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1. ECN **193432**

Proj. ECN

2. ECN Category (mark one)

- Supplemental
- Direct Revision
- Change ECN
- Temporary
- Standby
- Supersedure
- Cancel/Void

3. Originator's Name, Organization, MSIN, and Telephone No.

A. L. Hess/C&RA/H4-64/2-3771

3a. USQ Required?

Yes No

4. Date

March 10, 1995

5. Project Title/No./Work Order No.

232-Z Remediation/XR5067

6. Bldg./Sys./Fac. No.

232-Z

7. Approval Designator

S *azt*

8. Document Numbers Changed by this ECN (includes sheet no. and rev.)

WHC-SD-SQA-CSA-20390, Rev. 0

9. Related ECN No(s).

-

10. Related PO No.

N/A

11a. Modification Work

- Yes (fill out Blk. 11b)
- No (NA Blks. 11b, 11c, 11d)

11b. Work Package No.

N/A

11c. Modification Work Complete

N/A

11d. Restored to Original Condition (Temp. or Standby ECN only)

N/A

Cog. Engineer Signature & Date

Cog. Engineer Signature & Date

12. Description of Change

Revision of text to emphasize criticality not credible with limited fissile content, changing requirement for fire sprinkler shutoff to recommendation only.

13a. Justification (mark one)

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

13b. Justification Details

Exclusion of fire water not absolutely necessary to prevent criticality

*Refer to USQ screening 20-2371 *azt*

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Document Number: WHC-SD-SQA-CSA-20390, Rev. 1

Document Title: CSER 90-006, ADDENDUM, 1; CRITICALITY SAFETY CONTROL FOR SOURCE TERM REDUCTION PROJECT IN SCRUBBER GLOVEBOX OF BUILDING 232-Z

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This document was reviewed following the procedures described in WHC-CM-3-4 and is:

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SUPPORTING DOCUMENT

1. Total Pages **6**

2. Title

CSER 90-006, ADDENDUM 1: CRITICALITY SAFETY CONTROL FOR SOURCE TERM REDUCTION PROJECT IN THE SCRUBBER GLOVEBOX OF BUILDING 232-Z

3. Number

WHC-SD-SQA-CSA-20390

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5. Key Words

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6. Author

Name: A. L. Hess

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Signature

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7. Abstract

This Criticality Safety Evaluation Report addendum extends the coverage of the original CSER (90-006) about dismantling the ductwork in 232-Z to include cleanout of the Scrubber Glovebox, with an estimated residual Pu holdup of less than 200 grams. For conservatism and containment considerations, the provisions about waste packaging and water exclusion from the original work are retained, even though it is not credible for the Scrubber Pu content to be made critical with water added (NDA gives about 1/3 a minimum critical mass).

8. RELEASE STAMP

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ADDENDUM 1 TO CSER 90-006

Title: CRITICALITY SAFETY CONTROL FOR SOURCE TERM REDUCTION PROJECT IN THE SCRUBBER GLOVEBOX OF BUILDING 232-Z

Prepared by: Allen Z. Hesse Date: 3/8/95
Engineer, Criticality & Radiological Analysis

Reviewed by: Edward M. Miller Date: 3-8-95
Engineer, Criticality & Radiological Analysis

Approved by: Alan R. [Signature] Date: 3/8/95
Manager, Criticality & Radiological Analysis

INTRODUCTION AND SUMMARY

As part of a Cleanout Program for the 232-Z incinerator building, a Scrubber Hood in the facility is to be dismantled and the parts removed as waste in appropriate containers. The criticality safety controls to be used for the scrubber cleanup operations are essentially a continuance of the program established in the original CSER 90-006 for dismantling of ductwork between various hoods in the room. Non-destructive assays (NDA) of residual plutonium inside the scrubber give a high side estimate of 171 grams, which is only a third of the minimum critical mass under optimum water moderation and reflection. The combination of fault conditions (gross NDA errors, water or denser moderator addition, pooling or compaction, reflection, etc) which would be required to produce a criticality render such an event not credible.

DISCUSSION

Since 1987, Building 232-Z has been classified as a Limited Control Facility, meaning that criticality is prevented by the form and distribution of the fissile material. Control has been achieved primarily by prohibiting the addition, removal, or rearrangement of fissile material in the facility. In CSER 90-006, cleanout of some of the facility ductwork was authorized, based on adoption of special procedural controls. Cleanout of the scrubber glovebox is similar work and requires only slight modification of the requirements already provided in CSER 90-006.

It is established that criticality in the Scrubber Glovebox is NOT possible under any moderated and/or reflected conditions with the amount of fissile material present there (the 171 g Pu total documented in the attached table "Compilation of NDA Results"). However, the operating organization should follow best management and criticality prevention practices when performing the work. The controls below are recommended for inclusion in the operations and work plan:

1. Before beginning work that could disturb the fissile material from its current configuration, determine that the materials are essentially dry, that not more than 0.5 liter of liquid could be present in the "section"

to be dismantled. With regards to this glovebox (actually a walk-in cell), a "section" would refer to equipment pieces such as the scrubber, heat-exchanger, filter box, length of off-gas piping, heater, or pumps.

2. Establish physical and/or administrative barriers to preclude the entry of liquid into the fissile material deposits in the scrubber glovebox or in the removed materials:
 - The most appropriate physical barrier would be nuclear blanking and draining the fire sprinkler line to 232-Z building above and around the scrubber glovebox, if allowable under fire control program requirements.

Appropriate administrative controls for water exclusion are as follows;

- A limit in the project CPS to forbid the addition of liquid (with the exceptions of that contained in the paste used for sawing lubrication and in wrung-out damp rags used for cleanup).
- Containment of fissile material inside components during/after their removal, typically in sealed plastic bags or metal containers. Accumulations or minor spillage due to sawing through deposits can be swept into a 1/2-liter jar or can, which is then sealed.
- Double wrapping and sealing of the removed glovebox equipment or piping segments for contamination control, before removal from greenhouse and transfer from 232-Z.

The containment greenhouse constructed for dismantling and segmenting operations and the glovebags used around unbolting or sawing activities also will serve to inhibit fire water access to fissile material. (NOTE: these plastic shrouds are flammable).

3. The scrubber glovebox is near but not connected to the incinerator glovebox. It is required that the scrubber cleanout activity must not dislodge, relocate, or moderate the fissile material in the incinerator glovebox (which is subject to another set of strict inspection and cleanout rules).
4. Duct removal work done as part of the scrubber glovebox cleanout should be conducted in accordance with the existing CSER 90-006.
5. Packaging of contaminated components or spillage of fissile material using plastic containment bags or sleeves is to conform to Section G, "Use of Plastics" in CPS-Z-165-80010 (GENERAL LIMITS). Handling and storage of packages produced by the operations are subject to the rules in CPS-Z-165-80330, "200 Gram Storage Limit for Non-approved Containers". Limiting each package of waste transferred out of 232-Z to no more than 200 grams fissile also assures compliance with applicable waste packaging and disposal CPSs.

Because of the limited fissile content in the scrubber glovebox and its contained process equipment, the work "phase" provision of CSER 90-006 is not relevant to this addendum. (Previous dismantling of ducts required planning into phases with no more than 425 g total fissile material involved per phase).

The intent of the liquid controls is to add a level of conservatism and good management practice to preclude liquid from accumulating in one area in the event of a spill, and also to prevent the application of paints to fix and remove contamination. If the use of Butvar or similar strippable vinyl based paint is necessary, another addendum to the CSER will be needed.

FIRE FIGHTING

To exclude water streams which could rearrange fissile accumulations, it is appropriate to retain the fire category C (foam, mist-sprays, or dry chemicals allowed) for the facility as a whole. It is recommended that a non-hydrogenous fire extinguisher be available inside the greenhouse to handle potential fires in the plastics caused by sawing sparks or other activities.

CONCLUSIONS

The glovebox high-side assay of 171 grams Pu is less than 33% of the minimum critical mass for Pu-239 under ordinary (water moderated) conditions. Even if the NDA is 100% in error (341 grams residual holdup) it would be less than the plastic moderated and reflected plutonium minimum critical mass of about 360 grams Pu. Thus both moderator addition and overbatching would be required before criticality is possible. Further conservatism includes not accounting for ^{240}Pu or other absorbers and the assumptions of optimum Pu concentration, optimum geometry, and full water reflection.

Further support for the recommended controls is provided in CSER 90-006. It is noted that the NDA estimate for the scrubber glovebox is much less than the 600 grams fissile analyzed for the ductwork in CSER 90-006. This is judged to compensate for the lack of pipe diameter restrictions found in the original basis.

The waste packaging requirements for removed contaminated glovebox sections and components, and the administrative rules for keeping fissile material dry, provide conservative, extra contingency controls should the NDA assessments of scrubber Pu holdup be off by more than a factor of 3. For a criticality, it would also have to be possible to wash enough of the material into an unfavorable geometry pool during the cleanout operations; given the controls adopted, this scenario is not credible.

REVIEWER'S COMMENTS

E. M. Miller of Criticality and Radiological Analysis did an independent, technical review of this addendum to CSER 90-006. The reviewer agrees that for a loading of less than 200 grams of plutonium that cleanup of the Scrubber Glovebox is safe from inadvertent nuclear excursions regardless of the fissile materials form or distribution or of water addition. The limits and restrictions including water exclusion add to the safety margin and are appropriate when the quantity of fissile material is determined by NDA methods. The reviewer's suggestions were incorporated into the addendum.

Compilation of NDA results for 232-Z process equipment

The assay values listed below are the result of measurements performed during June, July and August 1994. The list was compiled as the result of a conversation with Cheryl Stallbaum and Don Sorenson on October 14, 1994.

The equipment listed below does not include the Burning Hood. The measured value for the Burning Hood is being determined by NDA.

Equipment ID	Best Value	Low Value	Most Value
Feed Hood	23	1	70
Conveyor	43	18	86
Ash Hood	16	0	39
Pipe below Ash Hood	7	3	12
Cyclone separators	101	60	156
Canning Hood	6	0	19
Scrubber Cell	148	119	171
Filter Box #1	1	0	1
Filter Box #2	2	1	3
E-4 Exhaust Lines	49	32	70
	=====	=====	=====
	396	234	627

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