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1	WHC-SD-SQA-CSA 20351		0	CSER 92-003: Classification of Hot Semiworks Waste Tank CX-72 as a Limited Control Facility	250	1,2		

16. KEY					
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		3. Information	6. Dist. (Receipt Acknow. Required)	3. Disapproved w/comment	6. Receipt acknowledged

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1	1	Cog. Eng. E. M. Miller	<i>E. M. Miller</i>	8/18/92	R3-01						
1	1	Cog. Mgr. P. C. Doto	<i>P. C. Doto</i>	8/20/92	R3-01						
1	1	QA <i>[Signature]</i>	<i>[Signature]</i>	8-25-92							
1	2	Safety <i>[Signature]</i>	<i>[Signature]</i>	8/25/92							
		Env.									
1	1	Peer Review S. J. Altschuler	<i>S. J. Altschuler</i>	8/18/92	R3-01						



18. Signature of EDT Originator <i>E. M. Miller</i> Date: <i>8/17/92</i>	19. Authorized Representative for Receiving Organization <i>P. C. Doto</i> Date: <i>8/26/92</i>	20. Cognizant/Project Engineer's Manager <i>[Signature]</i> Date: <i>8/24/92</i>	21. DOE APPROVAL Ltr. No. <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments
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SUPPORTING DOCUMENT

1. Total Pages 4

2. Title

CSER 92-003: Classification of the Hot Semiworks Waste Tank CX-72 as a Limited Control Facility

3. Number

WHC-SD-SQA-CSA-20351

4. Rev No.

0

5. Key Words

Limited Control Facility, CX-72, Pu 239, Hot Semiworks

6. Author

Name: E. M. Miller

Edward M. Miller
Signature

Organization/Charge Code 29210/UE3EE

7. Abstract

This document contains CSER 92-003, which addresses the classification of the Hot Semiworks Waste Tank CX-72 as a limited control area.

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10. RELEASE STAMP

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E.M.W.C. (13)
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9. Impact Level 2 SQ

CSER 92-003

Classification of the Hot Semiworks Waste Tank CX-72
As A Limited Control Facility

Prepared by: Edward M. Milder Date: Aug. 20, 1992
Engineer, Criticality Engineering Analysis (CEA)

Reviewed by: Sidney J. Altschuler Date: 8/20/92
Engineer, Criticality Engineering Analysis

Approved by: [Signature] Date: 8/20/92
Manager, Criticality Engineering Analysis

Approved by: [Signature] Date: 24 Aug 92
Manager, Nuclear Facility Safety

CONCLUSION AND SUMMARY

The Hot Semiworks waste tank 241-CX-72 is classified as a LIMITED CONTROL FACILITY on the basis of the form of the fissionable material. The fissionable material is diluted and confined in a dry solid matrix. The definition in the Nuclear Criticality Safety Manual, WHC-CM-4-29, says that "a limited control facility may contain more than one third of a MCM (minimum critical mass) of fissionable material, however, the form and distribution of the material ensures that a safe mass (considering the form and distribution) cannot be exceeded." To limit the probability of increasing the reactivity of this material in the tank, the following restrictions are imposed on any activity at the CX-72 facility.

- No addition of fissionable material
- Work plans shall include provisions to prevent introduction of significant amounts of moderator (i.e. rain, water, oil, grout, plastic, or other hydrogen bearing material) into the tank or into the space between the tank and the caisson.
- Work plans shall include provisions to prevent significant displacement of TRU waste and to prevent introduction of significant amounts of liquid into the tank that could permeate or dissolve the TRU waste.
- Work plans and procedures for operations at CX-72 shall be reviewed and approved by the Manager, Criticality Engineering Analysis.

These restrictions are specified to control reactivity in CX-72 before and during programs to remove the grout covering the TRU waste and when characterizing the TRU waste. Revisions to this CSER will be required to control removal of any significant amount of the TRU waste.

SYSTEM DESCRIPTION

WHC-SD-CP-TI-148, Revision 0, analyzed the state of the contents of the Hot Semiworks underground waste tank 241-CX-72. The waste is under approximately 20 feet of grout and cannot be easily sampled until the grout is removed. A 3-inch diameter drywell running to the bottom of the tank along the inside edge gave access for analysis of the radioactive material in the tank by insertion of detectors and neutron absorbing foils.

The vertically oriented tank is a cylinder 36 feet long and 40 inches in diameter inside a 6 foot diameter caisson.

METHODS OF ANALYSIS AND RESULTS

The tank was filled with waste from pilot studies of the Plutonium and Uranium Recovery by Extraction (PUREX) process. Boiling has concentrated the waste and reduced its volume by a factor of about five. This waste, which may include fluoride bearing fluids from decontamination of the Hot Semiworks, has dried out to occupy the bottom 11 feet of the tank. Measurements with neutron absorbing foils show that the neutron spectrum is more than 90 percent epithermal. The relative absence of thermal neutrons indicates the waste is dry (although an epithermal spectrum can also be caused by relatively strong absorption of thermal neutrons). However, based on this and other historical data, the report concludes that the waste is solid and dry.

The report also concludes that the plutonium content of the waste can only be determined by analysis of representative samples because estimates based on the measured neutron flux depend on the isotopic composition of the fissionable material and its chemical form. Neither can be measured without samples. Using a realistic and reasonable value of 1 percent plutonium in the waste and the presence of fluorides from the decontamination fluids used at the Hot Semiworks, the report gives a conservative estimate of 150 to 200 grams of plutonium. This amount is orders of magnitude less than a critical mass in a dry matrix of fission products and process chemicals. However, although considered highly unlikely, if the plutonium were in an oxide form with no fluorides, the report gives a plutonium mass in the tank of 150 kg for the most conservatively assumed isotropic composition. This amount is sufficient to cause concern, especially if moderation were present. Other combinations of compositions allow estimates between these values. Although the higher values are considered unlikely, since waste steams with concentrations of plutonium greater than 1 percent would not be thrown away, they are possible and only an analysis of samples can confirm the plutonium content.

To maintain the 241-CX-72 tank in its present state, reactivity disturbances are to be minimized. No fissile material is to be added to tank 241-CX-72.

Activities at the tank should be conducted to prevent a significant amount of moderator from getting between the waste tank and caisson where it could act as a reflector. Moderators would include rain, water, oil, plastics, graphite, concrete, or other hydrogen bearing materials. Liquids that could act as a moderator or dissolve material in the TRU waste are to be restricted from entry into the waste tank by work plans. Samples may be removed, but both grout removal and sample removal are to be controlled by work plans which minimize displacement of the waste. The caisson around and the grout in the tank provide a second barrier to mechanical disturbance and to the addition of moderator, solvent, or fissile material. Review of work plans for removal of the grout covering the waste in the tank or other activities are to be reviewed and approved by Criticality Engineering Analysis to give another check of these restrictions.

REVIEWERS COMMENTS

S. J. Altschuler of the Criticality Engineering Analysis group did the technical review. All his comments were resolved. He concurs with the restrictions, and classification of the Hot Semiworks Waste Tank 241-CX-72.

8/27/92

Date Received: 8/17/92	INFORMATION RELEASE REQUEST	Reference: WHC-CM-3-4
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Title CSER 92-003: The Classification of the Hot Semiworks Waste Tank CX-72 as a Limited Control Facility	Unclassified Category UC-	Impact Level 2SQ
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Project Title/Work Order:

CSER 92-003: The Classification of the the Hot Semiworks Waste Tank CX-72 as a Limited Control Facility

EDT No.: 157906

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