESSEL/RECIRCULATION LOOP LEAK TEST VT

Time and Date when Vessel was Filled: 6/1/98 04:31

Time and Date when inspection began: 6/3/98 1045

(1) Connections:

(1.1) From C-A-1: SEE COMMENTS BELOW 6.3.98

(1.2) To P-B-1:

(1.3) From P-B-1:

(1.4) To E-A-1:

(1.5) From E-A-1:

(1.6) To C-A-1:

Operations: 6/3/98

QC Inspectors: 6.3.98
DAVID H POYNTER B40 HANFORD WAY. II

Comments: INSPECTION WALKDOWN COMPLETED PER DIRECTION OF PROCESS MEMO PM# LW98-44 SECTIONS 6.3 & 6.4 WAS ACCEPTABLE NO OBVIOUS LEAKS WERE DETECTED.*

✓ System and components are acceptable based on the inspection results. No further evaluation is required.

___ System and components require further evaluation. Reference:

242-A Cognizant Engineer: Thomas Dalton Date: 6/5/98

Quality Assurance: M Date: 6/5/98

*SAC FLOOR COATING SHOWED NO SIGNS OF DETERIORATION OR WEAR 6.3.98

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1st Test 0% → 100%

BOILER TEST DATA SHEET #4

FIC-EA1-1 OUTPUT % (G13)	FIC-EA1-1 FLOW RATE (G13)	PI-STM-1 PRESSURE (G13)	PIC-CA1-7 OUTPUT % (G10)	PIC-CA1-7 PRESSURE (G10)	PI-EA1-13 PRESSURE (G13)	FI-EC2/EC3 FLOWRATE (G16)
5%	0	15.7	46	60.0	85.0	1166
10%	0	16.9	47	60.1	84.8	1165.1
15%	3200	16.6	~~58~~	60	84.9	1167
20%	4563	16.2	46	59.9	84.9	1170
25%	5780	15.6	46	59.8	84.8	1172
30%	7014	15.4	46	59.9	84.9	1170
35%	8395	15.36	46	59.8	84.7	1177
40%	9665	15.32	45	60.1	84.9	1174
45%	10870	15.24	45	59.6	84.8	1170
50%	11874	15.18	46	60.2	85.1	1178
55%	12723	15.11	45	60.3	84.8	1173
60%	13317	15.07	47	60.3	84.9	1169
65%	13848	15.02	46	60.4	84.9	1170
70%	14142	14.99	46	60.4	85.0	1172
75%	14592	14.97	47	60.4	85.1	1170
80%	~~14776~~ 15986	14.94	47	60.4	84.8	1168
85%	16400	15.07	46	60.0	84.8	1170
90%	16716	15.03	47	59.6	85.1	1176
95%	25649	14.03	84	63	84.93	1169
100%	25670	14.3	100	64	84.9	1166

bwl off @ 93.5°F 5.4 gpm by ∆P

Also, start to make up to 70%. →

→ reduced pressure. PIC-CA1-7 knob down to 60

* @ 70%, steve must clean steam strainers. it jumps from 16,716 lbs/hr → 27,213 lbs/hr
PIC-CA1-7 goes up from 47% → 75%

↗ stabilizes @ 26,176#

- After cleaning steam strainers, FIC-EA1-1 flowrate down from 27,213 → stabilized @ 25,600 even through 10% → 100%

...ower after blow down steam condensate

PNH LW98-044 PAGE 10 OF 10

2nd Test
100% → 0%

BOILER TEST DATA SHEET #4

FIC-EA1-1 OUTPUT % (G13)	FIC-EA1-1 FLOW RATE (G13)	PI-STM-1 PRESSURE (G13)	PIC-CA1-7 OUTPUT % (G10)	PIC-CA1-7 PRESSURE (G10)	PI-EA1-13 PRESSURE (G15)	FI-EC2/EC3 FLOWRATE (G16)	
100%	28104	14.152	~~66.48~~ 100%	66.64	84.72	1172.1	← after SC blow down
95%	28643	14.584	100%	67.36	84.88	1178.3	
90%	21421	14.694	98%	67.92	84.90	1175.0	← Denise SOH wants to get down first so All of us can go to safety
85%	21475	14.686	99%	66.52	84.84	1171.6	
80%	21247	14.716	100%	66.72	84.90	1172.9	
75%	20824	14.752	100%	66.46	85.05	1175.1	
70%	21166	14.806	100%	66.19	84.90	1171.1	
65%	20662	14.624	100%	65.90	84.85	1169.7	
60%	19463	14.844	100%	65.23	85.07	1167.1	
55%	19159	14.892	100%	64.98	84.86	1164.2	
50%	17998	15,106	99%	64.41	84.91	1165.7	
45%	16606	15.206	99%	63.78	84.86	1173.1	
40%	15435	15.274	99%	62.91	84.88	1164.4	
35%	14146	15.400	99%	61.74	84.91	1170.9	
30%	12593	15.580	98%	61.79	84.78	1171.2	
25%	11367	15.664	95%	59.36	84.82	1166.0	
20%	10647	15.764	77%	58.77	84.82	1170.0	
15%	9713	15.852	69%	57.80	84.83	1164.2	
10%	8971	15.934	44%	56.81	84.82	1170.3	
5%	8817	16.136	41%	57.85	84.85	1172.1	
0%	8013	16.150	44%	59.14	85.10	1172.1	

note transmitter screw.

If we do not have a good data, we can get them from Mac Tech MCC later.
Note that we have SC problems!

D-4: NDE UT Thickness Measurement Procedure and Test Report

Page 1 of ____

NDE ULTRASONIC THICKNESS MEASUREMENT PROCEDURE AND TEST REPORT

NONDESTRUCTIVE EXAMINATION
306E BLDG., 300 AREA - TEL. 376-6402

Job No. 98-7

Requester (client)	Company	MSIN	Bldg.	Area
T. GALIOTO/ S. TIFFT	RPSH	S6-72	2025EA	200E

Project/System/Work Package/Traveler No.
1998 242-A INTERIM EVAPORATOR TANK SYSTEM INTEGRITY ASSESSMENT PLAN

Acceptance Std. E-61749 | Section | Para. | Date | [X] NA
REF. DOC. HNF-2331 REV 0

PART INFORMATION

Material SS/CS
Wall Thickness [X] NA
Diameter [X] NA
Schedule [X] NA
Size [X] NA
Dwg. No. [ ] NA: SEE SKETCH
NCR [X] NA

PROCEDURE NO.
NDT-UT-9000, Revision No. 4
Appendix A Revision No. A
Special Technique No. [X] NA

COVERAGE
[X] 100% of Area Requested
[ ] Other

INSTRUMENTATION
Mfg. NORTEC Model 124-D
Standards Lab No. 584-31-50-022
Expiration Date 10/22/98

CALIBRATION STANDARD(S)
Standards Lab No. 584-99-30-091 C/S
Expiration Date 3/27/00
Standards Lab No. 584-99-30-135
Expiration Date 8/6/99

TRANSDUCER
Diameter 1/2"
Frequency 5 MHZ
Mfg. NORTEC
Serial No. 931422 932324
Stand Off NONE

Couplant ULTRAGELL II
Batch No. 8443

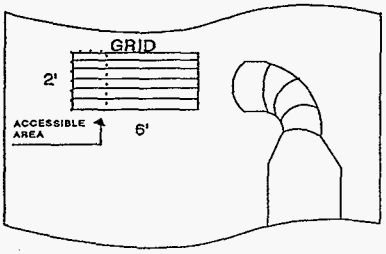
RESULTS

SEE ATTACHED SHEETS

Technician	UT Level	Interpreted by	UT Level	Reviewed by
W.D. PURDY W.D. Purdy	I	JAMES N FURTH James N. Furth	II	(W.H. Nelson)
BLANE HOPKINS B Hopkins	TRN			
Date of examination: 14 THRU 23 4/98		Date of examination: 14 THRU 23 4/98		Date: 4-30-98

A-6000-507 (02/98)

LOCATION 3 14 APRIL 1998
C-A-1 EVAPORATOR

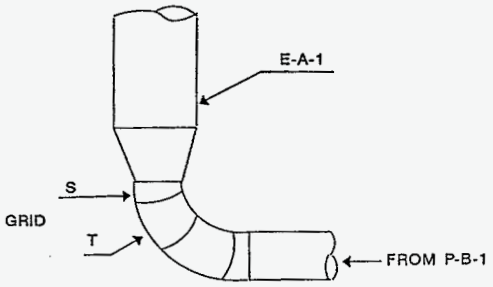


	1	2	3	4	5	6	7						
A	.385"	.387"	.386"	.396"	.387"	.386"							
B	.384"	.387"	.385"	.385"	.386"	.386"							
C	.384"	.386"	.386"	.385"	.385"	.386"							
D	.382"	.385"	.383"	.384"	.384"	.385"							
E	.383"	.382"	.382"	.381"	.381"	.381"							
F	.383"	.381"	.381"	.382"	.382"	.383"							
G	.383"	.382"	.381"	.382"	.381"	.383"							
H	.383"	.382"	.382"	.382"	.383"	.381"							
I	.384"	.384"	.384"	.385"	.384"	.385"							
J	.384"	.384"	.385"	.385"	.384"	.385"							
K	.383"	.383"	.384"	.383"	.383"	.381"							
L	.381"	.381"	.381"	.381"	.382"	.381"							

AVERAGE = 0.384" (0.975)

NOTE: AREA WAS VERY INACCESSIBLE, NO SCAFFOLD WAS PROVIDED
READINGS WERE TAKEN BELOW FLOOR GRATING
SCAN AREA STARTED AT UPPER LEFT CORNER OF GRID, 24" DOWN AND 12" RIGHT

LOCATION 5 14 APRIL 1998
LINE 1-1.2



DATA:(S)

	A	B	C	D
1	.271"	.252"	.253"	.264"
2	.269"	.264"	.257"	.269"
3	.268"	.267"	.262"	.269"

AVERAGE(S) = $\frac{0.264"}{(0.671\,cm)}$

DATA (T)

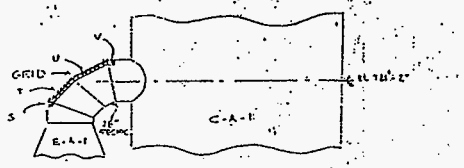
	A	B	C	D
1	.270"	.264"	.257"	.284"
2	.271"	.257"	.262"	.265"
3	.269"	.258"	.260"	.269"
4	.269"	.263"	.259"	.264"
5	.270"	.265"	.262"	.264"
6	.270"	.261"	.264"	.261"
7	.263"	.265"	.260"	.264"
8	.265"	.264"	.263"	.269"
9	.272"	.254"	.266"	.266"
10	.266"	.263"	.264"	.263"
11				

AVERAGE(T) = $\frac{0.265"}{(0.673\,cm)}$

LOCATION 7 14 APRIL 1998
LINE 1-1.4

COMPONENT: LINE NO 1-1.4 (¼" THK SS)
DESCRIPTION: 6" WIDE ALONG LENGTH OF MITERED ELBOW, TO EXTEND 3" ON EACH SIDE
GRID: 2" GRID

SKETCH.



DATA:(V)

	A	B	C	D
1	.250"	.249"	.249"	.250"
2	.246"	.248"	.248"	.250"
3	.254"	.241"	.239"	.245"

AVERAGE(V) = 0.247" (0.627cm)

DATA (T)

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				

DATA (U)

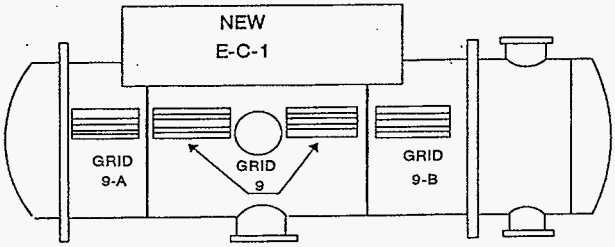
	A	B	C	D
1	.256"	.248"	.246"	.246"
2	.253"	.251"	.250"	.248"
3	.259"	.257"	.256"	.252"
4	.247"	.255"	.254"	.252"
5	.248"	.256"	.253"	.252"
6	.253"	.252"	.251"	.252"
7	.257"	.257"	.251"	.249"
8	.251"	.251"	.252"	.250"
9	.251"	.252"	.253"	.250"
10				
11				

AVERAGE(U) = 0.252" (0.640 cm)

DATA (S)

	A	B	C	D
1				
2				
3				

SKETCH



E-C-1 23 APRIL 1998
LOCATION 9A

DATA

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	.511"	.511"	.510"	.513"	.512"	.513"	.512"	.513"	.515"	.511"	.513"	.514"	.518"
2	.510"	.509"	.511"	.513"	.513"	.513"	.516"	.517"	.514"	.511"	.514"	.515"	.516"
3	.514"	.512"	.511"	.514"	.518"	.515"	.520"	.523"	.518"	.514"	.518"	.516"	.519"
4	.510"	.513"	.512"	.513"	.524"	.513"	.517"	.519"	.517"	.515"	.518"	.517"	.517"
5	.512"	.514"	.516"	.516"	.517"	.517"	.518"	.522"	.519"	.516"	.520"	.519"	.521"
6	.511"	.510"	.513"	.515"	.514"	.514"	.514"	.517"	.515"	.514"	.515"	.516"	.519"
7	.511"	.516"	.516"	.515"	.518"	.515"	.516"	.516"	.513"	.514"	.515"	.515"	.518"
8	.513"	.514"	.518"	.516"	.519"	.516"	.515"	.515"	.515"	.518"	.516"	.514"	.518"
9	.513"	.518"	.514"	.514"	.517"	.516"	.515"	.514"	.513"	.516"	.513"	.514"	.518"
10	.513"	.512"	.512"	.515"	.517"	.517"	.515"	.521"	.515"	.515"	.515"	.513"	.518"
11	.511"	.512"	.513"	.514"	.517"	.518"	.521"	.521"	.521"	.518"	.516"	.520"	.522"

AVERAGE(9A) = 0.515" / (1.308cm)

E-C-1 14 APR 1998

DATA LOCATION 9

	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1						.512"	.512"	.512"	.511"	.511"	.512"	.513"	.512"
2						.520"	.513"	.512"	.515"	.514"	.513"	.513"	.513"
3						.512"	.510"	.512"	.512"	.513"	.512"	.512"	.513"
4						.510"	.509"	.513"	.513"	.519"	.513"	.514"	.516"
5						.512"	.511"	.511"	.513"	.514"	.514"	.513"	.521"
6						.514"	.510"	.512"	.512"	.516"	.512"	.515"	.516"
7						.512"	.508"	.512"	.513"	.511"	.511"	.513"	.517"
8						.510"	.510"	.511"	.510"	.510"	.512"	.512"	.514"
9						.513"	.512"	.511"	.511"	.510"	.510"	.512"	.516"
10						.517"	.513"	.511"	.511"	.510"	.515"	.511"	.515"
11						.508"	.508"	.509"	.510"	.509"	.512"	.511"	.514"

AVERAGE = Ø.512" (1.300 cm)

DATA LOCATION 9 LOCATION 9

	A1	B1	C1	D1	E1	F1	G1	H1	I1	J1	K1	L1	M1
1	.514"	.515"	.516"	.517"	.519"					.523"	.520"	.519"	.519"
2	.513"	.517"	.516"	.520"	.522					.522"	.521"	.522"	.523"
3	.513"	.515"	.517"	.517"	.520"					.523"	.524"	.519"	.516"
4	.514"	.518"	.520"	.520"	.518"					.523"	.521"	.519"	.517"
5	.516"	.517"	.519"	.520"	.525"	AREA OF FLANGE				.520"	.519"	.523"	.517"
6	.518"	.519"	.519"	.520"	.519"					.522"	.520"	.517"	.518"
7	.515"	.516"	.519"	.521"	.522"					.521"	.519"	.517"	.515"
8	.515"	.518"	.519"	.520"	.521"					.512"	.518"	.516"	.515"
9	.521"	.518"	.518"	.517"	.516"					.517"	.510"	.515"	.515"
10	.511"	.513"	.515"	.515"	.515"					.515"	.514"	.516"	.514"
11	.512"	.513"	.516"	.516"	.515"					.515"	.515"	.515"	.513"

AVERAGE = Ø.517" (1.313 cm)

E-C-1 14 APRIL 1998

DATA LOCATION 9

	N1	O1	P1	Q1	R1	S1	T1	U1	V1	W1	X1	Y1	Z1
1	.520"	.520"	.616"	.516"	.516"	.517"	.518"	.515"	.517"				
2	.517"	.517"	.518"	.515"	.515"	.517"	.514"	.517"	.516"				
3	.516"	.515"	.517"	.515"	.513"	.514"	.507"	.515"	.516"				
4	.517"	.517"	.516"	.517"	.517"	.515"	.518"	.518"	.517"				
5	.518"	.525"	.526"	.519"	.518"	.515"	.514"	.516"	.513"				
6	.519"	.517"	.516"	.512"	.516"	.515"	.515"	.513"	.516"				
7	.515"	.515"	.518"	.513"	.513"	.514"	.514"	.514"	.514"				
8	.515"	.514"	.515"	.511"	.511"	.513"	.513"	.514"	.518"				
9	.513"	.514"	.511"	.517"	.514"	.513"	.513"	.515"	.518"				
10	.513"	.512"	.515"	.513"	.515"	.512"	.513"	.515"	.517"				
11	.513"	.512"	.514"	.514"	.513"	.514"	.513"	.519"	.517"				

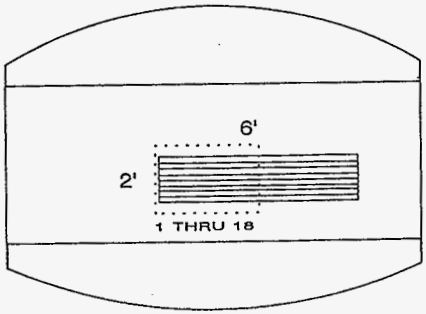
NOTE; A LOW READING OF .141" WAS FOUND JUST LEFT OF Q1-1 AVERAGE = .516" (1.311 cm)

DATA LOCATION 9-B APRIL 23 98

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	.519"	.518"	.515"	.515"	.513"	.511"	.509"	.510"	.510"	.508"	.506"	.512"	.506"
2	.517"	.517"	.514"	.514"	.513"	.512"	.511"	.511"	.510"	.510"	.510"	.508"	.509"
3	.520"	.519"	.517"	.515"	.514"	.513"	.512"	.510"	.511"	.512"	.513"	.509"	.508"
4	.522"	.520"	.517"	.517"	.514"	.512"	.514"	.511"	.511"	.510"	.519"	.515"	.511"
5	.522"	.518"	.514"	.514"	.514"	.510"	.511"	.510"	.510"	.511"	.509"	.509"	.508"
6	.522"	.518"	.515"	.513"	.515"	.512"	.512"	.510"	.517"	.509"	.511"	.508"	.504"
7	.524"	.518"	.516"	.516"	.513"	.515"	.512"	.509"	.511"	.511"	.510"	.507"	.509"
8	.522"	.519"	.515"	.514"	.514"	.512"	.511"	.511"	.508"	.508"	.509"	.507"	.507"
9	.522"	.518"	.515"	.513"	.512"	.514"	.510"	.511"	.513"	.511"	.509"	.516"	.509"
10	.518"	.518"	.515"	.513"	.512"	.512"	.512"	.513"	.517"	.515"	.513"	.509"	.509"
11	.517"	.515"	.515"	.515"	.514"	.514"	.512"	.515"	.521"	.519"	.515"	.511"	.512"

NOTE: A READING OF .133" WAS FOUND JUST LEFT OF J-6 AVERAGE = .513" (1.303 cm)

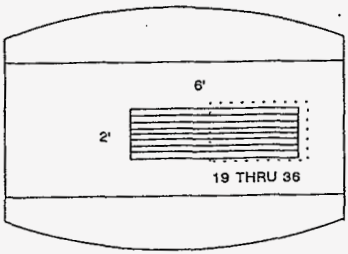
TK-C-100 14 APRIL 1998
LOCATION 11



AVERAGE = 0.326" (0.813cm)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A	.325"	.325"	.324"	.323"	.324"	.324"	.325"	.324"	.326"	.330"	.327"	.326"	.326"	.328"	.324"	.324"	.323"	.327"
B	.322"	.322"	.322"	.323"	.323"	.322"	.322"	.322"	.325"	.329"	.325"	.325"	.321"	.324"	.322"	.322"	.322"	.326"
C	.321"	.322"	.322"	.320"	.321"	.322"	.323"	.323"	.324"	.324"	.324"	.326"	.324"	.323"	.323"	.321"	.323"	.324"
D	.322"	.320"	.321"	.319"	.319"	.319"	.322"	.320"	.323"	.323"	.322"	.322"	.320"	.322"	.320"	.321"	.320"	.322"
E	.321"	.321"	.322"	.319"	.321"	.320"	.320"	.322"	.322"	.322"	.322"	.323"	.321"	.321"	.321"	.321"	.322"	.322"
F	.321"	.321"	.319"	.318"	.318"	.320"	.320"	.320"	.322"	.321"	.321"	.323"	.328"	.321"	.318"	.320"	.321"	.321"
G	.319"	.322"	.318"	.317"	.318"	.318"	.317"	.319"	.321"	.320"	.322"	.322"	.321"	.321"	.316"	.319"	.318"	.320"
H	.321"	.324"	.322"	.316"	.317"	.319"	.318"	.319"	.319"	.320"	.319"	.319"	.320"	.320"	.316"	.319"	.319"	.320"
I	.319"	.328"	.322"	.315"	.317"	.316"	.316"	.317"	.316"	.319"	.318"	.318"	.316"	.316"	.315"	.317"	.317"	.319"
J	.320"	.316"	.324"	.315"	.315"	.316"	.316"	.318"	.316"	.319"	.318"	.318"	.318"	.315"	.315"	.318"	.320"	.319"
K	.314"	.314"	.316"	.314"	.314"	.314"	.313"	.314"	.316"	.316"	.315"	.316"	.315"	.312"	.312"	.313"	.313"	.316"
L	.313"	.314"	.313"	.314"	.312"	.313"	.313"	.314"	.315"	.316"	.315"	.314"	.313"	.312"	.312"	.313"	.314"	.314"

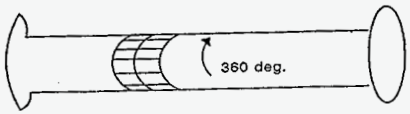
TK-C-100 14 APRIL 1998
LOCATION 11



AVERAGE = .321" (.815 cm)

	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
A	.327"	.327"	.326"	.326"	.329"	.326"	.326"	.327"	.327"	.328"	.327"	.326"	.329"	.329"	.326"	.325"	.325"	.324"
B	.324"	.323"	.323"	.323"	.324"	.324"	.328"	.325"	.326"	.325"	.325"	.326"	.326"	.325"	.325"	.322"	.323"	.327"
C	.326"	.324"	.324"	.323"	.322"	.324"	.326"	.326"	.324"	.324"	.324"	.322"	.324"	.324"	.323"	.322"	.323"	.325"
D	.322"	.323"	.322"	.321"	.333"	.322"	.323"	.324"	.326"	.323"	.323"	.323"	.323"	.322"	.321"	.322"	.321"	.322"
E	.321"	.320"	.320"	.319"	.324"	.322"	.322"	.321"	.322"	.323"	.323"	.324"	.323	.322"	.322"	.322"	.322"	.322"
F	.321"	.319"	.318"	.319"	.319"	.319	.320"	.322"	.320"	.320"	.324"	.322"	.321"	.321"	.318	.318"	.320"	.319"
G	.321"	.317"	.319"	.317"	.319"	.319"	.320"	.319"	.320"	.322"	.322"	.320"	.323"	.321"	.321"	.318"	.319"	.320"
H	.321"	.319"	.319"	.318"	.319"	.317"	.318"	.318"	.319"	.321"	.321"	.324"	.325"	.319"	.318"	.318"	.317"	.322"
I	.320"	.318"	.318"	.316"	.318"	.317"	.319"	.318"	.320"	.321"	.321"	.324"	.323"	.318"	.318"	.319"	.317"	.318"
J	.318"	.317"	.318"	.316"	.318"	.317"	.320"	.317"	.316"	.320"	.319"	.319"	.318"	.319"	.319"	.318"	.317"	.317"
K	.316"	.315"	.315"	.313"	.315"	.314"	.316"	.317"	.315"	.317"	.319"	.317"	.316"	.316"	.316"	.315"	.314"	.315"
L	.315"	.314"	.313"	.315"	.314"	.313"	.317"	.313"	.314"	.314"	.315"	.315"	.319"	.317"	.315"	.314"	.313"	.314"

E-C-2 14 APRIL 1998
LOCATION 12



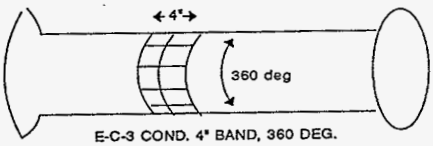
E-C-2 COND. 4" BAND 360 DEG.

	A	B	C
1	.338"	.328"	.331"
2	.332"	.340"	.333"
3	.336"	.336"	.338"
4	.340"	.341"	.340
5	.337"	.347"	.336"
6	.344"	.352"	.340"
7	.334"	.341"	.333"
8	.331"	.327"	.321"
9	.326"	.327"	.315"
10	.330"	.326"	.320"
11	.327"	.328"	.322"
12	.323"	.315"	.319"
13	.323"	.314"	.311"
14	.319"	.314"	.312"
15	.317"	.318"	.314"
16	.328"	.320"	.319"
17	.321"	.320"	.330"
18	.315"	.316"	.313"
19	.322"	.310"	.313"
20	.329"	.313"	.324"
21	.310"	.314"	.323"
22	.315"	.319"	.331"
23	.322"	.329"	.336"
24	.322"	.329"	.335"
25	.323"	.325"	.330"

NOTE:
E-C-2 COVERED W/
THICK PAINT

AVERAGE = $\frac{\phi .326"}{(0.828\,cm)}$

E-C-3 14 APRIL 1998
LOCATION 13



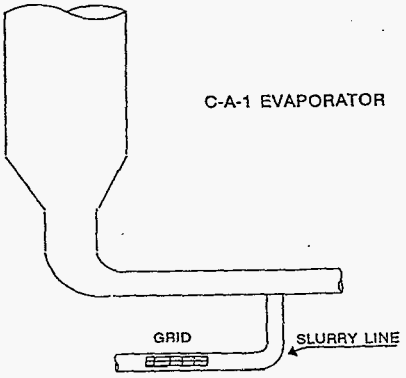
E-C-3 COND. 4" BAND, 360 DEG.

NOTE:
C-C-3 COVERED WITH
THICK PAINT

	A	B	C
1	.341"	.328"	.343"
2	.332"	.330"	.328"
3	.349"	.347"	.349"
4	.341"	.348"	.334"
5	.331"	.332"	.334"
6	.352"	.360"	.352"
7	.348"	.351"	.350"
8	.338"	.340"	.351"
9	.340"	.334"	.350"
10	.336"	.341"	.354"
11	.332"	.337"	.336"
12	.339"	.338"	.336"
13	.333"	.338"	.339"

AVERAGE = $\frac{0.341"}{(0.866\ cm)}$

LOCATION 15 14 APRIL 1998
LINE 1-3.5

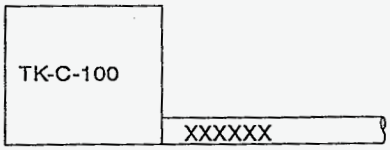


DATA

	A
1	.136"
2	.135"
3	.135"
4	.136"
5	.136"
6	.137"
7	.137"
8	.137"
9	.137"
9	.138"
10	.138"
11	.138"
12	.136"

AVERAGE = $\frac{0.137"}{(0.348cm)}$

TK-C-100 DRAIN LOCATION 16
14 APRIL 1998

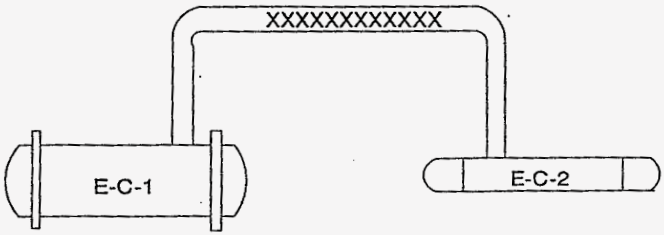


TK-C-100 TO LERF, 12 POINTS ALONG PIPE, 2" SPACE

	DATA
1.	.227"
2.	.223"
3.	.219"
4.	.218"
5.	.218"
6.	.215"
7.	.213"
8.	.211"
9.	.213"
10.	.213"
11.	.216"
12.	.214

AVERAGE = 0.217" (0.551 cm)

LOCATION 17 4/23/98
LINE FROM E-C-1 TO E-C-2



12 INDIVIDUAL READINGS ALONG PIPE, 2" SPACE

	DATA
1.	.309'
2.	.315'
3.	.310'
4.	.311"
5.	.320"
6.	.299"
7.	.318"
8.	.319"
9.	.316"
10.	.313"
11.	.314"
12.	.310"

AVERAGE = ϕ.313" (0.795 cm)

Appendix E (CORROSION STUDY)

FLUOR DANIEL
INTEROFFICE CORRESPONDENCE

To:	Sherm Tifft	Date:	June 16, 1998
Location:	Hanford	Reference:	1998 Interim 242-A Evaporator Tank System Integrity Assessment Plan
From:	Cathy Shargay		
Location:	Irvine	Client:	
Telephone:	(949)975-5137	Subject:	*Approval of* May 1998 Corrosion Evaluation Report
FAX Number:	(949)975-7178		

I have reviewed the "1998 Interim 242-A Evaporator Tank System Integrity Assessment Plan", the "1998 UT Results (Report)" and the May 18, 1998 "Corrosion Evaluation" report. The effects of radioactivity have not been evaluated as this was addressed during the original design and we were not provided the *nesessary data to update this* part of the materials analysis.

I certify that I have examined and am, familiar with the information submitted in the "Corrosion Evaluation" report. I believe that the information is true, accurate and complete.

Cathleen A. Shargay
Technical Director, Materials and Welding
Registered Professional Engineer
California State PE Registration # CR001053

6/30/00

(Original signed and sealed)

FLUOR DANIEL
INTEROFFICE CORRESPONDENCE

To:	Sherm Tifft	Date:	May 18, 1998
Location:	Hanford	Reference:	1998 Interim 242-A Evaporator Tank System Integrity Assessment Plan
From:	Ali A. Darwish		
Location:	Irvine	Client:	
Telephone:	(949)975-2929	Subject:	Corrosion Evaluation
FAX Number:	(949)975-7178		
cc:	Cathy Shargay		

A corrosion evaluation based on the 1998 Interim 242-A Evaporator Tank System Integrity Assessment Plan 1998 (IAP) and the 1998 ultrasonic testing (UT) results was performed to examine the compatibility of the materials used and the commodities being handled. The scope of this evaluation is limited to the equipment and piping sections listed in the Thickness and Corrosion Rate Table of this report.

The 1998 UT inspection did not cover all equipment and piping sections that were inspected in 1993. As a result, corrosion rates for locations 1, 2S, 2T, 4, 8, 10, and 14 could not be obtained.

As for the equipment that were inspected, not all grid points were measured. Therefore, for every equipment, an average thickness was calculated for the grid points measured and compared to the average thickness of the 1993 comparable grid points to make the corrosion rate calculations more accurate. For example, the 1993 average thickness (Tavg) for Location 3 is based on the average of readings from A1 to L6 only.

The nominal thickness (Tnom) minus the mill tolerance in the table are based on Table 1 of WHC-SD-WM-ER-124 Rev 1. One exception is that for TK-C-100, a minimum required thickness based on the ASME allowable stress has been calculated and is shown on page 6.9-3 of WHC-SD-WM-DP-019 Rev. 0.

FLUOR DANIEL
INTEROFFICE CORRESPONDENCE

Sherm Tifft
May 18, 1998
Page 2 of 3

Conclusion

Materials of construction as described in Table 2 of WHC-SD-WM-DP-019 Rev. 0 are compatible with the service conditions described in Table 4.2a and Table 4.2b of the 1998 IAP. Wall thicknesses of equipment and piping are above the Tnom minus the mill tolerance which is the minimum thickness expected during original construction. Corrosion rates are also negligible or within acceptable limits (<5 mpy). Hence, all equipment is acceptable for the next five years.

One concern is that Paragraph 4.3 of the 1998 IAP states "... and the portions of concrete structures that may come in contact with the waste are coated with a chemically resistant acrylic coating (Carboline D3358 primer and Carboline D3359 topcoat)". However, Carboline D3358 and D3359 are not recommended for immersion services. It is recommended that several concrete coating/lining manufacturers (Ameron, Stonehard, Plasite, Koch) be consulted for recommendations on the optimum concrete lining for this service.

The UT inspection during the next IAP should include all accessible equipment and grid points that were tested in 1993 so that a more extensive corrosion rates can be evaluated and and a more exhaustive remaining equipment life can be established.

FLUOR DANIEL
INTEROFFICE CORRESPONDENCE

Sherm Tifft
May 18, 1998

Thickness and Corrosion Rate Table

Location	Equipment	Material	Nominal Tnom, in	Tnom - Mill Tolerance , in	1993 Readings Tavg, in	1998 Readings Tavg, in	Corrosion Rate, MPY	1993 Readings Tmin, in	1998 Readings Tmin, in	Minimum Remaining Life (Note 5)
3	C-A-1	SS	0.375	0.32	0.381 (Note 1)	0.384 (Note 1)	0	0.35	0.381	>20
5	Line # 1-1.2	SS	0.25	0.205	0.264 (Note 2)	0.265 (Note 2)	0	0.244	0.252	>20
7	Line # 1-1.4	SS	0.25	0.205	0.25 (Note 3)	0.252 (Note 3)	0	0.223	0.239	>20
9	E-C-1	CS	0.5	0.47	0.522 (Note 4)	0.515 (Note 4)	1.4	0.489	0.507	13.5
11	TK-C-100	SS	0.3125	0.161	0.318	0.32	0	0.309	0.312	>20
12	E-C-2	CS	0.3125	0.273	0.333	0.326	1.4	0.314	0.31	>20
13	E-C-3	CS	0.322	0.282	0.345	0.341	0.8	0.334	0.328	>20
15	Line # 1-3.5	SS	0.134	0.117	0.137	0.137	0	0.135	0.135	>20
16	Line # 4.33	CS	0.216	0.189	0.212	0.217	0	0.208	0.211	>20
17	Line # 2.4	CS	0.28	0.245	0.308	0.313	0	0.3	0.309	>20

Notes:
1. Average for thickness readings from A1 to L6.
2. Average for Section T thickness readings from A1 to D10.
3. Average for Section U thickness readings A1 to D9.
4. Average for thickness readings from A1 to M11.
5. This remaining life is based on the minimum measured thickness (in 1993 or 1998), the average corrosion rate and the Tnom - Mill Tolerance thickness. When this thickness is approached, an actual Tmin based on the design pressure and applicable codes can be determined, which will probably indicate a significantly greater remaining life.

A. Darwish
Ali Darwish

product data sheet

carboline

CARBOLINE® 3358

VOC+

SELECTION DATA

GENERIC TYPE: Single component water-borne acrylic primer.

GENERAL PROPERTIES: A high performance, direct-to-metal acrylic primer which can tolerate a variety of topcoats. Carboline 3358 has exceptional film strength and chemical resistance.

- Low odor
- Excellent flexibility
- Excellent corrosion protection
- Excellent resistance to flash rusting
- Meets the most stringent VOC (Volatile Organic Content) regulations
- Authorized by USDA for Incidental Food Contact

RECOMMENDED USES: As a primer for applications requiring a VOC compliant primer such as railcar, tank exteriors and structural steel. Can be used as a two or three coat all acrylic system with Carboline 3359 topcoat.

NOT RECOMMENDED FOR: Immersion service.

TYPICAL CHEMICAL RESISTANCE
(With appropriate topcoat)

Exposure	Splash & Spillage	Fumes
Acids	Very Good	Excellent
Alkalies	Very Good	Excellent
Solvents	Fair	Good
Salt	Excellent	Excellent
Water	Excellent	Excellent

TEMPERATURE RESISTANCE (Non-immersion)*:
Continuous: 235°F (113°C)
Non-Continuous: 400°F (204°C)

*At 250°F and above, slight discoloration and loss of gloss is observed.

SUBSTRATES: Apply over suitably prepared metal, concrete or other surfaces as recommended.

COMPATIBLE COATINGS: May be applied over most tightly adhering coatings. Normally topcoated with Carboline 3359. Consult Carboline Technical Service for specific recommendations.

SPECIFICATION DATA

THEORETICAL SOLIDS CONTENT:

	By Volume
CARBOLINE 3358	37% ± 2%

June 94 Replaces Nov 91

VOLATILE ORGANIC CONTENT:*

		Calculated EPA Method 24	Per Actual Gallon
As supplied:	lbs/gal	1.43	0.63
	g/l	172	76
Thinned 5% with Potable Water	lbs/gal	1.43	0.55
	g/l	172	66
Thinned 5% with Additive 102	lbs/gal	2.03	0.95
	g/l	243	113
Thinned 10% with Additive 102	lbs/gal	2.53	1.24
	g/l	301	148

*May vary slightly with color.

RECOMMENDED DRY FILM THICKNESS PER COAT:*
2-3 mils (50-75 microns) (Ref: SSPC PA 2)

*Additional thickness may be required over rough surfaces for appearance. Dry film thickness in excess of 3 mils/coat is not recommended.

THEORETICAL COVERAGE PER GALLON:*
579 mil sq. ft. (14.1 sq. m/l at 25 microns)
192 sq. ft. at 3 mils (4.7 sq. m/l at 75 microns)

*Mixing and application losses will vary and must be taken into consideration when estimating job requirements.

STORAGE CONDITIONS: Store indoors.
Temperature: 40-110°F (4-43°C)
Humidity: 0-95%

KEEP FROM FREEZING

SHELF LIFE: 24 months when stored at 75°F (24°C).

COLOR: Salmon 0400 and Buff 0200

GLOSS: Satin

ORDERING INFORMATION

Prices may be obtained from your local Carboline Sales Representative or Carboline Customer Service Department.

APPROXIMATE SHIPPING WEIGHT:

	1's	5's	50 Gal. Drum
CARBOLINE 3358:	11 lbs. (5 kg)	53 lbs. (24 kg)	565 lbs. (257 kg)
Additive # 102	9 lbs. (4 kg)	40 lbs. (18 kg)	N/A
Surface Cleaner #3	N/A	48 lbs. (21.8 kg)	538 lbs. (244.5 kg)

FLASH POINT: (Setaflash)

CARBOLINE 3358:	>200°F	(>93°C)
Additive # 102	146°F	(64°C)
Surface Cleaner #3	>212°F	(>100°C)

APPLICATION INSTRUCTIONS
Carboline® 3358

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

SURFACE PREPARATION: Remove all dirt, oil, grease and contaminants in accordance with SSPC-SP1 with clean rags soaked in Thinner #2 or Surface Cleaner #3, followed by a thorough rinse with clean potable water. A mist coat may be required over inorganic zinc primers.

Steel: Abrasive blast according to SSPC-SP6 or Commercial Blast (Note: Section A.6) to obtain a 1-3 mil blast profile is recommended. Power tool or hand tool cleaning in accordance with SSPC-SP3 or SSPC-SP2, to produce a rust-scale free surface is acceptable. New or aged galvanized should be lightly sanded to remove sheen and/or surface deposits.

Concrete: Do not coat concrete treated with hardening solutions unless test patches dictate satisfactory adhesion. Do not apply coating unless concrete has cured at least 28 days at 70°F (21°C) and 50% RH or equivalent time. Can be applied direct to concrete where an uneven surface can be tolerated. Remove laitance by abrasive blasting or other means.

MIXING: Power mix until uniform in consistency. Avoid excessive air entrainment.

THINNING: May be thinned up to 5% by volume with clean, potable water where conditions dictate. Areas with cool substrate and warm ambient conditions can experience a surface skinning and separation. Under these conditions, the use of 5-10% (volume) of Additive #102 assists in the proper film formation at the recommended DFT, without surface skinning. Refer to specification data for VOC information.

Use of thinners other than those supplied or approved by Carboline may adversely affect product performance and void product warranty, whether express or implied.

POTLIFE: This is a single component product which has an indefinite working time. Keep container covered when not in use.

APPLICATION CONDITIONS:

	Material	Surfaces	Ambient	Humidity
Normal	60-90°F (16-32°C)	65-95°F (18-32°C)	65-90°F (18-32°C)	10-80%
Minimum	50°F(10°C)	50°F(10°C)	50°F(10°C)	0%
Maximum	105°F(40°C)	130°F(54°C)	110°F(43°C)	85%

Do not apply when the surface temperature is less than 5°F, or 3°C above the dew point. Keep dry at 75°F and 50% RH for 90 minutes after application. Water-based products are sensitive to moisture during cure. Do not apply if temperatures are expected to drop below 50°F (10°C) within 24 hours of application.

June 94 Replaces Nov 91

Special thinning and application techniques may be required above or below normal conditions.

ROLLER APPLICATION: Use a short woven nap synthetic roller and apply over smooth wall surfaces and smooth concrete. For rough surfaces, cinder block or very porous surfaces, use a 3/8" woven nap synthetic roller. Multiple coats may be required over rough surfaces.

BRUSH APPLICATION: Use a synthetic bristle brush. Two coats will be required in order to achieve desired film thickness and acceptable hiding characteristics.

SPRAY: Pre-rinse equipment with undiluted Surface Cleaner #3 before spraying. The following spray equipment has been found suitable and is available from manufacturers such as Binks, DeVilbiss and Graco.

Conventional: Pressure pot equipped with dual regulators, 1/2" I.D. material hose, .086" fluid tip and appropriate air cap.

Airless:

Pump Ratio:*	30:1 (min)
GPM Output:	3.0 (min)
Material Hose:	3/8" I.D. (min)
Tip Size:	.017"-.019"
Output psi:	1800-2200
Filter Size:	60

*For two or more pick-ups, a 45:1 pump ratio is recommended.

For ease of application using airless spray equipment, remove the pick-up tube and immerse the lower unit directly into the material.

*Teflon packings are recommended and are available from the pump manufacturer.

DRYING TIMES: These times are at the recommended dry film thickness (3.0 mils).

Temperature	Dry to Handle and Topcoat
50°F (10°C)	3 hours
75°F (24°C)	2 hours
90°F (32°C)	1 hour

High humidity, high film thickness or cooler temperatures will lengthen Dry to Handle/Topcoat and final cure times due to slower water evaporation rate. Cohesive strength will develop with time.

CLEAN UP: Use clean potable water, followed with suitable solvent to dry equipment.

CAUTION: READ AND FOLLOW ALL CAUTION STATEMENTS ON THIS PRODUCT DATA SHEET AND ON THE MATERIAL SAFETY DATA SHEET FOR THIS PRODUCT.

WATER-BASED PRODUCT. KEEP ABOVE 32°F (0°C). EMPLOY NORMAL WORKMANLIKE SAFETY PRECAUTIONS. USE WITH ADEQUATE VENTILATION AND WEAR GLOVES OR USE PROTECTIVE CREAM ON FACE AND HANDS IF HYPERSENSITIVE. KEEP CONTAINER CLOSED WHEN NOT IN USE. IN CASE OF SPILLAGE ABSORB AND DISPOSE OF IN ACCORDANCE WITH LOCAL APPLICABLE REGULATIONS.

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carboline

CARBOLINE® 3359

VOC

SELECTION DATA

GENERIC TYPE: Single component water-borne acrylic topcoat.

GENERAL PROPERTIES: A durable, high performance acrylic topcoat for use where excellent weathering properties and chemical resistance are required. Carboline 3359 can be used over Carboline 3358 for an all acrylic system, or applied over a variety of tightly adhering primers including inorganic zincs.

- Low odor
- Universal topcoat
- Excellent durability
- Excellent weatherability
- Excellent corrosion protection
- Meets the most stringent VOC (Volatile Organic Content) regulations
- Authorized by USDA for Incidental Food Contact
- Available in Rapid Tint colors

RECOMMENDED USES: As a topcoat for a variety of primers where a VOC compliant topcoat is required such as railcars, tank exteriors and structural steel.

NOT RECOMMENDED FOR: Immersion service.

TYPICAL CHEMICAL RESISTANCE:

Exposure	Splash & Spillage	Fumes
Acids	Very Good	Excellent
Alkalies	Very Good	Excellent
Solvents	Fair	Good
Salt	Excellent	Excellent
Water	Excellent	Excellent

TEMPERATURE RESISTANCE (Non-immersion)*:
Continuous: 235°F (113°C)
Non-Continuous: 400°F (204°C)

*At 250°F and above, slight discoloration and loss of gloss is observed.

SUBSTRATES: Apply over suitably prepared metal, concrete or other surfaces as recommended.

COMPATIBLE COATINGS: Can be applied over a variety of primers including inorganic zincs, alkyds, acrylics, epoxies, vinyls and urethanes. Used over Carboline 3358 as a two or three coat system. Consult Carboline Technical Service for specific recommendations.

SPECIFICATION DATA

THEORETICAL SOLIDS CONTENT:

	By Volume
Carboline 3359	36 ± 2%

June 94 Replaces Nov 91

VOLATILE ORGANIC CONTENT:

		Calculated EPA Method 24	Per Actual Gallon
As supplied:	lbs/gal	1.15	0.48
	g/l	138	57
Thinned 5% with Potable Water	lbs/gal	1.15	0.47
	g/l	138	56
Thinned 5% with Additive #102	lbs/gal	1.81	0.82
	g/l	217	98
Thinned 10% with Additive #102	lbs/gal	2.34	1.11
	g/l	281	133

*May vary slightly with color.

RECOMMENDED DRY FILM THICKNESS PER COAT*:
2-3 mils (50-75 microns) (Ref: SSPC PA 2)

*Certain colors may require multiple coats for adequate hiding. Additional thickness may be required over rough surfaces for appearance. Dry film thickness in excess of 3 mils/coat is not recommended.

THEORETICAL COVERAGE PER GALLON:*
579 mil sq. ft. (14.1 sq.m/l at 25 microns)
192 sq. ft at 3 mils (4.7 sq.m/l at 75 microns)

*Mixing and application losses will vary and must be taken into consideration when estimating job requirements.

STORAGE CONDITIONS: Store Indoors.
Temperature: 40-110°F (4-43°C)
Humidity: 0-95%

KEEP FROM FREEZING

SHELF LIFE: 24 months when stored at 75°F (24°C)

COLOR: Available in a variety of colors. Contact your local Carboline Sales Representative or Carboline Customer Service Department for availability.

GLOSS: SemiGloss

ORDERING INFORMATION

Prices may be obtained from your local Carboline Sales Representative or Customer Service Representative.

APPROXIMATE SHIPPING WEIGHT:

	1's	5's	50 Gal. Drum
CARBOLINE 3359	11 lbs. (5 kg)	51 lbs. (23 kg)	525 lbs. (239 kg)
Additive #102	9 lbs. (4 kg)	40 lbs. (18 kg)	N/A
Surface Cleaner #3	N/A	48 lbs. (21.8 kg)	538 lbs. (244.5 kg)

FLASH POINT: (Setaflash)

CARBOLINE 3359:	>200°F	(>93°C)
Additive #102	146°F	(64°C)
Surface Cleaner #3	>212°F	(>100°C)

APPLICATION INSTRUCTIONS

Carboline® 3359

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

SURFACE PREPARATION: Apply over clean, dry recommended primer. Remove all dirt, oil, grease and contaminants in accordance with SSPC-SP1 with clean rags soaked in Thinner #2 or Surface Cleaner 3 followed by a thorough rinse with clean, potable water. A mist coat may be required over inorganic zinc primers.

MIXING: Power mix until uniform in consistency. Avoid excessive air entrainment.

THINNING: May be thinned up to 5% by volume with clean, potable water where conditions dictate. Areas with cool substrate and warm ambient conditions can experience a surface skinning and separation. Under these conditions, the use of 5-10% (volume) of Additive #102 assists in the proper film formation at the recommended DFT, without surface skinning. Refer to specification data for VOC information.

Use of thinners other than those supplied or approved by Carboline may adversely affect product performance and void product warranty, whether express or implied.

POTLIFE: This is a single component product which has an indefinite working time. Keep container covered when not in use.

APPLICATION CONDITIONS:

	Material	Surfaces	Ambient	Humidity
Normal	60-90°F (16-32°C)	65-85°F (18-29°C)	65-90°F (18-32°C)	10-80%
Minimum	50°F(10°C)	50°F(10°C)	50°F(10°C)	0%
Maximum	105°F(40°C)	130°F(54°C)	110°F(43°C)	85%

Do not apply when the surface temperature is less than 5°F, or 3°C above the dew point. Keep dry at 75°F and 50% RH for 90 minutes after application. Water-based products are sensitive to moisture during cure. Do not apply if temperatures are expected to drop below 50°F (10°C) within 24 hours of application.

Special thinning and application techniques may be required above or below normal conditions.

ROLLER APPLICATION: Use a short woven nap synthetic roller and apply over smooth wall surfaces and concrete. For rough surfaces, cinder block or very porous surfaces, use a 3/8" woven nap synthetic roller. Multiple coats may be required over rough surfaces.

June 94 Replaces Nov 91

BRUSH APPLICATION: Use a synthetic bristle brush. Two coats will be required in order to achieve desired film thickness and acceptable hiding characteristics.

SPRAY: Pre-rinse equipment with undiluted Surface Cleaner #3 before spraying. The following spray equipment has been found suitable and is available from manufacturers such as Binks, DeVilbiss and Graco.

Conventional: Pressure pot equipped with dual regulators, 1/2" I.D. material hose, a .086" fluid tip, and appropriate air cap.

Airless:

*Pump Ratio:**	30:1 (min)
GPM Output:	3.0 (min)
Material Hose:	3/8" I.D. (min)
Tip Size:	.017"-.019"
Output psi:	1800-2200
Filter Size:	60

*For two or more pick-ups, a 45:1 pump ratio is recommended.

For ease of application using airless spray equipment, remove the pick-up tube and immerse the lower unit directly into the material.

*Teflon packings are recommended and are available from the pump manufacturer.

DRYING TIMES: These times are at the recommended dry film thickness (3.0 mils).

Temperature	Dry to Handle and Topcoat
50°F (10°C)	3 hours
75°F (24°C)	2 hours
90°F (32°C)	1 hour

High humidity, high film thickness or cooler temperatures will lengthen Dry to Handle/Topcoat and final cure times due to slower water evaporation rate. Cohesive strength will develop with time.

CLEAN UP: Use clean potable water, followed with suitable solvent to dry equipment.

CAUTION: READ AND FOLLOW ALL CAUTION STATEMENTS ON THIS PRODUCT DATA SHEET AND ON THE MATERIAL SAFETY DATA SHEET FOR THIS PRODUCT.

WATER-BASED PRODUCT. KEEP ABOVE 32°F (0°C). EMPLOY NORMAL WORKMANLIKE SAFETY PRECAUTIONS. USE WITH ADEQUATE VENTILATION AND WEAR GLOVES OR USE PROTECTIVE CREAM ON FACE AND HANDS IF HYPERSENSITIVE. KEEP CONTAINER CLOSED WHEN NOT IN USE. IN CASE OF SPILLAGE, ABSORB AND DISPOSE OF IN ACCORDANCE WITH LOCAL APPLICABLE REGULATIONS.

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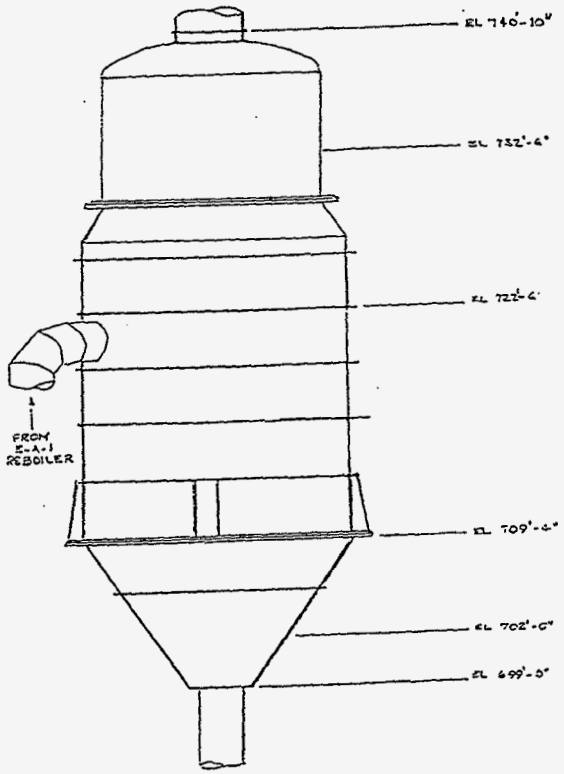
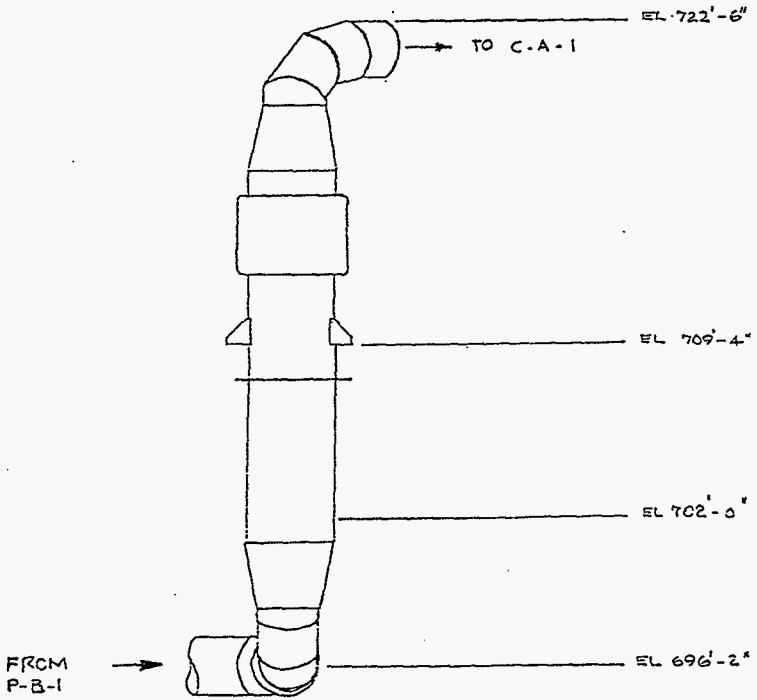
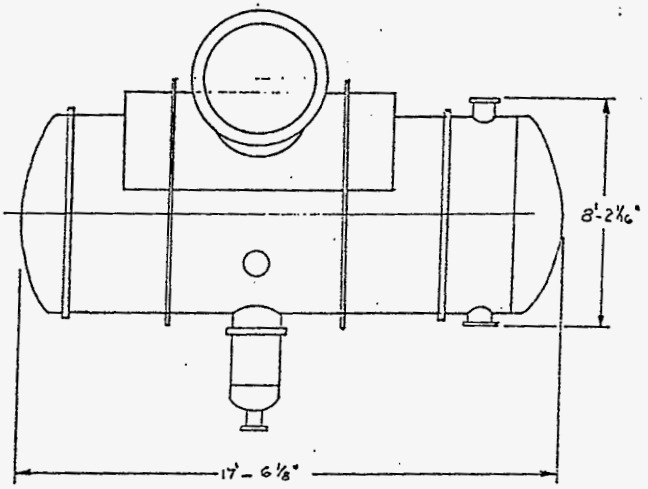
Appendix F (FIGURES)



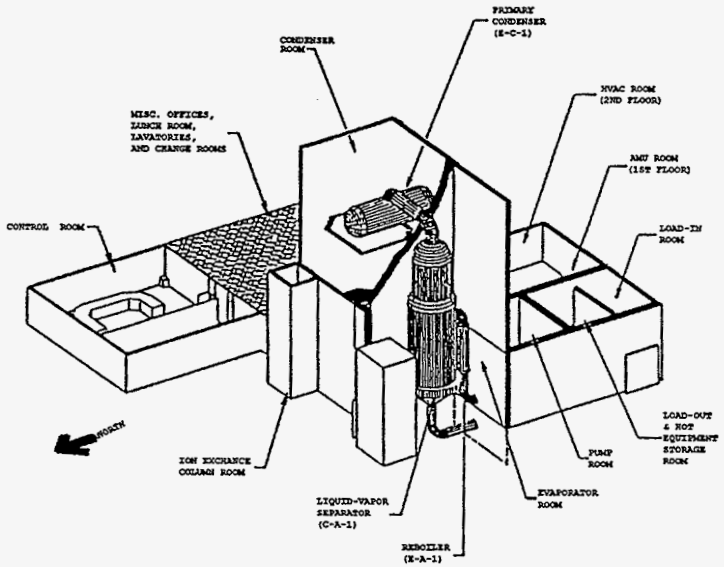
C-A-1 EVAPORATOR CRYSTALLIZER



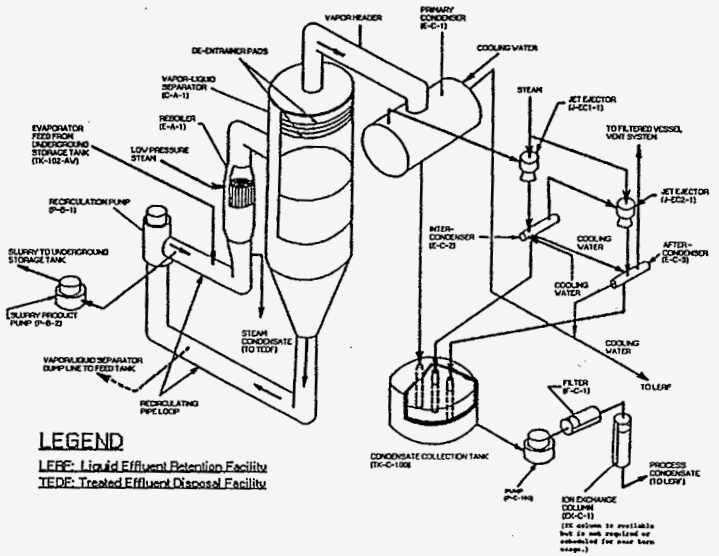
E-A-1 REBOILER



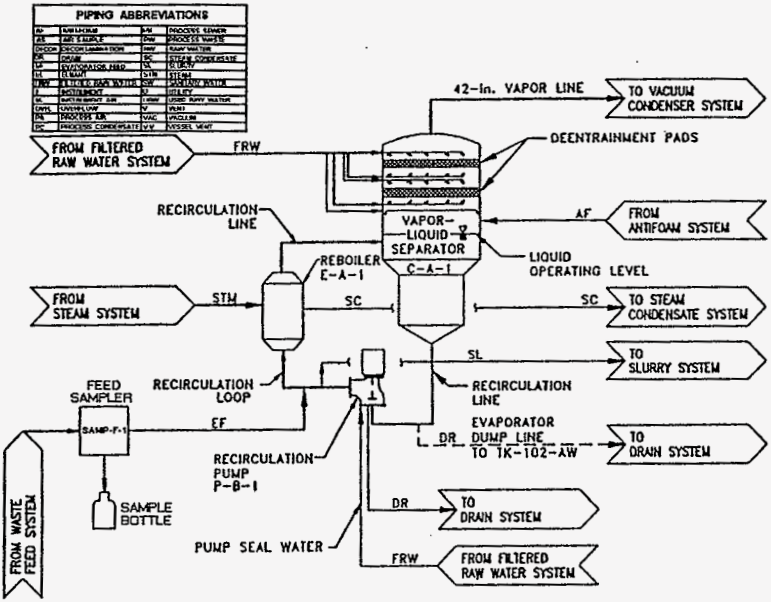
E-C-1 CONDENSER



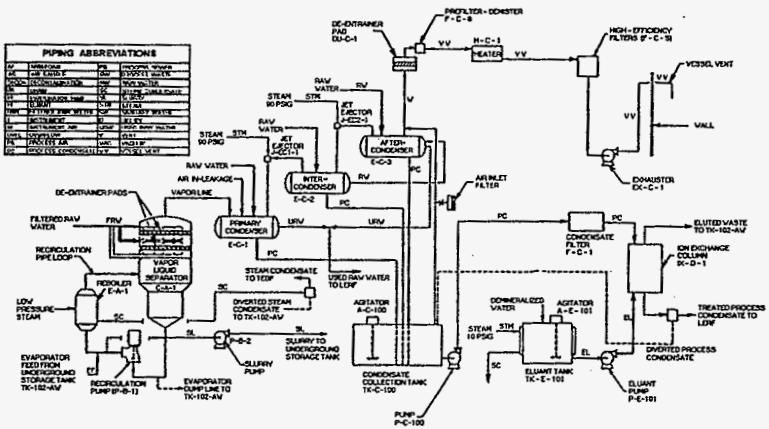
242-A Evaporator Perspective



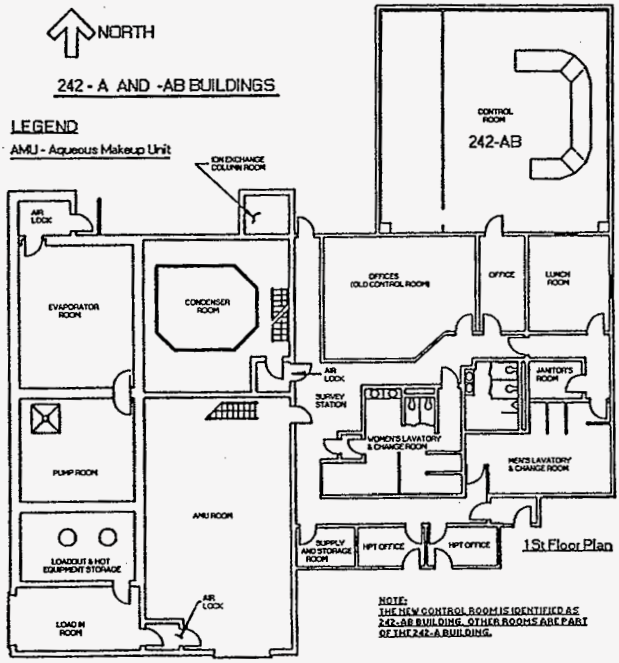
242-A Evaporator Simplified Schematic



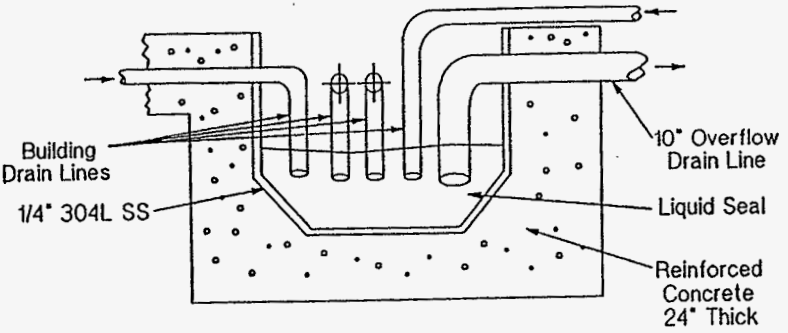
242-A Evaporator Process Loop



242-A Evaporator Simplified Process Flow Diagram



242-A Evaporator First Floor Plan



242-A Pump Room Sump Schematic

Appendix G (DESIGN PARAMETERS)

Table G-1: Operating Parameters

Component	Pressure/Flow	Temperature (F)
C-A-1 Evaporator		
Vapor Section	<0.8 psia	120
Lower Circulation Pipe	16,000 gpm	200
E-A-1 Reboiler		
Tube Side (Waste)	16,000 gpm	
Shell Side (Steam)	29.7 psia	250
E-C-1 Primary Condenser		
Tube Side (Cooling Water)	2,800 gpm	72
Shell Side (Waste Vapor)	0.8 psia	95
E-C-2 Intermediate Condenser		
Tube Side (Cooling Water)	150 gpm	72
Shell Side (Waste Vapor)	1.0 psia	150
E-C-3 Final Condenser		
Tube Side (Cooling Water)	150 gpm	95
Shell Side (Waste Vapor)	14.0 psia	170
TK-C-100 Condensate Catch Tank	14.0 psia	151

Table G-2: Equipment Design Criteria

COMPONENTS	DESIGN CRITERIA		COMMENTS
C-A-1 Evaporator	Standard(s):	ASME Section VIII Div. 1, HPS 230W & 220W	Designed by Struthers Nuclear and Process Co.
	Temperature:	200°F	
	Pressure:	Full Vacuum	
	Materials:	ASTM SA 240 304L (Shell)	
	Reference:	Construction Spec. B-100-P1, SD-WM-TI-003	
E-A-1 Reboiler	Standard(s):	ASME Section VIII Div. 1, HPS 230W & 220W	ASTM SA 312 304 (NOZZLES)
	Temperature:	350°F (Shell), 250°F (Tubes)	
	Pressure:	100 psig (Shell), Full Vacuum (Tubes)	
	Materials:	ASTM SA 240 304L (Shell)	
	Reference:	Construction Spec. B-100-P1, SD-WM-TI-003	
P-B-1 Recirculation Pump	Standard(s):	Not Specified	New Installation per Project B-534
	Temperature:	200°F	
	Pressure:	Not Specified	
	Materials:	ASTM A296 Gr CF-8 and GrGF-8	
	Reference:	Procurement Spec. B-534-P4	
	Capacity:	14,000 GPM	

COMPONENTS	DESIGN CRITERIA		COMMENTS
P-B-2 Bottoms Pump	Standard(s):	Not Specified	New Installation per Project B-534
	Temperature:	Not Specified	
	Pressure:	Not Specified	
	Materials:	Stainless Steel	
	Reference:	Procurement Spec. B-534-P11	
E-C-1 Primary Condenser	Standard(s):	ASME Section VIII Div. 1, NPS 220W	SA 515 GR70 (Tube Sheets). Original unit is being replaced by unused spare on Project B-534.
	Temperature:	150°F(Shell and Tubes)	
	Pressure:	Full Vacuum (Shell), 100 psig (Tubes)	
	Materials:	SA285 GrC (Shell Heads, Internal Supports)	
	Reference:	Construction Spec. B-100-P1	
E-C-2 Intermediate Condenser	Standard(s):	ASME Section VIII Div. 1, TEMAC	
	Temperature:	350°F(Shell and Tube)	
	Pressure:	100 psig to Full Vacuum (Shell), 100 psig (Tube)	
	Materials:	Carbon Steel	
	Reference:	Shutte and Koerting Co. Spec. Sheet 72-T-018-J-1	

COMPONENTS	DESIGN CRITERIA		COMMENTS
E-C-3 Final Condenser	Standard(s):	ASME Section VIII Div. 1, TEMAC	
	Temperature:	350°F	
	Pressure:	100 psig to Full Vacuum (Shell), 100 psig (Tube)	
	Materials:	Carbon Steel	
	Reference:	Shutte and Koerting Co. Spec. Sheet 72-T-018-J-1	
TK-C-100 Condensate Catch Tank	Standard(s):	ASME Section VIII Div. 1 & HWS 4311, Rev. 2	Modified in 1977 per ASME Sec. VIII Div. 2 New material ASTM A312 Type 304. 1124 Gallon capacity.
	Temperature:	Not Available	
	Pressure:	5 psig	
	Materials:	347 SS	
	Reference:	H-2-69357 & H-2-40704	
IX-D-1 Ion Exchange Column	Standard(s):	ASME Section VIII Div. 1	Fabricated in 1977. Corrosion allowance 1/16 inch. Mesh Screens 304 or 316 SS
	Temperature:	150°F	
	Pressure:	120 psig	
	Materials:	Carbon Steel (ASTM A36 & A285 GrC)	
	Reference:	H-2-69359	

COMPONENTS	DESIGN CRITERIA		COMMENTS
TK-C-103 Condensate Measurement Tank	Standard(s):	ASME Section VIII Div. 1	500 Gallon tank
	Temperature:	Not Available	
	Pressure:	Atmospheric	
	Materials:	ASTM A36 (Wier Plate ASTM A240 304L)	
	Reference:	H-2-69370	
Seal Pot, Liquid Seal	Standard(s):	ASME Section VIII Div. 1	27 Gallon tank
	Temperature:	Not Available	
	Pressure:	Atmospheric	
	Materials:	ASTM A36 CS	
	Reference:	H-2-69368	
Building/Structure	Standard(s):	UBC, 1972	Seismic Design Loads: Horizontal, 0.25g DBE/0.125g OBE, Vertical, 2/3 horizontal. Coated with phenoline 305 chemically resistant coating.
	Temperature:	N/A	
	Pressure:	N/A	
	Materials:	Poured in-place concrete	
	Reference:	Structural Dwgs. H-2-69276 thru 85 and H-2-69269 thru 75 and H-2-90739 thru 41	

Table G-3: Pipe Materials
(PER VITRO SPEC B-100-C1)

SYSTEM DESIGNATOR	MATERIAL
M1	ASTM A53, TYPE E OR S, GR A OR B, OR ASTM A106, GR A OR B
M2	ASTM A53, TYPE E OR S, GR A OR B, OR ASTM A106, GR A OR B
M5	ASTM A53, TYPE E OR S, GR A OR B, OR ASTM A106, GR A OR B
M7	ASTM A53, TYPE E OR S, GR A OR B, OR ASTM A106, GR A OR B
M8	ASTM A312, TP304L
M9	$\leq$12": ASTM A312, GRTP304L, $\geq$14": ASTM A240, GRTP304L
M21	SS 304L, PER HPS-124-M
M24	ASTM A53, TYPE S, GR B, OR ASTM A106, GR B
M25	ASTM A53, TYPE S, GR B, OR ASTM A106, GR B
M27	SS ASTM A312, TYPE 304L
M31 (TUBING)	.035" WALL THK, ASTM A269, GR TP304
M32 (TUBING)	POLYETHYLENE, SINGLE LINE OR BUNDLED & SHEATHED IN PVC
M33 (TUBING)	COPPER ASTM B68
M42	ASTM A53, TYPE E OR S, GR A OR B, OR ASTM A106, GR A OR B
(REFER TO SPEC. FOR VARIOUS SCHEDULES)	

Table G-4: 242-A Evaporator Bulk Chemistry Solutions

Description	Units	Evaporator Feed	Double Shell Slurry Feed	Process Condensate	Cooling Water	Steam Condensate
pH	--	13.0	13.0	10.0	6.2	8.0
TOC	mg/L	3.3 E+03	4.6 E+03	2.6 E+02	1.7 E+00	1.1 E+00
TDS	mg/L	0.0 E+00	0.0 E+00	3.4 E-01	0.0 E+00	7.6 E+01
Alpha	uCi/ML	0.0 E+00	2.9 E+11	5.7 E-11	8.1 E-10	6.5 E-10
Beta	uCi/ML	0.0 E+00	3.5 E-10	6.8 E-13	1.0 E-08	00 E+00
AlO_2^-	mg/L	2.2 E+04	3.2 E+04	4.1 E+01	00 E+00	00 E+00
NH_4^+	mg/L	9.3 E-02	1.3 E+02	2.3 E+03	00 E+00	6.3 E-02
Barium	mg/L	9.8 E+00	1.4 E+01	3.0 E-02	3.0 E-02	3.1 E-02
Baron	mg/L	1.2 E+01	1.7 E+01	3.5 E-02	0.0 E+00	1.8 E-02
Calcium	mg/L	5.1 E+01	7.3 E+01	1.9 E+01	1.9 E+01	1.9 E+01
Cadmium	mg/L	1.1 E+01	1.6 E+01	3.1 E-02	2.0 E-03	0.0 E+00
$CO_3^=$	mg/L	8.7 E+03	1.2 E+04	2.4 E+01	0.0 E+00	0.0 E+00
Cl-	mg/L	4.5 E+03	6.4 E+03	2.4 E+01	7.8 E-01	1.1 E+00
Chromium	mg/L	4.2 E+02	6.0 E+02	3.4 E-02	1.0 E-02	0.0 E+00
Copper	mg/L	4.8 E+00	6.9 E+00	1.5 E-02	7.3 E-02	1.1 E-02
CN^-	mg/L	3.4 E+01	4.8 E+01	9.5 E-02	0.0 E+00	0.0 E+00
F^-	mg/L	2.7 E+02	3.9 E+02	4.3 E-02	0.0 E+00	1.3 E-01
Iron	mg/L	2.8 E+01	3.9 E+01	8.5 E-02	1.0 E-01	8.4 E-02
H_2	mg/L	1.6 E-11	1.7 E-11	2.0 E-11	0.0 E+00	0.0 E+00
OH^-	mg/L	4.9 E+04	7.0 E+04	1.4 E+02	0.0 E+00	0.0 E+00
Lead	mg/L	5.1 E+01	7.0 E+01	4.6 E+00	1.3 E-02	5.5 E-05
Magnesium	mg/L	2.0 E+01	2.9 E+01	4.6 E-01	4.3 E+00	4.5 E+00
Manganese	mg/L	2.0 E+01	2.9 E+01	5.8 E-02	1.1 E-02	1.4 E-02
Mercury	mg/L	5.6 E+00	8.0 E+00	1.6 E-02	0.0 E+00	1.1 E-04
Molybdenum	mg/L	4.2 E+01	6.0 E+01	1.2 E-01	0.0 E+00	0.0 E+00
Nickel	mg/L	2.8 E+01	4.0 E+01	7.9 E-02	1.1 E-02	0.0 E+00
NO_3^-	mg/L	1.2 E+05	1.8 E+05	6.1 E+01	1.2 E+00	5.5 E-01
NO_2^-	mg/L	6.0 E+04	8.6 E+04	7.0 E+01	0.0 E+00	0.0 E+00
PO_4	mg/L	3.7 E+03	5.3 E+03	1.0 E+01	0.0 E+00	0.0 E+00
Phosphorus	mg/L	3.4 E+03	4.9 E+03	9.6 E+00	0.0 E+00	0.0 E+00
Potassium	mg/L	1.3 E+04	1.8 E+04	1.0 E+01	8.0 E-01	7.5 E-01
Silicon	mg/L	1.3 E+02	1.9 E+02	5.9 E-01	0.0 E+00	2.5 E+00
Sodium	mg/L	1.7 E+05	2.4 E+05	1.6 E+01	2.3 E+01	2.2 E+00
SO_4	mg/L	2.0 E+03	2.9 E+03	5.0 E+00	1.0 E+01	1.0 E+01
Tungsten	mg/L	1.5 E+02	2.1 E+02	4.1 E-01	0.0 E+00	0.0 E+00
Uranium	mg/L	5.3 E+01	7.5 E+01	1.5 E-01	6.4 E-04	5.2 E-04
Zinc	mg/L	3.4 E+01	4.8 E+01	9.6 E-02	4.8 E-02	1.9 E-02

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