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ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 653806

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. USQ Required?	5. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	Steve G. McKinney, Data Assessment and Interpretation, R2-12, 372-1945	[] Yes [X] No	05/26/99
	6. Project Title/No./Work Order No.	7. Bldg./Sys./Fac. No.	8. Approval Designator
	Tank 241-AW-102	241-AW-102	N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.)	10. Related ECN No(s).	11. Related PO No.
	HNF-SD-WM-ER-363, Rev. 1-C	ECNs: 635470, 635523, 644461, 644490	N/A

12a. Modification Work	12b. Work Package No.	12c. Modification Work Complete	12d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 12b) [X] No (NA Blks. 12b, 12c, 12d)	N/A	N/A Design Authority/Cog. Engineer Signature & Date	N/A Design Authority/Cog. Engineer Signature & Date

13a. Description of Change 13b. Design Baseline Document? [] Yes [X] No

This ECN has been generated in order to update the document to reflect results of recent data/information evaluation.

Replace pages:
2-1, 2-2, 2-5 through 2-8, 4-1, 4-2, 5-1, and 5-2

JUN 1999
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14a. Justification (mark one)

Criteria Change	[X]	Design Improvement	[]	Environmental	[]	Facility Deactivation	[]
As-Found	[]	Facilitate Const	[]	Const. Error/Omission	[]	Design Error/Omission	[]

14b. Justification Details

A tank characterization report page change revision is required to reflect the results of recent evaluation of data/information pertaining to adequacy of tank sampling for safety screening purposes (Reynolds et al. 1999, Evaluation of Tank Data for Safety Screening, HNF-4217, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington).

15. Distribution (include name, MSIN, and no. of copies)

See attached distribution.

RELEASE STAMP
DATE:
STA: 4
HANFORD RELEASE
MAY 27 1999

A-7900-013-2 (05/96) GEF095

ENGINEERING CHANGE NOTICE	Page 2 of 2	1. ECN (use no. from pg. 1) ECN-653806

16. Design Verification Required	17. Cost Impact				18. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] Yes	Additional	[] $	Additional	[] $	Improvement	[]
[X] No	Savings	[] $	Savings	[] $	Delay	[]

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]	Tickler File	[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
N/A		

21. Approvals

	Signature	Date		Signature	Date
Design Authority			Design Agent		
Cog. Eng. S.G. McKinney	Henry McKinney	5/27/99	PE		
Cog. Mgr. K.M. Hall	[signature]	5/27/99	QA		
QA			Safety		
Safety			Design		
Environ.			Environ.		
Other			Other		
			DEPARTMENT OF ENERGY		
			Signature or a Control Number that tracks the Approval Signature		
			ADDITIONAL		

Tank Characterization Report for Double-Shell Tank 241-AW-102

Steve G. McKinney
Lockheed Martin Hanford Corp., Richland, WA 99352
U.S. Department of Energy Contract 8023764-9-K001

EDT/ECN: ECN-653806 UC: 2070
Org Code: 74B20 CACN/COA: 102217/EI00
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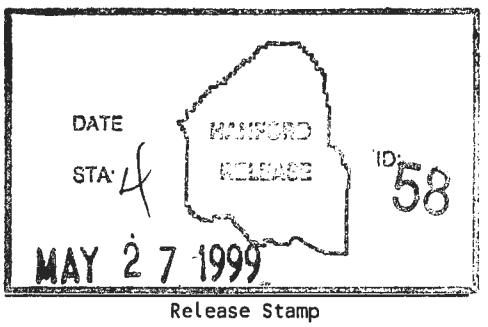
Key Words: Waste Characterization, Double-Shell Tank, DST, Tank 241-AW-102, Tank AW-102, AW-102, AW Farm, Tank Characterization Report, TCR, Waste Inventory, TPA Milestone M-44

Abstract: N/A

5/27/99
Release Approval Date



Release Stamp

Approved for Public Release

RECORD OF REVISION	(1) Document Number HNF-SD-WM-ER-363	Page 1

(2) Title
Tank Characterization Report for Double-Shell Tank 241-AW-102

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) Initially released 09/28/94 on EDT-608073.	B.C. Simpson	C.S. Haller
		K.E. Bell	Kathleen M. Hall 5/23/97
1 RS	Incorporate per ECN-635470.	K.E. Bell	K.M. Hall
		K.E. Bell	Kathleen M. Hall 8/20/97
1-A RS	Incorporate per ECN-635523.	K.E. Bell	K.M. Hall
		K.E. Bell	Kathleen M. Hall 8/20/97
1B RS	Incorporate per ECN-644461	M. J. Kupfer	K. M. Hodgson
		M.J. Kupfer 8-7-97	K.M. Hodgson 8-7-97
1C RS	Incorporate per ECN-644490	M. J. Kupfer	K. M. Hodgson
		M.J. Kupfer 9-10-98	K.M. Hodgson 9-11-98
1-D RS	Incorporate per ECN-653806.	S.G. McKinney	K.M. Hall
		Steve McKinney	K.M. Hall 5/27/99

2.0 RESPONSE TO TECHNICAL ISSUES

The following four technical issues have been identified for tank 241-AW-102 (Brown et al. 1996).

- **Safety screening**. Does the waste pose or contribute to any recognized potential safety problems?
- **Vapor screening**. Does the tank headspace exceed 25 percent of the lower flammability limit, and if so, what are the principal fuel components?
- **Compatibility**. Is there assurance that commingling waste types during interim storage creates no safety problems? Is there assurance of continued operability during waste transfer and waste concentration/minimization?
- **Pretreatment**. Will providing tank waste samples to the Pretreatment program result in information necessary to satisfactorily support the TWRS disposal mission?

The 1995 and 1996 grab sampling events took place to satisfy the compatibility issue. The 1996 vapor sampling satisfied the tank headspace flammability issue of the safety screening DQO. Data from the recent analysis of two grab sampling events provided the means to respond to the compatibility issue. The organic solvent screening requirements described in Cash (1996) do not apply to tank 241-AW-102 because the tank is actively ventilated. See Appendix B for sample and analysis data for tank 241-AW-102.

2.1 SAFETY SCREENING

The data needed to screen the waste in tank 241-AW-102 for potential safety problems are documented in *Tank Safety Screening Data Quality Objective* (Dukelow et al. 1995). The safety issues are exothermic conditions in the waste; flammable gases in the waste and/or tank headspace; and criticality conditions in the waste. Neither the 1995 nor 1996 grab sampling event was intended to specifically address the issues of the safety screening DQO. However, the tank was sufficiently sampled and analyzed to satisfy the requirements of the safety screening DQO (Reynolds et al. 1999). The safety of the tank is ensured by adhering to the operating and specifications document for the double-shell tanks (WHC 1996). Tank headspace vapor sample data were gathered during the 1996 grab sampling event and are available. In addition, energetics and $^{239/240}$Pu activity were determined on selected 1995 and 1996 grab samples to evaluate waste compatibility.

2.1.1 Exothermic Conditions (Energetics)

The first requirement outlined in the safety screening DQO is to ensure that tank 241-AW-102 does not contain enough fuel to cause a safety hazard. Energetic measurements using differential scanning calorimetry (DSC) were performed on supernatant from the 1995 grab samples and solids from the 1996 grab samples. No exotherms were observed.

2.1.2 Flammable Gas

Vapor phase measurements taken in the tank headspace before the 1996 grab sampling event indicated that no flammable gas was detected (0 percent of the lower flammability limit). Data from these vapor phase measurements are presented in Appendix B.

2.1.3 Criticality

The safety threshold limit is 1 g ^{239}Pu per liter of waste. Analyses for $^{239/240}Pu$ were performed on supernate and sludge from the 1995 grab samples and on solids from the 1996 grab samples. Attributing all $^{239/240}Pu$ activity to ^{239}Pu, the activity of ^{239}Pu is well below the 1-g/L limit in both the supernate and the solids. Therefore, the data indicate that tank 241-AW-102 had no criticality concern at the time of sampling.

2.2 WASTE COMPATIBILITY EVALUATION

Tank 241-AW-102 serves as the 242-A Evaporator feed tank and is therefore very active. The compatibility DQO (Fowler 1995a) involves the following two issues.

- "Assurance that no safety problems are created as a result of commingling wastes under interim storage."
- "Assurance of continued operability during waste transfer and waste concentration/minimization..."

In accordance with the compatibility DQO and the waste compatibility SAPs (Schreiber 1995 and Bell 1996), the 1995 and 1996 grab samples from tank 241-AW-102 were analyzed to assess the safety and operational implications of waste commingling and storage before, during, and after 242-A Evaporator campaigns. Safety considerations include criticality, flammable gas accumulation, energetics, and corrosion. Operational considerations include TRU and complexant segregation, heat load, pumpability, and high-phosphate waste. Table 2-1 presents the analyses used to evaluate the waste for compliance with

Table 2-1. Waste Compatibility Data Quality Objective Decision Variables and Criteria for the Tank 241-AW-102 1995 Grab Samples. (3 sheets)

Safety Issue	Primary Decision Variable	Decision Criteria Threshold	Mean Analytical Result - 1995 Grab Samples	Mean Analytical Result - 1996 Grab Samples (Solids only)
Operations Issue (Cont'd)				
High-phosphate waste	PO_4^{3-}, Na	$[PO_4^{3-}] < 0.1$ M, $[Na^+] < 8.0$ M[2]	Liquids: $[PO_4^{3-}] = 0.0149$ M, $[Na^+] = 2.09$ M Solids: NP	NP

Notes:

NP = not performed
TOC = total organic carbon
TRU = transuranic

[1]Additional analytes are ^{238}Pu, ^{241}Am, ^{237}Np, and volume percent solids (Fowler 1995a).
[2]Decision critertia(on) from Von Bargen (1995).
[3]Decision critertia(on) from WHC (1996).
[4]Decision critertia(on) from Fowler (1995a).
[5]The additional analyte of TGA was requested to aid in interpretation of the DSC results and for calculation of the dry TOC results.
[6]Fowler (1995b)
[7]Additional analyte of total alpha activity (Von Bargen 1995).
[8]Additional analytes are Cm-244, C-14, H-3, Se-79, Tc-99, Np-237, I-129, Total U, Total beta, Ru/Rh-106, Ra-226, Nb-94, Eu-154, Eu-155, Cs-134, Co-60, and Ce-144 (Von Bargen 1995).

the safety and operational considerations that are within the scope of this report. The primary decision variable, the notification limit, and the analytical results from the 1995 and 1996 grab sampling event are listed for each safety or operational issue.

Apparently not all listed analyses and evaluations were within the notification limits imposed by or through the waste compatibility DQO. Some criteria clearly apply only to supernatant (WHC 1996), however other safety and operational considerations could apply to both the supernatant and solid waste in the tank. The solids density measured 1.42 g/mL. The compatibility decision criterion of less than 1.41 g/mL applies to the commingled waste; presumably the solids and liquids in tank 241-AW-102. The average specific gravity of the solids and liquids is less than 1.41, therefore the flammable gas accumulation criterion was met.

The data show that the solids in tank 241-AW-102 were classified as TRU. This does not necessarily violate any compatibility operations issue. The compatilibity DQO requires that these TRU solids be segregated from non-TRU solids and from liquids containing complexing agents that would solubilize the TRU constituents.

A second operational consideration that appeared to have exceeded the threshold was heat load. The ^{90}Sr activity on the solids in the 1995 grab samples is greater than the threshold listed in the third column of Table 2-1. However, despite the high ^{90}Sr activity in the solids, the heat load limit was probably not violated for the following two reasons. WHC (1996) assumes that the tank contained one million gallons of waste when the solids volume was actually 35.5 kgal and the total (liquids plus solids) heat load was calculated at 909 W, well below the 20,000 W limit (Le 1997).

2.3 SUMMARY

Neither the 1995 nor the 1996 sampling event in tank 241-AW-102 was intended specifically to address the requirements of the safety-screening DQO. However, both the supernatant and solids waste samples analyzed by DSC showed no exothermic behavior. Analysis of the supernatant solids for $^{239/240}Pu$ were well below the safety screening notification limit, however the $^{239/240}Pu$ and ^{241}Am activities were high enough to designate the solids as TRU waste. Vapor samples in the tank headspace were measured at 0 percent of the lower flammability limit (LFL). Since 241-AW-102 is a feed tank for the evaporator, all waste is safety and compatibility screened prior to transfer to 241-AW-102. Sampling and analyses were sufficient to satisfy the safety screening DQO (Reynolds et al. 1999).

The results from all analyses performed to address the waste compatibility safety and operational issues showed that all the criteria were met. The only potential concern was with flammable gas accumulation caused by the high specific gravity of the solids in tank 241-AW-102. The low specific gravity of the tank liquids, the relatively shallow solids waste

layer, and the low total organic carbon (TOC) content of the solids suggest that flammable gas generation is not a concern (Simpson et al. 1993).

Designating the solids as TRU waste does not necessarily present a safety issue. The compatibility DQO only requires that any waste that contacts TRU wastes must not dissolve the TRU material. A summary of the DQO that applied to this tank is presented in Table 2-2. Analytical results are available in Appendix B.

Table 2-2. Summary of Compatibility Data Quality Objectives Evaluation.

Issue	Sub-issue	Result
Waste Compatibility	Criticality	Passed
	Flammable gas accumulation	Passed
	Energetics	Passed
	Corrosion	Passed
	TRU segregation	Passed
	Complexant segregation	Passed
	Heat load	Passed
	Pumpability	Passed
	High-phosphate waste	Passed

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4.0 RECOMMENDATIONS

The 1995 and 1996 grab sampling efforts in tank 241-AW-102 satisfied the sampling and analysis requirements of the compatibility and safety screening DQOs. All safety and operational criteria were met.

Although the 1995 and 1996 grab sampling of tank 241-AW-102 was not intended specifically to satisfy the safety screening DQO, tank headspace vapor sample data were gathered during the 1996 grab sampling event and are available. In addition, energetics and $^{239/240}Pu$ activity were determined on selected 1995 and 1996 grab samples to determine waste compatibility. The $^{239/240}Pu$ data indicated that no criticality issue is associated with the tank, no exotherms were observed, and the vapor sample showed the tank headspace flammability at 0 percent of the LFL.

Table 4-1 summarizes the status of the Project Hanford Management Contractor TWRS Program review and acceptance of the sampling and analysis results reported in this TCR. All DQO issues required to be addressed by sampling and analysis are listed in Column 1 of Table 4-1. Column 2 indicates (using "yes" or "no") whether the requirements of the DQO were met by the sampling and analysis activities performed. Column 3 indicates that the TWRS program responsible for the DQO concurs and accepts that the sampling and analysis activities performed adequately meet the needs of the DQO. A "yes" or "no" in Column 3 indicates acceptance or disapproval, respectively, of the sampling and analysis information presented in the TCR.

Table 4-1. Acceptance of Tank 241-AW-102 Sampling and Analysis.

Issue	Sampling and Analysis Performed	PHMC TWRS Program Office Acceptance
Safety screening DQO	Yes	Yes
Waste compatibility DQO	Yes	Yes

Note:

PHMC = Project Hanford Management Contractor

Table 4-2 summarizes the status of TWRS Program review and acceptance of the evaluations and other characterization information contained in this report. The evaluation specifically outlined in this report is the evaluation to determine whether the tank is safe, conditionally safe, or unsafe. Column 1 lists the different evaluations performed in this report. Columns 2 and 3 are in the same format as in Table 4-1. The manner in which concurrence and acceptance are summarized is also the same as in Table 4-1. None of the analyses performed on the 1995 or 1996 grab samples indicate any safety problems.

Table 4-2. Acceptance of Evaluation of Characterization Data and Information for Tank 241-AW-102.

Issue	Evaluation Performed	PHMC TWRS Program Acceptance
Safety categorization (tank is safe)	Yes	Yes

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DISTRIBUTION SHEET

To	From	Page 1 of 2
Distribution	Data Assessment and Interpretation	Date 05/26/99
Project Title/Work Order: Tank Characterization Report for Double-Shell Tank 241-AW-102, HNF-SD-WM-ER-363, Rev. 1-D		EDT No. N/A ECN No. ECN-653806

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
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Sandia National Laboratory P.O. Box 5800 MS-0744, Dept. 6404 Albuquerque, NM 87815					
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Tank Characterization Report for Double-Shell Tank 241-AW-102, HNF-SD-WM-ER-363, Rev. 1-D		ECN No. ECN-653806

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
ONSITE					
Department of Energy - Richland Operations					
W. S. Liou	S7-54	X			
DOE/RL Reading Room	H2-53	X			
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J. W. Cammann	R2-11	X			
S. G. McKinney	R2-12	X			
L. M. Sasaki	R2-12	X			
B. C. Simpson	R2-12	X			
R. R. Thompson	R2-12	X			
ERC (Environmental Resource Center)	R1-51	X			
T.C.S.R.C.	R1-10	5			
Lockheed Martin Services, Inc.					
B. G. Lauzon	R1-08	X			
Central Files	B1-07	X			
EDMC	H6-08	X			
Numatec Hanford Corporation					
J. S. Garfield	R3-73	X			
D. L. Herting	T6-07	X			
Pacific Northwest National Laboratory					
A. F. Noonan	K9-91	X			
Scientific Applications International Corporation					
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