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ORNL
CENTRAL FILES NUMBER
64 - 11 - 20

DATE: November 9, 1964

COPY NO. 32

SUBJECT: Review of Curium Recovery Facility (Building 4507)

TO: A. M. Weinberg; J. A. Swartout

FROM: Hot Cells and Sources Committee

REVIEW OF CURIUM RECOVERY FACILITY
(Building 4507)

Attendance: October 20, 1964

Members	Operators
D. G. Doherty, Chairman	J. E. Bigelow
C. J. Barton	R. E. Brooksbank
T. W. Hungerford	F. N. Browder
C. H. Miller	W. D. Burch
T. A. Arehart (Guest)	R. L. Jolley
	R. E. Leuze
	J. P. Nichols
	V. C. A. Vaughen
	W. R. Whitson

October 27, 1964

Members	Operators
D. G. Doherty, Chairman	J. E. Bigelow
C. J. Barton	F. N. Browder
J. T. Howe	W. D. Burch
T. W. Hungerford	R. E. Leuze
C. H. Miller	J. P. Nichols
T. A. Arehart (Guest)	F. L. Peishel
	V. C. A. Vaughen

On October 22, 1964, and October 27, 1964, the Hot Cells and Sources Committee met with the operators and reviewed the facility for conformance to Laboratory radiation safety policy. Prior to the meeting written material was distributed to the Committee members as follows:

1. Letter dated 10/16/64, V. C. A. Vaughen and J. E. Bigelow to T. W. Hungerford, "Hazards Review of Cell 4, Building 4507."

2. Letter dated 10/7/64, F. L. Peishel to R. A. Robinson, "Operating Procedure for Loading the Curium-Americium Slug Transfer Cask (CAST)."

3. Letter dated 9/25/64, W. D. Burch to Distribution, "Hazards Analysis for ^{242}Cm Carrier."

4. Draft of CF memorandum, J. P. Nichols and F. L. Peishel to W. D. Burch, "The Curium-Americium Slug Transfer Cask."

5. ORNL-CF-64-10-8, "The Curium-Americium Slug Transfer Cask."

6. Draft of ORNL report, "Hazards Evaluation for Processing Transuranium Elements in the Curium Recovery Facility (Building 4507)" by V. C. A. Vaughen et al., dated October 20, 1964.

7. Draft of ORNL CF Report "Americium-Curium Separation Facilities for Cell 3 of Building 4507."

8. ORNL Drawing No. E-57603

9. ORNL Drawing, "Cell 4 Am-Cm Recovery Engineering Flowsheet, Sheet 1 of 4."

10. ORNL Drawing, "Cell 4 Am-Cm Recovery Engineering Flowsheet, Sheet 2 of 4."

11. ORNL Drawing, "Cell 4 Curium Recovery Engineering Flowsheet, Sheet 3A of 4."

12. ORNL Drawing, "Cell 4 of Am-Cm Recovery Engineering Flowsheet, Sheet 4 of 4."

13. ORNL Drawing, "Cell 3 Engineering Flowsheet, Curium Recovery Facility."

The Committee members participated in an indoctrination tour and performed a physical inspection of the facility with the operators on October 21, 1964.

During discussions with the operators at the meetings additional information was supplied, and some of the pertinent subjects covered included:

1. The operators described the maximum credible accident within the cells as a fire involving diethylbenzene in the mixer-settler bank.

   To minimize the consequences of this type of accident the temperature of the mixer-settlers is maintained below the flash point of the solvent, and combustible material within the cell is limited. In addition, a heat-actuated detector, tied into the Gamewell Fire Alarm System, and a manually actuated water-spray system have been installed. The operators also agreed to write a memorandum to the Laboratory Shift Supervisor and the Fire Department outlining the procedures to be followed in the event a cell fire occurs when the facility is unattended.

2. The only practical method of disposing of the waste solvent, approximately 80 liters a week, appears to be by means of the hot aqueous drain to waste collection tank WC-14. The Committee was informed that this tank is continuously purged by the hot off-gas system.

3. In the slug dissolution step the Al-HCl ratio and the temperature control the hydrogen evolution rate. At an aluminum dissolution rate of 1 g/min, hydrogen will be evolved at 1 liter/min. The hydrogen will be diluted with 2 ft^3/min of air and discharged to the hot off-gas system. This rate approximates the available off-gas capacity at this point in the system and the gas-air mixture is below the lower explosive limit by a factor of two. The Al dissolution rate is controlled by temperature control and/or acid addition rate.

4. The Curium Recovery Facility occupies cells 3 and 4, and during operation it is necessary that construction work involving a future process proceed in cells 1 and 2. Administrative controls will be established to prevent cell entry without the knowledge of the operators, and a competent member of the operating group will be assigned to adequately supervise the actions of the construction personnel.

5. The ^{242}Cm solution carrier is intended to transport an aqueous solution of 35 liters containing 12 g of ^{242}Cm or 200 g of ^{244}Cm from the Curium Recovery Facility or the Transuranium Processing Plant (Melton Valley) to the Source Fabrication Facility. The duration of each transfer will be limited to less than nine hours to limit the curium solution temperature rise to $< 150°F$ and the pressure in the gas space above the solution to < 25 psig. The internal vessel is designed to withstand an explosion of the radiolytic gas without rupture.

   The cask will not withstand the standard 1-hr-exposure fire test, and such a fire would conceivably rupture the vessel. It was noted by the Committee that at the three stationary locations of the carrier, i.e., Curium Recovery Facility, Transuranium Processing Plant, and the Source Fabrication Facility, complete automatic sprinkler systems are provided which will provide adequate protection to the carrier from an exposure fire. The design of the carrier and the external valve enclosures for structural integrity were based only on those impacts that might result from credible accidents during shipment within the ORNL area. All transfers are planned to be accompanied by responsible personnel.

   The Committee feels that the consequences resulting from loss of integrity of the carrier during transfer would be completely unacceptable and brings the following points to the operators' attention for consideration to minimize the risk involved.

   (a) Prohibit transfers during periods of high or sensitive occupancy such as the normal 8:00-5:00 working hours.

(b) Use of the Guard Department to limit normal traffic over the prescribed route of travel.

(c) Use of a Health Physics escort.

6. The Curium-Americium Slug Transfer Cask is designed to transport 4 ORNL ^{241}Am slugs, 3 Martin ^{241}Am slugs, or 1 TRU-HFIR target after 30 days of postirradiation decay. A number of exceptions to the proposed ICC regulations, including fire resistivity, exist and the Committee feels that suggestions a, b, and c concerning the solution carrier are applicable to the slug transfer cask.

In executive session, after the review, the Committee arrived at the following recommendations and conclusions. The Committee recommends:

1. Approval of the facility and the use of the two casks for conducting operations as outlined in the referenced material submitted to the Committee.

2. Approval of the casks for transportation only within the ORNL area and the operators are requested to seriously consider suggestions a, b, and c.

3. The operators should inform the waste disposal group when transfers of flammable liquids are to be made to the aqueous waste system.

4. Administrative controls should be established to ensure against occupancy of cells 1 and 2 when operations which could present a hazard to the occupants are being conducted.

5. The floor drain in cell 2 should be sealed during the construction phase except when necessary to open it for decontamination.

6. Administrative controls should be established including a Health Physics survey and an inspection of the integrity of the primary containment in the penthouse before the crane door is opened to minimize the possibility of a release.

T. W. Hungerford
for D. G. Doherty, Chairman
Hot Cells and Sources Committee

DGD:TWH:bb

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