PART III, OPERATING UNIT 4 UNIT-SPECIFIC CONDITIONS

242-A Evaporator

The 242-A Evaporator is a mixed waste treatment and storage unit consisting of a conventional forced-circulation, vacuum evaporation system to concentrate mixed-waste solutions located in the 200 East Area.

This document sets forth the operating conditions for the 242-A Evaporator.

III.4.A COMPLIANCE WITH PERMIT CONDITIONS

The Permittees shall comply with all requirements set forth in the Hanford Facility RCRA Permit (Permit) as specified in Permit Attachment 3, Permit Applicability Matrix, including all approved modifications. All chapters, subsections, figures, tables, and appendices included in the following unit-specific Permit Conditions are enforceable in their entirety.

In the event that the Part III-Unit-Specific Conditions for Operating Unit 4, 242-A Evaporator conflict with the Part I-Standard Conditions and/or Part II-General Facility Conditions of the Permit, the unit-specific conditions for Operating Unit 4, 242-A Evaporator prevail.

OPERATING UNIT 4:

Chapter 1.0	Part A Form, Revision 9, dated May 2005
Chapter 2.0	Unit Description, dated August 2004
Chapter 3.0	Waste Analysis Plan, dated September 30, 2007
Chapter 4.0	Process Information, dated June 30, 2007
Appendix 4B	Tank Integrity Assessment, dated December 31, 2002
Chapter 5.0	Groundwater Monitoring, dated (not applicable)
Chapter 6.0	Procedures to Prevent Hazards, dated March 31, 2007 (also refer to Permit Attachment 33, §6.1, Security)
Chapter 7.0	Contingency Plan, dated September 30, 2006
Chapter 8.0	Personnel Training, dated September 30, 2007
Chapter 11.0	Closure and Postclosure Requirements, dated December 31, 2005
Chapter 12.0	Reporting and Recordkeeping (refer to Permit Attachment 33, Table 12.1, Reports and Records)

III.4.B UNIT-SPECIFIC CONDITIONS FOR 242-A EVAPORATOR

III.4.B.1 Portions of Permit Attachment 4 (DOE/RL-94-02) that are not made enforceable by inclusion in the applicability matrix for that document are not made enforceable by reference in this document.

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Chapter 1.0 Part A Form

1.0 Part A

The following is a chronology of the regulatory history of the 242-A Evaporator Part A.

- September 1, 1987, submitted the original Hanford Facility Dangerous Waste Part A Permit Application (Part A), Form 3, Revision 0, to the Washington State Department of Ecology (Ecology).
- November 16, 1987, Part A, Form 3, Revision 1, added Westinghouse Hanford Company (WHC) as co-operator.
- February 26, 1990, Part A, Form 3, Revision 2, added new dangerous waste numbers to reflect the waste identified within the Double-Shell Tank (DST) System (DOE/RL-90-39) and provided additional information on the process condensate waste stream.
- December 20, 1990, Part A, Form 3, Revision 3, added applicable dangerous waste numbers resulting from the addition of 15 new dangerous waste numbers subject to toxicity characteristics leaching procedure testing. The Part A, Form 3, added nonspecific source Dangerous Waste Number F005.
- April 13, 1993, Part A, Form 3, Revision 4, added nonspecific source Dangerous Waste Numbers F001, F002, and F003 to corresponded with the dangerous waste numbers from the DST System.
- November 4, 1994, Part A, Form 3, Revision 5, added Dangerous Waste Number F039 (multi-source leachate). Dangerous Waste Number F039 was added to reflect Low-Level Burial Grounds (DOE/RL-88-20) generation of multi-source leachate from lined mixed waste trenches.
- January 1, 1995, Part A, Form 3, Revision 6, added Process Code S02 and increased the process design capacity for tank storage for tanks C-100 and C-A-1 and converted English measurements to metric.
- October 10, 1997, Part A, Form 3, Revision 7, was revised to support the transition of this treatment, storage, and/or disposal unit (TSD) to the new Project Hanford Management Contractor. Part A, Form 3 was submitted to streamline the dangerous waste numbers list
- May 26, 2003, Part A Form 3, Revision 8, revised to support the transition of this treatment, storage, and/or disposal unit (TSD) to the Tank Farm Contractor.
- December 31, 2003, Part A Form 3, Revision 8A, revised to remove the ion-exhange column and add the process condensate line (PC 5000).
- May 2005, Part A, Revision 9, adopted the new Ecology Part A Form [ECY 030-31 Hanford (Rev. 3/5/04)].

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Dangerous Waste Permit Application Part A Form

Date Received	Reviewed by: Kathy Conaway	Date: 0 7 2 5 2 0 0 5
Month Day Year	Approved by: Greta P. Davis	Date: 0 8 1 0 2 0 0 5
0 7 1 1 2 0 0 5		

I. This form is submitted to: (place an "X" in the appropriate box)

- [X] Request modification to a final status permit (commonly called a "Part B" permit)
- [ ] Request a change under interim status
- [ ] Apply for a final status permit. This includes the application for the initial final status permit for a site or for a permit renewal (i.e., a new permit to replace an expiring permit).
- [ ] Establish interim status because of the wastes newly regulated on: (Date)

List waste codes:

II. EPA/State ID Number

W	A	7	8	9	0	0	0	8	9	6	7

III. Name of Facility

US Department of Energy – Hanford Facility

IV. Facility Location (Physical address not P.O. Box or Route Number)
A. Street

825 Jadwin

City or Town	State	ZIP Code
Richland	WA	99352

County Code (if known)	County Name
0 0 5	Benton

B. Land Type	C. Geographic Location Latitude (degrees, mins, secs)	Longitude (degrees, mins, secs)	D. Facility Existence Date Month	Day	Year
F	S E E T O P O	M A P	0 3	2 2	1 9 4 3

V. Facility Mailing Address

Street or P.O. Box

P.O. Box 550

City or Town	State	ZIP Code
Richland	WA	99352

VI. Facility contact (Person to be contacted regarding waste activities at facility)		
Name (last)	**(first)**	
Roy	Schepens	
Job Title	**Phone Number (area code and number)**	
Manager	(509) 376-6677*	
Contact Address		
Street or P.O. Box		
P.O. Box 450		
City or Town	**State**	**ZIP Code**
Richland	WA	99352

VII. Facility Operator Information		
A. Name	**Phone Number (area code and number)**	
Department of Energy* Owner/Operator CH2MHill Hanford Group, Inc.** Co-Operator for 242-A Evaporator	(509) 376-6677* (509) 373-1677**	
Street or P.O. Box		
P.O. Box 450 * P.O. Box 1500 **		
City or Town	**State**	**ZIP Code**
Richland	WA	99352
B. Operator Type	F	
C. Does the name in VII.A reflect a proposed change in operator?	☐ Yes ☒ No	
If yes, provide the scheduled date for the change:	Month: Day: Year:	
D. Is the name listed in VII.A. also the owner? If yes, skip to Section VIII.C.	☐ Yes ☒ No	

VIII. Facility Owner Information		
A. Name	**Phone Number (area code and number)**	
Keith A. Klein, Operator/Facility-Property Owner Roy J. Schepens, Operator/Facility-Property Owner*	(509) 376-7395 / (509) 376-6677*	
Street or P.O. Box		
P.O. Box 550		
City or Town	**State**	**ZIP Code**
Richland	WA	99352
B. Operator Type	F	
C. Does the name in VII.A reflect a proposed change in operator?	☐ Yes ☒ No	
If yes, provide the scheduled date for the change:	Month: Day: Year:	

IX. NAICS Codes (5/6 digit codes)		
A. First		**B. Second**
5 6 2 2 1	Waste Treatment & Disposal	9 2 4 1 1 0 — Administration of Air & Water Resource & Solid Waste Management Programs
C. Third		**D. Fourth**
5 4 1 7 1 0	Research & Development in the Physical, Engineering, & Life Sciences	9 9 9 9 9 9 — Unclassified Establishments

X. Other Environmental Permits (see instructions)

A. Permit Type			B. Permit Number												C. Description
	E		A	I	R	0	4	-	8	1	2				WAC 246-247, NOC Rad Air
	E		M	B	L	-	6	0	1	3	1	9	2	3	Master Business License
	E		T	S	C	A	0	6	-	0	8	-	0	4	40 CFR 761, TSCA RBDA Approval letter from L. J. Iani (EPA Region 10 Adminstator) to J. B. Hebdon and J. E. Rasmussen (DOE) dated June 8, 2004
	E		A	4	0	4	1								Petroleum Underground Storage Tank License

XI. Nature of Business (provide a brief description that includes both dangerous waste and non-dangerous waste areas and activities)

The 242-A Evaporator is used to treat and store mixed waste from the DST System. Two waste streams leave the 242-A Evaporator following the treatment process; a concentrated slurry waste stream that is routed to the DST System and a process condensate waste stream that is routed to the Liquid Effluent Retention Facility.

The waste fed to the 242-A Evaporator is regulated as a mixed waste with the same waste constituents as the waste in the DST System. The concentrated slurry is a characteristic waste (D001, D002, and D003), toxic waste (D004 through D011, D018, D019, D022, D028 through D030, D033 through D036, D038 through D041, and D043), nonspecific source waste (F001 through F005 and F039), and state-only characteristic waste (WT01, WT02, WP01, WP02. Multi-source leachate (F039) is included as a waste derived from nonspecific source waste F001 through F005.

The process condensate is regulated as a mixed waste due to the toxicity of ammonia (WT02) and because it is derived from the waste with a nonspecific source wastes F001 through F005. Multi-source leachate (F039) is included as a waste derived from nonspecific source waste F001 through F005.

The list of dangerous waste constituents under Section XIV.A includes constituents that have not been detected in the waste; however, knowledge of the processes providing the waste to the 242-A Evaporator indicates the strong possibility that these constituents are present in the waste or there is a potential for treating these constituents in the future. The annual waste quantity listed under Section XIV.B was calculated using an operating schedule of 365 days per year and a specific gravity of 2.0 for the waste. This calculation was done to provide a maximum estimate of annual waste quantity.

T04

The 242-A Evaporator began waste management operations in March of 1977. The 242-A Evaporator is located in the 200 East Area and is used to treat mixed waste from the Double-Shell Tank (DST) System by removing water and most volatile organics. Two waste streams leave the 242-A Evaporator following the treatment process. The first stream, the concentrated slurry (approximately 40 to 60 percent of the water is removed during evaporation along with a portion of volatile organics), is pumped back into the DST System. The second waste stream, process condensate (containing a portion of the volatile organics removed from the mixed waste during the evaporation process), is routed through condensate filters before release to a retention basis (Liquid Effluent Retention Facility). Offgasses from the process are routed through a de-entrainment unit, a prefilter, and high-efficiency particulate air filters before being discharged to the environment. The 242-A Evaporator is used to treat up to 870,642 liters (230,000 gallons) of mixed waste per day.

S02

Tank C-100, a 4.3-meter (14-foot) diameter and 5.9-meter (19-foot) high tank with a maximum design capacity of 67,380 liters (17,800 gallons) is located in the condensate room. Process condensate from the primary, inter-, and after-condensers drain by gravity to tank C -100, which is constructed of stainless steel. In addition, tank C-100 receives potentially contaminated drainage from the vessel vent system via a 102 -liter (27 gallon) seal pot.

Tank C-A-1 is located in the evaporator room and consists of two sections: the lower (liquid) section, a 4.3-meter (14-foot) diameter stainless steel shell, and an upper (vapor) section, a 3.5-meter (11.6-foot) diameter stainless steel shell, containing two wire-mesh de-entrainment pads for the removal of liquids and solids that could be carried into the vapor header. Process slurry from the reboiler discharges to the evaporator vessel (tank C-A-1). Concentrated process slurry exits the lower section of tank C-A-1 via the 28-inch recirculating line. Vapor flows out of tank C-A-1 through a 42-inch vapor line at the top. The maximum design capacity of tank C-A-1 is 103,217 liters (27,267 gallons).

EXAMPLE FOR COMPLETING ITEMS XII and XIII (shown in lines numbered X-1, X-2, and X-3 below): A facility has two storage tanks that hold 1200 gallons and 400 gallons respectively. There is also treatment in tanks at 20 gallons/hr. Finally, a one-quarter acre area that is two meters deep will undergo *in situ vitrification.*

Section XII. Process Codes and Design Capacities

Line Number		A. Process Codes (enter code)			B. Process Design Capacity		C. Process Total Number of Units
					1. Amount	2. Unit of Measure (enter code)	
X	1	S	0	2	1,600	G	002
X	2	T	0	3	20	E	001
X	3	T	0	4	700	C	001
	1	T	0	4	870,642	V	001
	2	S	0	2	170,597	L	001
	3						
	4						
	5						
	6						
	7						
	8						
	9						
1	0						
1	1						
1	2						
1	3						
1	4						
1	5						
1	6						
1	7						
1	8						
1	9						
2	0						
2	1						
2	2						
2	3						
2	4						
2	5						

Section XIII. Other Process Codes

Line Number		A. Process Codes (enter code)			B Process Design Capacity		C. Process Total Number of Units	D. Process Description
					1. Amount	2. Unit of Measure (enter code)		
X	1	T	0	4	700	C	001	In situ vitrification
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
1	0							
1	1							
1	2							
1	3							
1	4							
1	5							
1	6							
1	7							
1	8							
1	9							
2	0							
2	1							
2	2							
2	3							
2	4							
2	5							

XIV. Description of Dangerous Wastes

Example for completing this section: A facility will receive three non-listed wastes, then store and treat them on-site. Two wastes are corrosive only, with the facility receiving and storing the wastes in containers. There will be about 200 pounds per year of each of these two wastes, which will be neutralized in a tank. The other waste is corrosive and ignitable and will be neutralized then blended into hazardous waste fuel. There will be about 100 pounds per year of that waste, which will be received in bulk and put into tanks.

Line Number			A. Dangerous Waste No. (enter code)				B. Estimated Annual Quantity of Waste	C. Unit of Measure (enter code)	D. Processes (1) Process Codes (enter)									D. Processes (2) Process Description [If a code is not entered in D (1)]
X	1		D	0	0	2	400	P	S	0	1	T	0	1				
X	2		D	0	0	1	100	P	S	0	2	T	0	1				
X	3		D	0	0	2												Included with above
		1	D	0	0	1	635,029,318	K	T	0	4							
		2	D	0	0	2		K	T	0	4							
		3	D	0	0	3		K	T	0	4							
		4	D	0	0	4		K	T	0	4							
		5	D	0	0	5		K	T	0	4							
		6	D	0	0	6		K	T	0	4							
		7	D	0	0	7		K	T	0	4							
		8	D	0	0	8		K	T	0	4							
		9	D	0	0	9		K	T	0	4							
	1	0	D	0	1	0		K	T	0	4							
	1	1	D	0	1	1		K	T	0	4							
	1	2	D	0	1	8		K	T	0	4							
	1	3	D	0	1	9		K	T	0	4							
	1	4	D	0	2	2		K	T	0	4							
	1	5	D	0	2	8		K	T	0	4							
	1	6	D	0	2	9		K	T	0	4							
	1	7	D	0	3	0		K	T	0	4							
	1	8	D	0	3	3		K	T	0	4							
	1	9	D	0	3	4		K	T	0	4							
	2	0	D	0	3	5		K	T	0	4							
	2	1	D	0	3	6		K	T	0	4							
	2	2	D	0	3	8		K	T	0	4							
	2	3	D	0	3	9		K	T	0	4							
	2	4	D	0	4	0		K	T	0	4							
	2	5	D	0	4	1		K	T	0	4							

EPA/State ID Number	W	A	7	8	9	0	0	0	8	9	6	7

Line Number	A. Dangerous Waste No. (enter code)	B. Estimated Annual Quantity of Waste	C. Unit of Measure (enter code)	D. Process: (1) Process Codes (enter)	D. Process: (2) Process Description [If a code is not entered in D (1)]
26	D043		K	T04	
27	WT01		K	T04	
28	WT02		K	T04	
29	WP01		K	T04	
30	WP02		K	T04	
31	F001		K	T04	
32	F002		K	T04	
33	F003		K	T04	
34	F004		K	T04	
35	F005		K	T04	
36	F039		K	T04	
37	D001	348,241	K	S02	
38	D002		K	S02	
39	D003		K	S02	
40	D004		K	S02	
41	D005		K	S02	
42	D006		K	S02	
43	D007		K	S02	
44	D008		K	S02	
45	D009		K	S02	
46	D010		K	S02	
47	D011		K	S02	
48	D018		K	S02	
49	D019		K	S02	
50	D022		K	S02	
51	D028		K	S02	
52	D029		K	S02	
53	D030		K	S02	
54	D033		K	S02	
55	D034		K	S02	
56	D035		K	S02	
57	D036		K	S02	
58	D038		K	S02	
59	D039		K	S02	
60	D040		K	S02	
61	D041		K	S02	
62	D043		K	S02	
63	WT01		K	S02	
64	WT02		K	S02	
65	WP01		K	S02	
66	WP02		K	S02	

EPA/State ID Number	W	A	7	8	9	0	0	0	8	9	6	7

Line Number	A. Dangerous Waste No. (enter code)				B. Estimated Annual Quantity of Waste	C. Unit of Measure (enter code)	D. Process									
							(1) Process Codes (enter)									(2) Process Description [If a code is not entered in D (1)]
67	F	0	0	1		K	S	0	2							
68	F	0	0	2		K	S	0	2							
69	F	0	0	3		K	S	0	2							
70	F	0	0	4		K	S	0	2							
71	F	0	0	5		K	S	0	2							
72	F	0	3	9		K	S	0	2							
73																
74																
75																
76																
77																
78																
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92																
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XV. Map

Attach to this application a topographic map of the area extending to at least one (1) mile beyond property boundaries. The map must show the outline of the facility; the location of each of its existing and proposed intake and discharge structures; each of its dangerous waste treatment, storage, recycling, or disposal units; and each well where fluids are injected underground. Include all springs, rivers, and other surface water bodies in this map area, plus drinking water wells listed in public records or otherwise known to the applicant within ¼ mile of the facility property boundary. The instructions provide additional information on meeting these requirements.

XVI. Facility Drawing

All existing facilities must include a scale drawing of the facility (refer to Instructions for more detail).

XVII. Photographs

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment, recycling, and disposal areas; and sites of future storage, treatment, recycling, or disposal areas (refer to Instructions for more detail).

XVIII. Certifications

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

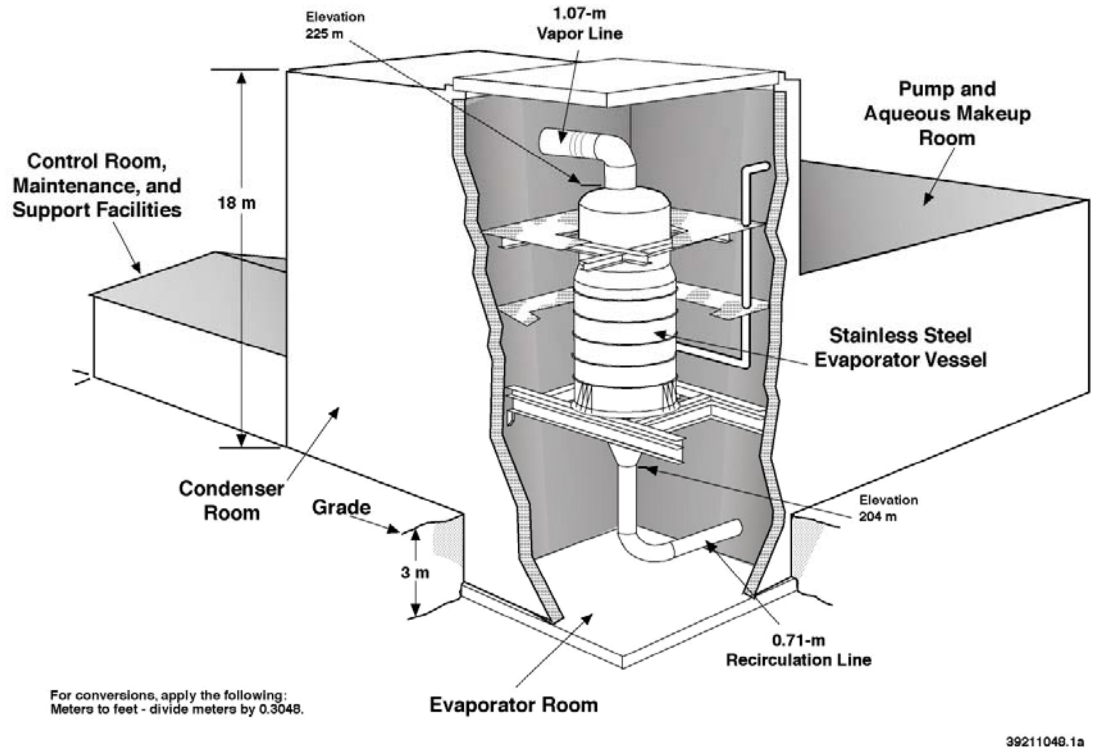
Operator* Name and Official Title (type or print)	**Signature**	**Date Signed**
Roy J. Schepens, Manager U.S. Department of Energy Office of River Protection	for [signature] Shirley J. Olinger	6/16/05
Co-Operator** Name and Official Title (type or print) Edward S. Aromi President and Chief Executive Officer CH2MHill Hanford Group, Inc.	**Signature** [signature]	**Date Signed** 6/15/05
Co-Operator** – Address and Telephone Number 2440 Stevens Center P.O. Box 1500 Richland, WA 99352 (509) 373-1677		
Facility-Property Owner* Name and Official Title (type or print) Keith A. Klein, Manager U.S. Department of Energy Richland Operations Office	**Signature** [signature]	**Date Signed** 7/11/05

Comments

242-A Evaporator

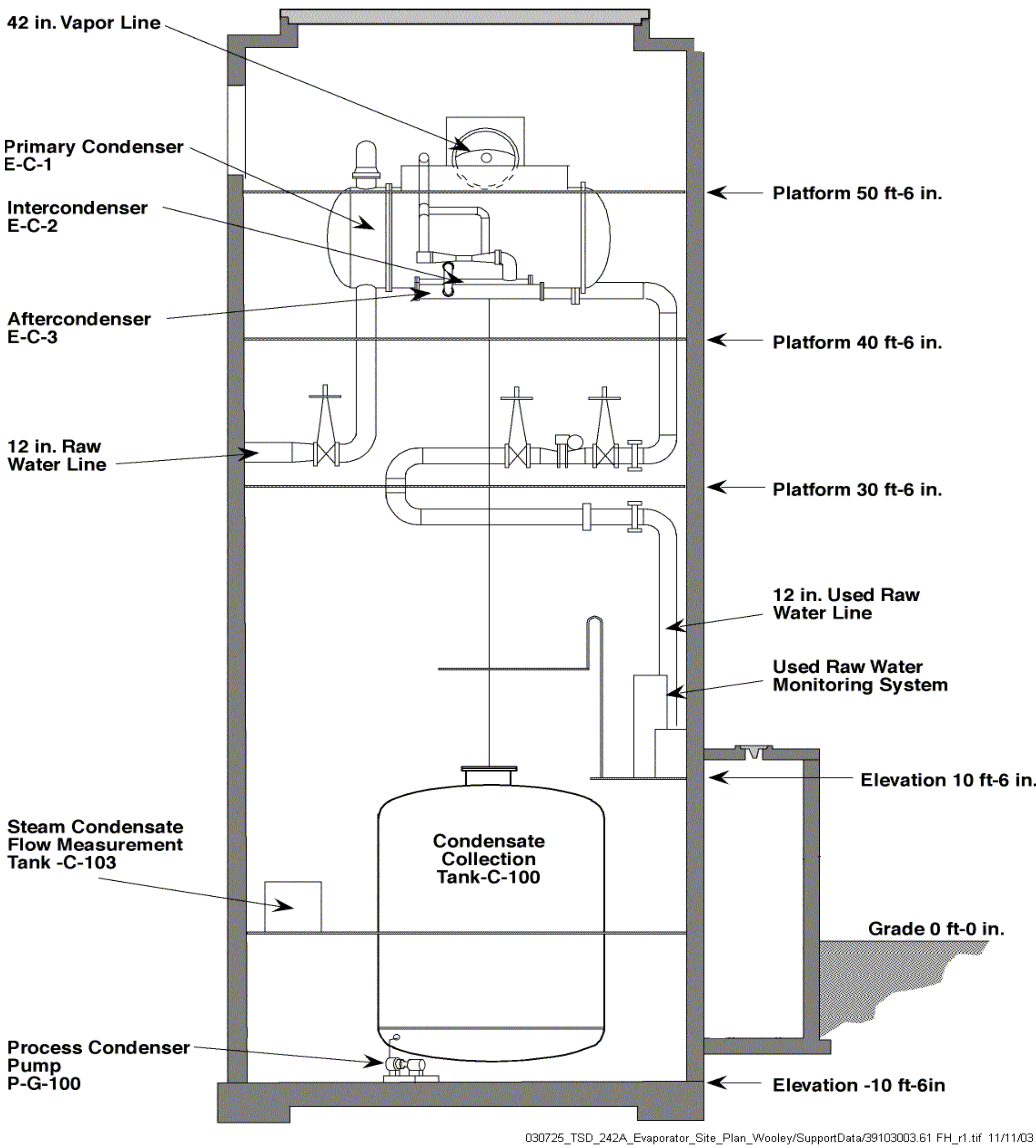
96080579-19CN
(PHOTO TAKEN 1996)

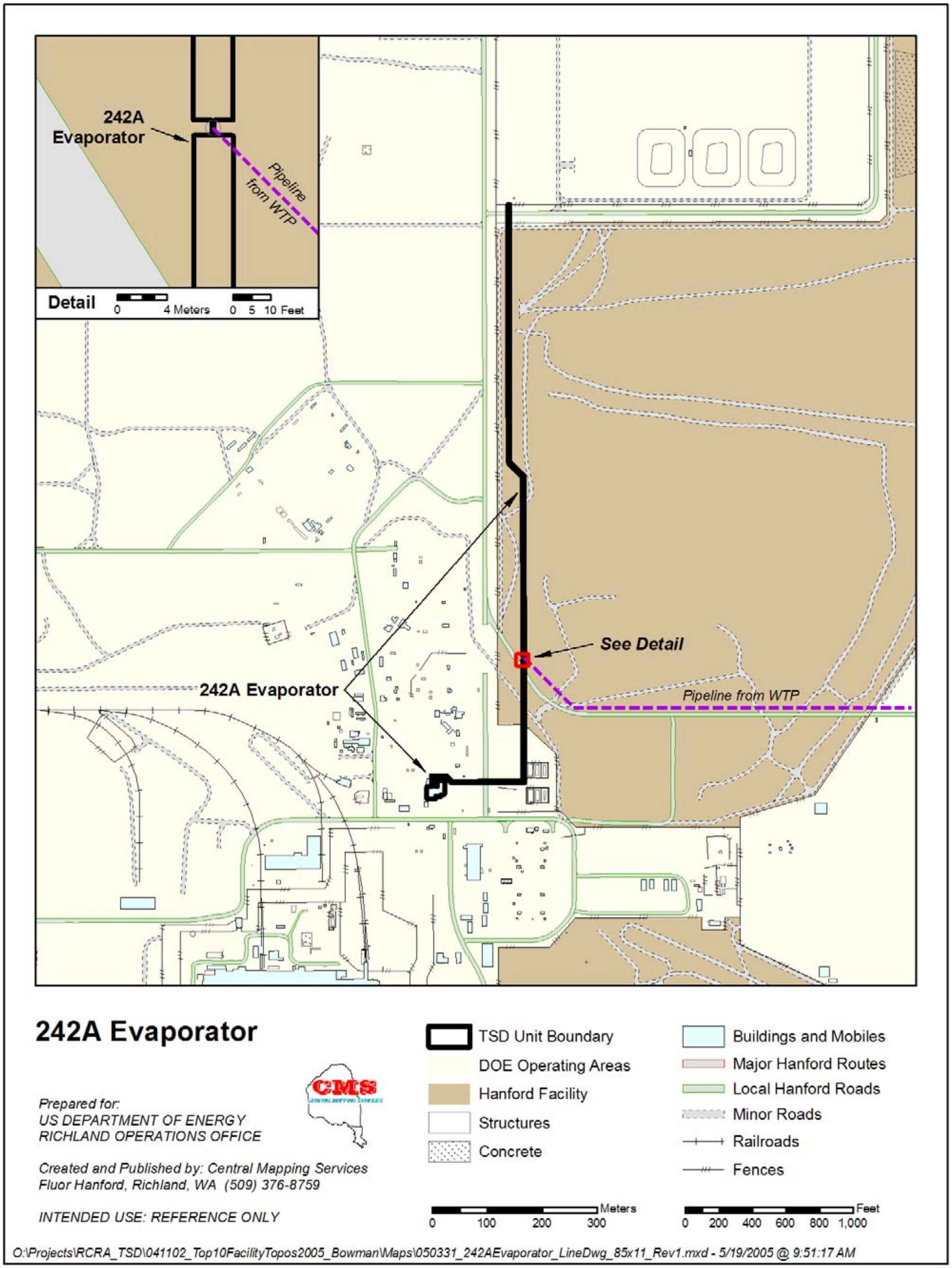
242-A Evaporator



242-A Evaporator

Tank C-100




242A
Evaporator
Pipeline from WTP
Detail
0 4 Meters
0 5 10 Feet
See Detail
242A Evaporator
Pipeline from WTP
242A Evaporator
Prepared for:
US DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
Created and Published by: Central Mapping Services
Fluor Hanford, Richland, WA (509) 376-8759
INTENDED USE: REFERENCE ONLY
TSD Unit Boundary
DOE Operating Areas
Hanford Facility
Structures
Concrete
Buildings and Mobiles
Major Hanford Routes
Local Hanford Roads
Minor Roads
Railroads
Fences
Meters
0 100 200 300
Feet
0 200 400 600 800 1,000
O:\Projects\RCRA_TSD\041102_Top10FacilityTopos2005_Bowman\Maps\050331_242AEvaporator_LineDwg_85x11_Rev1.mxd - 5/19/2005 @ 9:51:17 AM

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Chapter 2.0 Unit Description

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2.0 UNIT DESCRIPTION

The 242-A Evaporator unit description and general provisions were provided in the Part B permit application, Chapter 2.0 (DOE/RL-90-42, Rev 0). Washington Administrative Code (WAC) 173-303 was used to prepare the Part B permit application and does not require this information to be included in the unit-specific operating Permit. The exception to this is the topographic map (refer to Section 2.1). DOE/RL-90-42, Chapter 2.0 was used for the sole purpose of permitting the 242-A Evaporator and as such has not been updated since the time of permit issuance. A brief unit description is provided in Attachment 35, Chapter 1.0 and further detail is provided in Attachment 35, Chapter 4.0, Process Description of this Permit. Seismic consideration information is provided in Attachment 33, Chapter 2.0, §2.3 (DOE/RL-91-28, General Information Portion). Traffic information is provided in Attachment 33, Chapter 2.0, §2.4 (DOE/RL-91-28, *General Information Portion*).

2.1 TOPOGRAPHIC MAP

Topographic map Drawing H-13-000039, Rev 2, 200 Area Liquid Waste Processing Facilities, 242-A Evaporator, Liquid Effluent Retention Facility, Effluent Treatment Facility, Sheet 1 of 2, and Sheet 2 of 2.

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Chapter 3.0 **Waste Analysis Plan**

Figures

Tables

GLOSSARY

ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CFR	Code of Federal Regulations
C_T	total carbon
DOE	U. S. Department of Energy
DQO	data quality objective
DQO/DEFT	data quality objective/decision error feasibility trials
DSC	differential scanning calorimeter
DST	Double-Shell Tanks
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ETF	200 Area Effluent Treatment Facility
GC	gas chromotography
HDPE	high-density polyethylene
HFFACO	Hanford Federal Facility Agreement and Consent Order
IC_T	total inorganic carbon
IR	infared
LDR	land disposal restriction
LERF	Liquid Effluent Retention Facility
MS	mass spectrometry
N/A	not applicable
QA	quality assurance
QC	quality control
RCRA	*Resource Conservation and Recovery Act of 1976*
RPD	relative percent difference
TEDF	Treated Effluent Disposal Facility
TCLP	toxicity characteristic leaching procedure
TOC	total organic carbon
TSD	treatment, storage, and/or disposal
VOA	volatile organic analysis
WAC	Washington Administrative Code
WAP	waste analysis plan

METRIC CONVERSION CHART

Into metric units | Out of metric units

If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	millimeters	millimeters	0.0393	inches
inches	2.54	centimeters	centimeters	0.393	inches
feet	0.3048	meters	meters	3.2808	feet
yards	0.914	meters	meters	1.09	yards
miles	1.609	kilometers	kilometers	0.62	miles
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.092	square meters	square meters	10.7639	square feet
square yards	0.836	square meters	square meters	1.20	square yards
square miles	2.59	square kilometers	square kilometers	0.39	square miles
acres	0.404	hectares	hectares	2.471	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	grams	grams	0.0352	ounces
pounds	0.453	kilograms	kilograms	2.2046	pounds
short ton	0.907	metric ton	metric ton	1.10	short ton
Volume			**Volume**		
fluid ounces	29.57	milliliters	milliliters	0.03	fluid ounces
quarts	0.95	liters	liters	1.057	quarts
gallons	3.79	liters	liters	0.26	gallons
cubic feet	0.03	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.76456	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Force			**Force**		
pounds per square inch	6.895	kilopascals	kilopascals	0.14504	pounds per square inch

Source: *Engineering Unit Conversions*, M. R. Lindeburg, P.E., Second Ed., 1990, Professional Publications, Inc., Belmont, California.

3.0 WASTE ANALYSIS PLAN

3.1 INTRODUCTION

This waste analysis plan (WAP) addresses analysis necessary to manage the waste at the 242-A Evaporator according to *Resource Conservation and Recovery Act* (RCRA) requirements included in the *Hanford Facility RCRA Permit*, WA7 89000 8967 (Permit), *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement, Ecology et., al. 2003, Washington Administrative Code (WAC), Chapter 173-303, and Part 264 of the Code of Federal Regulations.

Modifications of the WAP require modifications of the Permit. Permit modifications are discussed in Permit Condition I.C and WAC 173-303-830.

Where information regarding treatment, management, and disposal of the radioactive source byproduct material and/or special nuclear components of mixed waste (as defined by the Atomic Energy Act of 1954 as amended) has been incorporated into this document, it is not incorporated for the purpose of regulating the radiation hazards of such components under the authority of this Permit or chapter 70.105 RCW and its implementing regulations but is provided for information purposes only.

3.2 PURPOSE

The purpose of the WAP is to ensure waste at the 242-A Evaporator is managed properly in accordance with WAC 173-303-300. To ensure the waste analysis is comprehensive, a data quality objectives (DQO) analysis was performed on all streams at the 242-A Evaporator. Sampling and analysis identified in the DQO analysis related to meeting RCRA requirements are included as an integral part of this WAP.

Regulatory and safety issues are addressed in the WAP by establishing boundary conditions for waste to be received and treated at the 242-A Evaporator. The boundary conditions are set by establishing limits for items such as reactivity, waste compatibility, and control of vessel vent organic emissions. Waste that exceeds the boundary conditions would not be acceptable for processing without further actions, such as blending with other waste.

3.3 SCOPE

This WAP discusses RCRA sampling and analysis of the waste in selected Double-Shell Tank (DST) System tanks to determine the acceptability of the waste for processing at the 242-A Evaporator. Sampling and analysis of DST System waste for other reasons, such as preparation for tank-to-tank transfers, is included in the waste analysis plan for the DST System.

RCRA sampling of the process condensate transferred to the Liquid Effluent Retention Facility (LERF) can be performed either at the 242-A Evaporator or at LERF. A discussion of process condensate sampling at the 242-A Evaporator is included in this WAP, while discussion of process condensate sampling at LERF is included in the Permit, Part III, Liquid Effluent Retention Facility and 200 Area Effluent Treatment Facility, *Waste Analysis Plan*.

Samples of other 242-A Evaporator waste streams, such as steam condensate, cooling water, and 242-A-81 back flush water, are taken as required for process control but are excluded from this plan because these streams have been previously characterized and determined to be nondangerous waste streams.

3.4 242-A EVAPORATOR PROCESS DESCRIPTION

The 242-A Evaporator, located in the 200 East Area of the Hanford Site, separates the incoming waste from the DST System into two aqueous streams as described in the following paragraph. Also associated with the 242-A Evaporator are utility waste streams such as cooling water and steam condensate, which are not dangerous waste. Description of the waste processed by the 242-A Evaporator is described in Section 3.4.

The 242-A Evaporator process uses a conventional forced-circulation, vacuum evaporation system to concentrate mixed waste solutions from the DST System tanks. The incoming stream is separated by evaporation into two liquid streams: a concentrated slurry stream and a process condensate stream. The slurry contains the majority of the radionuclides and inorganic constituents. After the slurry is concentrated to the desired amount, the slurry stream is pumped back to the DST System and stored for further treatment. Vapor from the evaporation process is condensed, producing process condensate, which is primarily water with trace amounts of organic material and a greatly reduced concentration of radionuclides. The process condensate is transferred to LERF for storage and treatment. Vacuum for the evaporator vessel is provided by two steam jet ejectors, producing a gaseous vessel vent exhaust. The 242-A Evaporator vessel vent stream is filtered and discharged through an exhaust stack. Figure 3.1 shows a simplified schematic of the 242-A Evaporator process. A more detailed description of the 242-A Evaporator process is provided in Chapter 4.0.

3.5 WASTE IDENTIFICATION

All of the waste accepted by the 242-A Evaporator comes from DST System. The waste in the DST System tanks is received from onsite generators, which characterize the waste before transfer to the DST System. Waste characterization is based on analytical data and/or process knowledge. Based on this information, the waste in certain DST System tanks are selected as 'candidates' for processing in the 242-A Evaporator. The contents of these candidate feed tanks are subjected to closer scrutiny and evaluated against 242-A Evaporator waste acceptance criteria before the final tank selection is made. To meet waste acceptance criteria, the contents of several tanks could be blended together in the feed tank (241-AW-102) prior to processing.

3.5.1 General Constituent Description

The only waste stream processed at the 242-A Evaporator is the DST System waste stream, which consists of mixed waste received from various Hanford Site activities. The mixed waste is a radioactive aqueous solution containing dissolved inorganic salts such as sodium, potassium, aluminum, hydroxides, nitrates, and nitrites. The mixed waste in some tanks has detectable levels of heavy metals such as lead, chromium, and cadmium. The radionuclide content includes fission products such as the Sr-90 and Cs-137, and actinide series elements such as uranium and plutonium. Small quantities of ammonia and organics, such as acetone, butanol, and tri-butyl phosphate, could also be present. Waste received in the DST System has been chemically adjusted to ensure the waste is compatible with materials used for construction of the waste tanks and the 242-A Evaporator. The consistency of the waste in the DST System ranges from liquid supernate to thick sludge. Waste fed to the 242-A Evaporator is supernate taken from the DST System; the sludge is not processed through the 242-A Evaporator.

The slurry is an aqueous solution containing the same components as the feed stream with increased concentrations. Most of the volatile constituents are evaporated and transferred to the process condensate. The process condensate is a dilute aqueous solution with ammonia, volatile organics, and trace quantities of radionuclides and inorganic constituents.

1 Figure 3.1. 242-A Evaporator Simplified Schematic

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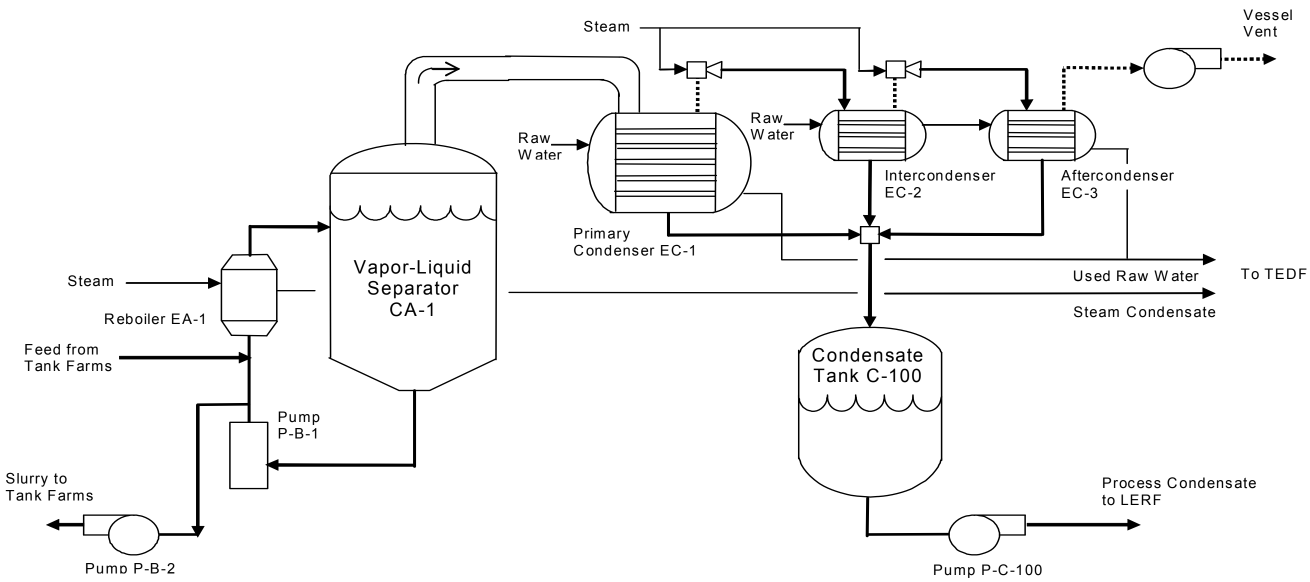


3.5.2 Classification of Waste

The waste processed at the 242-A Evaporator is classified as a mixed waste because it contains radioactive components and is a dangerous waste. The concentrated slurry produced by the evaporation process is also a mixed waste because it contains the same mixed waste constituents as the waste feed. The process condensate is classified as a mixed waste because it contains radioactive components and is a listed waste. The process condensate is a listed waste because it is derived from a listed waste.

Analysis of utility streams which do not contact mixed waste solutions, such as cooling water and steam condensate, are conducted per the requirements of the 200 Area Treated Effluent Disposal Facility, which receives these streams. These analyses are not discussed in this plan because these streams are not dangerous waste under WAC 173-303.

3.5.3 Dangerous Waste Numbers

Waste transferred to the 242-A Evaporator could be assigned any of the dangerous waste numbers found in Chapter 1.0, Part A, Form (latest Revision). These numbers are identical to the ones in the Part A, Form (latest Revision) for the DST System. Process knowledge and historical data indicate that the slurry stream returning to the DST System contains the same dangerous waste constituents as the waste feed, so the same dangerous waste numbers are applicable to the feed and slurry.

Table 3.1 lists the dangerous waste numbers assigned to the process condensate. The process condensate is designated with the dangerous waste numbers F001 to F005 because the process condensate is derived from treatment of DST System waste assigned these numbers.

Table 3.1. Waste Designation for Process Condensate.

Waste number	Characteristic/Source	Basis for designation
F001	Spent halogenated solvents	Derived from F001 waste
F002	Spent halogenated solvents	Derived from F002 waste
F003	Spent nonhalogenated solvents	Derived from F003 waste
F004	Spent nonhalogenated solvents	Derived from F004 waste
F005	Spent nonhalogenated solvents	Derived from F005 waste
F039	Multi-source leachate from waste disposal operations	Future receipt of waste with the F039 number, derived from F001 through F005.

3.6 WASTE ACCEPTANCE PROCESS

This section describes the actions performed before every campaign to determine if the waste in the DST System tanks is acceptable for treatment at the 242-A Evaporator. This section also describes the procedures and processes for sampling the process condensate stream at the 242-A Evaporator, if required by the waste acceptance criteria for treatment at the 200 Area Effluent Treatment Facility (ETF).

3.6.1 Candidate Feed Waste Acceptance Process

Candidate feed tank sampling performed for this WAP is done in the DST System before transfer of the waste to the 242-A Evaporator. Certain DST System tanks are selected as `candidates' for waste to be processed in the 242-A Evaporator. This section describes the method for determining if the waste in a candidate feed tank is acceptable for processing.

The following activities are performed to determine if candidate waste feed will meet the evaporator waste acceptance criteria.

- Estimate concentrations of the eight Critical analytes to determine the minimum number of feed tank samples needed for compliance with the waste acceptance criteria. The eight Critical analytes are Ammonia, Nitrite, Nitrate, Hydroxide, Acetone, Pu-239/240, Cs-137, and Sr-90. The evaporator DQO also specifies that a boil down study be performed to evaluate the impacts of solid formation.
- Evaluate Potential for Energetics/Uncontrolled Chemical Reactions: The 242-A Evaporator Waste Analysis Plan (WAP, Ecology 2003) requires that no exothermic reaction occur below 168°C and the ratio of exotherm-to-endotherm energy be less than 1.
- Evaluate Potential for Separable Organic Phase: Prior to operation of the evaporator, the absence of separable organics in the feed must be verified.
- Evaluate Feed Ammonia Concentration: The concentration of ammonia in the feed stream is limited to 6800 mg/L and must be confirmed.
- Calculate Process Condensate Ammonia and Organic Concentrations: Radionuclide, ammonia, and volatile organic concentrations are needed for the LERF waste profile sheet (refer to the Permit, Part III, LERF and 200 Area ETF, unit-specific conditions and Chapter 3.0, Waste Analysis Plan.)
- Calculate Vessel Vent Ammonia Emissions: Ammonia monitoring is required by the Permit to determine that the ammonia emissions do not exceed 100 lbs per 24 hours.

3.6.1.1 Selecting Candidate Feed Tanks

For each 242-A Evaporator campaign, DST System tanks are selected as candidate feed tanks based on process knowledge of chemical properties with respect to waste acceptance criteria (Section 3.6.1). After a candidate tank is selected, the waste in the tank is sampled and analyzed and the data evaluated to confirm waste acceptability. Every candidate feed tank is sampled and analyzed to confirm waste acceptability.

3.6.1.2 Determining the Number of Candidate Feed Tank Samples

The method for determining the number of feed tank samples is specified in the data quality objectives (DQO) (Banning et al. 2005) and this WAP, and uses power analysis software supplied by the U.S. Environmental Protection Agency (EPA) (EPA 2001). Estimated concentrations of eight critical analytes (Section 3.6.1) are used to determine the minimum number of samples, accounting for the desired confidence level and how close the estimated concentrations are to the waste acceptance limits a random number generator is then used to determine the sample locations in the tank, using constraints given in the WAP.

Figure 3.2 illustrates the decision logic used to determine the number of samples to be taken. Preliminary concentrations of critical analytes are compared to the waste acceptability limits statistically to determine the number of samples necessary to verify the composition of the waste. The statistical analysis accounts for how close the concentrations of critical analytes are to the limits and the desired confidence level. The closer the concentrations are to the limits, or the greater the desired confidence level, the more samples must be taken. For regulatory compliance, acetone is used as the critical analyte because it is often present at elevated levels. A 95% confidence level is specified for acetone. Critical analytes for process control are also assessed. Acetone analysis is usually not available from preliminary data, so process control analytes (such as nitrate and hydroxide) are often used. The statistical analysis includes the generation of power curve calculations using *Data Quality Objectives Decision Error Feasibility Trials* (EPA 2001 or current revision) software developed by the EPA. This software requires input of minimum and maximum expected values, action levels, mean sample results, standard deviations of sample results, and upper and lower confidence levels. The software outputs the minimum number of samples required. In general, three samples are taken as a minimum because taking two samples would require resampling if one sample should be lost or contaminated in the laboratory. A maximum of five samples generally is applied to minimize exposure to sampling personnel.

3.6.1.3 Assessing Candidate Feed Tank Analysis

When results of the sample analysis are available (and before the waste is processed), a second statistical analysis, similar to the first, is performed with the new analyte data to verify a sufficient number of samples were taken (Figure 3.3).

Candidate feed tank sampling and analysis, in conjunction with the waste acceptance criteria in Section 3.6.1, are used to assess whether established limits (limits are defined in the 242 Evaporator DQO, Banning 2004 and Permit, Part III, LERF and 200 Area ETF, unit-specific conditions and Chapter 3.0, Waste Analysis Plan) would be exceeded. Based on the results, four possible options are implemented:

- The waste is acceptable for processing at the 242-A Evaporator without further actions.
- The waste is unacceptable for processing as a single batch, but is acceptable if blended with other waste to be processed.
- The waste is unacceptable for processing.
- Perform further evaluation to determine if action limit can be protected through mid-campaign monitoring/sampling and/or process adjustments.

If the waste is suitable for evaporation, it will be transferred to the feed tank (241-AW-102) for processing.

3.6.2 Process Condensate Waste Sampling Process

RCRA sampling of process condensate is completed per the Permit, Part III, LERF and 200 Area ETF unit-specific conditions and Chapter 3.0, Waste Analysis Plan before treatment at the ETF. Depending on programmatic needs, this sampling can be performed at the 242-A Evaporator during a campaign or at LERF after the campaign is completed.

Before the start of a 242-A Evaporator campaign, the decision whether process condensate sampling will be performed at the 242-A Evaporator or at LERF is documented in the operating record. Planning for process condensate sampling at the 242-A Evaporator (i.e., number of samples, when samples are taken, etc.) is completed before starting the campaign.

3.6.2.1 Determining the Number of Process Condensate Samples

The purpose of sampling the process condensate stream at the 242-A Evaporator is to confirm that the stream is acceptable for treatment at the ETF. Before starting a 242-A Evaporator campaign where sampling will be performed at the 242-A Evaporator instead of LERF, characterization of the process condensate will be developed based on process knowledge. Process knowledge includes previous documented process condensate analysis, estimated concentrations based on documented candidate feed tank analysis, etc. RCRA sampling of the process condensate stream at the 242-A Evaporator is performed during the campaign to confirm the characterization is correct. Sampling frequency is determined using the following equation:

Number of process condensate = N + 1 samples required (per campaign). Where N is the number of candidate feed tanks to be processed during the campaign.

For example, a campaign processing waste from only one candidate feed tank would require two samples, while a campaign processing waste from three candidate feed tanks would require four samples. Sampling is spread approximately evenly through the campaign, allowing for operational events such as unexpected shutdowns and planned maintenance outages. This sample frequency represents a confirmation rate of about one sample every 5 to 8 days of processing. This is reasonable based on the extensive database of previous process condensate analysis. A minimum of two samples is taken to allow averaging of results.

3.6.2.2 Assessing Process Condensate Analysis

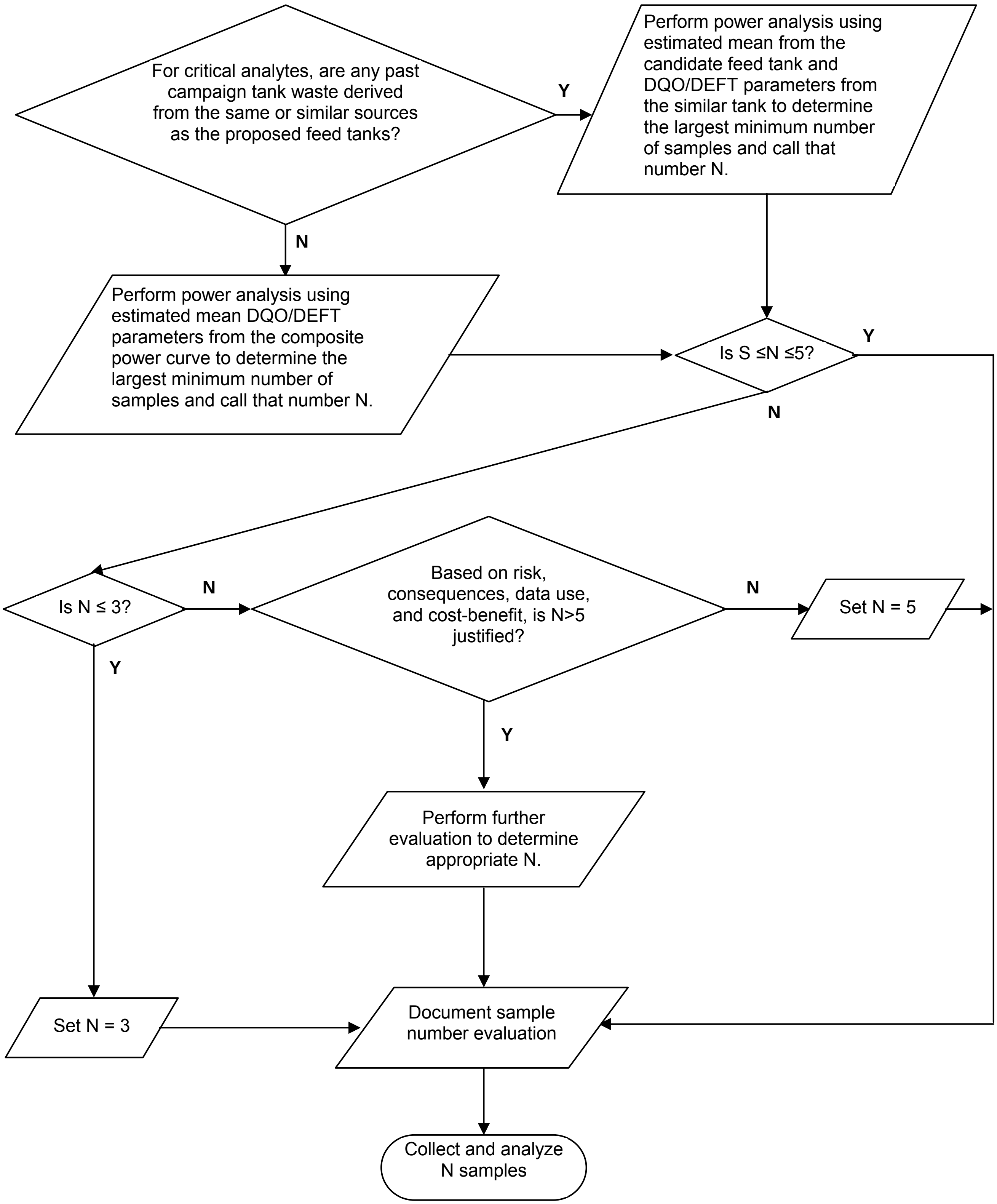
The process condensate sample results are assessed against the requirement in the Permit, Part III, LERF and 200 Area ETF unit-specific conditions and Chapter 3.0, Waste Analysis Plan. The discussion of the waste management decision process for process condensate sampling, including the reevaluation process, is also included in the Permit, Part III, LERF and 200 Area ETF unit-specific conditions and Chapter 3.0, Waste Analysis Plan.

3.7 242-A EVAPORATOR ACCEPTANCE CRITERIA

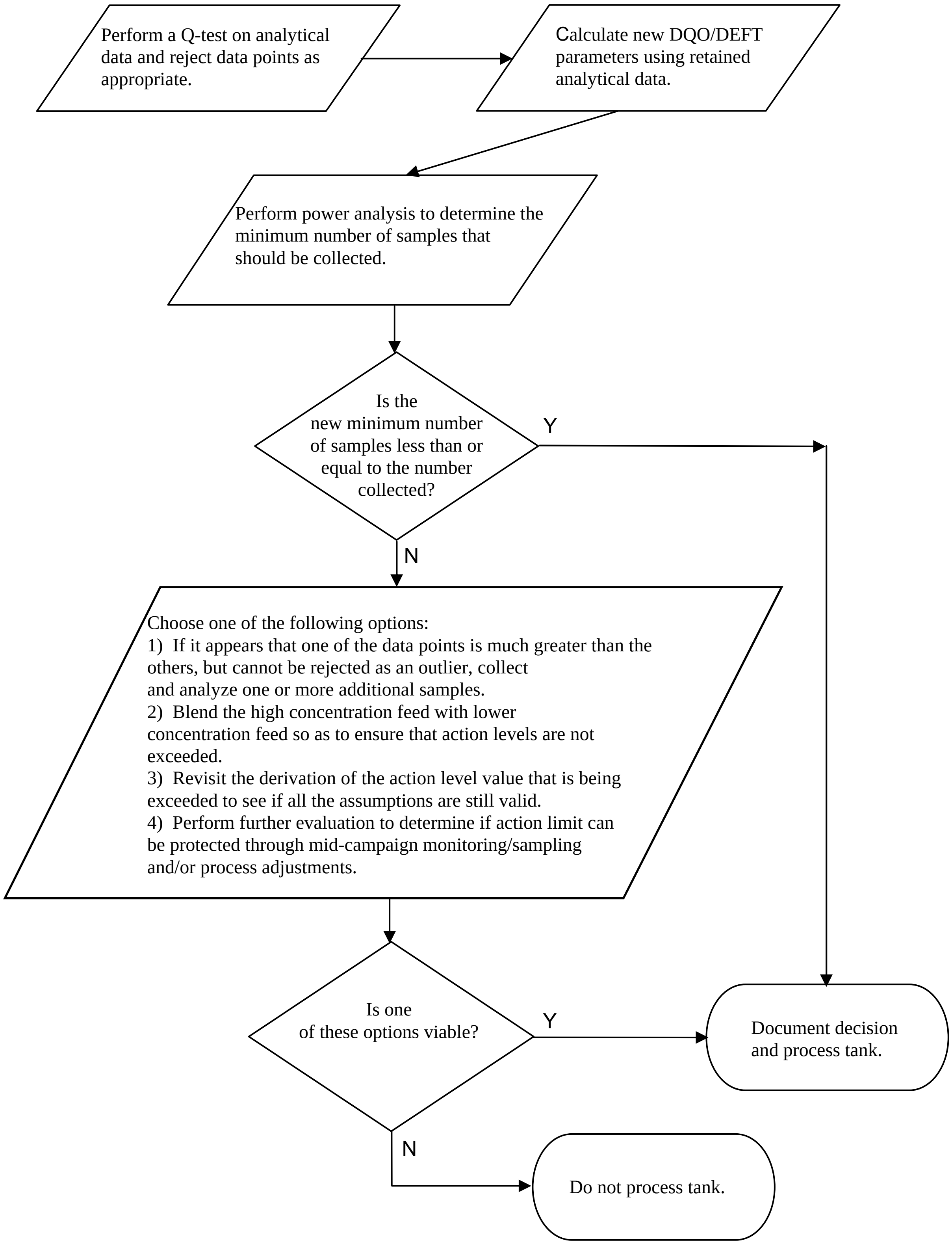
Acceptance criteria for the 242-A Evaporator have been established from regulatory requirements, operating experience, previous sample analyses, and engineering calculations. Processing criteria are maximum and/or minimum values of a waste analyte that, if exceeded, alert the operator that management of the waste requires further attention. The rationale for selecting a given analyte for inclusion in this WAP, as required by WAC 173-303-300, is indicated in this section.

Additional analyses (such as specific gravity and radionuclide analysis) of the feed tanks, process condensate, and other streams are performed to ensure that the facility is operating within established parameters. This process control sampling and analysis is outside the scope of this plan because it is not used to assess compatibility of the waste with other waste and with the 242-A Evaporator tank systems.

Figure 3.2. Strategy for Determining the Number of Candidate Feed Tank Samples.



1 Figure 3.3. Strategy for Verifying the Number of Candidate Feed Tank Samples.



3.7.1 Candidate Feed Tank Waste Acceptance Criteria

The following sections discuss waste acceptance criteria for candidate feed tanks to be processed in the 242-A Evaporator.

3.7.1.1 Exothermic Reactions

WAC 173-303-395 requires waste handling be conducted to prevent an uncontrolled reaction that could damage the tank system structural integrity or threaten human health or the environment. To evaluate the possibility of an uncontrolled reaction at the elevated temperatures in the evaporator vessel, a differential scanning calorimeter (DSC) test is performed on sample of all candidate waste to be processed. DSC measures the amount of heat absorbed or released by a sample as the temperature is increased. Waste exhibiting exotherms below 168EC, or with an absolute value of the exotherm-to-endotherm ratio greater than one, will not be processed in the 242-A Evaporator without further technical evaluation.

3.7.1.2 Compatibility

WAC 173-303-395 requires waste handling be conducted to prevent an uncontrolled reaction that could damage the tank system structural integrity or threaten human health or the environment. To verify there will be no adverse affects because of mixing the contents of different waste tanks in the feed tank and evaporator vessel, a compatibility evaluation is performed on waste in the candidate feed tanks. As samples from each of the planned waste sources are mixed, observations are made to note any changes in color, temperature, clarity, or any other visually determinable characteristic. This would indicate an unexpected chemical reaction that might have an impact on 242-A Evaporator operations. If such visible changes are observed when mixing samples, the waste would not be processed in the 242-A Evaporator without further technical evaluation.

Organic Constituents

The 242-A Evaporator performs distillation of waste containing organic concentrations greater than 10 parts per million by weight; therefore, organic air emissions are subject to WAC 173-303-690 (which incorporates 40 CFR 264, Subpart AA, by reference). Organic emissions from TSD units on the Hanford Site subject to 40 CFR 264, Subpart AA are controlled to ensure emissions to do not exceed 1.4 kilograms per hour and 2,800 kilograms per year. To ensure these requirements are met, the levels of volatile organics in the 242-A Evaporator feed must be limited to prevent excessive organic emissions during processing. Engineering calculations were used to determine the feed limits given in Table 3.2. The limits include a modifier "(R-1)/R", which adjusts the limits based on the campaign's planned boiloff rate. R is the ratio of feed flow rate to slurry flow rate. Typically, R is between 1 to 2, making the range of (R-1)/R 0 to 0.5.

In addition, analysis of the individual components in Table 3.2, total carbon (C_T) and total inorganic carbon (IC_T) analysis are performed as a screening tool to account for other organic species that might be present in the waste. The value of C_T minus IC_T represents the total organic concentration in the waste. If the C_T minus IC_T limit is exceeded, additional volatile organic species might be present and a more detailed evaluation will be conducted to determine organic emissions out of the vessel vent. The limit for evaluation is 174.4 milligrams per liter, based on the conservative assumption that all organic species present in the waste are as volatile as acetone. Acetone was chosen because of its relatively high volatility and low percentage of carbon.

The level of volatile organics in the feed must also be limited to ensure organic constituents that transfer to the process condensate are compatible with the LERF liner. The high density polyethylene (HDPE) liner used at the LERF is exposed to process condensate that could contain trace quantities of chemicals that could cause degradation of the liner material. Based on the liner manufacturer's compatibility data, the concentration limits in Table 3.3 are imposed on those classes of constituents that could potentially degrade the liner. To ensure that these limits are not exceeded in the process condensate, the concentration limits are applied to the candidate feed tanks as well, with the modifier "(R-1)/R". A C_T minus IC_T analysis, similar to the one described previously, is also applied to the LERF liner limits. The strictest limit for organic species in Table 3.3 is 2,000 milligrams per liter. Assuming the organic is acetone (with its low percentage of carbon); this converts to a carbon value of 1,240 milligrams per liter.

The calculations in Tables 3.2 and 3.3 require use of the эsum of the fractionsэ technique. A calculation is performed where the analysis of each constituent is divided by its associated limit to produce a fraction of the limit. If the sum of these fractions is less than 1, the waste meets the requirements in the tables.

3.7.2 Process Condensate Acceptance Criteria

The waste acceptance criteria for process condensate sampling, including treatability, LERF liner compatibility, compatibility with other waste, etc., is given in the Permit, Part III, LERF and 200 Area ETF unit-specific conditions and Chapter 3.0, Waste Analysis Plan.

Table 3.2. Candidate Feed Tank Limits for Vessel Vent Organic Discharge[a].

Feed constituent	Limit (milligrams per liter) b, c
Acetone	174.4 ([R-1]/R)
1-Butanol	452 ([R-1]/R)
2-Butoxyethanol	190.4 ([R-1]/R)
2-Butanone	116 ([R-1]/R)
Tri-butyl phosphate	2.03E+4 ([R-1]/R)
Total carbon and Total inorganic carbon	(CT-ICT) < 174.4 ([R-1]/R) (as acetone)

[a] Limits are based on a maximum continuous operating time equivalent to 6 months per year. If total operating time is expected to exceed 6 months per year, the limits must be re-evaluated.

$$\sum_{n=1}^{i}\left(\frac{Conc_n}{LIMIT_n}\right) \leq 1$$

[b] The limits are applied using the sum of the fractions technique: where i is the number of organic constituents detected in analysis of the waste feed tank. Total carbon and total inorganic carbon analysis are not part of the summation.

[c] R is the ratio of feed flow rate to slurry flow rate (typically R = between 1 and 2).

Table 3.3. Candidate Feed Tank Limits for LERF Liner Compatibility [f]

Chemical family/parameter[a]	Current target compounds	Limit (milligrams per liter)[b,c]
Alcohol/glycol	1-Butanol	500,000 ([R-1]/R)
Alkanone [d]	Sum of acetone, 2-butanone	200,000 ([R-1]/R)
Alkenone [e]	None targeted	2,000 ([R-1]/R)
Aromatic/cyclic hydrocarbon	None targeted	2,000 ([R-1]/R)
Halogenated hydrocarbon	None targeted	2,000 ([R-1]/R)
Aliphatic hydrocarbon	None targeted	500,000 ([R-1]/R)
Ether	2-Butoxyethanol	2,000 ([R-1]/R)
Other hydrocarbons	Tri-butyl phosphate	2,000 ([R-1]/R)
Oxidizers	None targeted	1,000 ([R-1]/R)
Acids, bases, and salts	Ammonia	100,000 ([R-1]/R)
Total carbon and total inorganic carbon	Not applicable	$(C_T\text{-}IC_T) < 1{,}240$ ([R-1]/R) (as acetone)

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a If a chemical fits in more than one chemical family, the more restrictive limit applies.

b The limits are applied using the sum of the fractions technique: where i is the number of constituents detected in analysis of the waste feed tank. Total carbon and total inorganic carbon analysis are not part of the summation.

$$\sum_{n=1}^{i}\left(\frac{Conc_n}{LIMIT_n}\right) \leq 1$$

c R is the ratio of feed flow rate to slurry flow rate (typically R = between 1 and 2).

d Ketone containing only saturated alkyl group(s)

e Ketone containing unsaturated alkyl group(s)

This table is used to ensure process condensate generated from candidate feed tank treatment is within LERF liner compatibility limits

3.8 SAMPLE COLLECTION AND ANALYSIS

This section discusses sampling and analysis, including sampling procedures, sample collection points, sample quality assurance/quality control (QA/QC), and selection of analytes.

3.8.1 Sample Collection

This section describes collection of candidate feed tank and process condensate samples for RCRA analysis. Candidate feed tank waste is sampled and analyzed before the start of each 242-A Evaporator campaign. Process condensate samples are taken at the 242-A Evaporator only if the decision is made before the start of the campaign that sampling will be done at the 242-A Evaporator instead of LERF.

3.8.1.1 Candidate Feed Tank Sample Collection

Candidate feed tank samples are obtained by using a grab sampling method (e.g. "bottle on a string method") specified in ASTM E300, *Standard Practices for Sampling Industrial Chemicals* (ASTM 1986). The number of lateral sampling locations in candidate feed tanks is limited by the availability of tank risers providing access into the tank. Generally, only a few risers in each tank are actually available for sampling because the risers are dedicated to instrumentation or other uses. Sampling within a vertical column is generally limited only by the depth of waste in the tank. The criteria in Table 3.4 are used when determining the specific sampling locations.

Riser selection is made by numbering the available risers that are at least 4.6 meters from each other and using a random number generator to select which risers will be used. Sample depths are determined by dividing the tank level into 1-foot increments and using a random number generator to determine a depth, which meets the criteria given in Table 3.4.

3.8.1.2 Candidate Feed Tank Sampling Quality Assurance and Quality Control

For each candidate feed tank sample, a sample solution is drawn from the sample riser using one or more sample bottles. All sample bottles are precleaned, amber-colored glass bottles sealed with Teflon* caps or septum caps and lined septums; however, the sample bottle for VOA must be sealed with septum cap and lined septum.

For candidate feed tank sampling quality control, one field blank, consisting of one or more sample bottles, is taken during the sample event. Field blanks are inserted at least 1-foot into the head space through any one of the sample risers used during the sample event. One trip blank, also consisting of one or more sample bottles, is taken during each sample event. Trip blanks are analyzed as independent samples for VOA. Field and trip blanks use the same types of sample bottles as the actual samples and are filled with reagent-grade water before shipment to the field.

Preservatives are not used with candidate feed tank samples because of concerns with high radiation exposure that would result from additional handling of sample solutions. It is not practical to refrigerate the bulky, shielded sample pigs and shipping containers. Biological activity, generally the largest problem in environmental samples, is unlikely in candidate feed tank samples because of the high salt content, pH, and radioactivity.

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*Teflon is a trademark of E.I. DuPont de Nemours & Company

The chain of custody is documented on a data sheet that includes a unique sample number, date and time sample was taken, custody seal number, and signature of the sampler. When possession of the sample is transferred to other persons, such as the shipper or laboratory, the signature of the relinquisher and receiver are recorded, along with date and time of the transfer. The receiver at the laboratory also documents on the data sheet that the sample seal number is correct and the seal is intact. The chain-of-custody data sheets are included in the operating record.

3.8.1.3 Deviations from Specified Sampling Practices

The WAP requires ASTM E 300 'bottle on a string procedure' for sampling (ASTM E300-86). Due to high radiation fields, some deviations to the standard have been necessary to implement safely the sampling practices in the field. These deviations are documented below.

- Requirement: The sampling apparatus be filled and allowed to drain before drawing the sample.

  Deviation: Sampling personnel lowers the sampling apparatus to the specified level and collects the sample. To pour the contents out and resample would encourage the spread of radiological contamination and additional whole body and extremity radiation exposure.

- Requirement: Bottles and jars may be made of clear or brown glass or polyethylene with necks shaped to receive glass stopper or a screw cap made of metal or plastic material.

  Deviation: Sampling personnel uses clear or amber glass with necks shaped to receive rubber stoppers. Glass stoppers were used at one time but resulted in broken sample bottles during the removal of the glass stoppers from the glass bottles.

- Requirement: Stopper and label bottles immediately after taking the samples and deliver them to the laboratory.

  Deviation: Sampling personnel screws on the bottle cap after the sample has been collected. Because of the alkalinity of the tank waste sample labels will not stay on bottles after samples are collected. Therefore, sample bottles are etched with the sample numbers before the samples are collected. The samples are shipped to the laboratory as soon as resources are available, within three days of sample collection.

- Requirement: Select wiping cloths so that lint is not introduced, contaminating the samples.

  Deviation: Sampling personnel uses damp cotton towels to wipe down sample bottles after the sample bottles have been capped. The intent is to remove any waste that may have been deposited on the bottle during the sampling event to minimize contamination and personnel exposure.

- Requirement: To prevent the loss of the liquid during shipment and to protect against moisture and dust, cover the closure of the glass bottle with plastic caps, which have been swelled in water, wiped dry, placed over the top of the stoppered bottle, and allowed to shrink tightly in place. Screw-top bottles are recommended. The cap should be lined with material inert to the sample. The screw caps should be secured by use of adhesive tape or similar material.

  Deviation: Sampling personnel uses screw caps and 4-mil plastic bags. The cap is Teflon-lined which is inert to the sample. The sample bottle is placed inside a plastic bag, which is placed inside a steel pig (or sample pig). The steel pig is placed inside a shipping pig. The screw cap is not secured with adhesive tape. Securing the sample bottle caps with tape would present the laboratory with difficulty of removing the caps remotely (in the hot cell). If the sample leaks from the sample bottle, it is trapped in the plastic bag. The custody seal is placed on the shipping pig per procedure.

- Requirement: All sampling apparatus and closures shall be clean, dry, free of contaminants, and constructed of materials that are inert to the product to be sampled.

  Deviation: The weldments are wiped down at the fabrication shop but are stored in open bins inside the warehouse. The stoppers are received in bags and are inspected for dirt and wiped down. By training, visual inspection is made of the sampling equipment to verify that the equipment does not contain any gross contamination. If any is found, the equipment is either replaced or wiped down. The bottles with screw caps are washed and certified and are not opened until at the time of the sampling event. The bottles are opened when the last sample is completed so that only one bottle is opened at the time of sampling to insert the rubber stopper from the sample holder. The weldments, stopper, and bottles are constructed from materials that are inert to the product to be sampled.

3.8.1.4 Process Condensate Sample Collection

Process condensate samples, when performed at 242-A Evaporator instead of LERF, are taken from the process condensate transfer line in the condenser room of the 242-A Building. Grab sampling is performed during the campaign at the SAMP-RC3-2 sampler or other sample port. Samples of process condensate are collected in a manner consistent with SW-846 procedures (EPA 1986) as documented in sampling procedures, which are maintained and implemented by unit personnel.

3.8.1.5 Process Condensate Sampling Quality Assurance and Quality Control

For information on process condensate sample collection, including the number and types of sample bottles, sampling QA/QC, etc., refer to the Permit, Part III, LERF and 200 Area ETF unit-specific conditions and Chapter 3.0, Waste Analysis Plan.

3.8.2 Analyte Selection and Rationale

The DQO analysis for the 242-A Evaporator examined the data needs for sampling the candidate feed tanks and determined that the analyses in Table 3.5 should be conducted to satisfy WAC 173-303-300 requirements. Table 3.5 also contains the rationale for these parameters being selected. Section 3.6 provides additional detail on the rationale.

For information on process condensate sample analyte selection and rationale, refer to the Permit, Part III, LERF and 200 Area ETF unit-specific conditions and Chapter 3.0, Waste Analysis Plan.

Table 3.4. Candidate Feed Tank Sample Point Selection.

Number of samples	Location of sample points
Two samples	One sample taken from the upper half of the waste from one riser and the other sample taken from the lower half of the waste from another riser.
Three samples	Two Samples taken from one riser (one from the top half and the other from the bottom half of the waste) and one sample from another riser
Four samples	Two samples taken from each of two separate risers. One sample is to be taken from the top half of the waste and one from the bottom half of the waste from each of the selected risers.
Five samples	Same as for four samples except one sample from either the top or bottom half of the tank will be taken from a third riser

Table 3.5. Analytes for Candidate Feed Tanks

Parameter	Test technique	Analyte	Rationale
Exotherm	Differential scanning calorimeter	Temperature and energy	Verify the waste will not undergo an exothermic reaction (Section 3.6.1.2).
Compatibility test	Mixing and compatibility study	Visual physical changes	Verify the waste is chemically compatible (Section 3.6.1.3).
Organic compounds	Gas chromatograph/ mass spectrometer	Acetone, 1-Butanol, 1-Butoxyethanol, 1-Butanone, Tri-butyl phosphate	Used in calculations to verify that vessel vent emissions will not exceed regulatory limits and to prevent compatibility problems with the LERF liner (Section 3.6.1.4).
	Carbon coulometric detector	Total carbon, Total inorganic carbon	Used in calculations to verify that vessel vent emissions will not exceed regulatory limits and to prevent compatibility problems with the LERF liner (Section 3.6.1.4).
Ammonia	Ion selective electrode	Ammonia	To prevent compatibility problems with the LERF liner (Section 3.6.1.45.1.3).

3.9 ANALYTICAL METHODS AND QUALITY ASSURANCE AND QUALITY CONTROL

This section provides information on the analytical methods and QA/QC for candidate feed tank samples, including discussions concerning laboratory selection and analytical methods. For information on process condensate analytical methods and QA/QC, refer to the Permit, Part III, LERF and 200 Area ETF unit-specific conditions and Chapter 3.0, Waste Analysis Plan.

3.9.1 Laboratory Selection

Because of the samples, it is anticipated that candidate feed tank sample analyses will be conducted at the 222-S Laboratory Complex. Other laboratories at the Hanford Facility could be used provided they are equipped to handle such samples. Laboratory selection depends on availability, analytical needs, and the ability of the laboratory to meet Permit and quality assurance requirements.

3.9.2 Analytical Methods

The analytical methods that must be followed for RCRA sampling of the candidate feed tanks are included in Table 3.6. Performance-based specifications rather than procedure-based specifications are used for determining the appropriate analytical methods. This allows for necessary adjustments to the methods for Hanford Facility-specific issues; related to high radioactivity of the sample matrix, while ensuring acceptable data quality. Because of the high radioactivity, the analytical method will in some cases deviate from those in national standards such as *Test Methods For Evaluating Solid Waste*, SW-846 (EPA 1986) and *Standard Methods for the Examination of Water and Waste Water* (AWWA 1989).

3.9.3 Laboratory Quality Assurance and Quality Control

Candidate feed tank analytical and sampling methods conducted as part of this plan meet the data quality requirements contained in Table 3.7. Quality control check samples (i.e., calibration samples and/or laboratory control samples) generally are performed once per sample event (e.g., once for all samples from one candidate feed tank). Matrix spike and duplicate analysis are performed once per sample event for all methods except differential scanning calorimetry (DSC). A duplicate analysis is performed for DSC analysis to determine method precision. Accuracy for DSC is evaluated by using the laboratory control standard.

The QA/QC program for sampling and analysis related to this unit must, at a minimum, comply with the applicable Hanford Site standard requirements and the regulatory requirements. All analytical data will be defensible and will be traceable to specific, related quality control samples and calibrations.

Table 3.6. Analytical Methods for Candidate Feed Tank Stream Analytes.

Category	Analyte	Performance-based analytical methods	Basis for method	Equipment/Method
Organics	Acetone 2-Butanol 2-Butanone	Purge and trap and GC/MS (VOA)	SW-846 Method 8260	A diluted sample is purged with nitrogen or helium and organic vapors are trapped in an adsorbent column. The column is desorbed at 180^{o}C into a 30-m long wide- or narrow-bore capillary column. The GC column is heated/desorbed into an MS for analysis.
	2-Butoxyethanol Tri-butyl Phosphate	Solvent extraction and GC/MS (semi-VOA)	SW-846 Method 3520B and 8270A	A diluted sample is adjusted to pH <2 (pH <6 in some cases) using sulfuric acid solution. The sample is placed in a continuous liquid-liquid extractor using methylene chloride as the extractant. The extractant is placed in an evaporator and volume is reduced. The extractant is injected into a GC/MS for analysis.
Inorganic	Ammonia	Ion selective electrode	AWWA Method 4500-NH3	The sample is preserved by the addition of hydrochloric acid solution to pH <2. For analysis, a diluted sample is made alkaline by sodium hydroxide solution. The ammonia is measured by an ammonia gas sensing electrode. A standard ammonium chloride solution is added and measured by the electrode in two stages. Based on the three readings, an ammonia concentration is calculated.
Other	Exotherm	Differential scanning calorimeter	N/A	A sample is placed in the DSC unit and heated to 500^{o}C. The differential heat flow between the sample and a reference pan is monitored by thermocouples. A duplicate sample is run on the equipment.
	Mixing and compatibility study	Lab specific	N/A	Solution from each sample are mixed and visually checked for gas evolution, heat generation, precipitation, dissolution of solids, color change, clarity, and any other observable characteristics.

Category	Analyte	Performance-based analytical methods	Basis for method	Equipment/Method
	Total carbon	Combustion with IC_T/TOC coulometric detection OR Persulfate oxidation with IC_T/TOC coulometric detection	Combustion and persulfate treatment: AWWA Method 5310 Coulometry: ASTM D4129 (AWWA approval pending)	A diluted sample is injected into a furnace heated to 800^{o} C while purged with oxygen. The furnace converts carbon to carbon dioxide, which is carried by the oxygen. The gas sample passes through adsorbent columns to remove acid vapors, sulfur oxides and nitrogen oxides. The carbon dioxide is absorbed in an organic solution and measured with a coulometric carbon analyzer. OR: A diluted sample is acidified with sulfuric acid, converting inorganic carbon to carbon dioxide. The sample purged with oxygen, stripping the carbon dioxide. Then, persulfate is added to the sample to oxidize the organic carbon. The sample is again acidified with sulfuric acid and purged with oxygen. The gas samples from both steps pass through an adsorbent column to remove acid vapors, sulfur oxides and nitrogen oxides. The carbon dioxide is absorbed in an organic solution and measured with a coulometric carbon analyzer.
	Total Inorganic Carbon	Acidification with IC_T/TOC coulometric detection	Acidification: AWWA Method 5310. Coulometry: ASTM D4129 (AWWA approval pending) GC/MS - gas chromatography/mass spectrometry VOA - volatile organic analysis IC_T - total inorganic carbon TOC - total organic carbon	A diluted sample is acidified with sulfuric acid/sulfamic acid, converting inorganic carbon to carbon dioxide. The sample purged with oxygen, stripping the carbon dioxide. The gas sample passes through scrubbers to remove acid vapors, sulfur oxides and nitrogen oxides. The carbon dioxide is absorbed in an organic solution and measured with a coulometric carbon analyzer.

Table 3.7. Quality Assurance Requirements for Candidate Feed Tank Stream Analytes

Category	Analyte	Estimated quantitation limit (matrix specific)	Precision (RPD between duplicates), %	Accuracy (recovery of matrix spike[1]), %	Action level [2]
Organics	Acetone	28 mg/L	<25	40-110	> 87 mg/L[3]
	1-Butanol	20 mg/L	<25	30-110	> 226 mg/L[3]
	2-Butoxyethanol	30 mg/L	<25	30-110	> 95.2 mg/L[3]
	2-Butanone (methyl ethyl ketone)	18 mg/L	<25	40-110	> 58 mg/L[3]
	Tri-butyl phosphate	50 mg/L	<25	40-125	> 1.015E+4 mg/L[3]
Inorganic	Ammonia	400 Φg/ml	<20	75-125	> 50,000 mg/L
Other	Exotherm	None	<20[4]	Not applicable [4]	< 168 EC or absolute value of ratio of exotherm to endotherm > 1
	Mixing and compatibility study	Not applicable	Not Applicable	Not Applicable	Visual: unusual changes in color, temperature, clarity, etc.
	Total carbon	25 Φg/mL	<20	75-125	C_T-IC_T > 87 mg/L
	Total inorganic carbon	25 Φg/mL	<20	75-125	C_T-IC_T > 87 mg/L

Reserved.
In deriving the action levels, the ratio of feed flow rate to slurry flow rate (R) is assumed to be 2.
For organic species limits, sum of the fractions rule apply (refer Tables 3.2 and 3.3). Total carbon and total inorganic carbon are not included in the summation of organics.
Precision for this method is evaluated by the deviation between sample (unspiked) and sample replicate.
Accuracy for DSC is evaluated by using the laboratory control standard.
RPD - relative percent difference C_T - total carbon IC_T - total inorganic carbon
Mg/L - milligram per liter   Φg/L - microgram per liter

3.10 REFERENCES

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Chapter 4.0 Process Information

Figures

Table

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4.0 PROCESS INFORMATION

Where information regarding treatment, management, and disposal of the radioactive source byproduct material and/or special nuclear components of mixed waste (as defined by the Atomic Energy Act of 1954 as amended) has been incorporated into this document, it is not incorporated for the purpose of regulating the radiation hazards of such components under the authority of this permit or chapter 70.105 RCW and its implementing regulations but is provided for information purposes only.

The 242-A Evaporator receives mixed waste from the DST System that contains inorganic and organic constituents and radionuclides. A 242-A Evaporator simplified process flow diagram is given in Figure 4.1. The 242-A Evaporator separates the mixed waste received from the DST System, generating the following waste streams:

- A concentrated aqueous waste stream (slurry) containing the nonvolatile components, including most of the radionuclides, inorganic constituents, and nonvolatile organics such as tri-butyl phosphate
- A dilute aqueous waste stream (process condensate) containing the volatile components, primarily water with low concentrations of radionuclides, inorganic constituents, and volatile constituents such as ammonia and acetone.

The slurry is routed back to the DST System pending further treatment. The process condensate is transferred to the LERF for storage until processed through the ETF.

The 242-A Evaporator process employs a conventional forced circulation, vacuum evaporation system to concentrate the DST System waste solution. The major components of this system include the reboiler, vapor-liquid separator, recirculation pump and pipe loop, slurry product pump, condenser, jet vacuum system, and condensate collection tank

The vapor-liquid separator, C-A-1, also called the evaporator vessel, and the condensate collection tank, C-100, meet the definition of a tank in WAC 173-303-040. Other process equipment associated with these tank systems is considered ancillary equipment. Drawings that aid in understanding the systems are provided in Section 4.3.

The 242-A Evaporator receives waste from a DST System tank, 241-AW-102 that serves as the 242-A Evaporator feed tank. The feed enters the recirculation line and blends with the main process slurry stream, which is pumped to the reboiler.

In the reboiler, the mixture is heated to the specified operating temperature, normally 38 to 77EC, using 21 to 69 kilopascals gauge pressure steam. The low-pressure steam provides adequate heat input, and the resulting low-temperature differential across the reboiler minimizes scale formation on the heat transfer surfaces. The static pressure of the waste in the reboiler is sufficient to suppress the boiling point so the waste does not boil in the reboiler tubes. Boiling occurs only near or at the liquid surface in the vapor-liquid separator.

The heated slurry stream is discharged from the reboiler to the vapor-liquid separator (C-A-1) that typically is maintained at an absolute pressure of 5.3 to 10.7 kilopascals. Under this reduced pressure, a fraction of the water in the heated slurry flashes to steam and the steam is drawn through two, wire mesh deentrainer pads into a 42-inch diameter vapor line that leads to the primary condenser, leaving behind a more concentrated slurry solution in the vapor-liquid separator.

After a brief residence time in the vapor-liquid separator, the slurry exits from the bottom through the lower portion of the recirculation line and is recirculated by the recirculation pump (P-B-1). The pump discharges the slurry back to the reboiler via the upper portion of the recirculation line, thus completing the recirculation loop.

The specific gravity of the waste liquid is monitored closely to ensure that the target density, established before the beginning of the campaign, is not exceeded. A portion of the slurry is removed from the upper portion of the recirculation line using the slurry pump (P-B-2) and transferred through an encased underground pipeline (pipe-within-a-pipe) to a designated slurry receiver tank in the DST System.

The vapors are drawn from the vapor-liquid separator, through a 42-inch diameter vapor line and enter a series of three condensers, where the vapors are condensed using raw water. The condensed vapors, called process condensate, are collected in tank C-100. Steam jets are used to create a vacuum on the vapor-liquid separator drawing the process vapors into and through the condensers. Noncondensable vapors are drawn from the condensers, then through a series of particulate filters and vented to the atmosphere. The air discharges are monitored continuously when the 242-A Evaporator is operating to verify that standards for radionuclide and ammonia emissions standards are met.

Process condensate contains the volatile constituents of the waste and trace quantities of inorganic materials and radionuclides. The process condensate is pumped from tank C-100 through an encased underground pipeline (pipe-within-a-pipe) to the LERF.

During a campaign, the evaporation process is continuous with typical feed flow rates of 260 to 450 liters per minute, process condensate flow rates of 150 to 230 liters per minute, and slurry flow rates of 110 to 230 liters per minute. The evaporator process is shutdown when the desired endpoint concentration of the slurry is met. Endpoints are established at the beginning of the campaign, based on the target specific gravity of the waste, or allowable waste volume reduction (WVR) and defined operating limits. If the evaporation rate cannot achieve the desired endpoint, slurry in the DST System serving as the slurry receiver is transferred to the feed tank for one or more passes through the 242-A Evaporator. At the end of each campaign, the 242-A Evaporator process equipment is shutdown, emptied, flushed with raw water, and placed in a safe standby mode.

Other discharges during 242-A Evaporator processing include condensate from the steam used to heat the waste and cooling water used to condense the vapors. The 242-A Evaporator is designed to prevent contamination of these streams. The fluids on the uncontaminated side of the heat exchangers are maintained at a higher pressure than the waste stream so that uncontaminated fluid migrates toward the contaminated waste if a leak were to occur. The steam condensate and the cooling water are monitored continuously for radiation, pH, conductivity, and discharged to TEDF as long as none of the discharge limits are exceeded. The steam condensate and cooling water streams were assessed in the stream specific reports (WHC 1990a and WHC 1990b) and are not dangerous waste in accordance with WAC 173-303.

The 242-A Evaporator process is controlled by the MCS. The MCS computer monitors process parameters and controls the parameters where required. Once the configuration parameters and other process control inputs are set, the MCS maintains the process parameters within specified ranges by sending output signals that operate specific pieces of equipment (e.g., control valves).

4.1 TANK SYSTEMS

This section discusses information associated with design requirements, integrity assessments, and any additional requirements for tanks used to treat and store mixed waste in the 242-A Evaporator.

4.1.1 Design Requirements

The following design requirements were addressed in the 242-A Evaporator/Crystallizer Tank System Integrity Assessment Report (IAR) (Appendix 4B):

- Minimum design wall thicknesses and measured wall thicknesses at various points throughout the tank systems

- Design standards used in construction, including references
- Waste characteristics
- Materials of construction and compatibility of materials with the waste being processed
- Corrosion protection
- Seismic design basis evaluation

The conclusion of the integrity assessment report is that the 242-A Evaporator system is not leaking and is fit for use. The inspections, tests, and analyses performed provide assurance that the tank system has adequate design, sufficient structural strength, and sufficient compatibility with the waste to not collapse, rupture, or fail during operation. The report also states that a review of construction files indicates that the building structure was designed and constructed to withstand a design-basis earthquake.

4.1.2 PC-5000 Transfer line

Process condensate from the 242-A Evaporator is transferred to the LERF using a pump located in the 242-A Evaporator and approximately 1,500 meters of pipe, consisting of a 3-inch carrier pipe within a 6-inch outer containment pipeline. Flow through the pump is controlled through a valve at flow rates from 150 to 300 liters per minute.

The encased fiberglass transfer line (PC-5000) exits the 242-A Evaporator below grade and remains below grade at a minimum 1.2-meter depth for freeze protection, until the pipeline emerges at the LERF catch basin, at the corner of each basin. All piping at the catch basin that is less than 1.2 meters below grade is wrapped with electric heat tracing tape and insulated for protection from freezing. Additional detail including information on secondary containment, leak detection and integrity assessment for this line is provided in § 4.1.6.3.3 and §4.1.4.1.

4.1.3 Vapor-Liquid Separator (C-A-1) and Ancillary Equipment

The following sections describe the vapor-liquid separator (C-A-1) and ancillary equipment.

Waste Feed System. Feed to the 242-A Evaporator is supplied via a pump located in the 241-AW-102 feed tank. The feed pump transfers the waste to the 242-A Evaporator through a 3-inch diameter carbon steel transfer pipeline encased in a 6-inch diameter carbon steel pipe to provide secondary containment. The feed pipeline is equipped with a leak detection system.

Samples can be taken from the waste feed when needed. The feed sampler (SAMP-F-1) is located in a sample enclosure located in the hot equipment storage room.

Evaporator Process Loop. The 242-A Evaporator process loop equipment components are as follows:

- Reboiler (E-A-1)
- Vapor-liquid separator (C-A-1)
- Recirculation pump (P-B-1)
- Recirculation loop

Figure 4.2 is a simplified process flow diagram showing the major components of the process loop.

Reboiler (E-A-1). Waste is heated as the waste passes through the reboiler before entering the vapor-liquid separator. The reboiler is a vertical tube unit with steam on the shell-side and process solution on the tube-side. The 364 tubes in the reboiler are enclosed in a 1.03-meter outside diameter, 4.6-meter-long stainless steel shell. Both the reboiler shell and tubes are constructed of 304L stainless steel. The shell is 0.64 centimeter thick and the tubes are 14-gauge steel. The reboiler is designed to distribute steam evenly and to prevent tube damage from water droplets that may be present in the steam.

Vapor-Liquid Separator (C-A-1). Process solution from the reboiler enters the vapor-liquid separator via the upper recirculation line. Some of the solution flashes into vapor, which exits through a vapor line at the top of the vapor-liquid separator. The remaining solution (slurry) exits through the recirculation line at the bottom.

The separator consists of a lower and upper section. The lower (liquid) section is a stainless steel shell 4.3 meters in diameter having an 85,200 to 94,600 liter normal operating capacity (including recirculation loop and reboiler). The maximum design capacity is 103,000 liters. The upper (vapor) section is a stainless steel shell 3.5 meters in diameter containing two deentrainment pads. These wire mesh pads remove liquids and solids that entrain into the vapor section of the vessel. Spray nozzles, using recycled process condensate or filtered raw water, wash collected solids from the deentrainment pads and vessel walls. Both sections of the vapor-liquid separator are constructed of 0.95-centimeter-thick stainless steel.

Operating parameters in the vapor-liquid separator are monitored to provide an indication of process problems such as slurry foaming, deentrainer flooding, or excessive vapor temperatures. Instrumentation also is available to monitor the liquid levels in the vapor-liquid separator. Interlocks are activated when high pressures or high- or low-liquid levels are detected, shutting down the evaporation process and placing the facility in a safe configuration.

The vapor-liquid separator and recirculation loop can be flushed to remove any residual solids from the system and/or to reduce radiation levels. The most common flush solution is water, but dilute nitric or citric acid solutions could be used. All acidic flush solutions are chemically adjusted to meet DST acceptance criteria before transfer to the DST System. Antifoam solution is added (at very low flow rates - approximately 0.04 to 0.4 liters per minute) to the vessel to prevent foaming. The antifoam solution is a noncorrosive, nonregulated silicone-based solution that is compatible with the evaporator components.

Recirculation Pump. The stainless steel recirculation pump (P-B-1), is constructed as part of the recirculation loop to the reboiler. The 28-inch diameter axial flow pump has 60,900 liters per minute output. The recirculation pump is designed to handle slurry up to 30 percent undissolved solids by volume at specific gravities up to 1.8. The recirculation pump moves waste at high velocities through the reboiler to improve heat transfer, keep solids in suspension, and reduce fouling of the heat transfer surfaces.

The recirculation pump is equipped with shaft seals with high-pressure recycled process condensate (or water) introduced between the seals to prevent the waste solution from leaking out of the system. Seal water pressure and flow are monitored and controlled to shut down the recirculation pump if conditions are not adequate to prevent waste liquid from migrating into the seal water. The used seal water is routed to the feed tank.

Recirculation Loop. The recirculation loop consists of a 28-inch diameter stainless steel pipe that connects the vapor-liquid separator to the recirculation pump and reboiler. The lower loop runs from the bottom of the vapor-liquid separator to the recirculation pump inlet. The upper loop connects the pump discharge to the reboiler and the reboiler to the vapor-liquid separator. The feed line from the feed tank and the slurry line to underground storage tanks are connected to the upper recirculation line.

Slurry System. The slurry system draws a portion of the concentrated waste from the upper recirculation loop and transfers it to the DST System. The major components of the slurry system are the slurry pump and the slurry transfer pipelines. Figure 4.3 shows a simplified flow diagram of the slurry system. These components are described in the following paragraphs.

The slurry pump (P-B-2) is used to transfer slurry from the recirculation loop to the underground storage tanks. The pump is driven by a variable speed motor and is constructed of 304L stainless steel. The slurry pump is designed to generate high pressures to alleviate the possibility of a transfer line plugging.

Interlocks control the operation of the slurry pump. The slurry pump (P-B-2) is shutdown if any of the following occur:

- Excessive pressure is detected in the slurry lines to 241-AW Tank Farm
- A leak is detected in the slurry transfer lines secondary containment
- A leak is detected in the 241-AW Tank Farm process pits where the transfer lines enter the DST System.

The slurry pump uses a shaft seal with recycled process condensate (or water) and pressure and flow controls similar to the system described above for the recirculation pump.

Transfer pipelines are 2-inch diameter, carbon steel encased lines which route slurry to a designated underground DST within the 200 East Area. All transfer pipelines are encased in a secondary containment pipe and equipped with leak detectors between the primary and encasement piping. The pipelines are sloped to drain to the valve pit. The detection of any leak by the automated leak detection system shuts off the slurry pump. In lieu of the MCS automated shutdown, the slurry pump (P-B-2) can be manually shutdown at the direction of the Shift manager or 242-A Evaporator Control Room operator if a leak occurs.

The flow rate of the slurry transfer to the DST System is monitored and a decrease in flow below a specified value automatically will shut down the slurry pump (P-B-2) and initiate a line flush with water. The objective of flushing the transfer line is to prevent settling of solids, which precludes plugging the slurry transfer lines.

Samples can be taken from the slurry line when needed via a sampler (SAMP-F-2) that is located near the feed sampler in the load out and hot equipment storage room.

4.1.3.1 Condensate Collection Tank (C-100) and Ancillary Equipment

The following section discusses the condensate collection tank (C-100) and ancillary equipment. This equipment collects process condensate via the condensers in the vacuum condenser system, filters the condensate, and pumps the process condensate to LERF. Figure 4.4 provides a simplified process flow diagram showing the major components of the process condensate system. The following major components make up the process condensate system:

- Vacuum condenser system
- Condensate collection tank (C-100)
- Process condensate pump (P-C-100)
- Condensate filters (F-C-1, F-C-2, and F-C-3)
- Process condensate radiation monitoring, sampling system and diversion system (RC3)
- Seal pot
- Process condensate recycle system
- Vessel Vent System

Vacuum Condenser System. Vapors removed from the vapor-liquid separator flow to a series of three condensers where the vapors are condensed using raw water. Condensate drains to the condensate collection tank (C-100). The vacuum condenser system consists of the following major components:

- Primary condenser (E-C-1)
- Intercondenser (E-C-2)
- Aftercondenser (E-C-3)
- Steam jet ejectors (J-EC1-1 and J-EC2-2)

Figure 4.5 provides a simplified process flow diagram showing the major components of the vacuum condenser system. These system components are discussed in the following sections.

Primary Condenser (E-C-1). Vapors drawn from the vapor-liquid separator flow through the 42-inch (3.5 feet) vapor line, into the E-C-1 condenser where the majority of the condensation takes place. Noncondensed vapors exit to the intercondenser (E-C-2) while the condensed vapors (process condensate) drain to the condensate collection tank (C-100). Cooling water passes through the cooling tubes and exits to TEDF.

The carbon steel condenser shell measures approximately 5.3 meters (17.4 feet) long and has a 2.2-meter (7.2 feet) inside diameter. The condenser consists of 2,950 equally spaced carbon steel tubes that are 3.6 meters (11.8 feet) long with a 1.9-centimeter (0.75 inches) outside diameter.

Intercondenser (E-C-2). Noncondensed vapors from E-C-1 enter the intercondenser. The vapor stream contacts the cooling tubes in the condenser where cooling water provides additional condensation. The condensate drains to the condensate collection tank (C-100). Noncondensed vapors and used cooling water are routed to the aftercondenser.

The carbon steel intercondenser measures 2.2 meters (7.2 feet) long with a 0.39 meter (1.3 feet) inside diameter. This heat exchanger contains 144 tubes that are 1.7 meters (5.6 feet) long with a 1.9-centimeter (0.75 inches) outside diameter.

Aftercondenser (E-C-3). Vapor discharged from the intercondenser enters the aftercondenser. Cooling is supplied to the aftercondenser by the cooling water from the intercondenser. Condensate is routed to the condensate collection tank (C-100), while the noncondensed vapors are filtered, monitored, and discharged to the atmosphere through the vessel ventilation system. The cooling water is discharged to TEDF.

The carbon steel aftercondenser measures 2.3 meters (7.5 feet) long and has a 0.20-meter (0.66 feet) inside diameter. This heat exchanger contains 45 tubes that are 1.8 meters (5.9 feet) long with a 1.9-centimeter (0.75 inches) outside diameter.

Steam Jet Ejectors. The vacuum that draws the vapors from C-A-1 into the condensers is created by a two-stage steam jet ejector system. The first-stage jet ejector (J-EC1-1) maintains a vacuum on the primary condenser, which in turn creates a vacuum on the vapor-liquid separator. The ejector consists of a steam jet, pressure controller, and air bleed-in valve. Steam and noncondensed vapors from the primary condenser are ejected from J-EC1-1 into the intercondenser. The desired vacuum is obtained by controlling steam pressure and bleeding ambient air as necessary into the vapor header through an air intake filter. The second-stage jet ejector (J-EC2-1) creates the vacuum that moves vapors from the intercondenser through the aftercondenser.

Condensate Collection Tank (C-100). Process condensate from the primary condenser, intercondenser, aftercondenser, and the vessel ventilation system drain to the condensate collection tank (C-100). The tank is 4.3 meters in diameter, 5.8 meters high, and is constructed of 0.79-centimeter (0.31 inches)-thick stainless steel. The tank has a maximum design capacity of 67,400 liters (17,805 gallons). Normal operating volume is approximately 50 percent of the tank capacity. A carbon steel base supports the tank. An agitator is installed but not used.

In the event of a tank overflow, the solution is routed through an overflow line to the drain system, which returns waste to the feed tank (241-AW-102). Overflow occurs when the volume exceeds about 60,600 liters. The overflow line is equipped with a liquid filled trap to isolate the drain system from the tank.

Process feed samples are evaluated for the presence of a separate organic layer and process controls are used to reduce the risk of the condensate collection tank to receive small amounts of immiscible organics with the condensed waste. If detected, the organic layer is removed by overflowing tank C-100 back to the feed tank 241-AW-102. The liquid level in the tank is controlled well above the discharge pump intake point and a controlled overflow is conducted upon completion of each processing cycle (campaign) to ensure that an organic layer does not accumulate and cannot be pumped to LERF.

Process Condensate Pump. A pump (P-C-100) moves the process condensate from tank C-100 through the condensate filter to LERF. The process condensate pump is a centrifugal pump constructed of 316 stainless steel.

Condensate Filters. After leaving the condensate collection tank, the process condensate is filtered to remove solids. The primary condensate filter (F-C-1) has a welded steel housing. A second filter system (F-C-3), installed downstream is also used to filter the process condensate. This system has duplex in-line filters in cast iron housing. Both filters employ a filter material that is compatible with the process condensate.

Process Condensate Radiation Monitoring, Sampling and Diversion System. The process condensate transferred to LERF is monitored continuously for radiation. If radiation levels exceed established limits, an alarm is received and interlocks immediately divert the stream back to the condensate collection tank (or the feed tank) and shut off the process condensate pump. This ensures process condensate containing excessive radionuclides due to an accidental carryover from the vapor-liquid separator is not transferred to LERF.

Seal Pot. The condensate collection tank receives condensed liquids from the vessel ventilation system. A seal pot collects the drainage before discharge into the condensate collection tank and isolates the tank from the vessel ventilation system.

Condensate Recycle System. For waste minimization, a portion of the process condensate from tank C-100 is recycled for use as decontamination solution for the deentrainment pad sprays and seal water for the recirculation pump (P-B-1) and slurry pump (P-B-2). Use of process condensate instead of raw water results in approximately 10 percent reduction in waste volume generated during continuous operation of the 242-A Evaporator. Filtered raw water also is available as a backup for sprays and seal water. A 2-inch (5.1 centimeters) diameter carbon steel line, stainless steel centrifugal pump (P-C106), and filters (F-C-5 and F-C-6) supply process condensate from tank C-100 to the pad sprays and pump seals. The filters are disposable cartridge filters in carbon steel housings arranged in parallel with one filter in service while the other is in standby.

4.1.4 Integrity Assessments

The integrity assessment report (Appendix 4B, Integrity Assessment Report) discusses:

- The standards used during design and construction of the 242-A Evaporator and the adequacy of those standards
- The characteristics of the DST waste processed
- The adequacy of the materials of construction to provide corrosion protection from the waste processed
- The age of the tanks and the affect of age on tank integrity
- The results of the leak tests, visual inspections, and tank wall thickness inspections
- The frequency and scope of future integrity assessment

- Deficiencies in secondary containment design. These deficiencies are discussed in-the integrity assessment report.

An independent, qualified, registered professional engineer certified the integrity assessment.

The inspections, tests, and analyses performed provide assurance that the 242-A Evaporator tank system has adequate design, sufficient structural strength, and sufficient compatibility with the waste to not collapse, rupture, or fail during operation. No evidence of degradation was noted during the visual test, ultrasonic test, or leak test. Both condensate collection tank C-100 and the vapor-liquid separator/reboiler loop passed leak tests. The frequency of subsequent integrity assessments has been established at every 10 years. This frequency is based on the results of the 1998 integrity assessment.

4.1.4.1 PC-5000

An integrity assessment for PC-5000 was performed, including a hydrostatic leak/pressure test at 10.5 kilograms per square centimeter gauge (150 pounds per square inch). A statement by an independent, qualified, registered professional engineer attesting to the integrity of the piping system is included in *Integrity Assessment Report for the 242-A Evaporator/LERF Waste Transfer Piping, Project W105* (WHC 1993), along with the results of the leak/pressure test. The next integrity assessment for PC-5000 will be conducted in the calendar year 2008. The schedule for conducting integrity assessments will be at a frequency of every 10 (calendar) years unless otherwise required by an IQRPE or as required for system repairs and upgrades. All integrity assessments will be conducted in accordance with WAC 173-303-640.

4.1.5 Additional Requirements for Existing Tanks

Refer to information in Section 4.1.2 and the integrity assessment report, which includes measuring tank wall thicknesses, evaluating corrosion protection, and performing leak tests.

4.1.6 Secondary Containment and Release Detection for Tank Systems

This section describes the design and operation of secondary containment sumps, drain lines, and leak detection systems for the 242-A Evaporator.

4.1.6.1 Requirements for All Tank Systems

The Construction Specification for 242-A Evaporator-Crystallizer Facilities Project B-100 (Vitro 1974) was used during preparation, design, and construction of the tank and secondary containment systems. The integrity assessment report details how the construction specification relates to the national codes and standards.

Constructing the building and vessels per this specification ensures that foundations are capable of supporting tank and secondary containment systems and that uneven settling and failures from pressure gradients do not occur. The integrity assessment report (Appendix 4B) states that the 242-A Evaporator has adequate design, sufficient structural strength, and sufficient compatibility with the wastes to not collapse, rupture, or fail during service loads associated with normal operations and that the building structure was designed and constructed to withstand a design basis earthquake".

The integrity assessment report (Appendix 4B) describes the building and secondary containment system. This system is designed to ensure any release is detected within 24 hours. The secondary containment system also is designed to contain 100 percent of the maximum operating capacity of the vapor-liquid separator/reboiler loop, and the drain systems are sloped to allow collection of solution and have sufficient capacity to drain this volume in less than the required 24 hours.

The integrity assessment report describes the protective coating material and sealant used to protect concrete and joints from attack by leaks to the secondary containment. The materials of construction for the sump and drain lines are also compatible with the waste processed at the 242-A Evaporator.

4.1.6.2 242-A Building Secondary Containment

The 242-A Building serves as a secondary containment vault for the vapor-liquid separator (C-A-1), condensate collection tank (C-100), and ancillary equipment used for transferring mixed waste at the 242-A Evaporator. The concrete for the operating area was poured to form a monolithic structure. Where needed, joints in the concrete were fabricated with preformed filler conforming to the standards of the American Society of Testing and Materials. Joint filler is sealed with a polysulfide sealant per the requirements of the construction specifications (Vitro 1974).

Before restart in 1994, a new acrylic special protective coating was applied to the concrete in the pump, evaporator, and condenser rooms. The coating meets the requirements of the construction specifications (Vitro 1974), including resistance to very high radiations doses, temperatures of 77o C, and spills of 25 percent caustic solution.

The following six rooms contain equipment used to process or store*mixed waste:

- Pump room
- Evaporator room
- Condenser room
- Ion exchange room
- Load out room* (used for temporary storage of mixed waste)
- Hot equipment storage room.

4.1.6.2.1 Pump Room

The pump room secondary containment walls are 0.38 to 0.56-meter (1.25 to 1.84-feet) thick reinforced concrete. The secondary containment floor is 0.51-meter-thick reinforced concrete. The pump room floor is lined with 0.64-centimeter (0.25-inch) stainless steel and the concrete walls and ceiling cover blocks are painted with a special protective coating. The pump room contains pipe jumpers used to transport feed and slurry solutions between the vapor-liquid separator and the DST System, and the process recirculation loop, recirculation pump (P-B-1), and slurry pump (P-B-2).

Leaks in the pump room collect in the pump room sump, a 1.5-meter (4.9-feet) by 1.5-meter (4.9-feet) by 1.8-meter (5.9 feet) deep sump with a 0.64-centimeter (0.25-inch) stainless steel liner. The pump room sump collects spills from various sources for transfer to the feed tank, 241-AW-102. Figure 4.6 provides a simplified process flow schematic of sources, which drain to the pump room sump. Drainage to the sump includes:

- Leaks to the pump room floor from equipment in the pump room
- Evaporator room floor drain
- Hot equipment storage room floor drain
- Loadout room floor drain
- Raw water backflow preventer drain

Solution in the pump room sump is transferred to the feed tank (241-AW-102) using a steam jet. A 10-inch secondary containment overflow line is provided for draining large volumes of solution should a catastrophic tank failure occur. Because the overflow line provides a direct path between the air space of tank 241-AW-102 and the pump room, a minimum level of water must be maintained in the sump to prevent cross ventilation. A leak into the pump room sump would be detected by a rise in the sump level. Instrumentation provided alarms on high sump level.

The recirculation and slurry pumps in the pump room are equipped with mechanical seals having pressurized water introduced between the seals. The seal water is maintained at a pressure that exceeds the process pressure at the seal to ensure water leaks into the process solution, but waste solution does not leak out. Water from seal leakage is collected in funnels in the pump room and routed to feed tank 241-AW-102 via the 10-inch overflow line described previously.

4.1.6.2.2 Evaporator Room

The evaporator room secondary containment walls are 0.56-meter-thick reinforced concrete. The secondary containment floor is 0.51-meter-thick reinforced concrete. The evaporator room contains the vapor-liquid separator vessel (C-A-1), part of the recirculation loop, the reboiler, the 42-inch vapor line, and line used to empty the vapor-liquid separator to feed tank 241-AW-102.

Leaks in the evaporator room flow to a floor drain that routes through a 3-inch line to the pump room sump described in Section 4.1.6.2.1. A leak in the evaporator room would be detected by a rise in the pump room sump level. The floor of the evaporator room and a portion of the pump room floor are 3.0 meters below grade to contain the entire contents of the vapor-liquid separator, reboiler, and recirculation loop in the event of a catastrophic failure. The floor and walls of the evaporator room up to an elevation of 1.8 meters are painted with a special protective coating.

4.1.6.2.3 Condenser Room

The condenser room secondary containment walls are 0.36- to 0.56-meter-thick reinforced concrete. The secondary containment floor is 0.51-meter-thick reinforced concrete. The condenser room contains all the components of the process condensate system described in Section 4.1.3.1 (refer Figure 4.4), including tank C-100.

Leaks in the condenser room flow to two floor drains that join and route through a 6-inch line to feed tank 241-AW-102. Leaks in the condenser room are detected by the following:

- Unexpected changes in liquid level in tank C-100. Instrumentation is provided to monitor liquid level in the tank, including high- and low-level alarms.
- Daily visual inspections of process condensate system components and piping.

The floor and walls of the condenser room up to an elevation of 1.2 meters are painted with a special protective coating.

4.1.6.2.4 Load out and Hot Equipment Storage Rooms

The load out and hot equipment storage rooms secondary containment walls are 0.30- to 0.56-meter (0.98- to 1.84-feet) thick reinforced concrete. The secondary containment floors are 0.15-meter (0.49-feet) thick reinforced concrete. The room contains two recirculation lines and samplers used to sample the feed and slurry streams. The lines and samplers are located in a shielded enclosure adjacent to the pump room wall.

The load out and hot equipment storage room contains two sumps: the drain sump and decontamination sump. The sumps are 0.91 meter in diameter, about 1.2 meters deep, and lined with stainless steel. Both sumps drain via a 3-inch drain line to the pump room sump described in Section 4.1.6.2.1. The sumps, floor, and walls of the load out and hot equipment storage room up to an elevation of 3.8 meters are painted with a special protective coating.

Leaks in the sampler piping, flow into two drains in the sample enclosure, which drain via a 2-inch line to the decontamination sump, which drains to the pump room sump (described in 4.1.6.2.1). Leak detectors in the sampler enclosures or a rise in the pump room sump level detects leaks in the sampler piping.

4.1.6.2.5 242-A Building Drain Lines

Figure 4.6 provides a simplified process flow schematic of sources routed to the 242-A Building drain lines. The 242-A TSD unit boundary includes these lines up until they exit the 242-A Building. At this point, the lines are considered DST system components. Four lines serve to drain the 242-A Building and equipment to feed tank 241-AW-102:

- Pump room sump drain line (DR-334): a 10-inch carbon steel line that transfers process condensate overflow/diverted liquids and empty-out of the pump room sump to the feed tank
- Vapor-liquid separator vessel drain line (DR-335): a 10-inch carbon steel line that allows gravity drain of the vessel to the feed tank
- Condenser room drain line (DR-343): a 6-inch carbon steel line that drains potential leakage from the condenser room.
- Diverted process condensate drain line (DR-338): process condensate liquid drains through DR-338 into sump drain line (DR-334) which drains to 241-AW-102.

The four lines are sloped to drain about 170 meters to feed tank 241-AW-102 via the drain pit (241-AW-02D). Although WAC 173-303-640(1)(c) exempts systems that serve as secondary containment from requiring secondary containment, drain lines DR-334, DR-335, and DR-338 have outer encasement piping.

The drain lines are connected to a cathodic protection system to prevent external corrosion from contact with the soil. The cathodic protection system consists of:

- A rectifier that converts supplied alternating current voltage to an adjustable direct current voltage
- Numerous anodes buried near the underground piping and connected to the rectifier.
- Return wiring that connects the piping to the rectifier, completing the circuit.

The rectifiers are inspected to component degradation has not occurred. Test stations along the system are checked annually to verify 0.85 volt is maintained on the system, as required by the National Association of Corrosion Engineers.

Further detail regarding design and construction of DR-334,-335,-338 and -343 is provided in DOE/RL-90-39 (Hanford Facility Dangerous Waste Permit Application Double-Shell Tank System). Further detail regarding the design, operation, maintenance, and inspection of the cathodic protect system for these lines are also provided in DOE/RL-90-39.

4.1.6.3 Transfer Line Containment

This section describes the design and operation of secondary containment and leak detection systems for transfer lines between the DST System and the 242-A Evaporator, and from 242-A to LERF (one line only, PC-5000). The 242-A TSD boundary for lines running between 242A and the DST System ends at exterior wall of 242-A building. At this point, these lines (e.g., feed and slurry line piping) are DST System components. For further detail regarding SN-269, SN-270, SL-167, and SL-168 refer to DOE/RL-90-39.

The PC-5000 transfer line transfers process condensate (Section 4.1.2) from the 242-A building to LERF. The 242-A TSD unit boundary includes PC-5000 up to the LERF fence line (Chapter 1.0, topographic map, and Section 4.1.2, for the TSD unit boundary)

4.1.6.3.1 Feed Line Piping

Two feed lines (SN-269 and SN-270) (one in service and one spare), each consist of 3-inch transfer piping within a 6-inch secondary containment encasement piping. Both the transfer and encasement pipes are constructed of Schedule 40 carbon steel. The lines run below grade about 120 meters from pump pit 241-AW-02E (above feed tank 241-AW-102) to the 242-A Building.

To detect transfer-piping failures, leak detector risers equipped with conductivity probes are installed on the encasement lines. The transfer piping and encasements are sloped towards the conductivity probe, which, on leak detection, annunciates an alarm in the 242-A Evaporator control room. A valve in the pump pit (241-AW-02E) can be opened to drain solution from the encasement pipe into the pit, which drains to feed tank 241-AW-102.

4.1.6.3.2 Slurry Line Piping

The slurry pump (P-B-2) transfers solution through one of two transfer lines: SL-167, for transfer to valve pit 241-AW-B (standard configuration), or SL-168 for transfer to valve pit 241-AW-A (alternate configuration, presently out of service). Slurry solution can be routed via double-encased piping from these valve pits to any designated DST slurry receiver. Both slurry transfer lines consist of 2-inch transfer piping within a 4-inch secondary containment encasement piping. Both the transfer and encasement pipes are constructed of Schedule 40 carbon steel. The lines run below grade about 73 meters between the 242-A Building and the valve pits.

These slurry lines contain leak detector risers and conductivity probes similar to the feed line piping described in Section 4.1.6.3.1.

4.1.6.3.3 PC-5000

The process condensate transfer line (PC-5000) from the 242-A Evaporator is centrifugally cast, fiberglass-reinforced epoxy thermoset resin pressure pipe fabricated to meet the requirements of ASME D2997 (ASME 1984). The 3-inch (7.6-cm) carrier piping is centered and supported within 6-inch (15.2-cm) containment piping. Pipe supports are fabricated of the same material as the pipe, and meet the strength requirements of ANSI B31.3 (ANSI 1987) for dead weight, thermal, and seismic loads.

Drawing H-2-79604 provides details of the piping from the 242-A Evaporator to LERF.

This permit includes the portion of the PC-5000 line leaving the 242-A Evaporator facility to the fence line of LERF (Chapter 1.0 and topographic maps for unit boundary).

Single-point electronic leak detection elements are installed along the transfer line at 305-meter (1000 foot) intervals. The leak detection elements are located in the bottom of specially designed test risers. Each sensor element employs a conductivity sensor, which is connected to a cable leading back to the 242-A Evaporator control room. If a leak develops in the carrier pipe, fluid will travel down the exterior surface of the carrier pipe or the interior of the containment pipe. As moisture contacts a sensor unit, a general alarm sounds in the 242-A Evaporator control room on the Monitoring Control System. In addition, the zone of the sensor unit causing the general alarm can be determined using the automated leak detection-monitoring panel. The pump located in the 242-A Evaporator is shut down, stopping the flow of aqueous waste through the transfer line. A low-volume air purge of the annulus between the carrier pipe and the containment pipe is provided to prevent condensation buildup and minimize false alarms by the leak detection elements.

If a leak is detected using visual inspection of the PC-5000 transfer line encasement at LERF Valve HV-43-2, the shift manager is notified. The Shift Manger will direct shutdown of the aqueous waste through the PC-5000 transfer line.

4.1.6.4 Additional Requirements for Specific Types of Systems

Addressed in this section are additional requirements in WAC 173-303-640 for vault systems like the 242-A Building to ensure neither buildup of ignitable vapors nor does infiltration of precipitation occur. This section also addresses secondary containment for ancillary equipment and piping associated with the tank systems.

4.1.6.4.1 Vault Systems

The 242-A Building is a vault constructed partially below ground, providing secondary containment for the tank systems. The DST System waste processed at the 242-A Evaporator is designated ignitable and reactive because of the presence of nitrite and nitrate salts, which are considered oxidizers per 49 CFR 173. Because of their low volatility, these compounds are unlikely to be present in the vapor phase of the tank systems at the 242-A Evaporator. However, to prevent the spread of contamination, the vapor-liquid separator (C-A-1) is ventilated and maintained at lower air pressure than the building air space. This ensures air leakage is from uncontaminated building air space into the tank vapor space. Vapors from the vapor-liquid separator flow to the vacuum condenser system described in Section 4.0.

The condensate collection tank (C-100), collects process condensate that is not designated ignitable or reactive.

The tank systems and ancillary equipment are located within the 242-A Building, which is completely enclosed to prevent run-on and infiltration of precipitation into the secondary containment system.

4.1.6.4.2 Ancillary Equipment

The 242-A Building provides secondary containment for ancillary equipment. Double containment is provided for the feed and slurry transfer lines between the 242-A Building and the AW Tank Farm by pipe-in-pipe arrangements. Therefore, all ancillary equipment has secondary containment and the daily inspection requirements in WAC 173-303-640(4)(f) are not applicable.

4.1.7 Variances from Secondary Containment Requirements

The integrity assessment report (Appendix 4B) discusses the following three deficiencies associated with the secondary containment system:

Pump Room Sump. The pump room sump does not comply with secondary containment requirements because liquid must be kept in the sump to provide a seal to prevent airflow between the pump room and feed tank 241-AW-102. Although the sump has a 0.63-centimeter (0.25-inch)-thick stainless steel liner to prevent corrosion of the concrete floor, the sump does not have secondary containment.

Routine Discharges through Secondary Containment. The configuration of the 242-A Evaporator process requires routine, batch discharges of dangerous waste through secondary containment drain lines. These routine discharges include the following.

- Steam condensate, cooling water, and process condensate sample stations drain to the feed tank, 241-AW-102, through drain line DR-343. Total discharge is about 38 liters (10 gallons) per month during operation.

- Sample bottle water sprays down in the feed and slurry sample stations drain to the decontamination sump in the load out and hot equipment storage room. The decontamination sump then drains to the pump room sump. Total discharge is about 76 liters per month during operation.

Transfer Piping Wall Penetrations. Three dangerous waste transfer line piping sections passing through the 242-A Building wall are single-walled, i.e., no secondary confinement in the wall (about 56-centimeter-thick reinforced concrete).

These deficiencies were identified to Ecology, October 28, 1993. Ecology's response stated, "No physical revision of the pipe wall penetrations or the floor drains in the evaporator pump room will be required prior to evaporator restart". The response required the following.

- If at any time leakage is seen or detected from these installations, or if for any reason these installations are repaired or rebuilt, they will be rebuilt or repaired in accordance with regulations.

- Should a spill occur in the evaporator pump room the sump and the piping shall be rinsed three times as required in WAC 173-303-160. 'Appropriate' in this case means that the original regulation was written for a free container, not a sump, so that judgment will have to be used in the application of the regulation. The rinsate shall be transferred to the double-shell tanks.

4.1.8 Tank Management Practices

All waste to be processed at the 242-A Evaporator must be sampled to determine if the waste is compatible with the materials of construction at the 242-A Evaporator. Before each campaign, candidate feed tanks are sampled per the requirements of the waste analysis plan (Chapter 3.0). Based on the results, three possible options are implemented.

- The waste is acceptable for processing without further actions.

- The waste is unacceptable for processing as a single batch, but is acceptable if blended with other waste that is going to be processed.

- The waste is unacceptable for processing.

The 242-A Evaporator process is controlled by the MCS. The MCS computer monitors liquid levels in the vapor-liquid separator (C-A-1) and condensate collection tank (C-100). The MCS system manages liquid levels in the C-A-1 using an auto-cascade function that controls feed delivery to the C-A-1 vessel. The MCS system also manages liquid levels in the C-100 using an auto-cascade function to maintain the tank level at approximately 50-percent. The MCS has alarms that annunciate on high-liquid levels for both C-A-1 and C-100 to notify operators that actions must be taken to prevent overfilling of these vessels.

An interlock is activated when high-liquid level in the vapor-liquid separator (C-A-1) is detected, automatically shutting down the feed transfer pump at feed tank 241-AW-102, thereby preventing overfilling of the vessel and carryover of slurry into the process condensate system. The condensate collection tank (C-100) has an overflow line that routes solution to feed tank 241-AW-102 in case of overfilling.

Process and instrumentation drawings are listed in Section 4.3.

The MCS also provides an automated interlock to shutdown the process condensate pump (P-C-100), recirculation pump (P-B-1), and slurry pump (P-B-2) if a leak is detected. The process condensate pump (P-C-100), recirculation pump (P-B-1) and slurry pump (P-B-2), can be shutdown automatically using the MCS interlock and/or manually at the direction of the Shift Manager or 242-A Evaporator Control Room Operator if a leak occurs.

4.1.9 Labels or Signs

A labeling upgrade was completed before restart in 1994 for tank C-100 to identify the waste contents and major risks associated with waste stored within the tank. Tank C-100 ancillary piping is labeled "PROCESS CONDENSATE" to alert trained personnel which pipes in the condenser room contain dangerous waste. The vapor-liquid separator (C-A-1) is located in the evaporator room, a normally unoccupied area. This area is posted as a high radiation area with ALARA access controlled and limited to trained personnel only. The tank labels are visible from the walls of the tank enclosure rooms, which are less than 15 meters from the tank systems; therefore, label visibility requirements are met.

4.1.10 Air Emissions

Tank systems that contain extremely hazardous waste, and is acutely toxic by inhalation must be designed to prevent the escape of such vapors. The DST System waste in the vapor-liquid separator, C-A-1, is designated extremely hazardous waste; however, no determination has been performed to determine if the waste is acutely or chronically toxic. Most of the toxic compounds in the DST waste are not volatile, but because of the high radioactivity of the waste, controls are included to prevent or mitigate the release of tank vapors. The vapor-liquid separator is maintained under vacuum to ensure air leakage is from uncontaminated building air space into the tank vapor space. The boiling vapor in C-A-1 passes through deentrainment pads and sprays to prevent liquid and solid carryover into the vapor section of the tank. The vapor stream passes through three condensers that remove the condensable components. The noncondensable vapors pass through HEPA filters before being discharged to the environment.

4.1.11 Management of Ignitable or Reactive Wastes in Tank Systems

Although the DST System waste reprocessed at the 242-A Evaporator is designated ignitable because of the presence of oxidizers (nitrates and nitrites), the waste does not meet the definition of a combustible or flammable liquid given in National Fire Protection Association (NFPA) code number 30 (NFPA 1996). The buffer zone requirements in NFPA-30, which require tanks containing combustible or flammable solutions be a safe distance from each other and from public way, are not applicable.

An analysis is performed on the DST System waste to be processed to verify the waste does not react exothermically at the elevated temperatures at the 242-A Evaporator. The waste analysis plan (Chapter 3.0) discusses waste acceptance requirements due to reactive waste designation.

4.1.12 Management of Incompatible Wastes in Tank Systems

Waste transferred to the 242-A Evaporator must be compatible before mixing. The waste analysis plan (Chapter 3.0) includes waste compatibility requirements.

4.2 AIR EMISSIONS CONTROL

This section addresses the requirements of Air Emission Standards for Process Vents, under Subpart AA (incorporated by reference in WAC 173-303-690).

4.2.1 Applicability of Subpart AA Standards

The 242-A Evaporator performs distillation that specifically requires evaluation of process vents for the applicability of 40 CFR 264 Subpart AA.

Waste processed at the 242-A Evaporator routinely contains greater than 10 parts per million organic concentrations; therefore, organic air emissions are subject to 40 CFR 264.1032, which requires organic emissions from all affected vents at the Hanford Facility be less than 1.4 kilograms per hour and 2.8 megagrams per year, or control devices be installed to reduce organic emissions by 95%.

The 242-A Evaporator has one process ventilation system that vents both the vapor-liquid separator (C-A-1) and the condensate collection tank (C-100). The vent lines from both tanks combine before entering an off-gas system consisting of a deentrainer, a prefilter/demister, HEPA filters, and an exhaust fan. The vessel vent off-gas system is located on the third floor of the condenser room, with the exhaust stack extending horizontally through the east wall of the building at an elevation of 14.7 meters above ground level. The exhaust stack bends to run vertically with the discharge point 18.6 meters above ground level.

The annual average flow rate for the vessel vent is given in *Radionuclide Air Emissions Report for the Hanford Site - Calendar* Year *1995* (DOE-RL 1996) as 18 cubic meters per minute and the total annual flow was 9.6 E+06 cubic meters. During waste processing, the airflow is about 20.5 cubic meters per minute, with about 4.3 cubic meters per minute ventilated from tank C-100 and the remainder from the vapor-liquid separator and air inleakage.

Organic emissions occur during waste processing, which is less than 6 months (182 days) each year. This is the maximum annual operating time for the 242-A Evaporator, as shutdowns are required during the year for maintenance outages, candidate feed tank analysis, and establishing transfer routes for staging waste in the DST System. The total operating time for the two campaigns in 1994 was 86 days.

4.2.2 Process Vents - Demonstrating Compliance

This section outlines how the 242-A Evaporator complies with the requirements of 40 CFR 264, Subpart AA, including a discussion of the basis for meeting the organic emission limits, calculations demonstrating compliance, and conditions for reevaluating compliance.

4.2.2.1 Basis for Meeting Limits/Reductions

The TSD units at the Hanford Facility subject to 40 CFR 264, Subpart AA meet the organic air emission limits of 1.4 kilograms per hour and 2.8 megagrams per year, established in 40 CFR 264.1032, by the design of the facility. The 242-A Evaporator and the other TSD units collectively can meet these standards without the use of air pollution control devices.

4.2.2.2 Demonstrating Compliance

Process vent organic air emissions are controlled by establishing limits for acceptance of waste at the 242-A Evaporator. Before startup of each campaign, the waste to be processed is sampled in the DST System to determine the organic content. If the concentrations of organic constituents are less than the limits in the waste analysis plan (Chapter 3.0), the waste can be processed, provided the Hanford Facility will not exceed 1.4 kilograms per hour and 2.8 megagrams per year. The waste acceptance limits in the waste analysis plan are based on equilibrium calculations and assumptions given in *Organic Emission Calculations for the 242-A Evaporator Vessel Vent System* (WHC 1996). The calculation to determine organic emissions consists of the following steps:

1. Determine the emission rate of each candidate feed tank organic constituent by multiplying the constituent concentration by the corresponding partition factor in *Organic Emission Calculations for the 242-A Evaporator Vessel Vent System* (WHC 1996).
2. Sum the emission rates of all organic constituents to determine the emission rate for the candidate feed tank. The maximum emission rate for the campaign is the rate from the candidate tank with the greatest emission rate.
3. Determine the total amount of emission during the campaign by using operating time and a weighted average emission rate, based on the volume of each candidate feed tank processed.

The organic emission rates and quantity of organics emitted during the campaign are determined using these calculations and are included in the operating record for each campaign, as required by 40 CFR 264.1035. The Hanford Facility has a system to ensure organic emissions from units subject to 40 CFR 264, Subpart AA are less than the limits of 1.4 kilograms per hour and 2.8 megagrams per year. Records documenting total organic emissions are available for Ecology review on request.

4.2.2.3 Reevaluating Compliance with Subpart AA Standards

Calculations to determine compliance with Subpart AA will be reviewed when any of the following conditions occur at the 242-A Evaporator:

- Changes in the configuration or operation that affect the assumptions in the Organic Emission Calculations for the 242-A Evaporator Vessel Vent System (WHC 1996)
- Annual operating time exceeds 182 days

4.3 ENGINEERING DRAWINGS

The drawings in Table 4.1 are process and instrumentation diagrams for the systems at the 242-A Evaporator that contact mixed waste. These drawings are provided for general information, and demonstrate adequacy of the tank systems design.

Table 4.1. Process and Instrumentation Diagrams

System	Drawing Number	Drawing Title
Vapor-Liquid Separator	H-2-98988 Sheet 1	P & ID Evaporator Recirc System
Reboiler/Recirculation Line	H-2-98988 Sheet 2	P & ID Evaporator Recirc System
Slurry System	H-2-98989 Sheet 1	P & ID Slurry System
Condensate Collection Tank	H-2-98990 Sheet 1	P & ID Process Condensate System
Secondary Containment Drain System	H-2-98995 Sheet 1	P & ID Drain System
Secondary Containment Drain System	H-2-98995 Sheet 2	P & ID Drain System
Condensers	H-2-98999 Sheet 1	P & ID Vacuum Condenser System
Pump Room Sump	H-2-99002 Sheet 1	P & ID Jet Gang Valve System
Condensate Recycle System	H-2-99003 Sheet 1	P & ID Filtered Raw Water System
Process Condensate Line PC-5000	H-2-79604	Piping Plot for PC-5000 between 242 A and the LERF fence line

The drawings in Table 4.2 are for secondary containment systems for the 242-A Evaporator. Because secondary containment systems are the final barrier for preventing the release of dangerous waste into the environment, modifications that affect the secondary containment systems will be submitted to the

Washington State Department of Ecology, as a Class 1, 2, or 3 Permit modification, as required by WAC 173-303-830.

Table 4.2. 242-A Evaporator Secondary Containment Systems Drawings

System	Drawing Number	Drawing Title
242-A Building	H-2-69277 Sheet 1	Structural Foundation Plan Sections & General Notes - Areas 1 & 2
	H-2-69278 Sheet 1	Structural Foundation Elevations & Details - Areas 1 & 2
	H-2-69279 Sheet 1	Structural First Floor Plan & AMU - Areas 1 & 2
Pump Room Sump Drainage	H-2-69352 Sheet 1	Sections Process Waste Drainage
242-A Building Drainage	H-2-69354 Sheet 1	Plan Process Waste Drainage
Pump Room Sump	H-2-69369 Sheet 1	Pump Room Sump Assembly & Details

Figure 4.1. 242-A Evaporator Simplified Process Flow Diagram

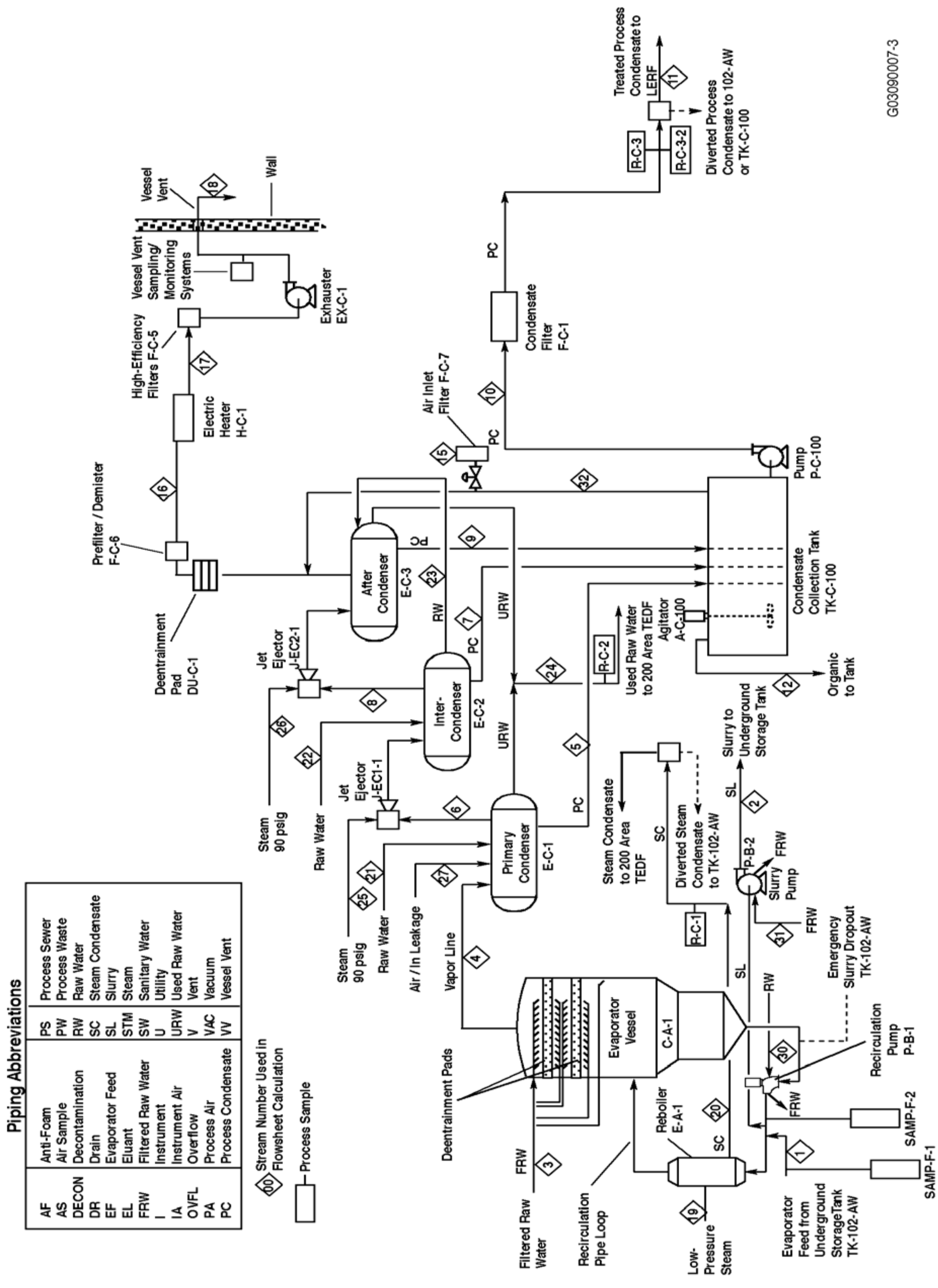


Figure 4.2. 242-A Evaporator Process Loop

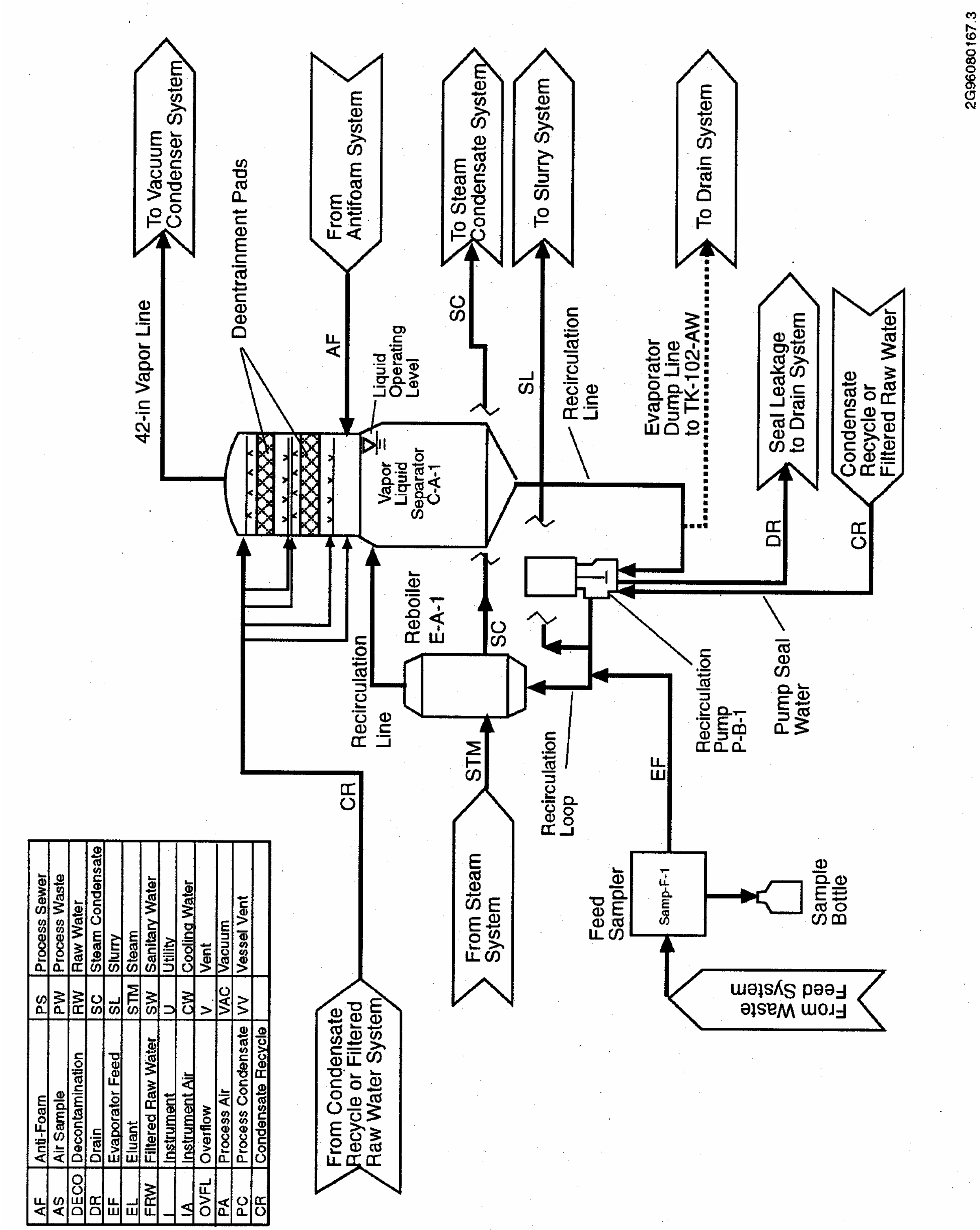


Figure 4.3. 242-A Evaporator Slurry System

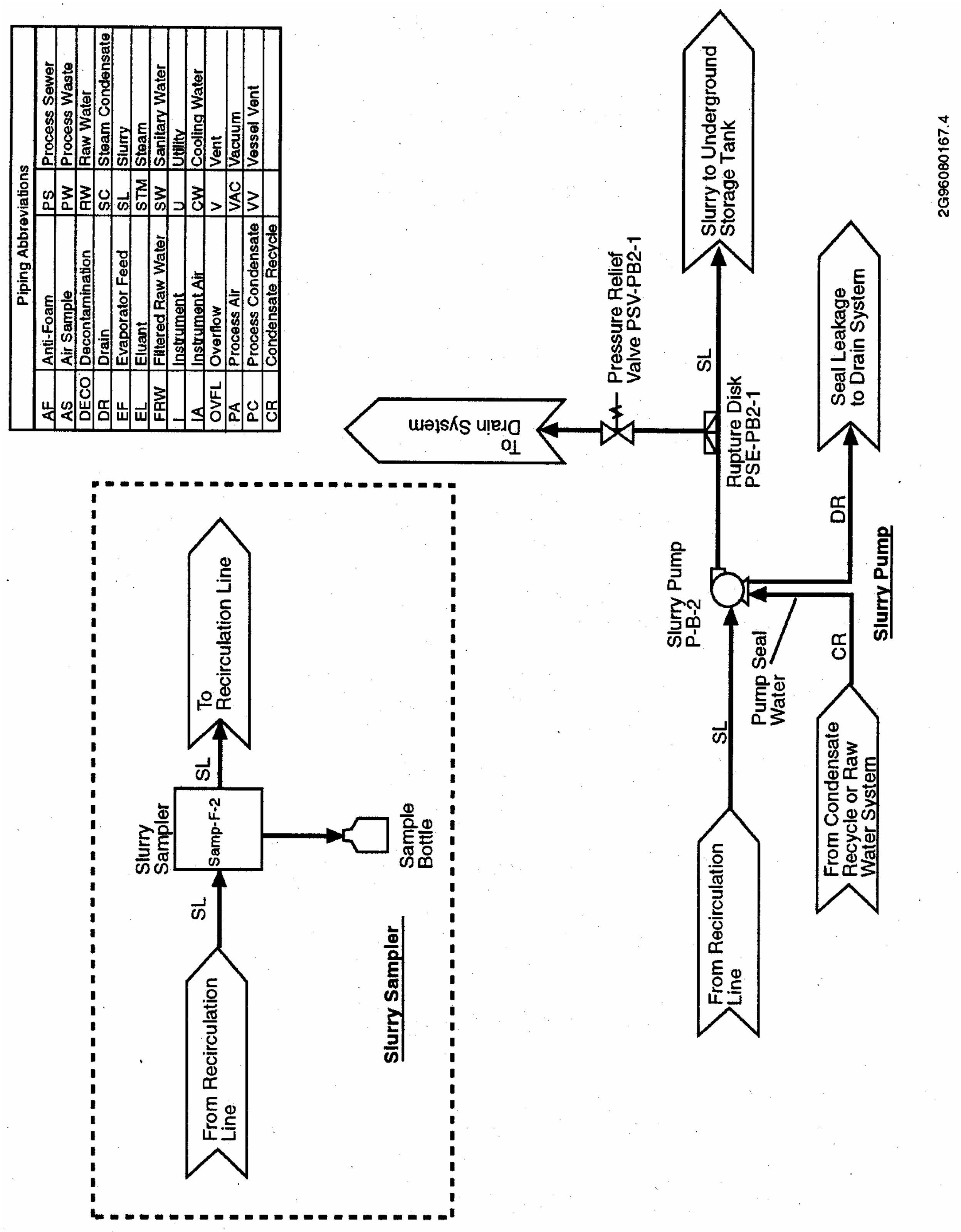
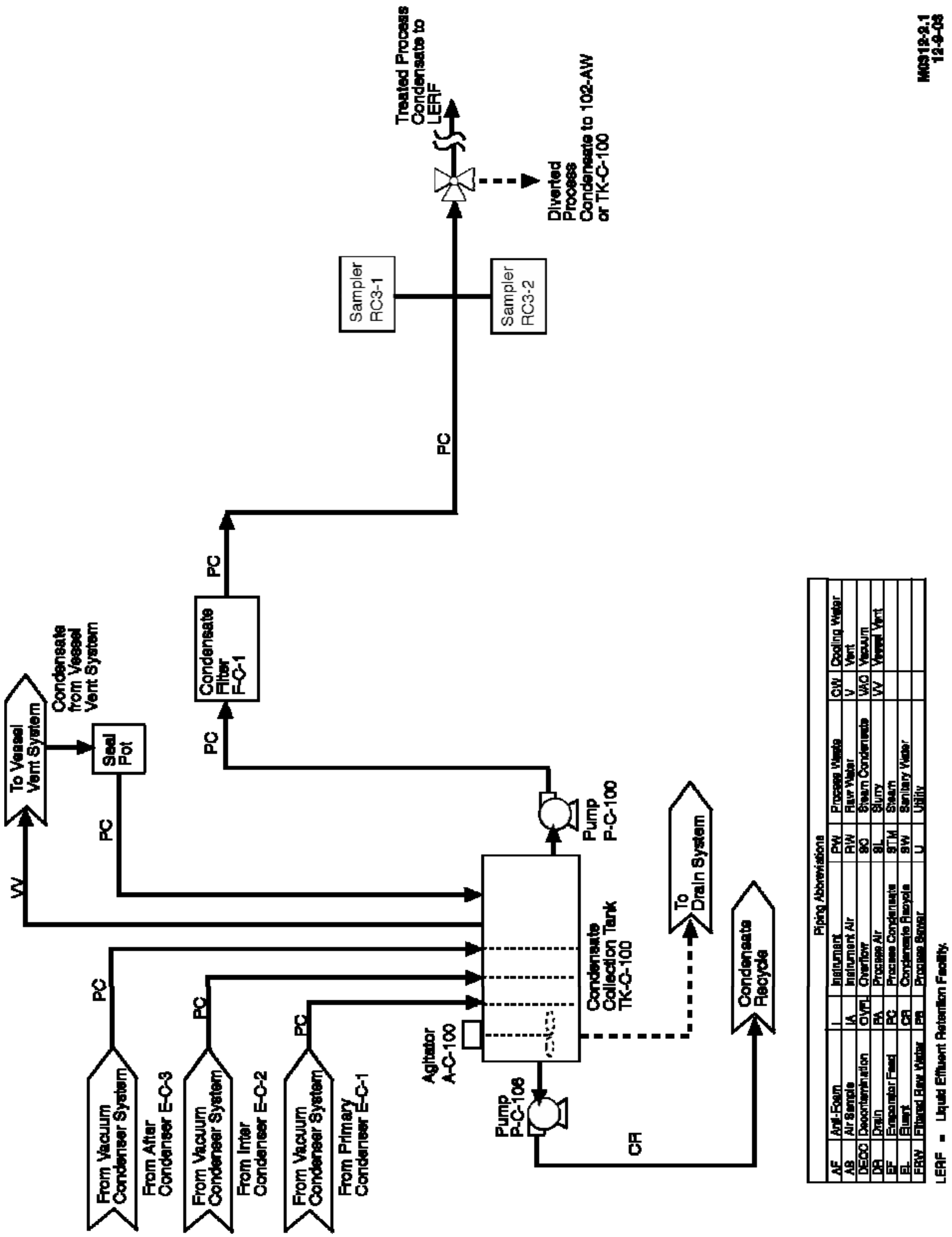
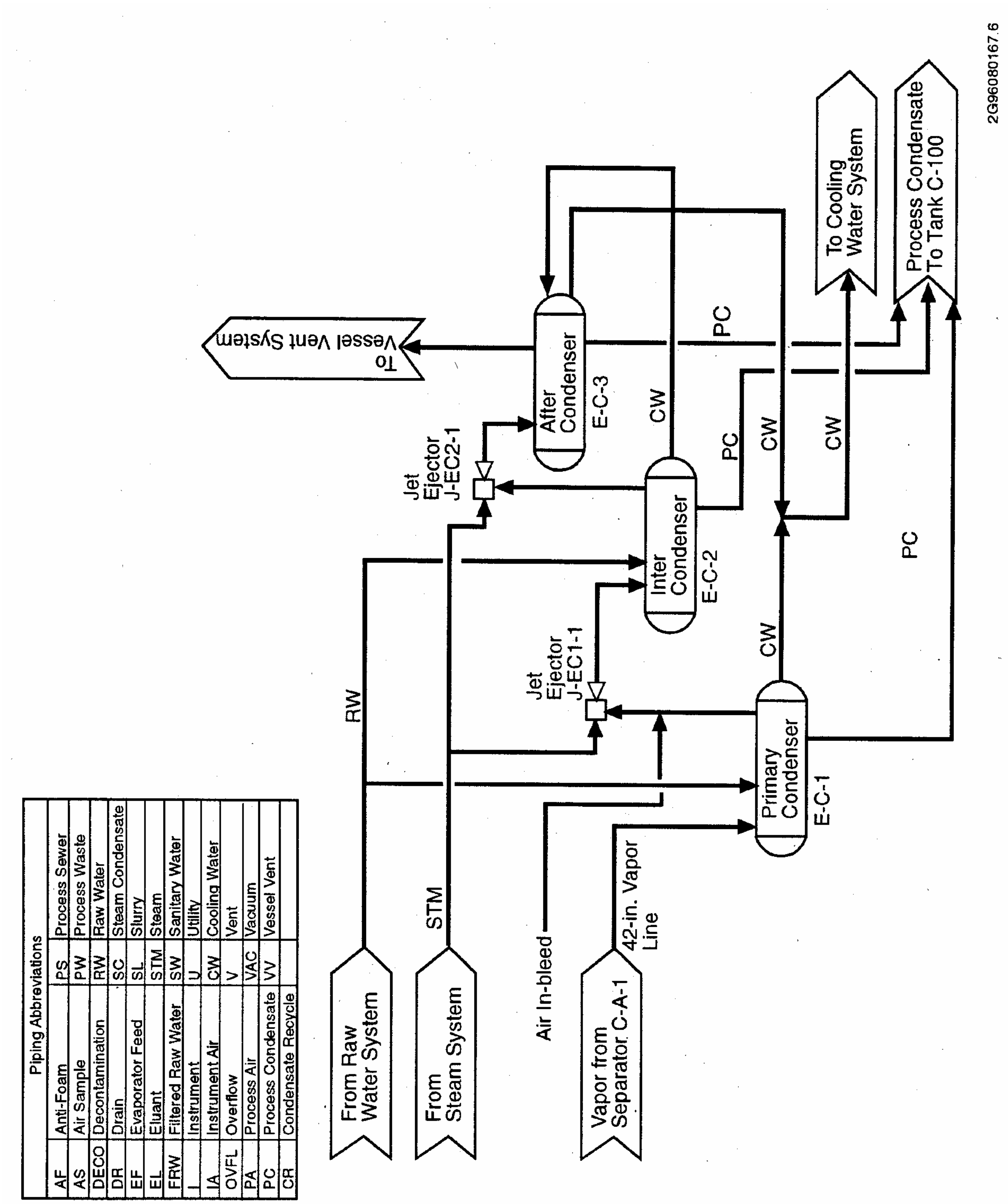


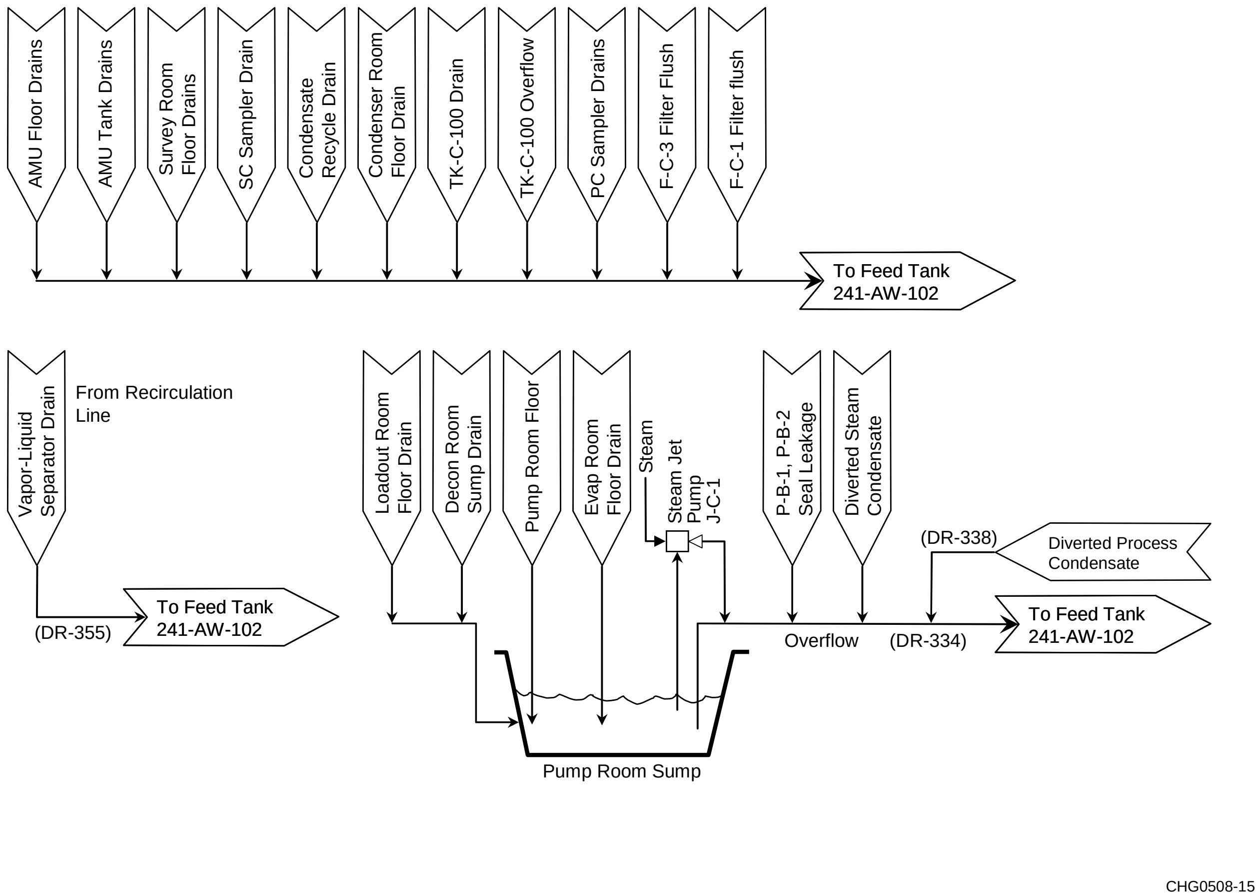
Figure 4.4. 242-A Evaporator Process Condensate System



1 **Figure 4.5. 242-A Evaporator Vacuum Condenser System**



1 **Figure 4.6. 242-A Evaporator Drain System**
2



APPENDIX 4B

THE 242-A EVAPORATOR/CRYSTALLIZER TANK SYSTEM INTEGRITY ASSESSMENT REPORT

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."

Sherman R. Tifft (signature) 6-22-98

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

Date

(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	S6-71
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: [signature] Cognizant Engineer [signature] FOR RJ Nickls Cognizant Engineering Manager or Delegate [signature] Operations Manager or Delegate Date 3-31-98	Completed [signature] 5-11-98 Operations Manager. or Delegate / Date [signature] 5-12-98 Cognizant Engineer / Date

PMH LW98-026 PAGE 4 OF 6

WSD WS Dabling WS. 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 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
	42898	1900	65.3	SC Burt
	42898	2000	65.3	SC Burt
	42898	2100	65.3	SC Burt
	42898	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

~~42898 0800~~ 65.2 WS Dabling

* 4-28-98 - 0800

NOTE: All DATES with AN "*" IN FRONT should be 4-29-98.

AMH LW98-026 PAGE 5 of 6

DATA SHEET #2

TK-C-100 4 HOUR VISUAL INSPECTION

DATE	TIME	OBSERVATION	RECORDED BY
4-28-98	12:00	OK	JB
4-28-98	400	OK	JB
4-28-98	2800	OK	SCB
4-29-98	00:00	OK	SCB
4-29-98	0400	OK	SLB
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

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

(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: [signature] 0845 4-29-98 [signature] 4-29-98

QC Inspectors: [signature] 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: [signature] Date: 4/30/98

Quality Assurance: [signature] 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	
			Documented Total Number of Hours/Years in Applicable QA Inspection Discipline
[X] High School (GED)	*> 24 hrs	**> 3 yrs	
[ ] Two Year College	* Includes 2 hours of refresher training.		
[ ] Four Year College	** Previously certified.		

Verified By: [signature]　　Date 10/08/96

QUALIFICATION EXAMINATION RESULTS

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

Minimum Points Passing: 80%

OTHER

Visual Acuity Examination

Verified By: [signature]　　Date: 10/08/96

Annual Reevaluations

Verified By: [signature]　　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.

[signature]
Level III Signature

10/08/96
Date

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

A-6000-800 (09/86)

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 PHMC Level II Mechanical Inspectors.

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

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Page 2 of 10

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# PE-98-034.

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
Potential C-100 PC to 102-AW	=	5000 gal
Total waste generation to tank farms	=	42100 gal (15.3 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: [signature] 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: [signature] 12 MAY 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.*

comp. W. Morris
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]* SOM Signature / 5/31/98 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]* SOM Signature / 6/1/98 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]* SOM Signature / 6-1-98 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 PHMC Level II 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 Integrity 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 102-AW.

7.2 Perform a partial drawdown of CA1 to 102-AW by opening HV-CA1-1 and monitoring until the CA1 level reaches 24,500-25,000 gal as read on LIC-CA1-1 or LIC-CA1-2.

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-EA1-1 during operation until 100% open.

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

8.6 Use HV-EA1-2 as a source for makeup water in the vessel as needed to obtain maximum boiloff.

8.7 If necessary 1K-C-100 may be reduced using valve 1-3A to 102-AW. This option is only a backup to Do not drain more than 5,000 gal. using the Process Condensate Recycle System for C-100 drawdown.

8.8 Terminate test after maximum boil-off is reached.

Completed: David A. Silie, 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.

9.1 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: DSilie, 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	
[signature]	5-27-98
Cognizant Engineer	Date
[signature]	5/28/98
Cog. Manager/Delegate	Date
[signature]	5/27/98
SO Manager/Delegate	Date

Completed by	
[signature]	6/5/98
SO Manager	Date
[signature]	6/5/98
Cognizant Engineer	Date

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DATA SHEET #1

EVAPORATOR VESSEL/RECIRCULATION LOOP LEVEL INSPECTION

start →

DATE	TIME	LEVEL LIC-CA1-1 / LIC-CA1-2	RECORDED BY
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	Abh
6-1-98	1930	27499	Abh
6-1-98	2030	27499	Abh
6-1-98	2130	27497	Abh
6-1-98	2230	27496	Abh
6-1-98	2330	27498	Abh
6-2-98	0030	27497	Abh
6-2-98	0130	27498	Abh
6-2-98	0230	27501	[illegible]
6-2-98	0330	27500	Abh
6-2-98	0430	27503	Abh
6-2-98	0530	27504	[illegible]
6-2-98	0630	27508	[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	0830	No Leaks	SLB
6/1/98	1230	No Leaks	SLB
6/1/98	1630	No Leaks	SLB
6/1/98	2030	No leaks	KEA
6/2/98	0030	No leaks	KEA
6/2/98	0430	No leaks	KEA
6/2/98	0830	No leaks	[illegible]

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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 [signature] 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: [signature] 6/5/98

QC Inspectors: [signature] 6-3-98
DAVID H POYNTER B4O HANFORD LAV. 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: [signature] Date: 6/5/98

Quality Assurance: [signature] Date: 6/5/98

*SPC FLOOR COATING SHOWED NO SIGNS OF DETERIORATION OR WEAR [signature] 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	48	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	48	60.1	84.9	1174
45%	10820	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	60.0	84.9	1170
70%	14192	14.99	46	60.4	85.0	1172
75%	14592	14.93	47	60.4	85.1	1170
80%	15886	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

boil off @ 93.5°F 5.4 gpm boil off

→ relieved pressure. PIC-CA1-7 back down to 60 (at 75% row)

Also, → start * make up H_2O to pot. (at 80% row)

* @ 90%, steve anst cleans steam strainers. it jumps from 16,716 lbs/hr → 27,213 lbs/hr & stabilizes @ 26,176lb
PIC-CA1-7 gets up from 47% → 75%

- After cleaning steam strainers, FIC-EA1-1 flow rate down from 27,213 → stablized @ 25,600 even though 90% → 100%

[illegible] steam condensate

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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 (G13)	FI-EC2/EC3 FLOWRATE (G16)
100%	28104	14.158	~~66.48~~ 100%	66.48	84.72	1172.9
95%	22683	14.564	100%	67.36	84.88	1178.3
90%	21421	14.694	98%	67.93	84.90	1175.0
85%	21475	14.646	99%	66.82	84.84	1171.6
80%	21247	14.726	100%	66.73	84.90	1172.9
75%	20824	14.756	100%	66.46	85.05	1175.1
70%	21166	14.808	100%	66.19	84.90	1177.1
65%	20662	14.884	100%	65.40	84.85	1169.7
60%	19963	14.948	100%	65.23	85.07	1167.1
55%	19159	14.992	100%	64.98	84.84	1169.2
50%	17998	15.106	99%	64.41	84.91	1165.7
45%	16606	15.206	98%	63.78	84.86	1173.1
40%	15435	15.278	99%	62.91	84.88	1164.4
35%	14186	15.400	99%	61.74	84.91	1170.9
30%	12593	15.500	98%	61.79	84.78	1171.2
25%	11367	15.63	85%	59.36	84.82	1166.0
20%	10612	15.764	77%	58.77	84.82	1170.0
15%	9713	15.852	67%	57.80	84.83	1164.2
10%	8971	15.934	49%	56.81	84.82	1170.3
5%	8817	16.136	41%	57.85	84.85	1172.1
0%	8013	16.250	44%	59.11	85.10	1172.1

← After SC blow down

← Dave SOM wants to get home first so all of us can go to safety.

Note transmitter screw.

If we do not have a good data, we can get them from Mac Teate MCS later.
Note that we have SC problem!

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. 376-5402

Job No. 98-7

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

Project/System/Work Package/Traveler No.
1998 242-A INTERIM EVAPORATOR TANK SYSTEM INTEGRITY ASSESSMENT PLAN
E-61749 REF. DOC. HNF-2331 REV 0

Acceptance Std. Section Para. Date [X] NA

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

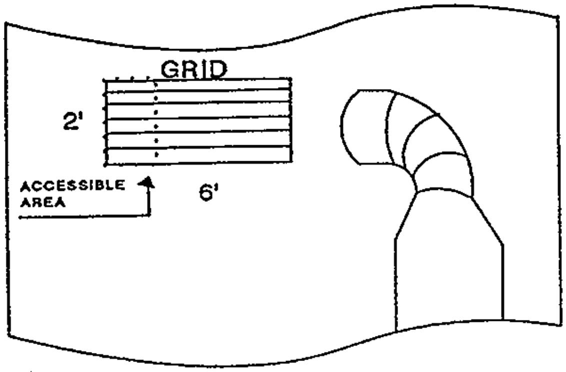
RESULTS

SEE ATTACHED SHEETS

Technician	UT Level	Interpreted by	UT Level	Reviewed by
W.D. PURDY *W.D. Purdy*	I	JAMES N FORTH *James N. Forth*	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

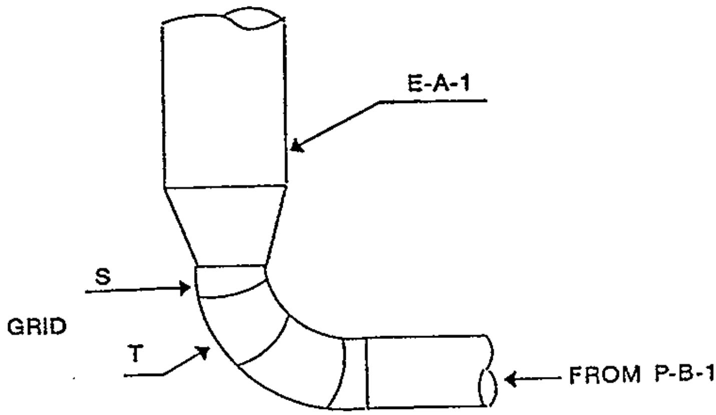


	1	2	3	4	5	6	7						
A	.385"	.387"	.386"	.396"	.387"	.386"							
B	.384"	.387"	.385"	.385"	.386"	.386"							
C	.384"	.386"	.386"	.385"	.385"	.386"							
D	.382"	.385"	.383"	.384"	.384"	.385"							
E	.383"	.382"	.382"	.381"	.381"	.381"							
F	.383"	.381"	.381"	.382"	.382"	.383"							
G	.383"	.382"	.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) = 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) = 0.265" (0.673 cm)

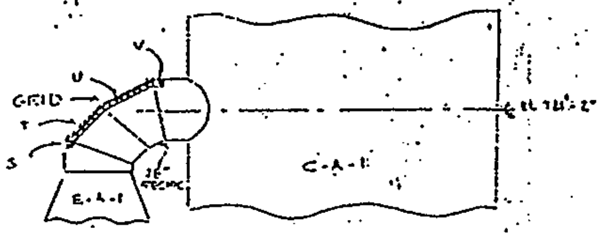
LOCATION 7 14 APRIL 1998
LINE 1-1.4

COMPONENT: LINE NO 1-1.4 (1/4" 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" (0.627 cm)

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)

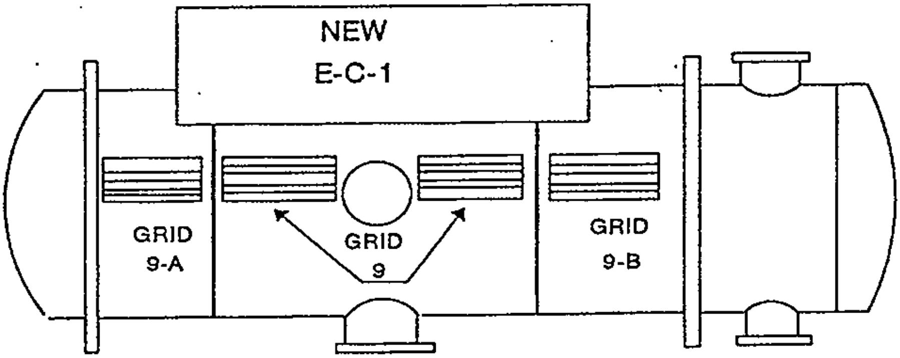
DATA (T)

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

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 $E_{(9A)}$ = 0.515" (1.308 cm)

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"	AREA OF FLANGE				.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"					.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 = Ø.516" (1.311 cm)

DATA

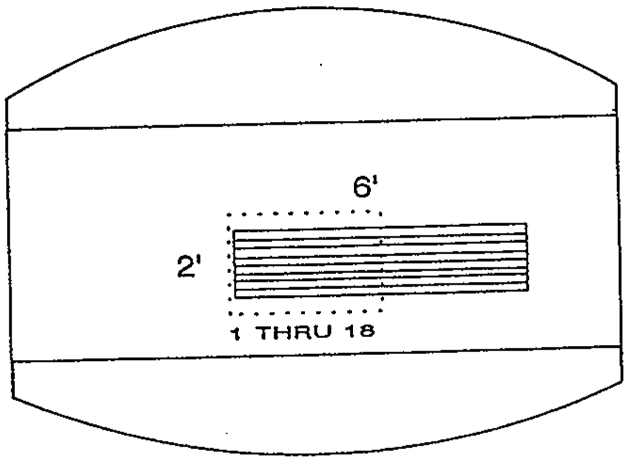
LOCATION 9-B APRIL 23 98

	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 = Ø.513" (1.303 cm)

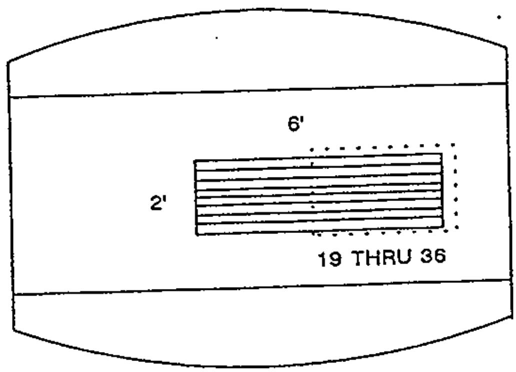
TK-C-100 14 APRIL 1998
LOCATION 11



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"	.318"	.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"

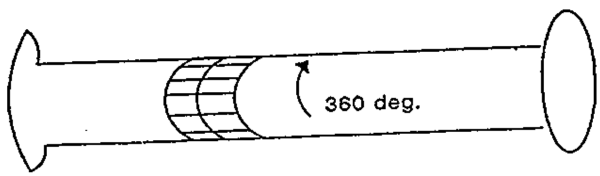
TK-C-100 14 APRIL 1998
LOCATION 11



AVERAGE = 0.321" (0.815 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



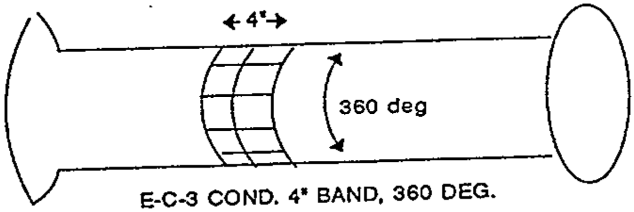
E-C-2 COND. 4" BAND 360 DEG.

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

	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"	

AVERAGE = ϕ.326"
(0.828 cm)

E-C-3 14 APRIL 1998
LOCATION 13



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

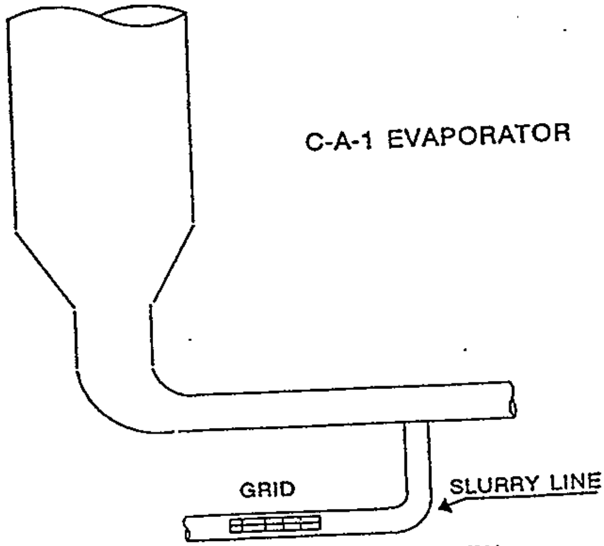
NOTE:
C-C-3 COVERED WITH
THICK PAINT

	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 = 0.341"
(0.866 cm)

LOCATION 15 14 APRIL 1998

LINE 1-3.5

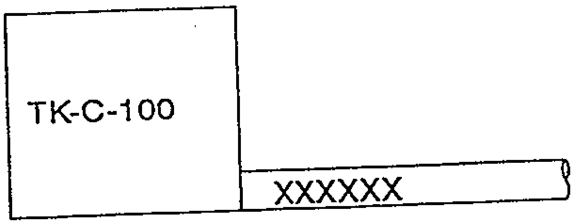


DATA

	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 = Ø.137"
(0.348cm)

TK-C-100 DRAIN LOCATION 16
14 APRIL 1998

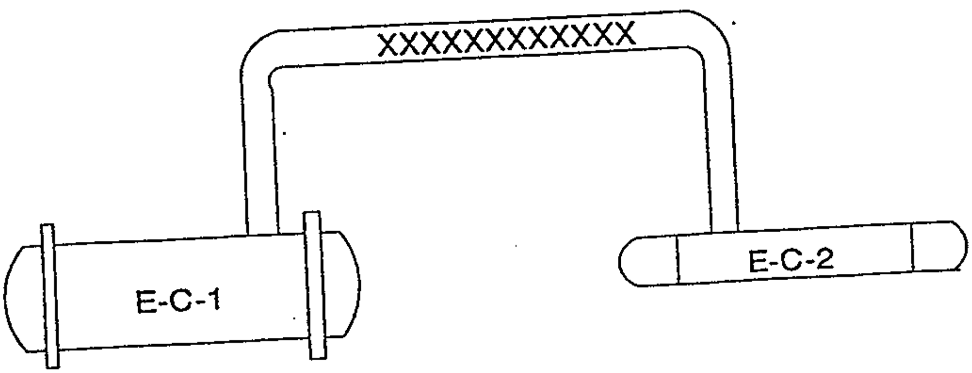


TK-C-100 TO LERF, 12 POINTS ALONG PIPE, 2" SPACE

	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 = 0.313" (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

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

9/30/00

(original signed and sealed)

FLUOR DANIEL
INTEROFFICE CORRESPONDENCE

To: Sherm Tifft

Location: Hanford

From: Ali A. Darwish

Location: Irvine

Telephone: (949)975-2929

FAX Number: (949)975-7178

CC: Cathy Shargay

Date: May 18, 1998

Reference: 1998 Interim 242-A Evaporator Tank System Integrity Assessment Plan

Client:

Subject: Corrosion Evaluation

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, 6, 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

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
Page 3 of 3

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	0.206	0.211	>20
17	Line # 2.4	CS	0.28	0.245	0.306	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	75
Thinned 5% with Potable Water	lbs/gal	1.43	0.66
	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)	65-85°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.

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.

carboline

350 Hanley Industrial Ct. • St. Louis, MO 63144-1599
an RPM company • 314-644-1000

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 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: 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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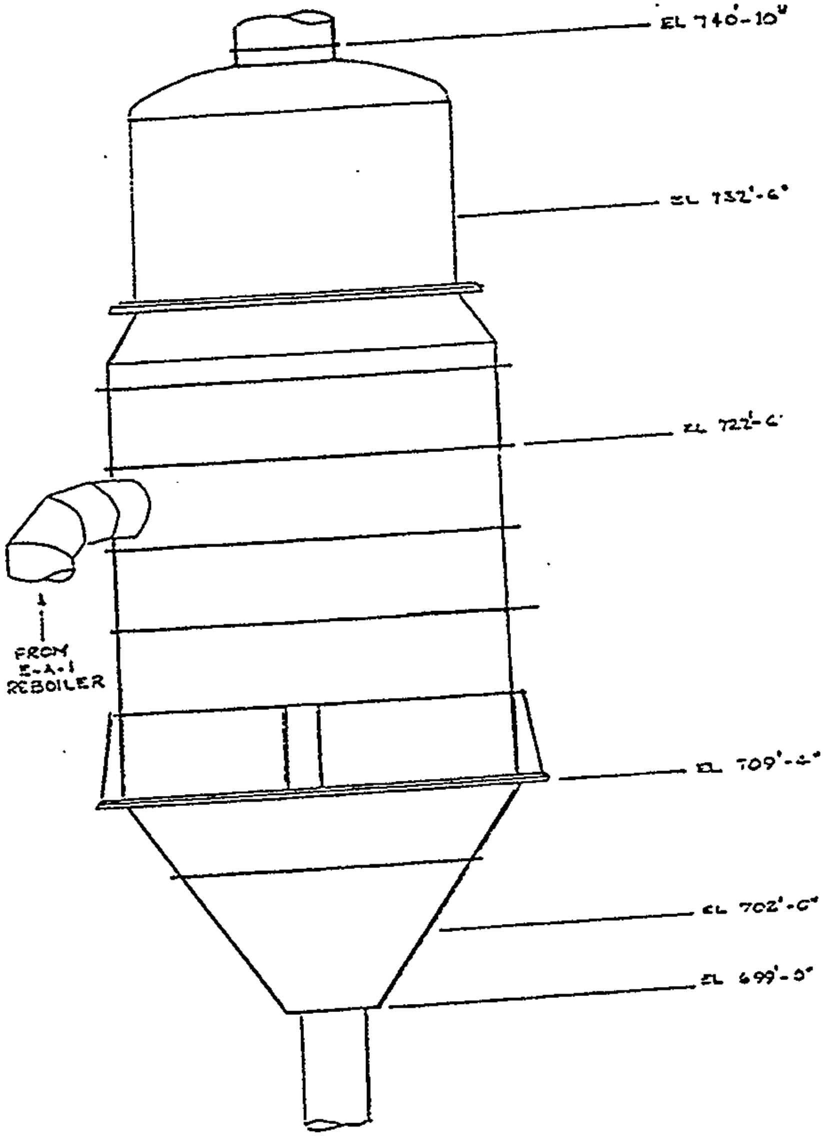
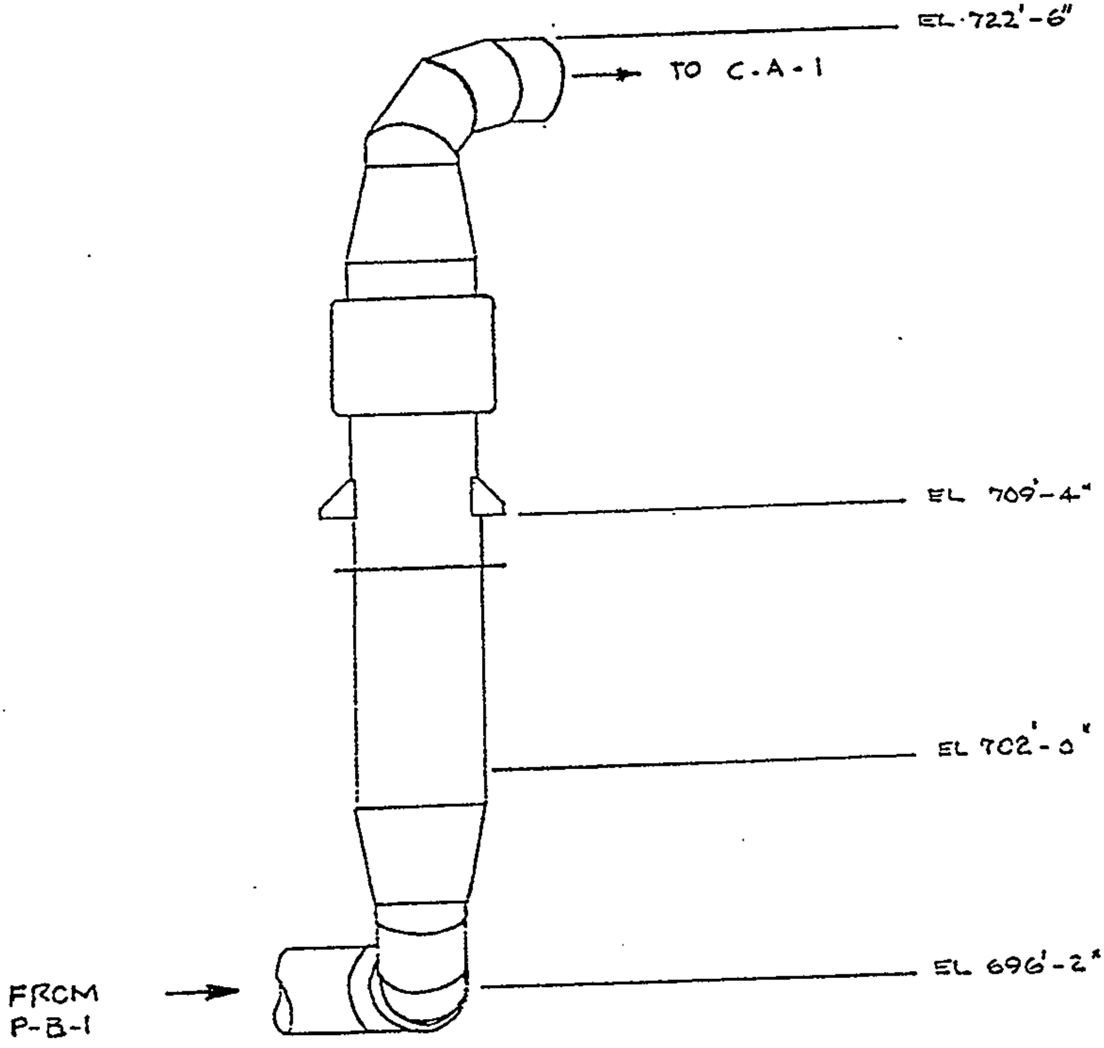
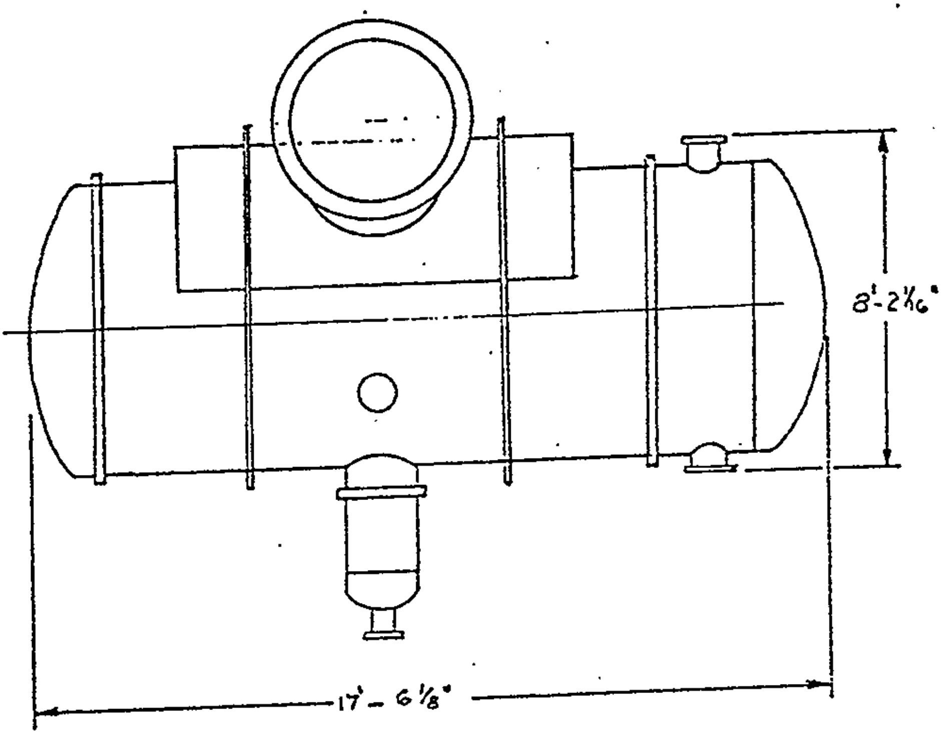
Appendix F (FIGURES)



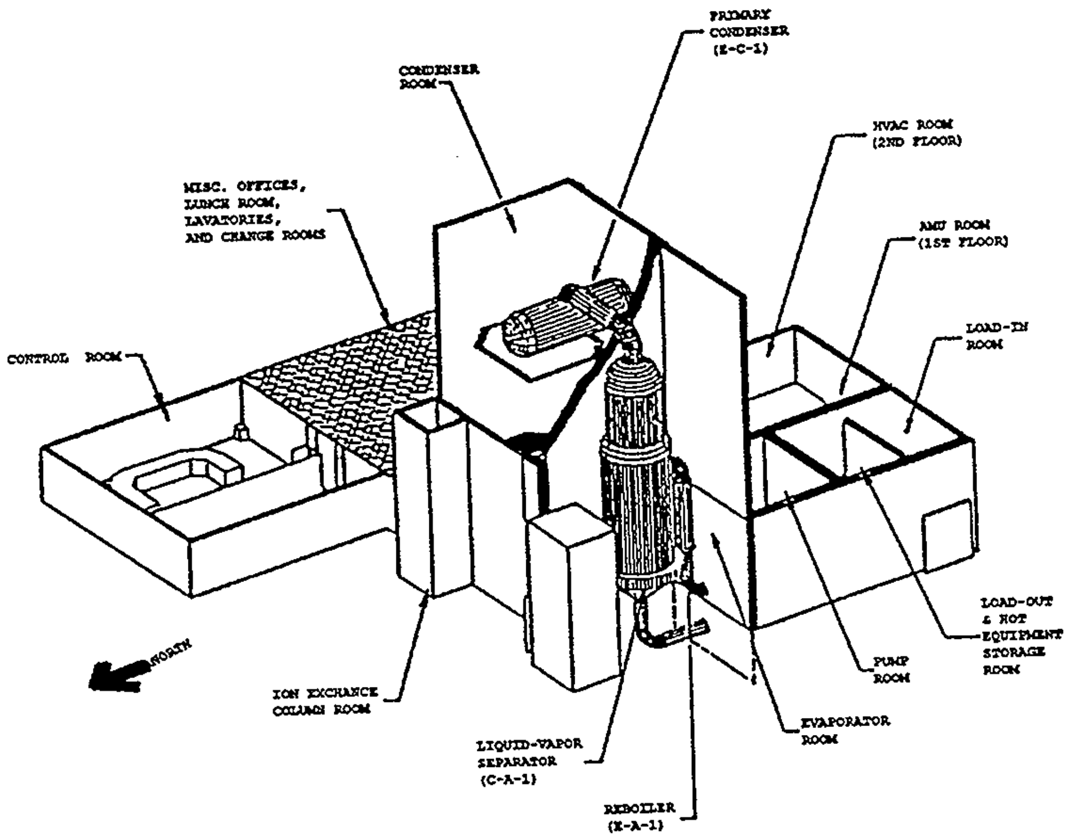
C-A-1 EVAPORATOR CRYSTALLIZER



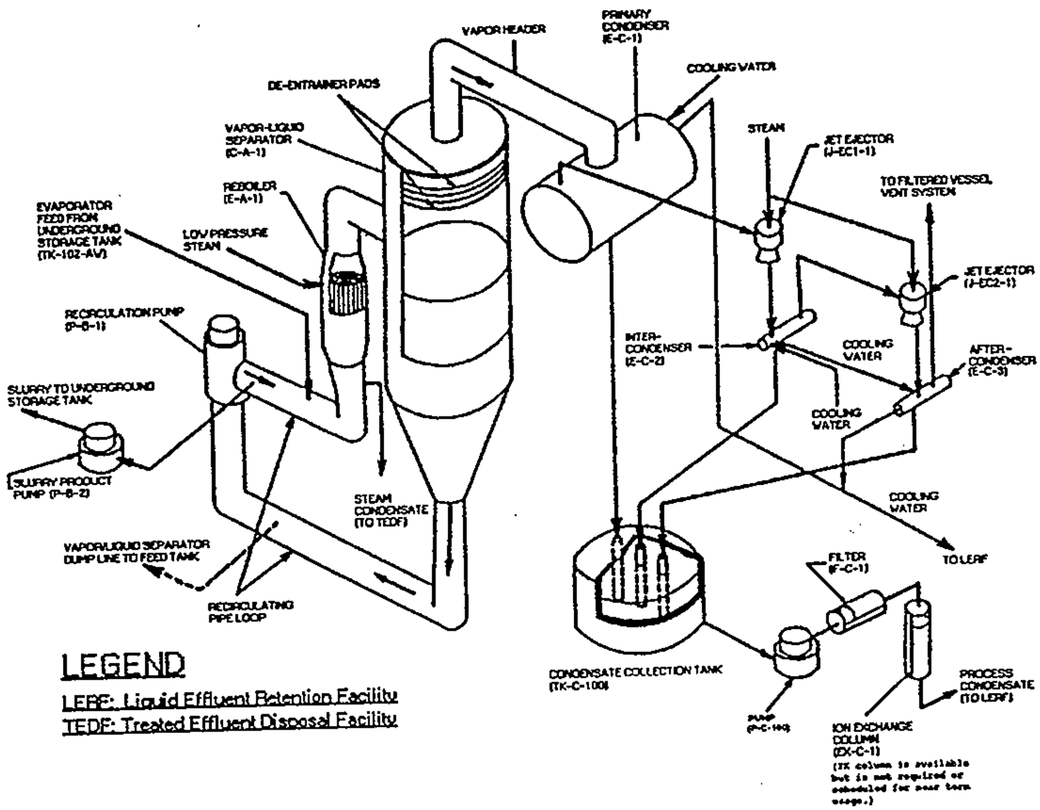
E-A-1 REBOILER



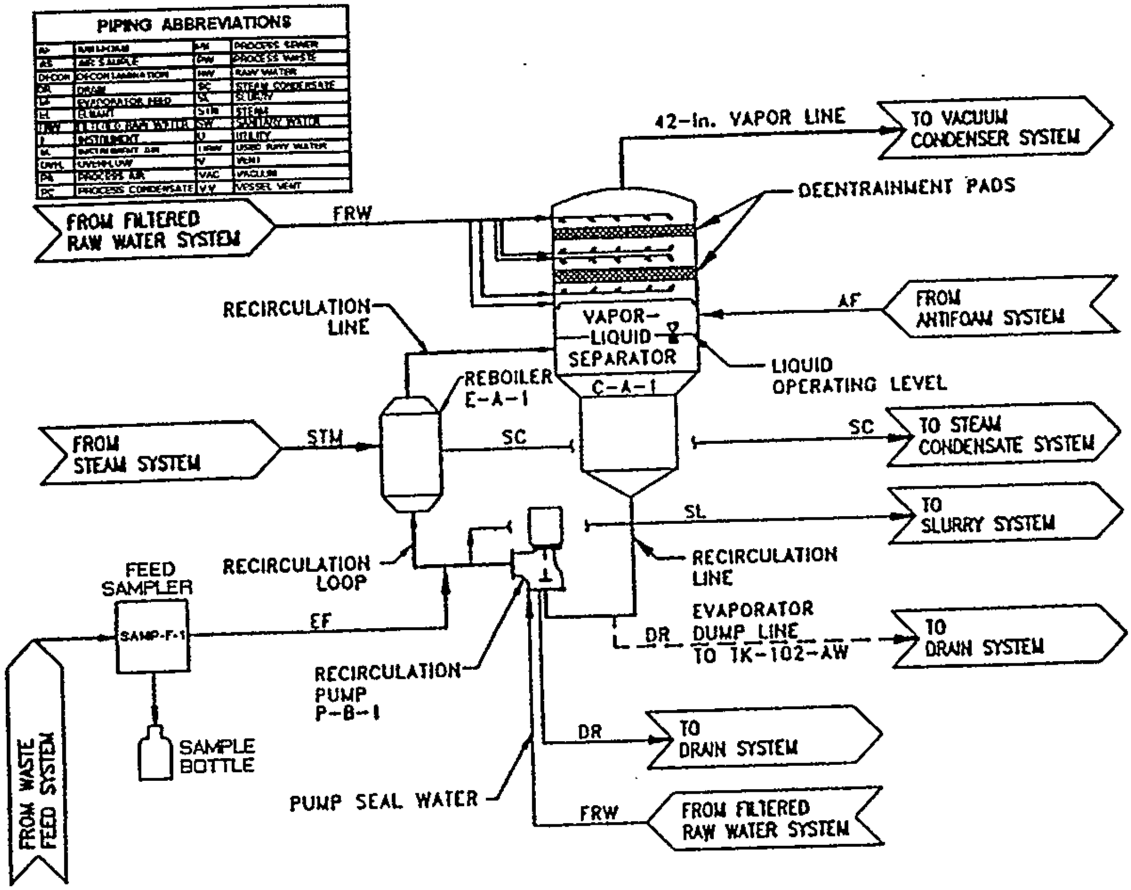
E-C-1 CONDENSER



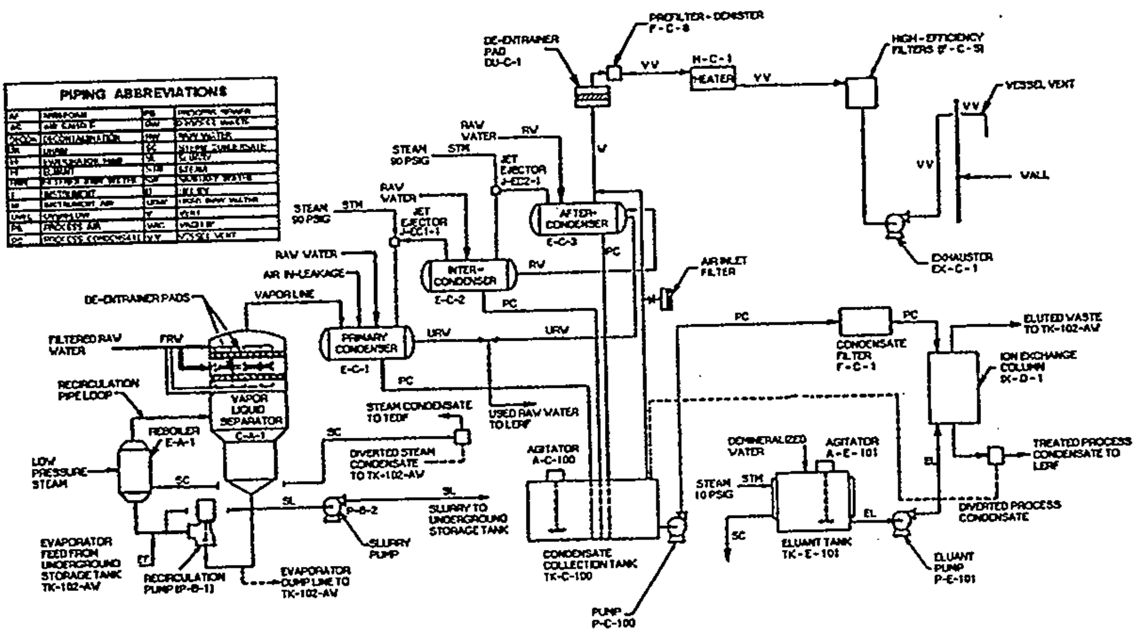
242-A Evaporator Perspective



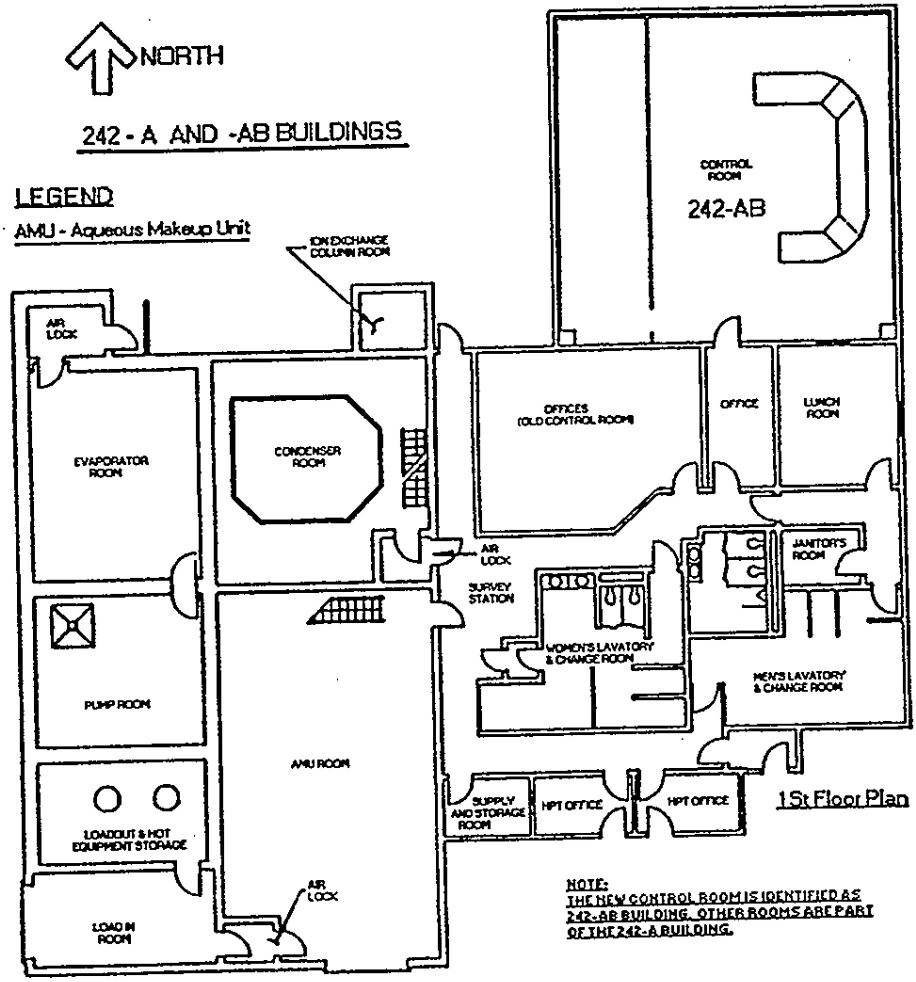
242-A Evaporator Simplified Schematic



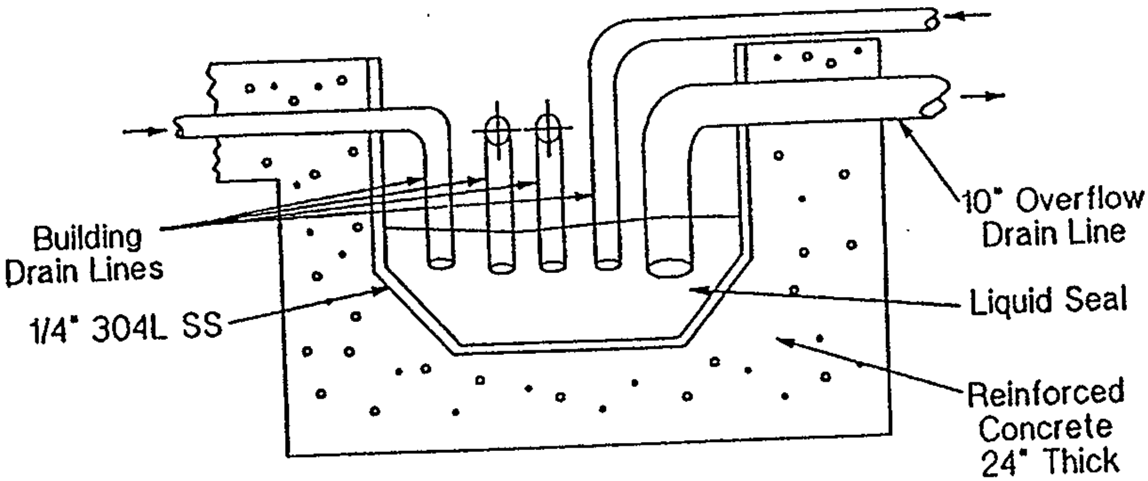
242-A Evaporator Process Loop



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 Lower Circulation Pipe	<0.8 psia 16,000 gpm	120 200
E-A-1 Reboiler Tube Side (Waste) Shell Side (Steam)	16,000 gpm 29.7 psia	250
E-C-1 Primary Condenser Tube Side (Cooling Water) Shell Side (Waste Vapor)	2,800 gpm 0.8 psia	72 95
E-C-2 Intermediate Condenser Tube Side (Cooling Water) Shell Side (Waste Vapor)	150 gpm 1.0 psia	72 150
E-C-3 Final Condenser Tube Side (Cooling Water) Shell Side (Waste Vapor)	150 gpm 14.0 psia	95 170
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, HPS 220W	SA 515 GR70 (Tube Sheets). Original unit is being replaced by unused spare on Project B-534.
	Temperature:	150^{o}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^{o}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^{o}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^{o}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	≤12": ASTM A312, GRTP304L, ≥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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Chapter 6.0 Procedures to Prevent Hazards

Tables

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6.0 PROCEDURES TO PREVENT HAZARDS

This chapter discusses security, inspection schedules, preparedness and prevention requirements, preventive procedures, structures, and equipment, and prevention of reaction of ignitable, reactive, and incompatible waste for the 242-A Evaporator.

Where information regarding treatment, management, and disposal of the radioactive source, byproduct material, special nuclear material (as defined by the Atomic Energy Act of 1954, as amended) and/or the radionuclide component of mixed waste has been incorporated into this permit, it is not incorporated for the purpose of regulating the radiation hazards of such components under the authority of this permit or chapter 70.105 RCW.

6.1 SECURITY

Refer to Permit Attachment 33, §6.1 Security.

6.1.1 Waiver

A waiver of security procedures and equipment requirements is not requested for the 242-A Evaporator. Therefore, the waiver requirements outlined in WAC 173-303-310(1)(a) and (b) are not applicable.

6.2 INSPECTION PLAN

This section describes the method and schedule for inspections of the 242-A Evaporator. The purpose of inspections is to identify situations that might cause or lead to a release of mixed waste that could pose a threat to human health and the environment. Abnormal conditions identified by an inspection must be corrected on a schedule that prevents hazards to the public and environment.

6.2.1 General Inspection Requirements

This section provides an overview of inspections performed at the 242-A Evaporator. A copy of the inspection plan is kept in the 242-A Evaporator control room. There are three general classes of inspections at the 242-A Evaporator:

- Monitoring of remote instrumentations and alarms are performed by operating personnel in the 242-A Evaporator control room using the MCS computer.
- Visual inspections of tanks and equipment are performed by operating personnel. Some inspections of fire protection equipment, such as sprinkler system inspections, are performed by the Hanford Fire Department.
- Preventive maintenance of equipment and calibration of instruments are performed by maintenance personnel. A computerized tracking system is used to identify and schedule preventive maintenance and calibration activities.

Preventive maintenance and instrument calibrations on certain equipment might not be possible when the 242-A Evaporator is operating. Because of the limited duration of 242-A Evaporator campaigns, these activities are scheduled during outages between campaigns to avoid interference with operating activities.

6.2.1.1 Types of Problems

The 242-A Evaporator inspections include, but are not limited to, the following:

- Condition of tanks and ancillary equipment

- Condition of secondary containment
- Evidence of leaks or overflows from tanks, piping, or transfer lines
- Condition of security equipment
- Condition of safety, communications, and emergency equipment.

A schedule of inspections, including items to be inspected, problems to look for, frequency of inspections and responsible organization are provided in Tables 6.1 through 6.4.

6.2.1.2 Frequency of Inspections

The frequency of inspections is based on the significance of a failure of the equipment and on regulatory requirements, Hanford Site and industry standards, and experience of the nature and frequency of equipment failures.

The frequency of inspections for the 242-A Evaporator is given in Tables 6.1 through 6.4. Examples of frequencies include:

- Daily (at least every 24 hours) - visual inspections of tanks, piping and secondary containment.
- Weekly (at least every 7 days) - visual inspections of personal protective equipment, exterior lighting, and posted warning signs.
- Monthly (at least every 31 days) - inspections of emergency sirens, fire extinguishers, safety showers, emergency lighting and the spill control kit.
- Annually (at least every 365 days) - instrumentation calibrations, cathodic protection system testing, fire inspections.

Leak detectors are functionally checked within 92 days of the start of a campaign and every 92 days thereafter until the campaign is over. The frequency of some alarm monitoring is continuous. This means an operator must be present in the control room to monitor alarm instruments that continuously check for conditions such as leaks and high sump levels. Continuous monitoring is only required when the 242-A Evaporator is processing waste

6.2.2 Tank System Inspections and Corrective Actions

This section discusses the inspections performed on the two tank systems at the 242-A Evaporator: the vapor-liquid separator, C-A-1, and the condensate collection tank, C-100. Inspections include secondary containment and leak and overfill prevention equipment.

6.2.2.1 Overfill Prevention

The vapor-liquid separator, C-A-1, is equipped with instrumentation that alarms before the tank reaches a level where the tank could overflow or entrain liquid waste into the vacuum condenser system. The alarm annunciates in the control room allowing operating personnel to take immediate action to stop the vapor-liquid separator from overfilling.

The condensate tank, C-100, was designed with an overflow line that routes waste to the feed tank, 241-AW-102. This design prevents tank overflow to the condenser room.

6.2.2.2 Visual Inspections

Visual inspections of tanks and secondary containments are performed to check for leaks, signs of corrosion or damage, and malfunctioning equipment. Inspections also include housekeeping checks to ensure aisle space requirements are met. The following rooms containing dangerous waste are inspected:

- Condenser room

- Pump room
- Hot equipment storage room
- Load out room

In addition, the AMU room is inspected when hazardous materials are present in the room.

The vapor-liquid separator is located in the evaporator room, with a portion of the recirculation loop located in the pump room. Because of the high radiation dose in the evaporator room, visual inspections cannot be performed. Leaks in the evaporator room drain to the pump room sump; monitoring of the pump room sump instrumentation is performed to determine if leaks have occurred. Visual inspection of the portion of the recirculation loop located in the pump room is performed through the shielding window on the AMU mezzanine.

6.2.2.3 Leak Detectors

The sample enclosures in the load out and hot equipment storage room have leak detectors for both the feed and slurry samplers. For information on these systems and their secondary containment, refer to Chapter 4.0, §4.1.4.

Leaks to secondary containment in the evaporator room, pump room, hot equipment storage room, and load out room drain to the pump room sump. The sump high-level alarm serves as a leak detector for these rooms. For information on the rooms and their drain systems, refer to Chapter 4.0, §4.1.4.

There are conductivity probe leak detectors installed in the secondary containment of the feed transfer line, slurry line, and drain lines connecting the 242-A Evaporator to AW Tank Farm. However, these detectors are considered part of the DST System.

The PC-5000 transfer line may be continuously monitored during transfers by an automated leak detection system (Chapter 4.0) or visually inspected at the LERF Valve HV-43-2. The automated leak detection system alarms are monitored in the 242-A Evaporator Control Room on the Monitoring and Control System (§4.1.6.3.3). Visual inspections of the PC-5000 transfer line are administratively controlled by the Shift Manager and occur at a minimum once every 24 hours during waste water transfers through the PC-5000 transfer line to ensure compliance with WAC 173-303-640(4)(c)(iii). Visual inspection for leaks from the PC-5000 transfer line are performed by 242-A Evaporator Operations, by looking for signs of any liquid not contributed to rain/precipitation at the open LERF HV-43-2 valve. If any liquid is observed the Shift Manager is notified to take corrective actions.

6.2.2.4 Cathodic Protection

Cathodic protection is not required for the equipment within the 242-A facility boundaries. The only portion of the system, which is underground is the PC-5000 transfer line. The PC-5000 line is constructed of fiberglass.

6.2.2.5 Tank Assessments

The IAR was issued in 1998. The frequency and nature of these assessments are discussed in the IAR.

6.2.3 Storage of Reactive and Ignitable Wastes

The Hanford Fire Department performs annual fire inspections of the 242-A Evaporator using a checklist developed specifically for facilities that handle dangerous and/or mixed waste. The checklist was developed from requirements in the Uniform Fire Code and the National Fire Protection Association code. A copy of the completed checklist is given to operating management to take remedial actions for any problems identified. The completed checklist is included in the operating record and also is available from the Hanford Fire Department.

6.2.4 Air Emissions Control and Detection Inspections

The process vent at the 242-A Evaporator is subject to 40 CFR 264, Subpart AA, which requires organic emissions be limited to 1.4 kilograms per hour, and 2.8 megagrams per year, or controls be installed to reduce organic emissions by 95 percent. Organic concentrations in the waste processed at the 242-A Evaporator are limited to ensure the values of 1.4 kilograms per hour and 2.8 megagrams per year are not exceeded. Therefore, no emission control devices are installed on the 242-A Evaporator vessel ventilation system and no inspections are required (Chapter 4.0, §4.2).

6.2.5 Inspection Logs

Visual inspections (refer to Tables 6.1-6.4) are performed using inspection log sheets (also called round sheets) that outline frequency, the components to inspect, operating conditions and ranges, and types of problems. Log sheets are kept in the 242-A Evaporator control room. Inspectors record the following information:

- Date and time of the visual inspection
- Printed name and signature of the person performing the inspection
- Notations of the observations made, including space for writing comments
- An account of spills or discharges in accordance with WAC 173-303-145.

Completed log sheets are reviewed and approved by the shift supervisor, collected, and stored for at least 5 years.

Maintenance inspections are performed as part of the maintenance job control system. After completion, the maintenance documentation is reviewed and signed.

6.2.6 Schedule for Remedial Action for Problems Revealed

If while performing a visual inspection (Table 6.1), a leak or spill is discovered, facility management responds immediately per Chapter 7.0, Contingency Plan. Action is taken to stop the leak and determine the cause. The waste is removed from the secondary containment within 24 hours or in a timely manner that prevents harm to human health and the environment. For spills that drain to the pump room sump, the sump must be emptied and rinsed three times (Chapter 4.0, §4.1.5).

If an alarm activates during inspections, an operator responds immediately and implements appropriate actions.

If an inspection identifies equipment that is missing, damaged, or not operating properly, the operator records the problem on a deficiency log in the 242-A Evaporator control room. Repair work is prioritized by facility management to mitigate health risks to workers, maintain integrity of the facility, and prevent hazards to public health and the environment. The Hanford Fire Department repairs fire prevention equipment.

6.3 PREPAREDNESS AND PREVENTION REQUIREMENTS

The following sections document the preparedness and prevention measures taken at the 242-A Evaporator.

6.3.1 Equipment Requirements

The following sections describe the internal and external communications and emergency equipment located at the 242-A Evaporator that can be activated by the 242-A Evaporator BED. Hanford Facility-wide equipment is identified in Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02).

6.3.2 Internal Communications

The 242-A Evaporator is equipped with internal communication systems to provide immediate emergency instruction to facility personnel. The onsite communication systems at the 242-A Evaporator include telephones, hand-held two-way radios, a public address system, and alarm systems. The telephone and radio systems provide for internal and external communication. Alarm systems allow facility personnel to appropriately respond to various emergencies, including building evacuations, take cover events, fires and/or explosions. The locations of telephones, public address systems, and alarms are given in the Chapter 7.0, Contingency Plan.

Immediate emergency instruction to personnel is provided by a public address system using speaker horns and speakers located throughout the 242-A and 242-AB Buildings and outside.

6.3.2.1 External Communications

The 242-A Evaporator is equipped with devices for summoning emergency assistance from the Hanford Fire Department, the Hazardous Materials Response Team, and/or local emergency response teams, as necessary. External communication is made through the normal system In addition, the following systems are available for external communication with persons assigned to emergency response organizations:

- A crash alarm telephone is available in the 242-A Evaporator control room. The crash alarm telephone system provides communication of centralized emergency response instructions to 242-A Evaporator personnel
- Fire alarm pull boxes Fire alarm pull boxes and fire sprinkler flow monitoring devices are connected to a system monitored around the clock by the Hanford Fire Department
- Telephone number 911 (811 if using a cellular phone) is the contact point for the Hanford Site; on notification, the Hanford Patrol Operations Center notifies and/or dispatches required emergency responders
- Telephone number 373-3800 is the single point of contact for the Hanford Site emergency duty officer; this number can be dialed from any Hanford telephone

During certain periods, only one operator may be available within the 200 East plateau. This operator has access to external communication using telephones located throughout the building.

6.3.2.2 Emergency Equipment

Emergency equipment is available throughout the 242-A Building. The locations of telephones, public address systems, and alarms are given in Chapter 7.0, Contingency Plan.

Major fire damage is unlikely at the 242-A Evaporator because of the concrete construction and because the amount of combustible material is minimized. Temperature-activated water sprinkler systems, emergency lights, fire alarms pull boxes, and fire extinguishers are located throughout the facility. The Hanford Fire Department is capable of providing rapid response to major fires at the 242-A Evaporator and its vicinity, with a fire hydrant located near the east side of the facility.

Safety showers are located in the areas where personnel are most likely to have direct exposure of hazardous materials: in the AMU room and on the first and fourth floors of the condenser room. Water for these devices is supplied from the sanitary water system. Self-contained breathing apparatus units are available in the control room for use throughout the 242-A Building for protection from radiological hazards and are not subject to the HF RCRA Permit provisions.

Respirators are located in the PPE storage room near the entryway to the condenser room. Other PPE, such as hazardous material protective gear and special work procedure clothing, are located in cabinets in the survey area. If required, PPE is donned before entry into the rooms containing mixed waste. The level of personal protective equipment required depends on the level of contamination in the area being entered and the activity being performed.

A spill control kit is located in a cabinet near the door to the PPE storage room. An inventory of the equipment in the spill kit is included inside the cabinet. The spill kit cabinet door seal is checked monthly to ensure the kit has not been used. The kit inventory is inspected annually.

The 242-A Evaporator operating personnel are trained in the use of emergency equipment (Chapter 8.0).

6.3.2.3 Water for Fire Control

Water for fire protection is supplied from the 200 East Area raw water system. Columbia River water is supplied to the fire control system from the 282-E Water Supply Reservoir. The water distribution system is sized to provide adequate volume and pressure to supply fire fighting needs under normal and emergency conditions. A fire hydrant is located in the immediate proximity of the 242-A Building.

In the event that the sprinkler system at the 242-A Evaporator does not put out a fire, or the sprinkler system is damaged during an accident, the Hanford Fire Department fire station will provide equipment as described in Permit Attachment 4, *Hanford Emergency Management Plan (DOE/RL-94-02)*

6.3.3 Aisle Space Requirement

Sufficient aisle space is maintained on the exterior of the 242-A Evaporator to allow access of personnel and equipment responding to fires, spills, or other emergencies. Unobstructed fire lanes run from Fourth Street and Canton Avenue to the 242-A Building main entrance to allow emergency vehicle access to the main entrance and the nearby fire hydrant.

The 242-A Building interior aisle space is designed to allow access by emergency response personnel while maintaining barriers to contain releases of gaseous or liquid waste and hazardous material. Walkways in the rooms containing mixed waste are checked daily to ensure the walkways have not been obstructed by portable equipment, trash, etc.

6.4 PREVENTIVE PROCEDURES, STRUCTURES, AND EQUIPMENT

The following sections describe preventive procedures, structures, and equipment.

6.4.1 Loading and Unloading Operations

The feed transfer and slurry lines between the 242-A Evaporator and AW Tank Farm are constructed of carbon steel piping with secondary containment and leak detection in a pipe-within-a-pipe arrangement. Although the regulations exempt systems that serve as secondary containment from requiring secondary containment, two of the drain lines from the 242-A Evaporator to AW Tank Farm also have outer encasement piping and leak detection (refer to Chapter 4.0, §4.1.4, for information on these lines).

Waste transfers within the 242-A Building are contained by the secondary containment walls, floors and drains (refer to Chapter 4.0, §4.1.4, for information on secondary containment at the 242-A Evaporator).

Mixed waste storage containers are not loaded or unloaded at the 242-A Evaporator. Unloading operations occur when equipment contaminated with mixed waste exits the facility. Such materials are fully sealed in plastic with absorbent material to absorb any free liquid present. Because of these requirements, the likelihood of a spill outside the 242-A Building during this operation is extremely low.

6.4.2 Run-Off

Liquid waste handling at the 242-A Evaporator occurs within tank systems with secondary containment. Rooms containing mixed waste have drains that route to either the pump room sump or the feed tank, 241-AW-102. The pump room sump overflows to the feed tank as well. Therefore, run-off from a major leak, such as a break in a large water line within the 242-A Building, would be contained within the facility or drained to the feed tank (refer to Chapter 4.0, §4.1.4 for information on secondary containment and drain systems).

6.4.3 Water Supplies

Raw and sanitary Columbia River water are supplied to the 242-A Evaporator via separate underground lines from the 282-E Water Supply Reservoir. Raw water is filtered to prevent organisms and other debris from clogging valves, fire hydrants, and other equipment. Sanitary water is filtered and treated before distribution through a piping system separate from the raw water system.

The raw water supply to the 242-A Evaporator enters the 242-A-81 Water Service Building, passing through a strainer and backflow preventer before entering the facility. The backflow preventer ensures contaminated water cannot flow back into the raw water system. A second backflow preventer is installed in the 242-A Building on the raw water supply line connecting with the condensate recycle line. This system allows either raw water or process condensate to be used for the pump seal water and deentrainment pad spray water without risk of contamination of the raw water system.

The sanitary water system provides water to the lunchroom, drinking fountains, men's and women's change rooms, safety showers, and supply ventilation system air washers. There are no connections between sanitary water and any system or piping containing mixed waste.

6.4.4 Equipment and Power Failures

Backup power is provided by a diesel generator. The diesel motor starts automatically on loss of electrical power and has sufficient fuel to operate the generator to safely shut down the evaporator process. An uninterruptible power supply system also is provided to allow continued operation of the MCS computer to ensure uninterrupted monitoring until the emergency generator is fully on line.

The 242-A Evaporator is designed to mitigate the effects of failure of a major piece of equipment. In general, the evaporator process can be shut down and the vapor-liquid separator gravity-drained to the feed tank, 241-AW-102, in the event of equipment failure. The process condensate tank, TK-C-100, is designed to overflow to feed tank 241-AW-102. This mitigates failure of the process condensate pump used to transfer the process condensate to LERF.

Response to equipment and power failures are discussed in more detail in Chapter 7.0, Contingency Plan.

6.4.5 Personnel Exposure

Facility design, administrative controls, and personal protective equipment are used at the 242-A Evaporator to prevent undue exposure of personnel to mixed waste and other hazardous materials. The following features were incorporated into the 242-A Evaporator design to minimize personnel exposure.

- The facility is designed for remote operation of equipment containing highly radioactive solutions such as waste feed and slurry. These solutions usually are present only in the pump room and evaporator room, which are heavily shielded and routinely are not entered by operating personnel.
- The 242-A Building ventilation system is designed to provide air flow from uncontaminated zones to progressively more contaminated zones.

- Emergency lighting devices are located strategically throughout the 242-A Building.
- Eyewash stations and safety showers are located in rooms containing mixed waste or other hazardous materials that personnel routinely enter. For location of these, refer to Chapter 7.0, Contingency Plan.
- Continuous air monitors with audio and/or visual alarms to notify personnel of airborne radioactive contamination are provided in rooms that contain mixed waste and that routinely are entered.
- Methods for decontaminating vessels and equipment are available to reduce personnel exposure if entry for maintenance activity is required.
- Offices, control room, change rooms, and lunchroom are situated to minimize casual exposure of personnel.

All operations are conducted so employee exposure to mixed waste and other hazardous materials are maintained ALARA. Exposures are minimized by engineering or administrative controls with protective gear used where such controls are not practical. Before the start of any operation that might expose personnel to the risk of injury or contamination, a review of the operation is performed to ensure the nature of hazards that might be encountered are considered and that appropriate protective gear is selected. Administrative procedures dictate the level of protective clothing worn and depend on the location within the 242-A Building and the nature of the activity being performed. Personnel are trained to wear personal protective equipment in accordance with approved work procedures.

6.5 PREVENTION OF REACTION OF IGNITABLE, REACTIVE, AND INCOMPATIBLE WASTE

The following sections describe prevention of reaction of ignitable, reactive, and incompatible waste.

6.5.1 Precautions to Prevent Ignition or Reaction of Ignitable or Reactive Waste

Administrative procedures are designed to prevent the ignition or reaction of waste at the 242-A Evaporator. The precautions include the following.

- Analysis is performed on candidate waste in the DST System to check that there are no exothermic reactions when the waste is heated and that there will be no adverse affects due to mixing the contents of different waste tanks in the feed tank and evaporator vessel (refer to Chapter 3.0, for details on waste analysis).
- Sample analysis of the candidate waste in the DST System includes a surface sample to identify the presence of a separable organic phase that might be ignitable. If a separate organic phase is detected, the waste solution level in the feed tank is maintained above 2.54 meters to prevent transfer of the organic phase to the 242-A Evaporator.
- The condensate tank, C-100, is equipped with instrumentation to detect the presence of a separable organic phase. If a separate organic phase is detected, the tank is allowed to overflow, transferring the organic phase to the feed tank, 241-AW-102.
- The condensate tank, C-100 is overflowed to the DST System following each campaign to prevent the possibility of accumulating immiscible organics in the condensate waste tank.
- The vapor-liquid separator and the condensate tank are drained and flushed before any welding is performed.
- Administrative safety controls have been established to control the use and quantities of combustibles materials, fuels, and gases. Hot work activities such as cutting, welding, and brazing are administratively controlled as part of the industrial safety program.

6.5.2 Precautions for Handling Ignitable or Reactive Waste and Mixing of Incompatible Waste

Waste received at the 242-A Evaporator is protected from materials or conditions that might cause the waste to ignite or react. Much of the waste handling is done remotely to reduce the risk to operating personnel. For precautions taken to prevent the ignition or reaction of waste, refer to Section 6.5.1.

The constituents in the waste received at the 242-A Evaporator that are ignitable or reactive are not very volatile. Therefore, the evaporation process renders the waste that is evaporated (i.e., the process condensate) neither ignitable nor reactive.

Table 6.1. Visual Inspection Schedule for Tanks, Piping, and Rooms.

Item	Inspection	Frequency[1]	Responsible organization	Comments
Tank and Piping Inspection				
Condensate tank and piping	Inspect tank and piping for leaks, corrosion, or wear.	Daily	Operations	
Room Inspections				
AMU room	• Inspect tanks and piping for leaks, corrosion, or wear. • Inspect floor for spills or damage. • Inspect for equipment malfunctions. • Inspect for housekeeping/aisle space.	Daily	Operations	
Pump room	• Inspect piping for leaks, corrosion, or wear. • Inspect floor for spills or damage. • Inspect for equipment malfunctions. • Inspect for housekeeping. • Inspect pump room sump for overflow.	Daily	Operations	Use viewing window in AMU room to perform inspection.
Load out and hot equipment storage room	• Inspect piping for leaks, corrosion, or wear. • Inspect sumps and floor for spills or damage. • Inspect for housekeeping/ aisle space.	Daily	Operations	Use viewing window in AMU room to perform inspection.
Loading room	• Inspect for housekeeping/ aisle space.	Daily	Operations	Use viewing window in AMU room to perform inspection.
Condenser room	• Inspect tanks and piping for leaks, corrosion, or wear. • Inspect floors for spills or damage. • Inspect for equipment malfunctions. • Inspect for housekeeping/ aisle space.	Daily	Operations	
IX column [2] room	• Inspect piping for leaks, corrosion, or wear. • Inspect floor for spills or damage.	Daily	Operations	Surveillance is required only when mixed waste is present in the piping.

[1] Continuously: an operator must be present in the control room to respond to alarms when processing waste
Daily: at least every 24 hours
Weekly: at least every 7 days
Monthly: at least every 31 days
Biannually: at least every 184 days
Annually: at least every 365 days
[2] IX column was removed in 2003

Table 6.2. Inspection Schedule of Safety, Security, and Emergency Equipment.

Item	Inspection	Frequency[1]	Responsible organization	Comments
Security				
Building external doors	Verify external doors are closed and locked.	Daily	Operations	Entrances to office areas are allowed to be unlocked.
Posted warning signs	Verify signs are present, legible, and visible at 7.6 meters.	Weekly	Operations	
Outdoor lighting	Verify outdoor lighting is sufficient.	Weekly	Operations	
Communications				
Crash alarm telephone	Verify crash alarm telephone is operable.	Monthly	Operations	
Emergency sirens	Perform functional check to verify operability.	Monthly	Operations	
Radios	Verify radios are operable and batteries are charged.	Monthly	Operations	
Telephones	Verify telephones are operable.	Quarterly	Operations	
Intercom/public address system	Verify systems are working properly.	Quarterly	Operations	
Emergency Equipment				
Safety showers/ eyewash station	Verify safety showers and eyewash station are operable.	Monthly	Operations	
Emergency lanterns	Verify emergency lanterns are operable.	Monthly	Maintenance	
Fire extinguishers	Verify fire extinguishers are in their proper location with no signs of tampering.	Monthly	Operations	
Spill response kit	Verify all equipment is present (from checklist in kit) with no signs of tampering.	Monthly	Operations	
Self-contained breathing apparatus (SCBA)	Verify shelf life of SCBA is current, no signs of tampering.	Monthly	Operations	
Personal protective clothing	Verify sufficient stock of clothing is available.	Weekly	Operations	
Full-face respirators	Verify respirator shelf life are current and sufficient stock is available.	Monthly	Operations	

[1] Continuously: an operator must be present in the control room to respond to alarms
Monthly: at least every 31 days.
Daily: at least every 24 hours
Biannually: at least every 184 days
Weekly: at least every 7 days
Annually: at least every 365 days

Table 6.3. Inspection Schedule for Alarm Monitoring.

Item	Inspection	Frequency[1]	Responsible organization	Comments
Overfill Protection				
Vapor-liquid separator: WFSH-CA11 WFSH-CA12	Monitor for vapor-liquid separator high level.	Continuously	Operations	Surveillance required only when solution is in the vapor-liquid separator.
Leak Detection				
Sampler lines: LDS-SMPL1 LDS-SMPL2	Monitor feed and slurry sampler lines for leaks.	Continuously	Operations	Surveillance required only during feed or slurry sampling.
Pump room sump: WFI-SUMP1	Monitor for leaks in the evaporator room, pump room, load out and hot equipment storage room and loading room. These rooms drain to the pump room sump.	Continuously	Operations	Surveillance required only when waste solution is present in the rooms listed.

[1] Continuously: an operator must be present in the control room to respond to alarms.
Monthly: at least every 31 days.
Daily: at least every 24 hours.
Biannually: at least every 184 days.
Weekly: at least every 7 days.
Annually: at least every 365 days.

Table 6.4. Inspection Schedule for Maintenance and Other Inspections.

Item	Inspection	Frequency[1]	Responsible organization	Comments
Instrumentation Functional Checks and Calibrations				
Leak detectors	Perform leak detector functional checks.	Refer to comment	Maintenance/ Operations	Perform functional checks within 92 days of campaign startup and every 92 days thereafter until the campaign is over.
Vapor-liquid separator high level alarms: WFSH-CA11 WFSH-CA12	Perform calibrations of loop instruments.	Annually	Maintenance	
Pump room sump level: WFI-SUMP1	Perform calibrations of loop instruments.	Annually	Maintenance	
Emergency Electrical Equipment				
Diesel generator	Verify operability.	Monthly	Maintenance	
Uninterruptible power supply	Verify output voltage and inspect battery for signs of damage or tampering.	Annually	Maintenance	
Fire Systems				
Smoke detectors	Verify operability	Annually	Hanford Fire Department	
Pull stations	Verify operability	Annually	Hanford Fire Department	
Fire extinguishers	Verify that pressure is within proper range and verify unimpaired physical condition.	Annually	Hanford Fire Department	Refer to Table 6.2 for monthly inspection.
Fire hydrant	Check that hydrant is operational.	Biannually (182 days)	Hanford Fire Department	
Fire inspection	Walk down to check for fire extinguishers, access control, labeling, fire lanes, fire hydrants, etc.	Annually	Hanford Fire Department	Hanford Fire Department Checklist is used for the inspection.
Other Inspections				
Integrity assessment	Check integrity of vapor-liquid separator and condensate tank per IAR.	Refer to comment	Operations	Based on the 1998 IA report frequencies for integrity testing is every 10 years, unless otherwise required for system repairs and upgrades.
Integrity assessment	Check integrity of Process Condensate transfer line (PC-5000)	Refer to comment	Operations	The next IA will be performed in 2008 with a frequency for integrity testing every 10 (calendar) years, unless otherwise required by an IQRPE or as required for system repairs and upgrades. All integrity assessments will be conducted in accordance with WAC 173-303-640.

[1] Continuously: an operator must be present in the control room to respond to alarms.
Monthly: at least every 31 days
Daily: at least every 24 hours
Biannually: at least every 184 days
Weekly: at least every 7 days
Annually: at least every 365 days
IAR = initial integrity assessment
NACE = National Association of Corrosion Engineers

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Chapter 7.0 Contingency Plan

Figure

Table

OFFICIAL USE ONLY

May be exempt from public release under the Freedom of Information Act (5 U.S.C. 552)Exemption number(s) and category: Exemption 2

Circumvention of Statute

Department of Energy review required before public release

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Chapter 8.0 Personnel Training

Tables

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8.0 PERSONNEL TRAINING

This chapter discusses personnel training requirements based on WAC 173-303 and the Hanford Facility RCRA Permit, WA7 89000 8967 (Permit). In accordance with WAC 173-303-806(4)(a)(xii), the Hanford Facility Dangerous Waste Part B permit application must contain two items: (1) an outline of both the introductory and continuing training programs by owners or operators to prepare persons to operate or maintain the TSD facility in a safe manner as required to demonstrate compliance with WAC 173-303-330, and (2) a brief description of how training will be designed to meet actual job tasks in accordance with the requirements in WAC 173-303-330(1)(d). Permit Condition II.C, Personnel Training contains training requirements applicable to Hanford Facility personnel and non-Facility personnel.

Compliance with these requirements at 242-A Evaporator is contained in Permit Attachment 33, Chapter 8.0 and this chapter. This chapter supplements Permit Attachment 33, Chapter 8.0.

8.1 OUTLINE OF INTRODUCTORY AND CONTINUING TRAINING PROGRAMS

The introductory and continuing training programs are designed to prepare personnel to manage and maintain the TSD unit in a safe, effective, and environmentally sound manner. In addition to preparing personnel to manage and maintain TSD units under normal conditions, the training programs ensure that personnel are prepared to respond in a prompt and effective manner should abnormal or emergency conditions occur. Emergency response training is consistent with the description of actions contained in, Chapter 7.0, Contingency Plan. The introductory and continuing training programs contain the following objectives:

- Teach Hanford Facility personnel to perform their duties in a way that ensures the Hanford Facility's compliance with WAC 173-303
- Teach Hanford Facility personnel dangerous waste management procedures (including implementation of the contingency plan) relevant to the job titles/positions in which they are employed, and
- Ensure Hanford Facility personnel can respond effectively to emergencies.

8.1.1 Introductory Training

Introductory training includes general Hanford Facility training and TSD unit-specific training. General Hanford Facility training is described in Attachment 33, Chapter 8.0, Section 8.1, and is provided in accordance with the Permit Condition II.C.2. TSD unit-specific training is provided to Hanford Facility personnel, allowing those personnel to work unescorted, and in some cases is required for escorted access. Hanford Facility personnel cannot perform a task for which they are not properly trained, except to gain required experience while under the direct supervision of a supervisor or coworker who is properly trained. Hanford Facility personnel must be trained within 6 months after their employment at or assignment to the Hanford Facility, or to a new job title/position at the Hanford Facility, whichever is later.

General Hanford Facility training: Refer to description in Attachment 33, Chapter 8.0, Section 8.1.

Contingency Plan training: Hanford Facility personnel receive training on applicable portions of the *Hanford Emergency Management Plan* (Permit Attachment 4) in general Hanford Facility training. In addition, Hanford Facility personnel receive training on content of the description of actions contained in contingency plan documentation in Chapter 7.0 to be able to effectively respond to emergencies.

Emergency Coordinator training: Hanford Facility personnel who perform emergency coordinator duties in WAC 173-303-360 (e.g., Building Emergency Director) in the Hanford Incident Command System receive training on implementation of the contingency plan and fulfilling the position within the Hanford Incident Command System. These Hanford Facility personnel must also become thoroughly familiar with applicable contingency plan documentation, operations, activities, location, and properties of all waste handled, location of all records, and the unit/building layout.

Operations training: Dangerous waste management operations training (e.g., waste designation training, shippers training) is determined on a unit-by-unit basis and considers the type of waste management unit (e.g., container management unit) and the type of activities performed at the waste management unit (e.g., sampling). For example, training provided for management of dangerous waste in containers is different than the training provided for management of dangerous waste in a tank system. Common training required for compliance within similar waste management units can be provided in general training and supplemented at the TSD unit. Training provided for TSD unit-specific operations is identified in the training plan documentation based on: (1) whether a general training course exists, (2) the training needs to ensure waste management unit compliance with WAC 173-303, and (3) training commitments agreed to with Ecology.

8.1.2 Continuing Training

Continuing training meets the requirements for WAC 173-303-330(1)(b) and includes general Hanford Facility training and TSD unit-specific training.

General Hanford Facility training: Annual refresher training is provided for general Hanford Facility training. Refer to description in Attachment 33, Chapter 8.0, Section 8.1.

Contingency plan training: Annual refresher training is provided for contingency plan training. Refer to description above in Section 8.1.1.

Emergency coordinator training: Annual refresher training is provided for emergency coordinator training. Refer to description above in Section 8.1.1.

Operations training: Refresher training occurs on many frequencies (i.e., annual, every other year, every 3 years) for operations training. When justified, some training will not contain a refresher course and will be identified as a one-time only training course. The TSD unit-specific training plan documentation will specify the frequency for each training course. Refer to description above in Section 8.1.1.

8.2 DESCRIPTION OF TRAINING DESIGN

Proper design of a training program ensures personnel who perform duties on the Hanford Facility related to WAC 173-303-330(1)(d) are trained to perform their duties in compliance with WAC 173-303. Actual job tasks, referred to as duties, are used to determine training requirements. The first step taken to ensure Hanford Facility personnel have received the proper training is to determine and document the waste management duties by job title/position. The second step compares waste management duties to general waste management unit training curriculum. If general waste management unit training curriculum does not address the waste management duties, the training curriculum is supplemented and/or on-the-job training is provided. The third step summarizes the content of a training course necessary to ensure that the training provided to each job title/position addresses associated waste management duties. The last step is to assign training curriculum to Hanford Facility personnel based on the previous evaluation. The training plan documentation contains this process.

Waste management duties include those specified in Section 8.1 as well as those contained in WAC 173-303-330(1)(d). Training elements of WAC 173-303-330(1)(d) applicable to the 242-A Evaporator operations include the following:

- Procedures for using, inspecting, repairing, and replacing emergency and monitoring equipment
- Key parameters for automatic waste feed cut-off systems
- Communications or alarm systems
- Response to fires or explosions
- Shutdown of operations.

Hanford Facility personnel who perform these duties receive training pertaining to their duties. The training plan documentation described in Section 8.3 contains specific information regarding the types of training Hanford Facility personnel receive based on the outline in Section 8.1.

8.3 DESCRIPTION OF TRAINING PLAN

In accordance with Permit Condition II.C.3, the unit-specific portion of the Hanford Facility Dangerous Waste permit application must contain a description of the training plan. Training plan documentation is maintained outside of the Hanford Facility Dangerous Waste Part B permit application and the Permit. Therefore, changes made to the training plan documentation are not subject to the Permit modification process. However, the training plan documentation is prepared to comply with WAC 173-303-330(2).

Documentation prepared to meet the training plan consists of hard copy and/or electronic media as provided by Permit Condition II.C.1. The training plan documentation consists of one or more documents and/or a training database with all the components identified in the core document.

A description of how training plan documentation meets the three items in WAC 173-303-330(2) is as follows:

1. -330(2)(a): "The job title, job description, and name of the employee filling each job. The job description must include requisite skills, education, other qualifications, and duties for each position."

   Description: The specific Hanford Facility personnel job title/position is correlated to the waste management duties. Waste management duties relating to WAC 173-303 are correlated to training courses to ensure training properly is assigned.

   Only names of Hanford Facility personnel who carry out job duties relating to TSD unit waste management operations at the 242-A Evaporator are maintained. Names are maintained within the training plan documentation. A list of Hanford Facility personnel assigned to the 242-A Evaporator is available upon request.

Information on requisite skills, education, and other qualifications for job titles/positions are addressed by providing a reference where this information is maintained (e.g., human resources). Specific information concerning job title, requisite skills, education, and other qualifications for personnel can be provided upon request.

2. -330(2)(b): "A written description of the type and amount of both introductory and continuing training required for each position."

Description: In addition to the outline provided in Section 8.1, training courses developed to comply with the introductory and continuing training programs are identified and described in the training plan documentation. The type and amount of training is specified in the training plan documentation as shown in Table 8-1.

3. -330(2)(c): "Records documenting that personnel have received and completed the training required by this section. The Department may require, on a case-by-case basis, that training records include employee initials or signature to verify that training was received."

Description: Training records are maintained consistent with Attachment 33, Chapter 8.0, Section 8.4.

Table 8.1. 242-A Evaporator Training Matrix

		Training Category					
Attachment 33 Chapter 8 Training Category		General Hanford Facility Training	Contingency Plan Training	Emergency Coordinator Training	Operations Training		
Operating Unit 4: 242A Evaporator Dangerous Waste Training Plan (TFC-PLN-07) implementing category		Orientation Program (Tank Farm and 242-A Evaporator)	Emergency Hazards Check List	Emergency Coordinator Training	General Waste Management (handling, segregation, and packaging)	Container Management	Tank System Management
Job title/position	Dangerous Waste Worker Categories*						
Nuclear Chemical (Operators)	Waste Worker	X	X	X	X	X	X
Shift Technical Advisor (STAs)	Waste Worker Supervisor/ Manager	X	X		X		
Shift Manager (SMs)	Waste Worker Supervisor/ Manager	X	X	X	X		
Operational Engineer (OEs)	Waste Worker Supervisor/ Manager	X	X	X	X		
Environmental Compliance Officer	Waste Worker Supervisor/ Manager	X	X	X	X		
Waste Service Provider	Advanced Waste Worker	X	X	X	X	X	

* Dangerous Waste Worker categories are defined in the Tank Farm Contractor Dangerous waste Training Pan (TFC-PLN-07 current revision)

[1] All training currently in Table 8-1 is class-room instruction per WAC 173-3-3-330(1)

Chapter 11.0 Closure and Financial Assurance

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11.0 CLOSURE AND FINANCIAL ASSURANCE

This chapter describes the planned activities and performance standards for closing the 242-A Evaporator. Final closure will begin when the 242-A Evaporator is no longer needed.

Where information regarding treatment, management, and disposal of the radioactive source byproduct material and/or special nuclear components of mixed waste (as defined by the Atomic Energy Act of 1954 as amended) has been incorporated into this document, it is not incorporated for the purpose of regulating the radiation hazards of such components under the authority of this permit or chapter 70.105 RCW and its implementing regulations but is provided for information purposes only.

11.1 CLOSURE PLAN/FINANCIAL ASSURANCE FOR CLOSURE

The 242-A Evaporator will be clean closed with respect to dangerous waste contamination that resulted from operation as a TSD unit. To facilitate closure, the 242-A Evaporator is being viewed as consisting of six components: tanks, ancillary equipment, piping, concrete floors/liners, structures, and underlying soil. Only areas that have treated, stored, or handled dangerous waste will undergo closure activities. Remedial actions with respect to contamination that was not a result of use of these areas for treatment, storage, or handling of dangerous waste are outside the scope of this closure plan.

Contaminated equipment, tanks, and piping removed from the 242-A Evaporator will be considered "debris" and transported to an appropriate permitted treatment, storage, or disposal unit for final disposition. Uncontaminated structures will be left for future use or disassembled, dismantled, and removed for disposal. Uncontaminated equipment and structures could include aqueous makeup, HVAC and piping, steam condensate and cooling water piping, the control room, change rooms and administrative/office areas.

The pipes located west and north of the 242-A Evaporator, which connect to A Farm and AW Farm, are in the same bundles with pipes used for transfers between tanks in the DST System. To minimize radiation exposure during closure, these pipes will be closed at the same time the piping for the DST System is closed. Closure of these pipes will be performed per Double-Shell Tank System Dangerous Waste Permit Application (DOE/RL-90-39).Clean closure requires decontamination or removal and disposal of all dangerous waste, waste residues, contaminated equipment, soil, or other material established in accordance with the clean closure performance standards of WAC 173-303-610(2). This and future closure plan revisions will provide for compliance with these performance standards. All work will be performed ALARA with respect to worker exposure to dangerous and/or any other workplace hazards. Activities that are planned to achieve clean closure are presented in the following sections.

11.2 CLOSURE PERFORMANCE STANDARD

Clean closure, as provided for in this plan, and in accordance with WAC 173-303-610(2), will eliminate future maintenance and will be protective of human health and the environment.

After closure, the appearance of the land where the 242-A Evaporator is located will be consistent with the appearance and future use of the surrounding land areas. This closure plan proposes to leave clean structures and equipment in place after closure for potential future operations. This need will be evaluated at the time of closure.

11.2.1 Closure Standards for Metal Surfaces, and Concrete

This closure plan proposes use of a 'clean debris surface' (defined in the following paragraph) as the clean closure performance standard for the metal surfaces, and concrete that will remain after closure. This approach is consistent with Ecology guidance (Ecology 1994) for achievement of clean closure.

Attainment of a clean debris surface can be verified visually in accordance with the standard that states, "A clean debris surface means the surface, when viewed without magnification, shall be free of all visible contaminated soil and hazardous waste except residual staining from soil and waste consisting of light shadows, slight streaks, or minor discolorations and soil and waste in cracks, crevices, and pits may be present provided that such staining and waste and soil in cracks, crevices, and pits shall be limited to no more than 5% of each square inch of surface area" (40 CFR 268.45).

Decontamination of concrete, per the 'debris rule' is based on a physical extraction method (40 CFR 268.45, Table 1). The performance standard is based on removal of the contaminated layer of debris. The physical extraction performance standard for concrete is removal of 0.6 centimeter of the surface layer and treatment to a clean debris surface.

11.2.2 Closure Standards for Tanks

Using the 242-A Evaporator's decontamination system, the tank system could be flushed and decontaminated. The rinsate will be sampled and analyzed. Results of the analysis with less than designation limits for the constituents of concern will be accepted as indicating that the tanks are clean with respects to dangerous waste residues. An alternative to decontaminating the tanks is to remove and dispose of the tanks accordingly.

11.2.3 Closure Standards for Internal and/or External Piping

The internal and/or external piping of 242-A Evaporator will be flushed and drained as part of closure. For piping where the contaminated surfaces can be inspected, an inspection will be performed to see if the piping meets the clean debris surface standard in 40 CFR 268.45 incorporated by reference and can be declared non-dangerous in accordance with WAC 173-303-071(3)(qq). If it is not possible to inspect the contaminated surfaces or meet the clean debris surface performance standard, the particular piping of concern will be removed, designated, and disposed of accordingly.

Dangerous and/or mixed-waste materials generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303-610(5).

11.2.4 Closure Standards for Ancillary Equipment

Ancillary equipment is defined as pumps and other miscellaneous equipment not otherwise specified in this closure plan. Ancillary equipment will be removed and disposed.

11.2.5 Closure Standards for Underlying Soils

Clean closure of soil under the 242-A Evaporator will be accomplished by determining that the coated concrete floor and stainless steel liners, kept contaminants from reaching the soil. The coated concrete and liners provided secondary containment for all the tanks, process piping, and ancillary equipment within the building. Unless inspections identify potential through-thickness cracks indicating containment failure and a subsequent potential for soil contamination from TSD unit operations, the soil will be considered clean closed. However, if inspections identify such cracks, and there have been documented spills in the vicinity, potential soil contamination will be investigated. Soils will be sampled and analyzed for constituents of concerns. If the soil analytical results determine that, the constituents of concern are at or below agreed to regulatory cleanup levels, the soil will be considered clean closed. Permit Condition II.K defines regulatory cleanup levels. Sampling and disposal objectives will be determined at the time of closure activities through the data quality objectives process. If verification sampling is required, a sampling analysis plan will be prepared before closure in a manner consistent with Ecology guidance (Ecology 1994) for achievement of clean closure.

11.3 CLOSURE ACTIVITIES

At the time of closure, the closure plan will be modified as necessary to reflect current regulations and information. If it is determined that clean closure is not possible, the closure plan will be modified to address required postclosure activities.

11.3.1 General Closure Activities

Closure of the 242-A Evaporator will include removal of accumulated liquid waste (i.e., liquid remaining from evaporator campaigns) by transferring the waste to the DST System and/or LERF. After the waste has been removed, clean closure of the tanks, process equipment, the piping, concrete/liners, and the structures will be accomplished by decontaminating the components, if required and demonstrating that clean closure performance standards are met in accordance with WAC 173-303-610. Clean closure of the soil will be accomplished by demonstrating that the concrete and liners kept the contaminants from reaching the soil. If it is determined that soil contamination is possible, investigation and cleanup of the soils will also be managed in accordance with WAC 173-303-610(2)(b).

Equipment or materials (personnel protective equipment, steam cleaners, etc.) used in performing closure activities will be decontaminated or disposed at a permitted TSD facility as appropriate.

11.3.2 Constituents of Concern for Closure for 242-A Evaporator

Based on process knowledge and the risk to human health and the environment, the constituents of concern for closure will be selected from the list of dangerous waste numbers in Chapter 1.0 through the data quality objective process.

11.3.3 Removing Dangerous Waste

All of the waste inventory at the 242-A Evaporator will be processed before closure. Any residue remaining in piping and equipment will be removed to an appropriate TSD unit.

11.3.4 Decontaminating Structures, Equipment, and Soils

Before closure activities begin, all waste inventories will be removed. To facilitate closure, tanks, internal and/or external piping, ancillary equipment, concrete floors/liners, structures, and soil directly beneath the structure will be decontaminated, as necessary, to demonstrate that the clean closure performance standards are met.

Removal and disposal of most of the components will be determined at the time of closure. Clean closure of the soil will be accomplished by demonstrating that the concrete/liners kept contaminants from reaching the soil.

11.3.4.1 Tanks

In accordance with WAC 173-303-640 (8) at closure all pumpable waste will be removed from the interior of the tanks, including the internal components such as the process condensate agitator. Both interior and exterior tanks surfaces will be decontaminated by flushing or spraying with steam, a water-soluble cleaner, or other approved method, or removed as debris and disposed appropriately.

If the tanks are decontaminated, the tanks will be inspected visually for compliance with the clean debris surface standard (40 CFR 268.45, Table 1, Extraction Technologies). If any areas are found not to meet the clean debris surface performance standard, these areas will be decontaminated in-place. Per the debris rule, only removal of contaminants from the surface layer is necessary for metal surfaces. Contamination will be removed as specified in 40 CFR 268.45, Table 1, Extraction Technologies and/or other Ecology approved methods.

If the decontamination option is used, the outside of the tanks also will be inspected for compliance to the clean debris surface standard. Any areas found not to meet this performance standard will be decontaminated in-place. Contamination will be removed from the surface layer using any of the methods described for internal tank decontamination as specified in *Alternate Treatment Standards for Hazardous Debris* (40 CFR 268.45, Table 1, Extraction Technologies and/or other Ecology approved methods).. Before using decontamination solutions on the outside of the tanks, the floor will be inspected for cracks or other openings that could provide a pathway to soil. This inspection will be performed as described in Section 11.2.1 of this chapter in conjunction with mapping of potential through-thickness cracks. Any such cracks will be mapped. The cracks will be sealed before beginning treatment or other engineered containment devices (e.g., collection basins) will be used to collect and contain solutions.

Decontamination waste will be generated as a result of decontamination activities. Decontamination waste may include but not be limited to the following: contaminated rags, and decontamination residue (liquids and solvents used in the decontamination process). This waste will be collected, designated, and managed in accordance with WAC 173-303. If it is not possible to meet the closure by removal or decontamination (clean closure) performance standard, contaminated portions of the tanks could be removed, designated, and disposed of in accordance with 40 CFR 268, incorporated by reference by WAC 173-303-140 as appropriate. The inspections for a clean debris surface will be documented on an inspection record.

11.3.4.2 Internal and/or External Piping and Ancillary Equipment

The internal piping and ancillary equipment for the 242A Evaporator will be flushed and drained as part of closure. For piping where the contaminated surfaces can be inspected, an inspection will be performed to see if the piping meets the clean debris surface standard in 40 CFR 268.45 and can be declared non-dangerous. If it is not possible to meet the clean debris surface standard or the piping cannot be inspected, portions of the internal piping will be removed, designated, and disposed of accordingly.

External piping (transfer lines) and ancillary equipment between 242A and LERF consists of below grade and above grade piping. Below grade piping will be dispositioned at closure either by removal, designation and disposal in accordance with WAC 173-303-610(5) and 40 CFR 268 or closed in accordance with another Ecology approved process. For above grade piping, it will be dispositioned consistent with the provisions for internal piping.

Rinsate from the external piping and internal piping will be processed through ETF. Details regarding the process for rinsing any internal and external piping and ancillary equipment will be provided in the closure plan in accordance with WAC 173-303-610(3)(a)(v) upon modification as stated in Section 11.6 Dangerous and/or mixed-waste generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303-610(5).

If the performance standards are not met, the interior surfaces will be cleaned using an appropriate decontamination method and the method repeated until the surfaces meet the clean closure performance standard.

The 207-A pump pit, located east of the 242-A Evaporator, will be closed using the performance standards for pipes and concrete (e.g., WAC 173-303-610(5) and 40 CFR 268 debris rule standards Table 1, Extraction technologies.). A visual inspection will be performed. If the interior surfaces meet the performance standards (clean debris surface), the 207-A pump pit will be considered clean closed.

If the performance standards are not met for any components described above, the interior surfaces will be cleaned using an Ecology approved decontamination method and the method repeated until the surfaces meet the clean closure (clean debris surface) performance standard; or a decision will be made to remove, designate and dispose of piping and equipment in accordance with WAC 173-303.

11.3.4.3 Concrete/Liner

The coated concrete floor and the pump room sump liner provide secondary containment for all the tanks, process piping, and ancillary equipment. All concrete and liners will be inspected visually and surveyed radiologically before any decontamination. The purpose of the inspection will be twofold: to identify and map any cracks in the concrete that might have allowed contaminants a pathway to the soil below and to identify areas that potentially are contaminated with dangerous waste or dangerous waste residues. The inspection standard will be a clean debris surface as defined in Section 11.2 .1. The inspection of the concrete for a clean debris surface will be documented on an inspection record. Those areas already meeting the standard will be clean closed as is.

Those potentially contaminated areas will undergo decontamination to meet the clean closure standard of a clean debris surface. The concrete will be washed down; the rinsate collected, designated, and disposed of accordingly. The concrete will be re-inspected for a clean debris surface. Concrete surfaces indicated by visual examination, as potentially still being contaminated will have the surface layer removed to a depth of 0.6 centimeter by scabbing or other approved methods. This will not threaten the environment, even if potential through-thickness cracks had been found during the inspection, because concrete decontamination (scabbing) will not employ liquid solutions that could enter cracks and because scabbing residues will be vacuumed away from cracks as any residue is generated.

Achievement of a clean debris surface will be documented on an inspection record. Decontamination residues will be collected, designated, and managed as appropriate.

11.3.4.4 Structures

If contaminated with either dangerous or mixed waste constituents, structures will be decontaminated and/or disassembled, if necessary, packaged, and disposed in accordance with existing land disposal restrictions (WAC 173-303-140).

Closure steps could include the following activities.

- Containerize (as necessary and practicable) and remove any remaining waste.
- Review operating records for spillage incidents and visually inspect area surfaces for evidence of contamination or for cracks that could harbor contamination or allow the escape of decontamination solutions. Inspect storage area surfaces for visible evidence of contamination (e.g., discoloration, material degradation, wetness, and odor). If contamination is evident, the affected area(s) will be decontaminated.

- Decontaminate walls and floors to minimize the potential for loose contamination and to facilitate any required radiation surveys and/or chemical field screening. Wash down could be by water rinse or high-pressure, low-volume steam cleaning coupled with a detergent wash. After decontamination, the building walls and floor will be compared to closure performance standards.
- Collect rinsate and manage as dangerous waste for appropriate disposal.
- Secure (lock) personnel entries into building and post doors with appropriate warning signs.

Clean closure of structures will occur in accordance with WAC 173-303-610. Remediation of soil contamination beneath or around containment buildings will be performed in conjunction soil closure requirements.

11.3.4.5 Underlying Soils

Clean closure of soil under the 242-A Evaporator will be accomplished by demonstrating that the coated concrete floor and stainless steel liners kept contaminants from reaching the soil. The coated concrete floor provided secondary containment for all the tanks, process piping, and ancillary equipment. Unless inspections identify potential through-thickness cracks indicating containment failure and a subsequent potential for soil contamination from TSD unit operations, the soil will be considered clean closed. However, if inspections identify such cracks, and there have been documented spills in the vicinity, potential soil contamination will be investigated.

Where it is possible to inspect visually directly beneath the tanks, a visual inspection will be performed. Where it is not possible to inspect visually beneath the tanks, an evaluation of the tank integrity will be made. The condition of the tank will be evaluated to determine if there was any potential for leakage. If no cracks, severe corrosion, or evidence of leaks is observed, it will be reasoned that mixed or dangerous waste solutions could not have penetrated to the soil directly below the tank.

11.4 MAXIMUM WASTE INVENTORY

The 242-A Evaporator is used to treat mixed waste from the DST System by removing water and most volatile organics. Two waste streams leave the 242-A Evaporator following the treatment process. The first waste stream, the concentrated slurry (in which approximately half the water content is removed and a portion of the volatile organics), is pumped back into the DST System. The second waste stream, process condensate (containing a portion of the volatile organics removed form the mixed waste during the evaporation process), is routed through condensate filters before being transferred to LERF. The 242-A Evaporator is used to treat up to 870,642 liters of mixed waste per day.

Tank C-100 receives process condensate and potentially contaminated drainage from the vessel vent system. The maximum design capacity for the C-100 tank is 67,380 liters.

Vapor-liquid separator, C-A-1, is located in the evaporator room and is used to separate vapor from the boiling slurry solution and deentrain liquid from the vapor before it enters the condensers in the condenser room. The maximum design capacity of C-A-1 is 103,217 liters.

11.5 CLOSURE OF TANKS

Clean closure of 242-A Evaporator will consist of the removal and disposal of all dangerous waste and the decontamination and/or removal and disposal of contaminated equipment, including tanks.

11.6 SCHEDULE FOR CLOSURE

Closure of 242-A Evaporator is not anticipated to occur within the next 15 to 20 years. The actual year of closure will depend on the time required for current waste to be processed and what role the 242-A Evaporator will play in processing additional waste generated during future activities in the 200 Areas. Other factors affecting the year of closure include changes in operational requirements, lifetime extension upgrades, and unforeseen factors. When a definite closure date is established, a revised closure plan will be submitted to Ecology. The activities required to complete closure are planned to be accomplished within 180 days in accordance with WAC 173-303-640(4)(c). Should a modified schedule be necessary, a revised schedule will be presented and agreed to before closure in accordance with WAC 173-303-640(4)(b).

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