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**BUILDING 003
DECONTAMINATION AND DISPOSITION
FINAL REPORT**

ERDA Research and Development Report

*Prepared for the United States
Energy Research and Development Administration,
Environmental Controls Technology Division
under Contract Number AT(04-3)-701.*



Rockwell International

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ABSTRACT

The decontamination and disposition (D&D) of the contaminated facilities in Building 003 are complete. The Hot Cave, the building radioactive exhaust system, the radioactive liquid waste system, and the fume hoods were removed. The more significant D&D activities are summarized, special techniques are noted, and problems and their resolution are discussed. Results of the radiological monitoring are presented.



I. INTRODUCTION

The Hot Cave in Building 003 had been inactive since the close-out of the SNAP Program in GFY 1973. Prior to that time, the facility had been used for the analysis of SNAP fuel burnup samples and evaluation of irradiation experiments. The inner surfaces of the Hot Cave were grossly contaminated with mixed fission products. Containment of this high level contamination required continuous radiological surveillance and maintenance of the radioactive exhaust system. Since Building 003 facilities were declared "excess," decontamination and dismantling of the contaminated facility proceeded as described in the Decontamination and Disposition of Facilities Program Plan No. PP-704-990-002.

The Hot Cave (Figure 1) was totally dismantled and all materials and equipment removed from the site. Dismantling included removal of:

- 1) Block and steel structure
- 2) Floor and footings down to original earth
- 3) Radioactive liquid waste
- 4) Air exhaust systems
- 5) Electrical and water support systems.

Figures 2, 3, 4, and 5 present views of the Hot Cave front, side, rear, and top respectively, prior to dismantling.

Other contaminated facilities removed from Building 003 were:

- 1) Fume hoods
- 2) Radioactive waste sinks
- 3) Drain lines
- 4) Holding tanks
- 5) Facility exhaust system.

In addition, test and experimental equipment used in other Building 003 activities were removed.

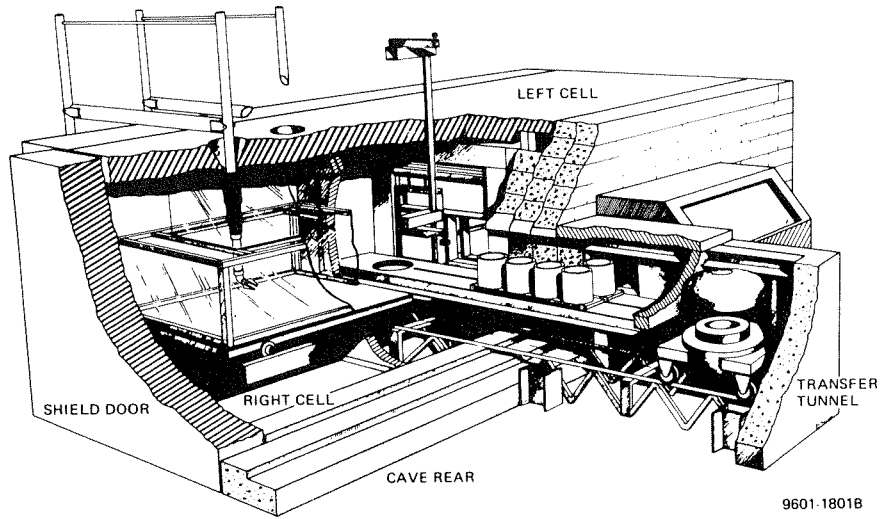
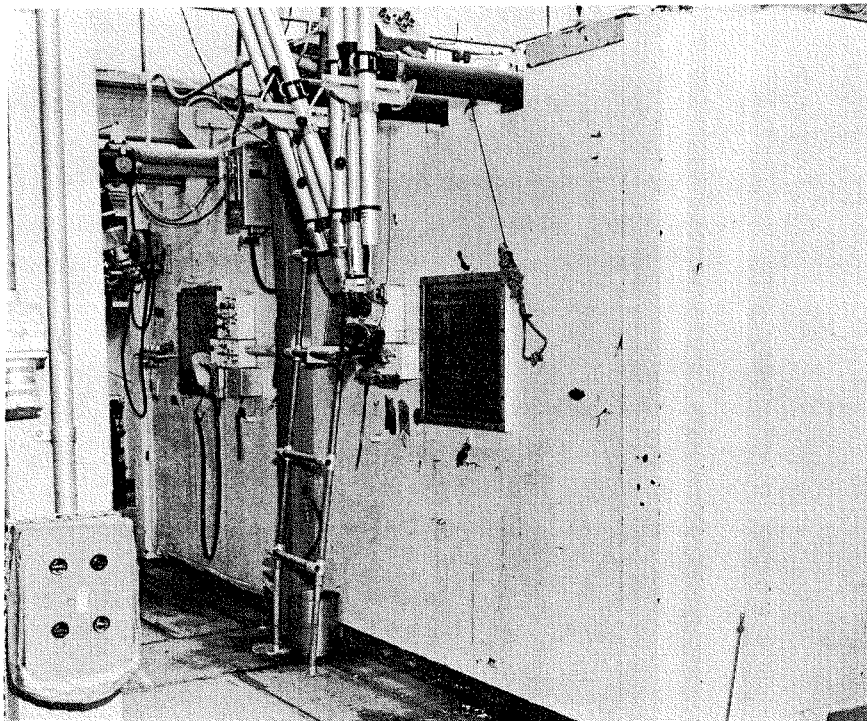
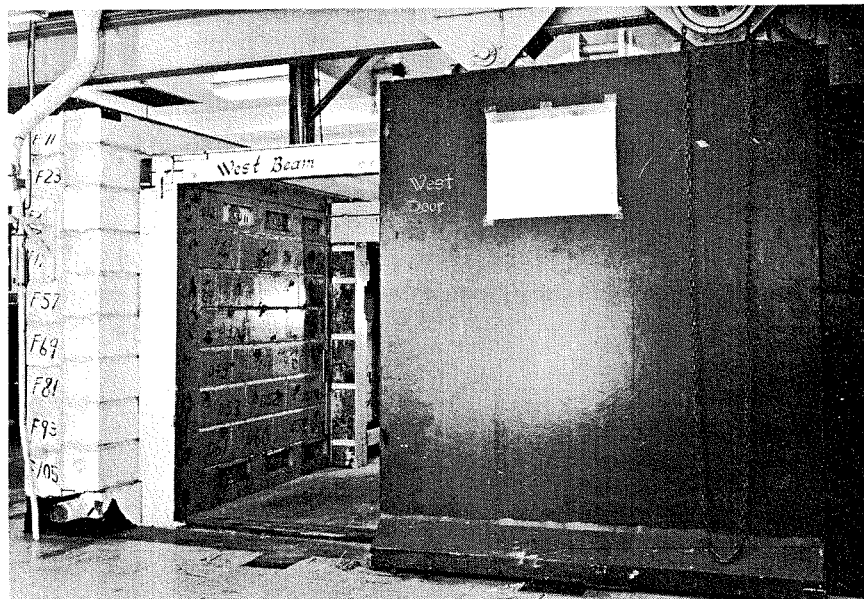


Figure 1. Hot Cave Layout



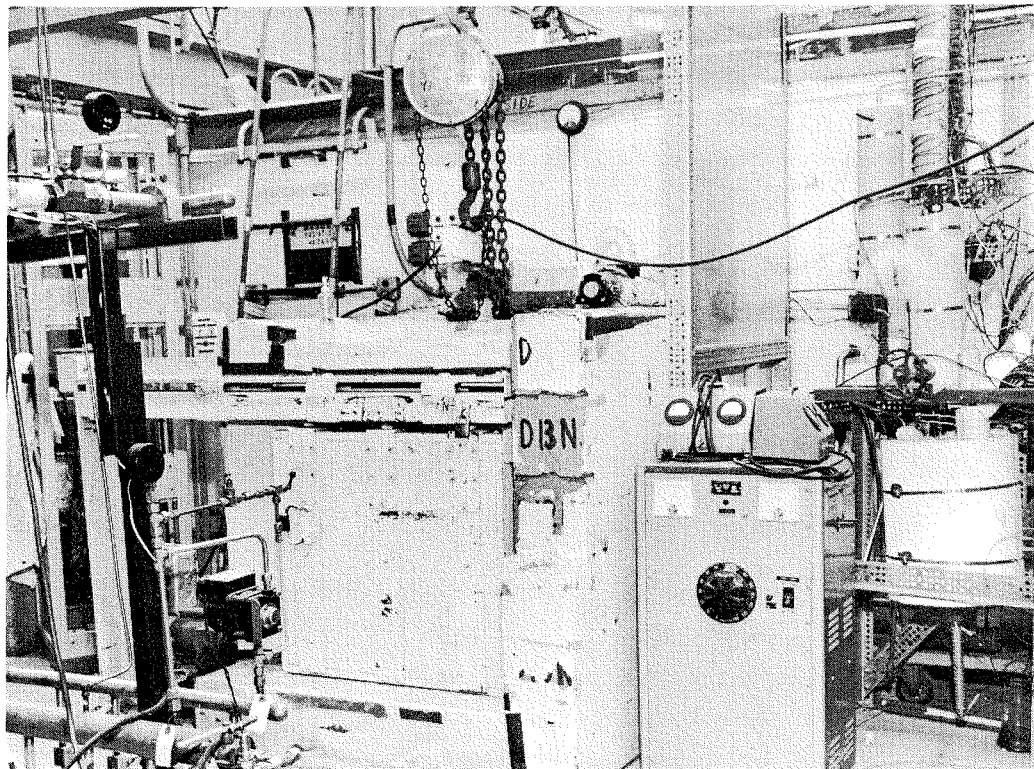
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Figure 2. Front of Hot Cave



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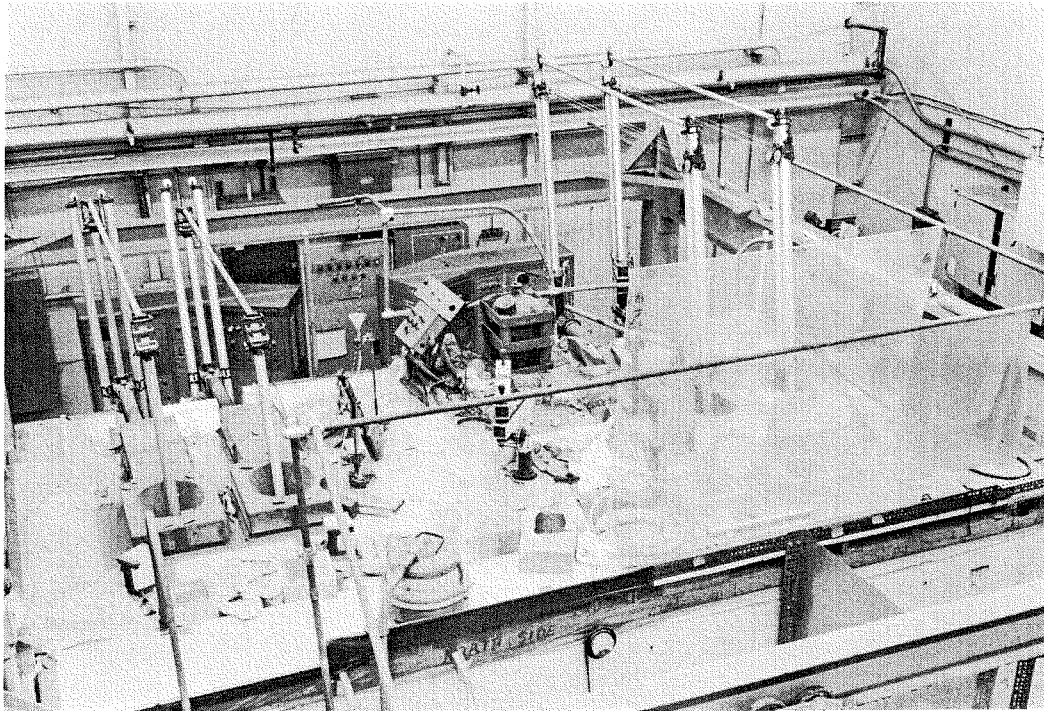
Figure 3. Side View of Hot Cave



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Figure 4. Rear of Hot Cave

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Figure 5. Top of Hot Cave

This report summarizes the more significant D&D activities, discusses special techniques used, and reviews major problems and their resolution. The report notes the radiological surveillance conducted throughout the D&D and includes the record of the radiological survey upon completion.

II. SUMMARY OF ACTIVITIES

The actual decontamination and disposition (D&D) efforts in Building 003 began January 24, 1975, and ended June 22, 1975. The main effort, dismantling of the Hot Cave, was completed April 3, 1975. Because the facility exhaust system was needed during the decontamination and disposition construction work, the exhaust system was not removed until June 22, 1975.

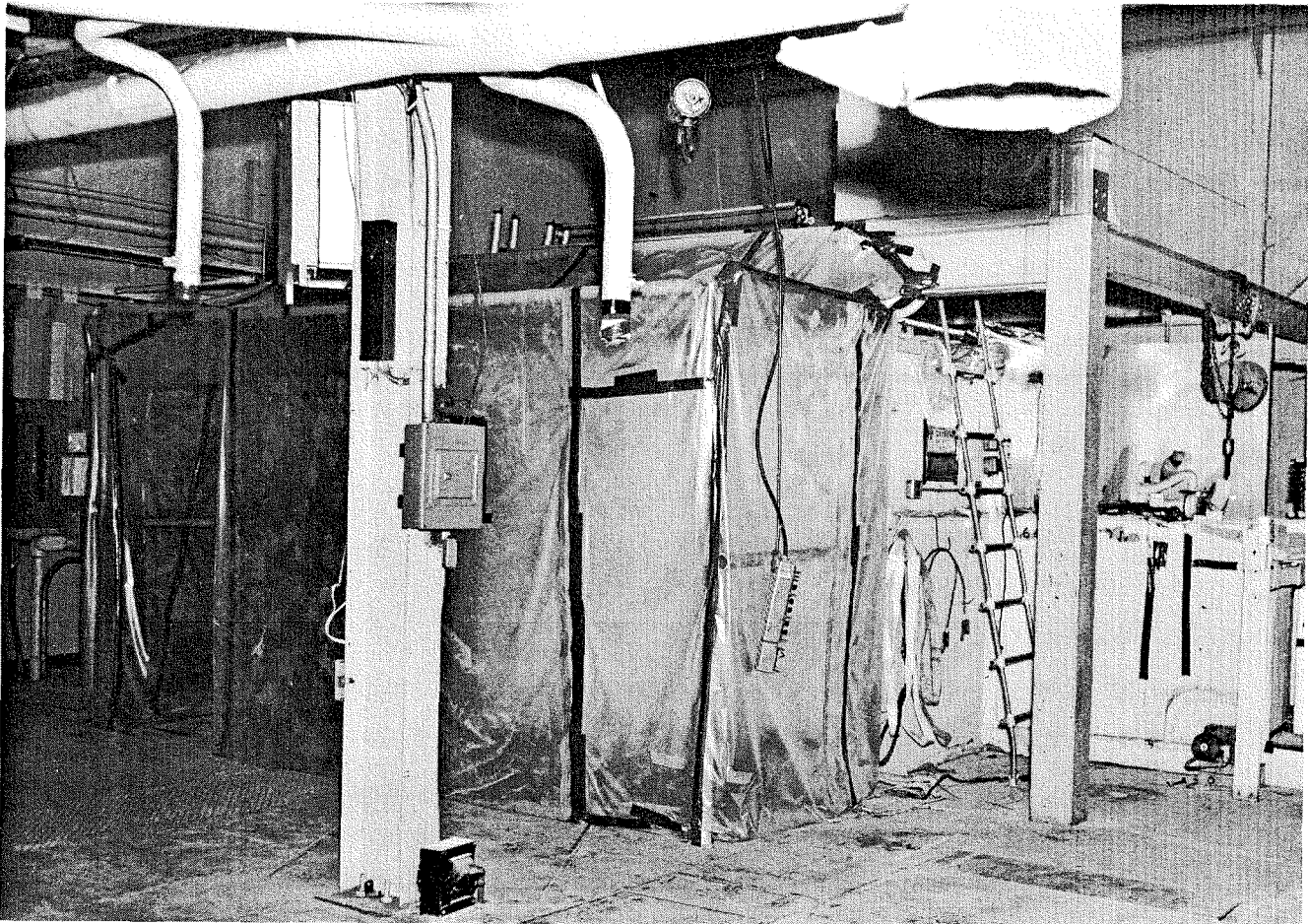
A Facilities Dismantling Plan for Building 003 (Appendix A) which defined the scope of the dismantling effort was prepared. This plan was reviewed and approved by the Isotopes Committee of the AI Nuclear Safeguards Review Panel and subsequently approved by ERDA. A detailed working procedure for dismantling Building 003⁽¹⁾ was then prepared which provided step by step delineation of the tasks described in the dismantling plan. This procedure was also reviewed and approved by the Isotopes Committee.

The basic work was performed by AI Remote Technology Unit personnel trained to work in radiation areas. This Unit was supported by the Health, Safety, and Radiation Services (HSRS); Industrial Engineering; and Maintenance Departments. A contractor was hired to remove the concrete floor and structural footings. The contract was amended later to authorize the contractor to use explosives to remove the floor pans imbedded in the concrete.

A. PREPARATIONS

The existing personnel change room was reactivated and resupplied. An HSRS work station, equipped with alpha and beta-gamma counting instrumentation, survey meters, air samplers, personnel dosimeters, protective breathing apparatus, protective clothing, gloves, shoe covers, and other safety materials, was established in the high bay along the south wall.

Plastic sheet entry enclosures (Figure 6) were constructed, one each for the east and west door openings. The enclosures allowed opening the cell doors for personnel entry, and prevented the spread of contamination into the Building 003 high bay. The Hot Cave exhaust system was operated throughout the Hot Cave decontamination activities. This system also vented the entry enclosures when the cell doors were opened. The building and the cell doors (Figure 3) were kept



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Figure 6. Cell Door Enclosure

locked whenever the facility was unattended. Before beginning the D&D activities, all personnel associated with this work were briefed by the unit manager on the scope of the work, radiation hazards, and the necessary safety precautions. A familiarization review of the detailed procedures and the requirements for limiting personnel exposure to levels which are "as low as practicable" (described in Reference 2) was also presented by the unit manager. The dismantling was then begun.

B. DISMANTLING

To provide the required access to the Hot Cave, the Building 003 high bay was cleared of unnecessary equipment, including the remains of a sodium experiment.

1. East Cell

The east cell of the Hot Cave was entered and decontaminated first. Restricted Access Entry Permit No. 17602 was issued by the Health, Safety, and Radiation Services Department. Figure 6 shows the typical entry enclosure erected over the cell door.

The removal of the manipulator and other equipment, materials, and structures from the east cell was accomplished as planned. When removed, contaminated materials were wrapped in plastic sheeting to contain removable contamination and placed in a U.S. Department of Transportation (DOT) specification shipping container for shipment to Beatty, Nevada for burial. The radiation levels found before and after cleaning are reported in Section III, Radiological Monitoring and Surveying, Tables 3 and 4. The east cell was decontaminated using a "foamer" to loosen the contamination, and a vacuum cleaner to remove the contamination. The solvent used in the "foamer" was "Big K," which is a light caustic. Foaming action was provided by detergent. Following "foaming," the cell was cleaned further by wiping using the "Big K" solvent. The vacuum cleaner was later decontaminated at the Radioactive Material Disposal Facility (RMDF). All other residue and wiping cloths were placed in a plastic bag and shipping container, and shipped to the RMDF.

2. West Cell

The west cell was opened and a radioactivity survey conducted (Table 3, Section III). The west cell contained considerably higher levels of radioactivity than the east cell. The west cell contained test analysis equipment and experimental residue. Upon initial entry, miscellaneous waste was removed, including three trays (7 rad/hr) and two 1-gal. paint cans (~25 rad/hr). This waste was bagged and placed in a conduit with 6 in. of concrete shielding and sent to the RMDF for disposal. The cell interior was wiped using the cell manipulators. After the wiping materials were bagged and removed, the cell was vacuum cleaned. Five prefilters (250 mrad/hr) from the lower section of the cell and a 30-gal. bag of solid waste (2 rad/hr) were then removed, and the cell was vacuum cleaned again so that most of the loose contamination was removed. As the roof shield blocks associated with the manipulators, and the manipulators, were removed, the openings in the roof were covered with

TABLE 1
 FILM-BADGE AND FINGER-RING ANALYSES
 FOR INCIDENT INVOLVING DISCOVERY OF
 HIGH LEVEL RADIATION SOURCE

Technician	Film Badge Number	Dose (mrem)	
		β	γ
<i>Whole Body Dose*</i> <i>and/or Skin Dose†</i>			
A	219	120	240
A	220	120	210
B	221	135	0
B	222	165	0
C	223	70	15
C	224	70	30
D	225	110	0
D	226	110	0
Hand Dose‡		$\beta + \gamma$	
A	—	610§	
B	—	50§	
C	—	300§	

*Body badges worn two days

†Finger rings worn two days

§Average both hands

plastic sheet to contain the loose contamination on the adjacent blocks. The remaining items in the cell, including a lucite enclosure, shelf, cell table, and 90 gal. of solid radioactive waste were removed. At this time, an area of the cell floor, covered with what appeared to be dried uranyl salt solution, was discovered to be contaminated (25 rad/hr at 10 cm). Further investigation was initiated when removal of this contamination failed to reduce the radiation levels in the cell to the levels anticipated.

The investigation revealed that a container of SNAP burnup samples lay in the transfer tunnel between the two cells. The container was picked up with tongs to obtain a radiation level measurement using a Juno portable ionization chamber-type detector (0 to 25 R/hr). When radiation levels in excess of the upper limit of this instrument were observed, the container was immediately placed farther into the transfer tunnel, and the transfer tunnel west door was closed. All personnel then exited the cell, and film badges and finger rings were collected and developed. Operations on the Hot Cave were halted pending the assessment of radiation exposure to personnel, and establishment of steps to remove the high level radioactive material. The personnel radiation exposure for this particular activity was evaluated immediately. These exposures appear in Table 1.

Upon determination that the radiation exposures to the personnel involved were well within occupational exposure limits, the cell was entered again, and the container of radioactive material was transferred with tongs to a 5-gal. can which was placed into a lead cask. After placing the container in the cask, maximum radiation levels of 2.3 R/hr, and 165 mR/hr were observed at the surface, and at 1 meter from the surface of the cask, respectively. The cask was transferred to the Radioactive Waste Storage Facility, Building T075.

In removing the west cell manipulator, access to the west portion of the roof was necessary. The west roof, unlike the exterior walls of the Hot Cave, was contaminated and required protective clothing for access.

3. Transfer Tunnel

Table 6 in Section III shows the contamination levels in the transfer tunnel. All contaminated materials (cask dolly, rails, push-pull rods) were removed from the tunnel and packaged for shipment to Nuclear Engineering Company for

