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ORNL/ER-399

ENVIRONMENTAL RESTORATION PROGRAM

Final Deactivation Project Report on the Alpha Powder Facility, Building 3028, at Oak Ridge National Laboratory, Oak Ridge, Tennessee

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DEPARTMENT OF ENERGY

ORNL/ER-399

Energy Systems Environmental Restoration Program

Final Deactivation Project Report on the Alpha Powder Facility, Building 3028, at Oak Ridge National Laboratory, Oak Ridge, Tennessee

Date Issued—April 1997

Prepared by
Isotopes Facilities Deactivation Project

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PREFACE

This *Final Deactivation Project Report on the Alpha Powder Facility, Building 3028, at Oak Ridge National Laboratory, Oak Ridge, Tennessee* (ORNL/ER-399), although this element of work is not part of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), it was accomplished in accordance with the substantive requirements of the act. This work was performed under Work Breakdown Structure 1.6.6.2.10.02, Activity Data Sheet 6504IS, "Isotopes Facilities Deactivation Project." This document provides the Environmental Management and Enrichment Facilities program with the final report on the deactivation of the Alpha Powder Facility, Building 3028.

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ABBREVIATIONS

AMF	American Machine and Foundry
APF	Alpha Powder Facility
BEL	Biological Evaluation Laboratory
CAAM	continuous alpha air monitor
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
EM	DOE Office of Environmental Restoration and Waste Management
EM-40	DOE Office of Environmental Restoration
EM-60	DOE Nuclear Materials and Facility Stabilization Program
HAZOP	hazard and operability study
HEPA	high-efficiency particulate air
HVAC	heating, ventilating, and air-conditioning
LLLW	liquid low-level waste
MOA	Memorandum of Agreement
ORNL	Oak Ridge National Laboratory
S&M	surveillance and maintenance
SLFP	short-lived fission products

DEFINITIONS

Term	Definition
Commitments	Tasks required to be accomplished to meet non-regulatory requirements. (site, stakeholders, etc.)
Deactivation	The process of placing a facility in a safe and stable condition to minimize the long-term cost of a surveillance and maintenance (S&M) program that is protective of workers, the public, and the environment until decommissioning is completed.
Decommissioning	Refers to the ultimate disposition of a facility. Also substitutes for previously used "D&D" (decontamination and decommissioning).
Decontamination	The removal or reduction of radioactive or hazardous contamination from facilities, equipment, or soils by washing, heating, chemical or electro-chemical action, mechanical cleaning or other techniques to achieve a stated objective or end condition.
Defense-in-Depth	Achieving required levels of safety and protection there is more than one layer of protection between the hazard and that which is being protected.
End Point	A detailed specification for the final deactivation condition of areas and hardware within a facility and related documentation. An individual milestone towards the deactivation and/or the decommissioning of a facility.
End Point Technical Information	A compilation of documents to support end point conclusions.
Stakeholder	Individuals and organizations (i.e. regulators, local municipalities, the public, etc.) who may be directly or indirectly impacted by activities associated with the Isotopes Facilities Deactivation Project.
Turnover Package	A compilation of project related documents to be given to a post-deactivation organization.

EXECUTIVE SUMMARY

This report documents the condition of the Alpha Powder Facility, Building 3028, after completion of deactivation activities by the Isotopes Facilities Deactivation Project. This report outlines the activities conducted to place the facility in a safe and environmentally sound condition for transfer to the U.S. Department of Energy (DOE) Office of Environmental Restoration (EM-40) program.

A history and profile of Building 3028 prior to commencing deactivation activities and a profile of the building after completion of deactivation activities is provided. Turnover items, including the post-deactivation surveillance and maintenance (S&M) plan, remaining hazardous materials, radiological controls, safeguards and security, quality assurance, facility operations, and supporting documentation provided in turnover package are discussed.

Building 3028 will require access to facilitate required S&M activities to maintain the building safety envelope. Building 3028 was stabilized during deactivation so that when it is transferred to the DOE EM-40 program, only a minimal S&M effort will be required to maintain the building safety envelope. Except for minimal S&M activities, the building will be unoccupied and the exterior doors will be locked to prevent unauthorized access. The building will be entered only to perform the required S&M until D&D activities begin.

The hazard category for Building 3028 is "RADIOLOGICAL." All materials have been removed from the cells. However, the cells and the area behind the cells remain contaminated. All utility systems, piping, and alarms have been deactivated.

1. INTRODUCTION

1.1 PURPOSE

This report documents the condition of the Alpha Powder Facility (APF), Building 3028, after completion of deactivation activities. Activities conducted to place the facility in a safe and environmentally sound condition for transfer to the U.S. Department of Energy (DOE) Office of Environmental Restoration (EM-40) program are outlined.

A history and profile of the facility prior to commencing deactivation activities and a profile of the building after completion of deactivation activities are provided. Turnover items, such as the post-deactivation surveillance and maintenance (S&M) plan, remaining hazardous materials, radiological controls, safeguards and security, quality assurance, facility operations, and supporting documentation provided for in the DOE Nuclear Materials and Facility Stabilization Program (EM-60) turnover package are discussed.

1.2 SCOPE

This report addresses the activities performed during deactivation of the Alpha Powder Facility, Building 3028, to place the facility in a safe and environmentally sound condition to await decommissioning. It also discusses the status of the facility and the activities required to maintain the facility following deactivation. Appendix A, "Building 3028 Floor Plans," provides floor plans of Building 3028 and its systems which illustrate the physical boundaries and scope of this Final Deactivation Project Report.

2. BACKGROUND

2.1 FACILITY DESCRIPTION

Building 3028 is located on the northwest corner of Isotope Circle in the Oak Ridge National Laboratory (ORNL) Isotopes Area adjacent to Stack Area 3039. The facility is a four-story steel frame structure covered by corrugated aluminum siding. The first level contains the processing cells and their operating areas. The first-floor area of the building covers 4,000 ft^2 with a total volume of 80,000 ft^3 of free space. The three upper levels contain laboratories for various isotope and target fabrication production.

The facility has 7 hot cells. Cells 1-4 have 2 ft of water contained in steel tanks for neutron shielding. Three chilled water systems provided cooling to the cells through the steel shielding tanks and provided cooling of cell pans and vessels used during various operations. Extended reach Model-8 manipulators are installed through the top of the cells. The slave sections of the manipulators are covered with urethane manipulator boots sealed to the inside top surfaces of the cells. An additional plastic boot and wiper seals in the manipulator barrels provide a secondary containment for manipulator penetration. Cells 3 and 4 contain glove ports in the rear wall of the cell. The glove ports are gasket sealed to the cell liner and were used primarily for the alpha powder (transuranic isotopes in powder from) operations.

2.2 FACILITY HISTORY

Building 3028 was constructed in 1950 as part of the Isotopes Program. It originally housed the ^{131}I processing facility and a four-story ion-exchange column separation facility for ^{147}Pm. The ^{131}I facility was converted to manipulator cells in the early 1960s and for the short-lived fission products (SLFP) facility. A ^{133}Xe facility was added at the same time. Products and processes developed for sale included ^{133}Xe, ^{131}I, ^{99}Mo and mixed short-lived fission products. The ^{133}Xe operation was discontinued in 1980. The SLFP program was discontinued in 1985.

The ion exchange column was removed in the early 1960s and the upper three floors were converted to target fabrication facilities in the mid-to-late 1960s and later to the Biological Evaluation Laboratory (BEL). The four water-shielded cells and the steel concrete shielded cells (Cells 1–5) were installed on the first floor in 1964 for the curium source fabrication program of Space Nuclear Systems. The curium cells were partially decontaminated in the early 1980s. In the late 1970s, the target facility moved to building 3038 and the upper floors were occupied by the Nuclear Medicine Research Group. The Nuclear Medicine Research Group turned the laboratory facilities over to the Office of Risk Assessment in 1988.

3. FACILITY STATUS

3.1 PRE-DEACTIVATION FACILITY STATUS

Following approximately 40 years of operations and processing, Building 3028 was classed as surplus and many of the process systems were abandoned in place. General housekeeping was not maintained and the structural integrity of the building was allowed to lapse.

Chapter 9, "Photographs," displays photographs of the building conditions prior to deactivation activities.

3.1.1 Hazards Analysis

Phase I Safety Documentation Radioisotope Laboratory A, Building 3028: Hazard Screening (HS/3028/F/RT-5, Rev. 1) was written on 12/20/94 and approved on 1/24/95. This hazard screening documents the postulated hazards associated with Building 3028 using the "HAZOP (hazard and operability study) Analysis Method" of process hazards review. The primary purpose of this hazard screening was to identify possible hazards associated with Building 3028 due to the inventory of hazardous materials and the deactivation activities being performed in the facility. Excerpts from the hazard screening document appear in Appendix D.

The status of Building 3028 is identified as being in a safe standby mode and no longer used for processing, dispensing, or storage of radioactive materials. No operations activities, other than S&M and deactivation activities, are being performed in the facility. The only non-industrial hazard identified for Building 3028 is residual surface radioactive contamination.

There are known isolated areas of transferable contamination within the facility, but these areas have been secured and access is restricted. The presence of fixed contamination is addressed by isolation of the affected areas and good radiation protection practice. There is a slight potential for radiation exposure to personnel working within and in the immediate vicinity of Building 3028.

The post-deactivation hazard level classification for this facility is **RADIOLOGICAL**. There is no potential for other than negligible impact to any individual on-site or off-site. The following hazard items were reviewed and considered to be "No Significant Hazard" for Building 3028:

- Chemical — Due to the small quantities of chemicals currently used in the facility.
- High Pressure Air — Less than hazard criteria of 3000 psig.
- Steam — Less than hazard criteria of 3000 psig and 250 degrees centigrade.
- Electrical Power — Less than hazard criteria of 600V.
- Special Equipment — No unique equipment which would pose a non-standard industrial hazard.
- Fire — Fire is not considered a credible hazard due to the lack of combustible materials in the building.

3.1.2 Internal Spaces

3.1.2.1 General Areas

The general areas of Building 3028 consist of the areas of the first, second, third, and fourth floors. An elevator connected these four floor levels. The general areas contained furniture, cabinets, and various miscellaneous items used when the facility was in operation and abandoned when the facility was no longer in use. The second, third, and fourth floors and the elevator shaft are contaminated with plutonium under the paint. The paint is chipping and peeling, which provides a potential for transferring the contamination. Prior to deactivation, the second, third, and fourth floors were monitored by continuous alpha air monitors (CAAMs) to alert personnel if alpha emitting material had been released into the area.

Pre-deactivation radioactive contamination levels and radiation levels for these areas are listed in Table 1, "Pre-Deactivation Radioactive Contamination Levels," and Table 2, "Pre-Deactivation Radiation Levels," respectively. See Sect. 3.1.5. Pre-deactivation hazardous materials and waste located in these areas are listed in Table 3, "Building 3028 Pre-Deactivation Hazardous Materials and Waste." See Sect. 3.1.6.

3.1.2.2 East Air Lock

The east air lock contained cabinets, shelving, and various miscellaneous items used when the facility was in operation and abandoned when the facility was no longer in use. The pit below the floor in the southeast corner contains drain piping for Building 3047 and part of the filters for the Building 3028 process off-gas system. The pit contained 6 in. of water the last time it was opened prior to deactivation. The floor above the pit has been roped off as a radiation area. Tank W-1, a 500-gal waste tank from the liquid low-level waste (LLLW) system, was used for process waste from the hot cells and is located below the building floor under the east air lock. An access cover to Tank W-1 is located in the east air lock. The associated LLLW pump that was used to evacuate Tank W-1 was abandoned in place prior to deactivation. The chilled water unit located in the east air lock is internally contaminated. Prior to deactivation, the chilled water system provided space cooling as well as process cooling in the facility. Prior to deactivation, the east air lock operating area was monitored by a CAAM to alert personnel if alpha emitting materials had been released into the area.

Pre-deactivation radioactive contamination levels and radiation levels for the east air lock are listed in Table 1, "Pre-Deactivation Radioactive Contamination Levels," and Table 2, "Pre-Deactivation Radiation Levels," respectively. See Sect. 3.1.5. Pre-deactivation hazardous materials and waste located in the east air lock are listed in Table 3, "Building 3028 Pre-Deactivation Hazardous Materials and Waste."

3.1.2.3 West Air Lock

The west air lock contained cabinets, shelving, and various miscellaneous items used when the facility was in operation and abandoned when the facility was no longer in use. The charcoal filter pit, located under the floor in the west air lock, was removed from service when the new air handling system was installed in the early 1980s. The pit is potentially contaminated. However, short-lived fission products were last processed in Building 3028 in 1986 and are expected to have decayed prior to deactivation. Prior to deactivation, the west air lock area was monitored by a CAAM to alert personnel if alpha emitting material had been released into the area.

Pre-deactivation radioactive contamination levels and radiation levels for the west air lock are listed in Table 1, "Pre-Deactivation Radioactive Contamination Levels," and Table 2, "Pre-Deactivation Radiation Levels," respectively. See Sect. 3.1.5. Pre-deactivation hazardous materials and waste located in the west air lock are listed in Table 3, "Building 3028 Pre-Deactivation Hazardous Materials and Waste."

3.1.2.4 Short-Lived Fission Products Operating Area

The SLFP operating area provided access to the manipulators and windows associated with Cell 7. The SLFP operating area contained furniture, cabinets, and various miscellaneous items abandoned when the facility was no longer in use. Prior to deactivation, the SLFP operating area was monitored by a CAAM to alert personnel if alpha emitting materials had been released into the area.

Pre-deactivation radioactive contamination levels and radiation levels for the SLFP operating area are listed in Table 1, "Pre-Deactivation Radioactive Contamination Levels," and Table 2, "Pre-Deactivation Radiation Levels," respectively. See Sect. 3.1.5. Pre-deactivation hazardous materials and waste located in the SLFP operating area are listed in Table 3, "Building 3028 Pre-Deactivation Hazardous Materials and Waste." See Sect. 3.1.6.

3.1.2.5 Alpha Powder Facility Operating Area

The APF operating area provided access to the manipulators and windows associated with Cells 1 through 6, as well as, the ^{133}Xe recovery and purification cubicle. The air lock to Cell 6 is also located in the APF operating area. The first floor elevator station is located in the APF operating area and provided a convenient mode of transporting personnel from the first floor to the three upper floors. The APF contained furniture, cabinets, shelving, and various miscellaneous items used when the facility was in operation and abandoned when the facility was no longer in use. Prior to deactivation, the APF operating area was monitored by a CAAM to alert personnel if alpha emitting materials had been released into the area.

Pre-deactivation radioactive contamination levels and radiation levels for the APF operating area are listed in Table 1, "Pre-Deactivation Radioactive Contamination Levels," and Table 2, "Pre-Deactivation Radiation Levels," respectively. See Sect. 3.1.5. Pre-deactivation hazardous materials and waste located in the APF operating area are listed in Table 3, "Building 3028 Pre-Deactivation Hazardous Materials and Waste." See Sect. 3.1.6.

3.1.2.6 Alpha Powder Facility Cell Access Area

The APF cell access area contains the process off-gas filters for Cells 1 through 5. The filter for Cells 1-4 is located in the ceiling of the APF cell access area, and are contaminated. The cell ventilation system for Hot Cell 5 is also located in the APF cell access area. The area is highly contaminated with alpha emitting material. All painted surfaces are suspected to have contamination under them.

Pre-deactivation radioactive contamination levels and radiation levels for the alpha powder cell access area are listed in Table 1, "Pre-Deactivation Radioactive Contamination Levels," and Table 2, "Pre-Deactivation Radiation Levels," respectively. See Sect. 3.1.5. Pre-deactivation hazardous materials and waste located in the alpha powder cell access area are listed in Table 3, "Building 3028 Pre-Deactivation Hazardous Materials and Waste." See Sect. 3.1.6.

3.1.2.7 Cell 1–4

Prior to deactivation, the APF cells contained various process items (i.e. cell tools, source cans, and welders) abandoned when the facility was no longer in use. The APF Cell 1 hot drains were connected to the LLLW system. APF cells are highly contaminated with alpha (Pu, Cm) from the process activities performed prior to deactivation. Prior to deactivation, the APF cells provided primary containment for radioactive material and were shielded by a 2 ft thick water filled shielding tank containing a glass window. The cells are lined with stainless steel and all penetrations are seal welded. Cell 1 lighting and electrical services are in poor condition due to radiation damage.

Pre-deactivation radioactive contamination levels and radiation levels for this hot cell are listed in Table 1, "Pre-Deactivation Radioactive Contamination Levels," and Table 2, "Pre-Deactivation Radiation Levels," respectively. See Sect. 3.1.5. Pre-deactivation hazardous materials and waste located in this hot cell are listed in Table 3, "Building 3028 Pre-Deactivation Hazardous Materials and Waste."

3.1.2.8 Cell 5

Prior to deactivation, Cell 5 contained various process items (i.e. cell tools, source cans, and welders) abandoned when the facility was no longer in use. The Cell 5 floor drain was connected to the process drain system. The Cell 5 floor drain was suspected of being disconnected from the process drain system. The Cell 5 was highly contaminated with beta/gamma emitters from the process activities performed prior to deactivation. Prior to deactivation, Cell 5 provided primary containment for radioactive material and was shielded by 1 ft thick concrete walls with 9.5 inches of armor-plate-steel. The cell has a mineral oil filled lead glass viewing window.

Pre-deactivation radioactive contamination levels and radiation levels for this hot cell are listed in Table 1, "Pre-Deactivation Radioactive Contamination Levels," and Table 2, "Pre-Deactivation Radiation Levels," respectively. See Sect. 3.1.5. Pre-deactivation hazardous materials and waste located in this hot cell are listed in Table 3, "Building 3028 Pre-Deactivation Hazardous Materials and Waste."

3.1.2.9 Cell 6

Prior to deactivation, Cell 6 contained various process items (i.e. operating equipment, filters, cans, and welders) abandoned when the facility was no longer in use. The Cell 6 floor drain was connected to the LLLW system. Cell 6 is highly contaminated with ^{147}Pm from the process activities performed prior to deactivation. Prior to deactivation, Cell 6 provided primary containment for radioactive material and was shielded with stacked barytes concrete-block walls. Steel clad lead access doors are located in the east and north walls of the hot cell and the east wall is lead shielded.

Pre-deactivation radioactive contamination levels and radiation levels for this hot cell are listed in Table 1, "Pre-Deactivation Radioactive Contamination Levels," and Table 2, "Pre-Deactivation Radiation Levels," respectively. see Sect. 3.1.5. Pre-deactivation hazardous materials and waste located in this hot cell are listed in Table 3, "Building 3028 Pre-Deactivation Hazardous Materials and Waste."

3.1.2.10 Cell 7

Cell 7 contained various process items (i.e. cell tools, source cans, and welders) abandoned when the facility was no longer in use. The Cell 7 hot drain is connected to the LLLW system. Cell 7 is relatively clean; It was entered in 1986 to connect the new cell ventilation system; to install new equipment and refurbish the windows. This work was halted before it was completed and no operations have been performed since that time. The west cell window in Cell 7 has only one pane of glass. Work was stopped in replacing the lead glass when the facility was shutdown. The cell ventilation filter system was never completed to provide testable high-efficiency particulate air (HEPA) filters on Cell 7. Process off-gas from Cell 7 exhausts through HEPA filters to the area process off-gas system. It is assumed that the scrubber still contains contaminated dried salts.

Prior to deactivation, Cell 7 provided primary containment for radioactive material and is shielded by 3 ft thick high-density concrete south and west walls, a 1 ft. thick high-density concrete east wall lined with 4 inches of lead, a north wall consisting of a 2 ft. thick concrete partition, and a top consisting of a stack of five sheets of 3.5 in. thick armor-plate-steel. A steel clad lead access door and a roof plug are also located on the hot cell. The cell has two mineral oil filled lead glass viewing windows.

Pre-deactivation radioactive contamination levels and radiation levels for this hot cell are listed in Table 1, "Pre-Deactivation Radioactive Contamination Levels," and Table 2, "Pre-Deactivation Radiation Levels," respectively. See Sect. 3.1.5. Pre-deactivation hazardous materials and waste located in this hot cell are listed in Table 3, "Building 3028 Pre-Deactivation Hazardous Materials and Waste."

3.1.2.11 Xe Recovery and Purification Cubicle

Prior to deactivation, the Xe Recovery and Purification Cubicle provided primary containment for radioactive material and was shielded by 3 inch thick steel walls and has a lead glass viewing window. This system was abandoned in place prior to deactivation activities.

Pre-deactivation radioactive contamination levels and radiation levels for the Xe recovery and purification cubicle are listed in Table 1, "Pre-Deactivation Radioactive Contamination Levels," and Table 2, "Pre-Deactivation Radiation Levels," respectively. see Sect. 3.1.5. Pre-deactivation hazardous materials and waste located in the Xe recovery and purification cubicle are listed in Table 3, "Building 3028 Pre-Deactivation Hazardous Materials and Waste." See Sect. 3.1.6.

3.1.2.12 Low-Level Scrubber Cubicle

Prior to deactivation, the Low-Level Scrubber Cubicle provided primary containment for radioactive material and was shielded by 8 inches of stacked barytes concrete block. This system was abandoned in place prior to deactivation activities.

Pre-deactivation radioactive contamination levels and radiation levels for the low-level scrubber cubicle are listed in Table 1, "Pre-Deactivation Radioactive Contamination Levels," and Table 2, "Pre-Deactivation Radiation Levels," respectively. See Sect. 3.1.5. Pre-deactivation hazardous materials and waste located in the low-level scrubber cubicle are listed in Table 3, "Building 3028 Pre-Deactivation Hazardous Materials and Waste." See Sect. 3.1.6.

3.1.3 Building Structure and External Spaces

3.1.3.1 Building 3028 Structure

The exterior of Building 3028 was inspected and found to be in generally good structural condition, with the exception of air in-leakage through various paths. The Building 3028 structure and exterior in conjunction with the Building 3028 roof provided secondary containment for the APF

3.1.3.2 Building 3028 Roof

The roof of Building 3028 was inspected and found to be in generally good structural condition, with the exception of air in-leakage through various paths. The Building 3028 roof, in conjunction with the Building 3028 structure and exterior, provided secondary containment for the APF.

3.1.4 Process, Utility and Support Systems

3.1.4.1 Process Off-Gas System

Prior to deactivation, the process off-gas system provided exhaust ventilation services the hot cells 1-5 in Building 3028. The process off-gas system for Building 3028 is connected to the ORNL stack which provided a vacuum exhaust of up to -9.0 inches of mercury. The off-gas system for the cells is controlled to -4.0 meters of water. The process off-gas from the hot cells was filtered through various sets of HEPA filters prior to discharging to the ORNL stack. The process off-gas system was determined to be highly contaminated from the process activities performed prior to deactivation.

3.1.4.2 Liquid Low-Level Waste System

Prior to deactivation, the LLLW system provided collection from the hot drain system in the hot cells. Liquids collected by the LLLW system were stored in a 500 gallon tank (W-1) located below the floor in the east air lock. Tank W-1 was maintained at a high pH to keep ^{131}I in solution unit it decayed. A remote potential for criticality existed in this vessel due to enriched uranium in the waste stream. Therefore, a depleted uranium solution was mixed with all wastes discharged to tank W-1. Tank W-1 was pumped from Building 3028 to the ORNL Tank farm via the LLLW discharge pump. W-1 tank level was monitored in the APF operating area. The LLLW system was determined to be highly contaminated from the process activities performed prior to deactivation.

3.1.4.3 Process Drain System

Prior to deactivation, the process drain system provided a means of removing liquids from the operating area floors to the ORNL process waste treatment facility. The process drain system was a gravity drain system. The process drain system is slightly contaminated from the process and cleaning activities performed prior to deactivation.

3.1.4.4 Process Water System

Prior to deactivation, the process water system provided make-up water and process water to the hot cells, laboratories and chilled water systems. The process water system is fed from the potable water system through a backflow preventer. The process water system is not believed to be contaminated.

3.1.4.5 Hot Cell Manipulators

Prior to deactivation, the hot cell manipulators provided a means of remote process operation within the hot cells. Two types of manipulators are in use in Building 3028; the Model 8 manipulator and the AMF manipulator. Cells 1 through 4 and Cell 7 are equipped with Model 8 manipulators, Cell 5 is equipped with AMF manipulators. Cell 6 is not equipped with manipulators. Prior to deactivation, the hot cell manipulator boots and seals were determined to be in poor condition and a potential for the spread of contamination from the hot cells. The manipulator boots were changed during the deactivation work.

3.1.4.6 Electrical Power System

Prior to deactivation, the electrical power system provided power and distribution for the 480 VAC electrical service to Building 3028. Typical electrical loads were lighting, pumps, compressors, welders, heaters, and exhaust fans.

3.1.4.7 Fire Protection System

Prior to deactivation, the fire protection system provided a wet pipe fire suppression system for Building 3028. Each of the operating areas and laboratories was equipped with sprinkler heads and alarms as required by the local fire code. In addition, fire extinguishers were placed strategically in and around Building 3028. No fire protection was provided inside the hot cells or cubicles. The fire protection system is not believed to be contaminated.

3.1.4.8 Building Steam System

Prior to deactivation, the Building steam system provided steam for use in heating the operating areas, as well as, various hot cell processes. A total of 8 heat exchangers were located through out Building 3028 to provide space heating for operating personnel. The building steam system is not believed to be contaminated. However, the majority of the steam piping within Building 3028 is lagged with asbestos insulation materials and is in generally poor shape as indicated by the large number of steam leaks experienced in the facility during the last several years.

3.1.4.9 HVAC and Building Exhaust System

Prior to deactivation, the (heating, ventilating and air-conditioning) HVAC and building exhaust system provided cooling and ventilation to the operating areas within Building 3028. A total of 6 heat exchangers were located through out Building 3028 to provide cooling for operating personnel. The heat exchangers were cooled by the chilled water system. The HVAC and building exhaust system is not believed to be contaminated. However, the majority of the chilled water piping within Building 3028 is lagged with asbestos insulation materials.

3.1.14.10 Elevator

Prior to deactivation, the Building 3028 elevator provided a convenient mode of transporting personnel from the first floor to the three upper floors. The first floor elevator station is located in the APF operating area and there are stations located on the second, third, and fourth floors also. The Building 3028 elevator is a two person drum drive type elevator with a minimal load capacity. The machinery for the elevator is located in a top hat area above the fourth floor ceiling. The Building

3028 elevator and elevator shaft are contaminated from the process activities performed prior to deactivation.

3.1.4.11 Potable Water System

Prior to deactivation, the potable water system provided water to the Building 3028 safety showers and eye wash stations. The potable water system is not believed to be contaminated.

3.1.4.12 Natural Gas System

The natural gas system to Building 3028 was never used. The system remained capped at the building from the time of its installation. The natural gas system is not believed to be contaminated.

3.1.4.13 Overhead Cranes

Prior to deactivation, a total of 5 overhead cranes were used in Building 3028 to provide a means of moving heavy equipment between floors and to gain access to various hot cells. The overhead cranes are slightly contaminated from the process activities performed prior to deactivation.

3.1.4.14 Plant Air System

Prior to deactivation, the plant air system provided 110 psig air to Building 3028. The plant air system was regulated and used for process activities and instrumentation throughout the facility. The plant air system is not believed to be contaminated.

3.1.4.15 Chilled Water System

Prior to deactivation, a chilled water system with a capacity of five tons was used for all in-cell cooling. The chiller consisted of a 5-ton compressor unit with an automatic process water condenser. The chilled water was recirculated through the cell equipment by a dual pump system. An automatic make-up tank supplied the necessary water for the chilled water system. The chilled water system was located in the east air lock. The chilled water system is highly contaminated from the process activities performed prior to deactivation.

3.1.4.16 Process Vacuum System

Prior to deactivation, the process vacuum system provided a mode of transferring process solutions. The equipment was located in Cell 6. A filter system of stainless steel Nevaclog[1] prefilters and HEPA filters removed particulate matter before the air was discharged to the process off-gas system. A 50 liter surge tank was located on the main vacuum header and provided an adequate catch vessel for the maximum solution volume handled in the facility. A vacuum pump was used to provide the vacuum to the system. The process vacuum system was determined to be highly contaminated from the process activities performed prior to deactivation.

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[1]Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply endorsement, recommendation, or favoring by the United States Government or any agency thereof.

3.1.4.17 Chemical Make-up Area

Prior to deactivation, the Chemical Make-up area, located on the second floor on the west end was used to provide chemical make-up solutions for addition to the Cell 7 vessels. The chemical make-up area contained two small stainless steel vessels. The make-up tanks drained, through flexible lines, to funnels connected to pipes leading to vessels in Cell 7. The chemical make-up area is not believed to be contaminated.

3.1.4.18 Isotope Area Still Area

This system was abandoned in place prior to deactivation activities and is not contaminated.

3.1.4.19 Air Alpha Monitoring System

Prior to deactivation, the air alpha monitoring system consisted of 8 CAAMs located throughout Building 3028. Each of the operating areas and air locks, as well as, the second, third, and fourth floors of Building 3028 were equipped with a CAAM. A CAAM alarm system actuated building evacuation signals and facility exhaust interlocks automatically when high activity was detected. All of the original 8 CAAMs have been removed from the facility. The individual CAAMs were considered to be contaminated from the process activities performed prior to deactivation.

3.1.5 Radioactive Material, Contamination, and Waste

Table 1, "Pre-Deactivation Radioactive Contamination Levels," lists the radioactive contamination levels identified on radiation surveys conducted prior to deactivation.

Table 1. Pre-Deactivation Radioactive Contamination Levels

Identification	Description	Quantity
West Air Lock	alpha smear—transferable contamination	less than 20 dpm/100cm^2
West Air Lock	beta/gamma smear—transferable contamination	less than 340 dpm/100cm^2
SLFP Operating Area	alpha smear—transferable contamination	less than 20 dpm/100cm^2
SLFP Operating Area	beta/gamma smear—transferable contamination	less than 200 dpm/100cm^2
APF Operating Area	alpha smear—transferable contamination	less than 20 dpm/100cm^2
APF Operating Area	beta/gamma smear—transferable contamination	less than 610 dpm/100cm^2
East Air Lock	alpha smear—transferable contamination	less than 20 dpm/100cm^2
East Air Lock	beta/gamma smear—transferable contamination	less than 200 dpm/100cm^2
Alpha Powder Cell Access Area	alpha smear—transferable contamination	Unknown
Alpha Powder Cell Access Area	beta/gamma smear—transferable contamination	Unknown
Cell 1	alpha smear—transferable contamination	greater than 10^7 dpm/100cm^2
Cell 1	beta/gamma smear—transferable contamination	Unknown, masked by the alpha
Cell 2	alpha smear—transferable contamination	greater than 10^7 dpm/100cm^2
Cell 2	beta/gamma smear—transferable contamination	Unknown, masked by the alpha

Table 1 (continued)

Identification	Description	Quantity
Cell 3	alpha smear—transferable contamination	1 to 10×10^6 dpm/100cm^2
Cell 3	beta/gamma smear—transferable contamination	Unknown, masked by the alpha
Cell 4	alpha smear—transferable contamination	1 to 10×10^6 dpm/100cm^2
Cell 4	beta/gamma smear—transferable contamination	unknown, masked by the alpha
Cell 5	alpha smear—transferable contamination	1 to 10×10^6 dpm/100cm^2
Cell 5	beta/gamma smear—transferable contamination	Unknown, masked by the alpha
Cell 6	alpha smear—transferable contamination	Unknown, masked by the beta/gamma
Cell 6	beta/gamma smear—transferable contamination	greater than 10^7 dpm/100cm^2
Cell 7	alpha smear—transferable contamination	Unknown, masked by the beta/gamma
Cell 7	beta/gamma smear—transferable contamination	greater than 10^7 dpm/100cm^2
Xe Cubicle	alpha smear—transferable contamination	Unknown
Xe Cubicle	beta/gamma smear—transferable contamination	Unknown
Low-Level Scrubber Cubicle	alpha smear—transferable contamination	Unknown
Low-Level Scrubber Cubicle	beta/gamma smear—transferable contamination	Unknown
Second Floor	alpha smear—transferable contamination	less than 20 to 300 dpm/100cm^2
Second Floor	beta/gamma smear—transferable contamination	less than 200 to 1,000 dpm/100cm^2
Third Floor	alpha smear—transferable contamination	less than 20 dpm/100cm^2
Third Floor	beta/gamma smear—transferable contamination	less than 200 dpm/100cm^2
Fourth Floor	alpha smear—transferable contamination	less than 20 dpm/100cm^2
Fourth-Floor	beta/gamma smear—transferable contamination	less than 200 dpm/100 cm^2

Table 2, "Pre-Deactivation Radiation Levels," lists radiation levels identified on radiation surveys conducted prior to deactivation.

Table 2. Pre-Deactivation Radiation Levels

Identification	Description	Quantity
West Air Lock	fixed and transferable radiation levels	0.43 mRem/hr
SLFP Operating Area	fixed and transferable radiation levels	0.24 mRem/hr
APF Operating Area	fixed and transferable radiation levels	0.02 mRem/hr
East Air Lock	fixed and transferable radiation levels	1.35 mRem/hr
Alpha Powder Cell Access Area	fixed and transferable radiation levels	Unknown
Cell 1	fixed and transferable radiation levels	Unknown, probably very high
Cell 2	fixed and transferable radiation levels	Unknown, probably very high
Cell 3	fixed and transferable radiation levels	Unknown, probably very high
Cell 4	fixed and transferable radiation levels	Unknown, probably very high
Cell 5	fixed and transferable radiation levels	Unknown, probably very high
Cell 6	fixed and transferable radiation levels	Unknown, probably very high
Cell 7	fixed and transferable radiation levels	Unknown, probably very high
Xe Cubicle	fixed and transferable radiation levels	Unknown
Low-Level Scrubber Cubicle	fixed and transferable radiation levels	Unknown
Second Floor	fixed and transferable radiation levels	0.07 mRem/hr
Third Floor	fixed and transferable radiation levels	0.02 mRem/hr
Fourth Floor	fixed and transferable radiation levels	0.05 mRem/hr

3.1.6 Hazardous Materials and Waste

Table 3, "Building 3028 Pre-Deactivation Hazardous Materials and Waste," lists the hazardous materials and waste identified during facility walkdowns prior to deactivation.

Table 3. Building 3028 Pre-Deactivation Hazardous Materials and Waste

Identification	Description	Quantity
Lead- based paint	Used as wall covering throughout building.	indeterminate
Asbestos Floor Tiles	Used as floor covering throughout the building.	approx. 4000 sq ft
Asbestos Lagging	Used as pipe lagging throughout the building	indeterminate
Polychlorinated biphenyls	Electrical devices and transformers	indeterminate
Lead Shielding	Used in Cell walls, doors and windows	indeterminate
Mineral Oil	Used in Cell 5 window	indeterminate
Crank Case Oil	Used in Chilled Water Compressor	indeterminate
Freon Refrigerant	Used in Chilled Water Compressor	indeterminate

3.2 POST DEACTIVATION FACILITY STATUS

Chapter 9, "Photographs," contains photographs of the building conditions following deactivation activities.

3.2.1 Deactivation End Point Completion

End point criteria for deactivation activities and end point completion documentation are not applicable for Building 3028. The requirement and guidance for these program elements were not developed prior to Building 3028 deactivation.

3.2.2 Hazards Analysis

A post-deactivation hazard screening has not been performed for this facility. Therefore Hazards Screening HS/3028/F/RT-5, Rev. 1 remains the current hazard screening for the facility with a Hazard Level Classification for this facility of RADIOLOGICAL.

3.2.3 Internal Spaces

3.2.3.1 General Areas

The general areas of Building 3028 consist of the once occupied areas of the first, second, third and fourth floors as well as the elevator and elevator machinery room. The miscellaneous items abandoned when the facility was no longer in use have been removed from general areas. No significant combustibles remain in the general areas. The general areas of Building 3028 were decontaminated to remove transferable contamination from access-required spaces.

The second, third, and fourth floors and the elevator shaft are contaminated with plutonium under the paint. The paint is chipping and peeling, providing a potential for transferring the contamination and endangering personnel and the environment. Following deactivation, the second, third, and fourth floors no longer require monitoring by CAAMs. The CAAMs have been removed from these areas.

Post-deactivation radioactive contamination levels and radiation levels for this area are listed in Table 4, "Post-Deactivation Radioactive Contamination Levels," and Table 5, "Post-Deactivation Radiation Levels," respectively. See Sect. 3.2.6. Post-deactivation hazardous materials and waste located in this area are listed in Table 6, "Building 3028 Post-Deactivation Hazardous Materials and Waste." See Sect. 3.2.7.

3.2.3.2 East Air Lock

The miscellaneous items abandoned when the facility was no longer in use have been removed from this area. No significant combustibles remain. The pit below the floor in the southeast corner contains drain pipes for Building 3047 and part of the filters for the Building 3028 process off-gas system. The floor above the pit is roped off as a radiation zone. A 500-gal waste tank (W-1) from the liquid low-level waste (LLLW) system, used to collect LLLW from hot Cells, 1-5, is located below the building floor under the east air lock. The cell drains has been plugged and the tank level instrumentation has been abandoned. The chilled water unit, located in the east air lock, is internally contaminated. The chilled water system is abandoned in place. Following deactivation the east air

lock no longer requires monitoring by CAAM. The CAAM has been removed from this area. The east air lock was decontaminated to remove transferable contamination.

Post-deactivation radioactive contamination levels and radiation levels for this area are listed in Table 4, "Post-Deactivation Radioactive Contamination Levels," and Table 5, "Post-Deactivation Radiation Levels," respectively. See Sect. 3.2.6. Post-deactivation hazardous materials and waste located in this area are listed in Table 6, "Building 3028 Post-Deactivation Hazardous Materials and Waste." See Sect. 3.2.7.

3.2.3.3 West Air Lock

The miscellaneous items abandoned when the facility was no longer in use have been removed from this areas. No significant combustibles remain. Following deactivation the west air lock no longer requires monitoring by CAAM. The CAAM has been removed from this area. The west air lock was decontaminated to remove transferable contamination.

Post-deactivation radioactive contamination levels and radiation levels for this area are listed in Table 4, "Post-Deactivation Radioactive Contamination Levels," and Table 5, "Post-Deactivation Radiation Levels," respectively. See Sect. 3.2.6. Post-deactivation hazardous materials and waste located in this area are listed in Table 6, "Building 3028 Post-Deactivation Hazardous Materials and Waste." See Sect. 3.2.7.

3.2.3.4 Short-Lived Fission Product Operating Area

The miscellaneous items abandoned when the facility was no longer in use have been removed from this areas. No significant combustibles remain. Following deactivation the SLFP operating area no longer requires monitoring by CAAM. The CAAM has been removed from this area. The SLFP operating area was decontaminated to remove transferable contamination.

Post-deactivation radioactive contamination levels and radiation levels for this area are listed in Table 4, "Post-Deactivation Radioactive Contamination Levels," and Table 5, "Post-Deactivation Radiation Levels," respectively. See Sect. 3.2.6. Post-deactivation hazardous materials and waste located in this area are listed in Table 6, "Building 3028 Post-Deactivation Hazardous Materials and Waste." See Sect. 3.2.7.

3.2.3.5 Alpha Powder Facility Operating Area

The miscellaneous items abandoned when the facility was no longer in use have been removed from this area. No significant combustibles remain. The first floor elevator station has been locked and is considered a no- access- required area. Following deactivation the APF operating area no longer requires monitoring by CAAM. The CAAM has been removed from this area. The APF operating area was decontaminated to remove transferable contamination.

Post-deactivation radioactive contamination levels and radiation levels for this area are listed in Table 4, "Post-Deactivation Radioactive Contamination Levels," and Table 5, "Post-Deactivation Radiation Levels," respectively. See Sect. 3.2.6. Post-deactivation hazardous materials and waste located in this area are listed in Table 6, "Building 3028 Post-Deactivation Hazardous Materials and Waste." See Sect. 3.2.7.

3.2.3.6 Alpha Powder Facility Cell Access Area

The miscellaneous items abandoned when the facility was no longer in use have been removed from this area. No significant combustibles remain. The process off-gas filters for Cells 1 through 4 and the cell ventilation system for Cell 5 have been abandoned in place. Following deactivation the alpha powder cell access area requires monitoring by CAAM. The alpha powder facility cell access area was decontaminated to remove transferable contamination. However, the area remains highly alpha contaminated. All painted surfaces have contamination under them.

Post-deactivation radioactive contamination levels and radiation levels for this area are listed in Table 4, "Post-Deactivation Radioactive Contamination Levels," and Table 5, "Post-Deactivation Radiation Levels," respectively. See Sect. 3.2.6. Post-deactivation hazardous materials and waste located in this area are listed in Table 6, "Building 3028 Post-Deactivation Hazardous Materials and Waste." See Sect. 3.2.7.

3.2.3.7 Cell 1-4

The miscellaneous items abandoned when the facility was no longer in use have been removed from this hot cell. No significant combustibles remain. The hot cell manipulator boots and isolation bags were removed and replaced. New boots were placed on the master slaves of the manipulators. The plastic boot and wiper which seals around the manipulator were removed. The manipulator control arms are bagged as an added precaution. The viewing window and shield tanks are drained and abandoned in place. All service lines and systems have been deactivated and abandoned in place. Drains have been plugged.

Post-deactivation radioactive contamination levels and radiation levels for this area are listed in Table 4, "Post-Deactivation Radioactive Contamination Levels," and Table 5, "Post-Deactivation Radiation Levels," respectively. See Sect. 3.2.6. Post-deactivation hazardous materials and waste located in this area are listed in Table 6, "Building 3028 Post-Deactivation Hazardous Materials and Waste." See Sect. 3.2.7.

3.2.3.8 Cell 5

The miscellaneous items abandoned when the facility was no longer in use have been removed from this hot cell. No significant combustibles remain. The hot cell manipulator boots and isolation bags were removed and replaced. New boots were placed on the master slaves of the manipulators. The plastic boot and wiper which seals around the manipulator were removed. The manipulator control arms are bagged as an added precaution. The viewing window for Cell 5 still contains mineral oil. All service lines and systems have been deactivated and abandoned in place. Drains have been plugged.

Post-deactivation radioactive contamination levels and radiation levels for this area are listed in Table 4, "Post-Deactivation Radioactive Contamination Levels," and Table 5, "Post-Deactivation Radiation Levels," respectively. See Sect. 3.2.6. Post-deactivation hazardous materials and waste located in this area are listed in Table 6, "Building 3028 Post-Deactivation Hazardous Materials and Waste." See Sect. 3.2.7.

3.2.3.9 Cell 6

The miscellaneous items abandoned when the facility was no longer in use have been removed from this hot cell. No significant combustibles remain. All service lines and systems have been deactivated and abandoned in place. Drains have been plugged.

Post-deactivation radioactive contamination levels and radiation levels for this area are listed in Table 4, "Post-Deactivation Radioactive Contamination Levels," and Table 5, "Post-Deactivation Radiation Levels," respectively. See Sect. 3.2.6. Post-deactivation hazardous materials and waste located in this area are listed in Table 6, "Building 3028 Post-Deactivation Hazardous Materials and Waste." See Sect. 3.2.7.

3.2.3.10 Cell 7

The miscellaneous items abandoned when the facility was no longer in use have been removed from this hot cell. No significant combustibles remain. The hot cell manipulator boots and isolation bags were removed and replaced. New boots were placed on the master slaves of the manipulators. The plastic boot and wiper which seals around the manipulator were removed. The manipulator control arms are bagged as an added precaution. All service lines and systems have been deactivated and abandoned in place. Drains have been plugged.

Post-deactivation radioactive contamination levels and radiation levels for this area are listed in Table 4, "Post-Deactivation Radioactive Contamination Levels," and Table 5, "Post-Deactivation Radiation Levels," respectively. See Sect. 3.2.6. Post-deactivation hazardous materials and waste located in this area are listed in Table 6, "Building 3028 Post-Deactivation Hazardous Materials and Waste." See Sect. 3.2.7.

3.2.3.11 Xe Recovery and Purification Cubicle

This system was abandoned in place prior to deactivation activities, however, the walls and floor were sealed during deactivation activities.

Post-deactivation radioactive contamination levels and radiation levels for this area are listed in Table 4, "Post-Deactivation Radioactive Contamination Levels," and Table 5, "Post-Deactivation Radiation Levels," respectively. See Sect. 3.2.6. Post-deactivation hazardous materials and waste located in this area are listed in Table 6, "Building 3028 Post-Deactivation Hazardous Materials and Waste." See Sect. 3.2.7.

3.2.3.12 Low-Level Scrubber Cubicle

This area of the facility was abandoned prior to deactivation. No deactivation activities were performed for this area.

Post-deactivation radioactive contamination levels and radiation levels for this area are listed in Table 4, "Post-Deactivation Radioactive Contamination Levels," and Table 5, "Post-Deactivation Radiation Levels," respectively. See Sect. 3.2.6. Post-deactivation hazardous materials and waste located in this area are listed in Table 6, "Building 3028 Post-Deactivation Hazardous Materials and Waste." See Sect. 3.2.7.

3.2.4 Building Structure and External Spaces

3.2.4.1 Building 3028 Structure

The exterior of Building 3028 was inspected and found to be in generally good structural condition. The building exterior has been cocooned to eliminate air in-leakage and to provide an effective containment for the building.

3.2.4.2 Building 3028 Roof

The roof of Building 3028 was inspected and found to be in generally good structural condition. The building exterior has been cocooned to eliminate air in-leakage and to provide an effective containment for the building.

3.2.5 Process, Utility, and Support Systems

3.2.5.1 Process Off-Gas System

The process off-gas system remains in operation to provide negative pressure contamination control for Cells 1 through 5 and Cell 7. All controls and negative pressure relief valves associated with the process off-gas system remain in operation as well. The process off-gas system remains contaminated from the process activities performed prior to deactivation.

3.2.5.2 Liquid Low-Level Waste System

The LLLW system has been abandoned in place. The system remains connected to the ORNL tank farm. Drains in individual cells have been plugged. The LLLW system remains highly contaminated from the process activities performed prior to deactivation.

3.2.5.3 Process Drain System

The process drain system has been abandoned in place. The process drain system remains connected to the ORNL process waste system. The process drain system remains highly contaminated from the process and cleaning activities performed prior to deactivation.

3.2.5.4 Process Water System

Isolated, drained, and abandoned in place.

3.2.5.5 Cell Manipulators

The hot cell manipulator boots and isolation bags were removed and replaced. New boots were placed on the slave ends of the manipulators. The plastic boot and wiper which seals around the manipulator were removed. The manipulator control arms are bagged as an added precaution.

3.2.5.6 Electrical Power System

All electrical services, with the exception of lighting, have been disconnected or de-energized at the main breaker box.

3.2.5.7 Fire Protection System

The fire protection system will be drained and isolated from the fire main header. The fire protection system was drained and abandoned but potentially available for use if there is a fire in the building. A automatic heat detector system was connected to the alarm system and is active.

3.2.5.8 Building Steam System

The building steam system has been isolated, drained, and abandoned in place.

3.2.5.9 HVAC and Building Exhaust System

The HVAC and building exhaust system has been isolated, de-energized, and abandoned in place.

3.2.5.10 Elevator

The Building 3028 elevator has been de-energized and abandoned in place. The elevator stations on the first, second, third, and fourth floors have been locked to prevent access. The Building 3028 elevator and elevator shaft remain contaminated from the process activities performed prior to deactivation.

3.2.5.11 Potable Water System

The potable water system has been isolated, drained, and abandoned in place. The incoming potable water line has been capped in the Cell 6 air lock.

3.2.5.12 Natural Gas System

The natural gas system has been isolated, vented, and abandoned in place.

3.2.5.13 Overhead Crane

All overhead cranes have been de-energized and abandoned in place. All oil has been drained from gear boxes. The overhead cranes remain contaminated from the process activities performed prior to deactivation.

3.2.5.14 Plant Air System

The plant air system has been isolated, vented, and abandoned in place.

3.2.5.15 Chilled Water System

The chilled water system has been isolated, drained, and abandoned in place. The chilled water system remains contaminated from the process activities performed prior to deactivation.

3.2.5.16 Process Vacuum System

The process vacuum system has been isolated, de-energized, and abandoned in place. The process vacuum system remains highly contaminated from the process activities performed prior to deactivation.

3.2.5.17 Chemical Make-up Area

The Chemical Make-up Area has been isolated and abandoned in place.

3.2.5.18 Isotope Area Still

The Isotope Area Still has been isolated and abandoned in place.

3.2.5.19 Air Alpha Monitoring System

All operable CAAMs have been removed from Building 3028.

3.2.6 Radioactive Material, Contamination, and Waste

Table 4, "Post-Deactivation Radioactive Contamination Levels," lists the radioactive contamination levels identified in Hazards Screening HS/3028/F/RT-5, Rev. 1.

Table 4. Post-Deactivation Radioactive Contamination Levels

Identification	Description	Quantity
West Air Lock	alpha smear—transferable contamination	less than 20 dpm/100cm^2
West Air Lock	beta/gamma smear—transferable contamination	less than 200 dpm/100cm^2
SLFP Operating Area	alpha smear—transferable contamination	less than 20 dpm/100cm^2
SLFP Operating Area	beta/gamma smear—transferable contamination	less than 200 dpm/100cm^2
APF Operating Area	alpha smear—transferable contamination	less than 20 dpm/100cm^2
APF Operating Area	beta/gamma smear—transferable contamination	less than 200 dpm/100cm^2
East Air Lock	alpha smear—transferable contamination	less than 20 dpm/100cm^2
East Air Lock	beta/gamma smear—transferable contamination	less than 200 dpm/100cm^2
Alpha Powder Cell Access Area	alpha smear—transferable contamination	less than 300 to 2,100 dpm/100cm^2
Alpha Powder Cell Access Area	beta/gamma smear—transferable contamination	less than 1,000 to 8,000 dpm/100cm^2
Cell 1	alpha smear—transferable contamination	greater than 10^7 dpm/100cm^2
Cell 1	beta/gamma smear—transferable contamination	Unknown, masked by the alpha
Cell 2	alpha smear—transferable contamination	greater than 10^7 dpm/100cm^2

Table 4 (continued)

Identification	Description	Quantity
Cell 2	beta/gamma smear—transferable contamination	Unknown, masked by the alpha
Cell 3	alpha smear—transferable contamination	1 to 10×10^6 dpm/100cm^2
Cell 3	beta/gamma smear—transferable contamination	Unknown, masked by the alpha
Cell 4	alpha smear—transferable contamination	1 to 10×10^6 dpm/100cm^2
Cell 4	beta/gamma smear—transferable contamination	Unknown, masked by the alpha
Cell 5	alpha smear—transferable contamination	1 to 10×10^6 dpm/100cm^2
Cell 5	beta/gamma smear—transferable contamination	Unknown, masked by the alpha
Cell 6	alpha smear—transferable contamination	Unknown, masked by the beta/gamma
Cell 6	beta/gamma smear—transferable contamination	greater than 10^7 dpm/100cm^2
Cell 7	alpha smear—transferable contamination	Unknown, masked by the beta/gamma
Cell 7	beta/gamma smear—transferable contamination	greater than 10^7 dpm/100cm^2
Xe Cubicle	alpha smear—transferable contamination	Unknown
Xe Cubicle	beta/gamma smear—transferable contamination	Unknown
Low-Level Scrubber Cubicle	alpha smear—transferable contamination	Unknown
Low-Level Scrubber Cubicle	beta/gamma smear—transferable contamination	Unknown
Second Floor	alpha smear—transferable contamination	less than 20 to 300 dpm/100cm^2
Second Floor	beta/gamma smear—transferable contamination	less than 200 to 1,000 dpm/100cm^2
Third Floor	alpha smear—transferable contamination	less than 20 dpm/100cm^2
Third Floor	beta/gamma smear—transferable contamination	less than 200 dpm/100cm^2
Fourth Floor	alpha smear—transferable contamination	less than 20 dpm/100cm^2
Fourth Floor	beta/gamma smear—transferable contamination	less than 200 dpm/100cm^2

Table 5, "Post-Deactivation Radiation Levels," lists radiation levels identified in Hazards Screening HS/3028/F/RT-5, Rev. 1.

Table 5. Post-Deactivation Radiation Levels

Identification	Description	Quantity
West Air Lock	fixed and transferable radiation levels	less than or equal to 3.0 mRem/hr
SLFP Operating Area	fixed and transferable radiation levels	less than or equal to 1.0 mRem/hr
APF Operating Area	fixed and transferable radiation levels	less than 1.0 mRem/hr
East Air Lock	fixed and transferable radiation levels	less than or equal to 15.0 mRem/hr
Alpha Powder Cell Access Area	fixed and transferable radiation levels	less than 1.0 mRem/hr
Cell 1	fixed and transferable radiation levels	Unknown, probably very high
Cell 2	fixed and transferable radiation levels	Unknown, probably very high
Cell 3	fixed and transferable radiation levels	Unknown, probably very high
Cell 4	fixed and transferable radiation levels	Unknown, probably very high
Cell 5	fixed and transferable radiation levels	Unknown, probably very high
Cell 6	fixed and transferable radiation levels	Unknown, probably very high
Cell 7	fixed and transferable radiation levels	Unknown, probably very high
Xe Cubicle	fixed and transferable radiation levels	Unknown
Low-Level Scrubber Cubicle	fixed and transferable radiation levels	Unknown
Second Floor	fixed and transferable radiation levels	less than 20.0 mRem/hr
Third Floor	fixed and transferable radiation levels	less than 0.05 mRem/hr
Fourth Floor	fixed and transferable radiation levels	less than 0.1 mRem/hr

3.2.7 Hazardous Materials and Waste

Table 6, "Building 3028 Post-Deactivation Hazardous Materials and Waste," lists the hazardous materials and waste identified during facility walkdowns following deactivation.

Table 6. Building 3028 Post-Deactivation Hazardous Materials and Waste

Identification	Description	Quantity
Lead based paint	Used as wall covering throughout building.	indeterminate
Asbestos Floor Tiles	Used as floor covering throughout the building.	approx. 4000 sq.ft.
Asbestos Lagging	Used as pipe lagging throughout the building	indeterminate
Asbestos Waste	Bagged waste from steam leak repairs	1 bag
Polychlorinated biphenyls	Electrical devices and transformers	indeterminate
Lead Shielding	Used in Cell walls, doors and windows	indeterminate
Mineral Oil	Used in Cell windows	indeterminate

4. BUILDING 3028 DEACTIVATION ACTIVITIES

The following section addresses the major activities performed during the deactivation of Building 3028. The objectives of the deactivation process were to place the facility in a passively safe and environmentally stable configuration which can be efficiently and cost effectively maintained for an indefinite period of time. The major deactivation issues with regard to Building 3028 are listed below.

4.1 INTERNAL SPACES—ACCESS REQUIRED

4.1.1 General Areas

All storage cabinets, desks, file cabinets and miscellaneous office materials were removed from the building. Some were green-tagged for reuse. The remaining items were size reduced as applicable and disposed of. Some asbestos was removed in accordance with safety work permits and plant and equipment asbestos removal procedures. The asbestos floor tiles were not removed and are not intended to be removed until facility decontamination and decommissioning. Asbestos insulation of steam piping and dulled water lines remaining. Lead based paint exists through out the building as wall covering. The areas which were peeling and flaking have been repaired, the remainder of the paint will remain as is. Paint condition is an inspection item in the S&M plan for Building 3028.

4.1.2 East Air Lock

All storage cabinets, desks, file cabinets and miscellaneous materials were removed from the east air lock. All combustibles were removed from the area. The east air lock was decontaminated to remove transferable contamination from the access required area. All systems and services to the east air lock were de-energized, drained, vented, and isolated. The process off-gas filter pit, located in the east air lock remains contaminated.

4.1.3 West Air Lock

All storage cabinets, desks, file cabinets and miscellaneous materials were removed from the west air lock. All combustibles were removed from the area. The west air lock was decontaminated to remove transferable contamination from the access required area. All systems and services to the west air lock were de-energized, drained, vented, and isolated.

4.1.4 Short-lived Fission Product Operating Area

All storage cabinets, desks, file cabinets and miscellaneous materials were removed from the SLFP operating area. All combustibles were removed from the area. The SLFP operating area was decontaminated to remove transferable contamination from the access required area. All systems and services to the SLFP operating area were de-energized, drained, vented, and isolated.

4.1.5 Alpha Powder Facility Operating Area

All storage cabinets, desks, file cabinets and miscellaneous materials were removed from the APF operating area. All combustibles were removed from the area. The APF operating area was

decontaminated to remove transferable contamination from the access required area. All systems and services to the APF operating area were de-energized, drained, vented, and isolated.

4.1.6 Alpha Powder Facility Cell Access Area

Entrance into old cell ventilation duct was sealed to prevent new ventilation system from pulling contamination from the duct. The charging area behind the cells was cleaned to remove potential airborne contaminates in accordance with parameters detailed in the radworker permits.

4.2 INTERNAL SPACES—NO ACCESS REQUIRED

4.2.1 Cells 1-4

The following deactivation activities were performed in Cell 1:

- All waste and loose equipment was removed, cut up, and downsized then placed in five gallon lard containers. The five gallon lard containers were then placed into 55-gallon transuranic waste drums.
- The cell manipulator boots and isolation bags were removed and replaced. New boots were placed on the master slaves of the manipulators. The plastic boot and wiper which seals around the manipulator were removed.
- The cell windows and water-filled shielding tanks were drained and disposed of as processed waste.
- The cell was wiped down to reduce airborne contamination.
- All cell service lines were identified, labeled, and plugged.
- All in-cell filters were removed.
- All cell drains were plugged.
- Access to the cell was secured.
- Aluminum plates were placed over the cell glove parts in Cells 2 and 3.

4.2.5 Cell 5

The following deactivation activities were performed in Cell 5:

- All waste and loose equipment was removed, cut up, and downsized then placed in five gallon lard containers and transferred to waste management.
- The cell manipulator boots and isolation bags were removed and replaced. New boots were placed on the slave ends of the manipulators. The plastic boot and wiper which seals around the manipulator were removed.

- The cell was wiped down to reduce airborne contamination.
- All cell service lines were identified, labeled, and plugged.
- All in cell filters were removed.
- All cell drains were plugged.
- Access to the cell was secured.

4.2.6 Cell 6

The following deactivation activities were performed in Cell 6:

- All waste and loose equipment was removed, cut up, and downsized then placed in five gallon lard containers and transferred to waste management.
- The cell was wiped down to reduce airborne contamination.
- All cell service lines were identified, labeled, and plugged.
- All in cell filters were removed.
- All cell drains were plugged.
- Access to the cell was secured.

4.2.7 Cell 7

The following deactivation activities were performed in Cell 7:

- All waste and loose equipment was removed, cut up, and downsized then placed in five gallon lard containers and transferred to waste management.
- The cell manipulator boots and isolation bags were removed and replaced. New boots were placed on the master slave ends of the manipulators. The plastic boot and wiper which seals around the manipulator were removed.
- The cell was wiped down to reduce airborne contamination.
- All cell service lines were identified, labeled, and plugged.
- All in cell filters were removed.
- All cell drains were plugged.
- Access to the cell was secured.

4.2.8 Xe Recovery and Purification Cubicle

The only deactivation activity that was performed consisted of sealing the walls and floor.

4.2.9 Low-Level Scrubber Cubicle

This area of the facility was abandoned prior to deactivation. No deactivation activities were performed for this area.

4.3 EXTERNAL SPACES

4.3.1 Building 3028 Structure

The building structure was inspected and repaired, as necessary, to provide structural stability for the next 5 years. The building was sealed to provide an effective secondary containment boundary and to prevent animal intrusion to the interior during the post-deactivation S&M period.

4.3.2 Building 3028 Roof

The building roof was repaired and sealed, as necessary, to provide an effective secondary containment boundary and to minimize the amount of water in leakage during the post-deactivation S&M period.

4.4 OPERATIONAL SYSTEMS

4.4.1 Electrical Power System

All electrical services that were not essential to the basic S&M operations were disconnected at the main breaker box.

4.4.2 Process Off-Gas System

The process off-gas system remains in operation to provide negative pressure contamination control for Cells 1 through 5 and Cell 7. All controls and negative pressure relief valves associated with the process off-gas system remain in operation as well. No decontamination of the process off-gas system has been performed.

4.4.3 Fire Protection System

The fire protection system has been drained and isolated from the fire main header. The fire protection system has been converted from a wet pipe protection system to a dry pipe delivery system available for use if there is a fire in the building.

4.5 MOTHBALLED SYSTEMS

None associated with Building 3028.

4.6 ABANDONED SYSTEMS

4.6.1 Building Steam System

The building steam system supply was drained and valved off at the pipe chase south of the building.

4.6.2 HVAC and Building Exhaust System

The HVAC and building exhaust system was de-energized and abandoned in place.

4.6.3 Elevator

The Building 3028 elevator was parked, de-energized, and abandoned in place. No decontamination was performed on the elevator or the elevator shaft.

4.6.4 Cell Manipulators

The cell manipulator boots and isolation bags were removed and replaced. New boots were placed on the master slaves of the manipulators. The plastic boot and wiper which seals around the manipulator were removed. Decontamination was performed, as required, during manipulator boot replacement.

4.6.5 Potable Water System

Potable water has been isolated from Building 3028 by capping the incoming line located in the Cell 6 air lock. The header for the building also supplies Building 3047 and was therefore not isolated.

4.6.6 Natural Gas System

Natural gas was drained and valved off at Valve 147 on the pipe chase south of the building.

4.6.7 Overhead Cranes

The overhead cranes were de-energized and abandoned in place. Minor decontamination was performed on the overhead cranes to minimize the potential spread of contamination.

4.6.8 Plant Air System

The plant air system has been depressurized and valved off at Valve 86 on the south pipe chase.

4.6.9 Chilled Water System

Cooling water for the air handling systems has been isolated and drained. No decontamination of the chilled water system has been performed.

4.6.10 Liquid Low-Level Waste System

Deactivation activities were performed for the LLLW system, which included plugging the drain access with a plexiglass plug to prevent spills. No decontamination of the LLLW system has been performed.

4.6.11 Process Drain System

The process floor drains remain in operation to direct any water in-leakage to the ORNL Tank Farm and prevent any contamination from leaving a controlled system. No decontamination of the process drain system has been performed.

4.6.12 Process Water System

The main process water supply header to the building was valved off at Valve 2-170 as shown in Figure 4. In addition, the process water supply pipe was cut and capped inside the building in the Cell 6 Air lock.

4.6.13 Process Vacuum System

The process vacuum system has been isolated, de-energized, and abandoned in place.

4.6.14 Chemical Make-up Area

The chemical make-up area has been isolated and abandoned in place.

4.6.15 Isotope Area Still

The Isotope Area Still Area has been isolated and abandoned in place.

4.6.16 Air Alpha Monitoring System

All CAAMs were removed from Building 3028.

5. TRANSITION ACTIVITIES

Building 3028 will be officially transferred from the DOE Office of Facility Transition and Management (EM-60) program to the EM-40 program by a Memorandum of Agreement (MOA). The building will be accepted "as is" by EM-40 at the time of transfer.

5.1 MEMORANDUM OF AGREEMENT

The Memorandum of Agreement (MOA) documents the requirements agreed upon between the Office of Environmental Restoration (EM-40) and the Nuclear Materials and Facility Stabilization Program (EM-60). The signed MOA indicates acceptance by EM-40 that the criteria outlined in the MOA have been completed satisfactorily, with the exception of a post-transition punch list, and that the level of deactivation of the facility is acceptable for transition to the EM-40 program.

The items on the post-transition punch list will be finished using EM-60 funding after deactivation is complete. The details of how the punch list items will be completed and documented are addressed in the MOA.

5.2 REQUIREMENTS AND COMMITMENTS

5.2.1 Regulatory Requirements

None associated with Building 3028.

5.2.2 Stakeholder Commitments

None associated with Building 3028.

5.3 POST-TRANSITION ACTIVITIES

No Post-Transition punch list items have been identified for Building 3028. All deactivation activities have been completed prior to transfer to EM-40.

6. POST-DEACTIVATION SURVEILLANCE AND MAINTENANCE

The post-deactivation S&M plan for Building 3028 covers S&M activities associated with the interior spaces, operational and mothballed systems, and external areas related to Building 3028.

The specific objectives of the S&M program for Building 3028 are as follows:

1. Ensure adequate containment of contamination,

2. Provide physical safety and security control,

3. Maintain the facility in a manner that will minimize potential hazards to the public, and

4. Provide a mechanism for the identification and compliance with applicable environmental, safety, and health requirements.

The post-deactivation S&M plan for Building 3028 details the specific S&M items to be performed and estimates the annual cost of performance. The S&M cost estimates are based on previous operational costs associated with similar S&M activities at ORNL.

The S&M activities associated with Building 3028 include the following types of activities:

- Walkdowns and inspections for structural integrity, safety, radioactive contamination, and hazardous material conditions;

- General housekeeping of the interior and exterior of the building as needed; and

- Maintenance activities required to maintain the security and safety envelop of the facility.

7. ABNORMAL ACTIVITIES/CONDITIONS

No Abnormal Activities/Conditions have been identified for Building 3028.

8. TURNOVER PACKAGE DOCUMENTATION

8.1 ADMINISTRATIVE TURNOVER PACKAGE

The administrative turnover package consists of a collection of administrative documents. This includes procedures, agreements, permits, and other documents not directly related to the physical facility. The level of detail depends on the conditions, requirements, and agreements specific to the facility. Appendix B, "Turnover Package Checklists," contains the Administrative Turnover Package Checklist which reflects the documents required for this facility with respect to administrative turnover. The following sections detail the contents of the applicable sections required for Building 3028.

8.1.1 Final Deactivation Project Report

The final deactivation project report is a management summary describing the facility deactivation completion, general status, and conditions of the facility and demonstrating conformance with DOE end point specifications. It identifies management actions needed that are not routine. Unresolved issues are also described.

8.1.2 Deactivation Locks and Keys Log

The deactivation locks and keys log describes a formal "deactivation lock system" for facility access, isolation of electrical components, chaining of valves, and other situations where physical access is to be controlled. The primary purpose of this system is to ensure control as the work force "backs out" of the facility as specified end points are achieved.

8.2 TECHNICAL TURNOVER PACKAGE

The technical turnover package consists of a collection of technical documents that describe the facility, its equipment, and the conditions at the completion of all deactivation activities. The level of detail depends on the conditions, requirements, and agreements specific to the facility. Appendix B, "Turnover Package Checklists," contains the Technical Turnover Package Checklist which reflects the documents required for this facility with respect to technical turnover. The following sections detail the contents of the applicable sections required for the Building 3028.

8.2.1 Updated Facility Drawings

Facility, room, and cell arrangement drawings—to the extent they exist —are provided. However, except in unique circumstances, as-built drawings of the deactivated conditions within the facility are not provided. A list of these drawings for Building 3028 is provided in Table 7. The documentation provides current status of the deactivation/safe shutdown (if applicable)of the facility and addresses systems, such as the water, sewer, air, electric, gas, process (mechanical and chemical), and fire protection systems.

Table 7. Building 3028 Updated Drawings

Number	Rev.	Title
H3E-20011-G022		3028 RF Cell Vnt. & Off-Gas
H3E-20011-G031		3028 Flr. Cell Vnt. & Off-Gas
H3E-20011-G040		3028 Sec. Cell Vnt. & Off Gas
H3E-20011-SK7		3028, 3047 Demo. CV & OG
I3E-20011-0002		3028 Off Gas ISD Cell. Vac.
I3E-20011-0005		CV & OG Installation Dets.
H20360EG-004-D	1	Target Fab. Fac. A/C Exh. System Plan 1st Fl.
H20360EG-008-D	2	Target Fab. Fac. A/C Equip. Ductwork Elev. 4th Fl.
S3E-20011-B005		Duct Support Details—Sheet 2

8.2.2 Radioactive Materials Inventory and Survey

An inventory with characterization information of radioactive and fissile material remaining as contamination is provided. The final radiological/hazardous materials survey records, final configuration and S&M requirements, available drawings, specifications, procedures, manuals, and unplanned occurrences records applicable to the facility are also provided.

8.3 SURVEILLANCE AND MAINTENANCE TURNOVER PACKAGE

S&M turnover consists of a collection of documents required to support post-deactivation S&M activities. The level of detail depends on the S&M specific to the facility. Appendix B, "Turnover Package Checklists" contains the S&M Turnover Package Checklist which reflects the documents required for this facility with respect to S&M turnover. The following sections detail the contents of the applicable sections required for the APF.

8.3.1 Post-Deactivation S&M Plan

This document describes the S&M plan for the facility after deactivation is complete, up to the initiation of decommissioning. The S&M activities will be integrated into the decommissioning work and phased out as decommissioning is completed.

8.3.2 Post-Deactivation S&M Procedures

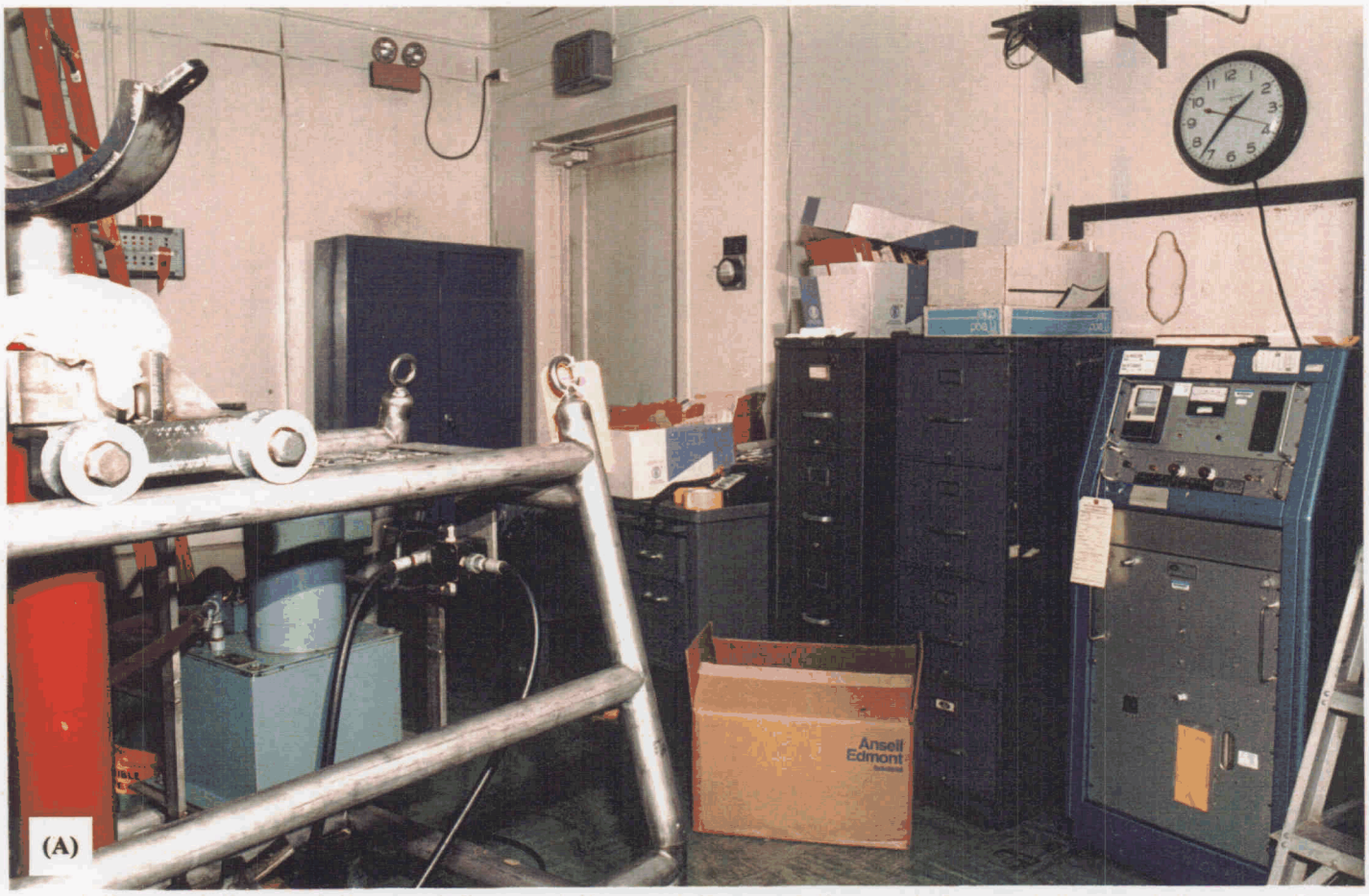
Table 8, "Building 3028 Surveillance and Maintenance Procedures," contains a list of procedures required during the post-deactivation S&M period. These procedures outline the maintenance activities and special surveillances required to ensure that the facility conditions and safety envelop remain consistent until decommissioning can take place.

Table 8. Building 3028 surveillance and maintenance procedures

Number	Procedure Title
IP-900	Building 3028 Hazards and Structural Integrity Inspection
RPP-550	Radiological Survey
N/A	Building Roof Repair and Maintenance Procedure
IP-900	General Housekeeping Procedure
IP-1418	Manipulator Removal, Repair, and Replacement
SSI 150	HEPA Filter Performance Testing
MMD/CIDG 1022	Calibration of Photohelic Pressure Gauge
MMD/CIDG 1022	Calibration of Magnahelic Pressure Gauge
MMD/CIDG 1110	Calibration of CAAMs
MMD/CSSP 1010	Calibration and Testing of Pressure Relief Valves
MMD/PORB 1011	Calibration and Testing of Control Valves
MMD/CREC 1011	Calibration of Recorder Controller
MMD/CTMZ 1012	Calibration of Pressure Differential Transmitter
IP-1312, Rev. 2	Process Off-Gas System HEPA Filter Replacement
IP-1313, Rev. 2	Local and Central Ventilation System HEPA Filter Replacement

9. PHOTOGRAPHS

The following photographs show the pre-deactivation and post-deactivation condition of various areas of the Alpha Powder Facility, Building 3028.



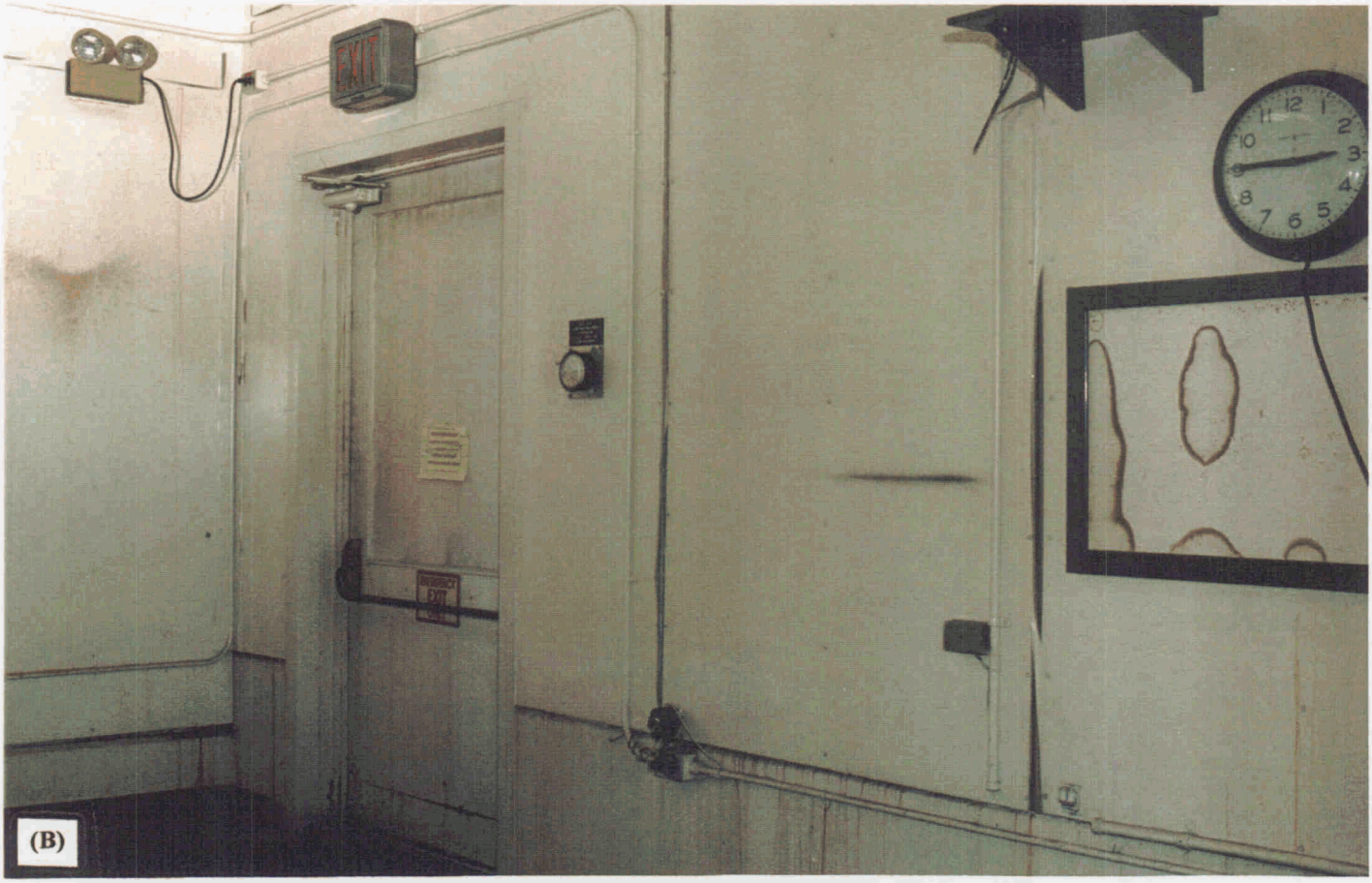
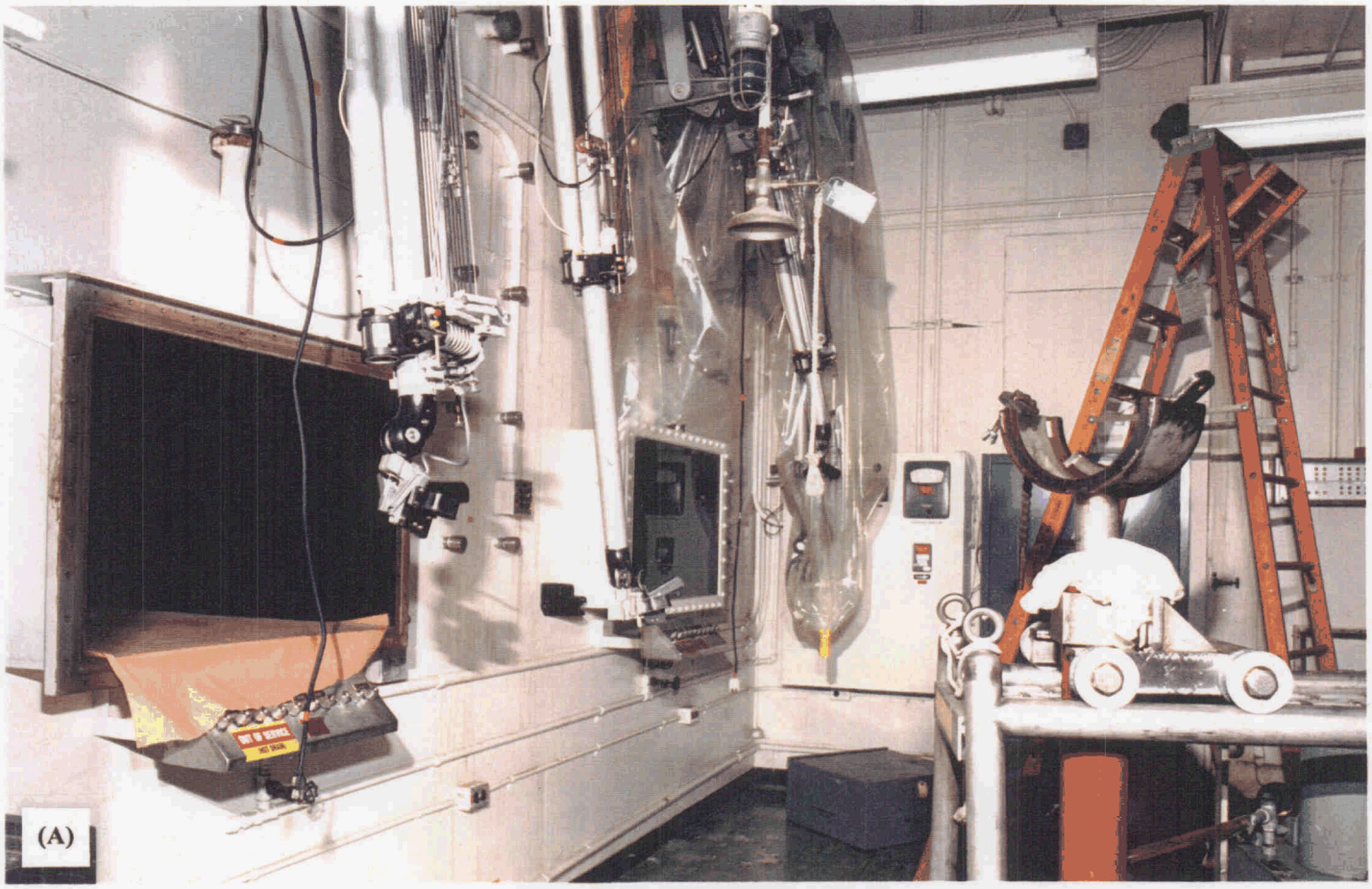


Fig. 1. Short-lived fission products operating area: (A) Pre-deactivation view; (B) Post-deactivation view.



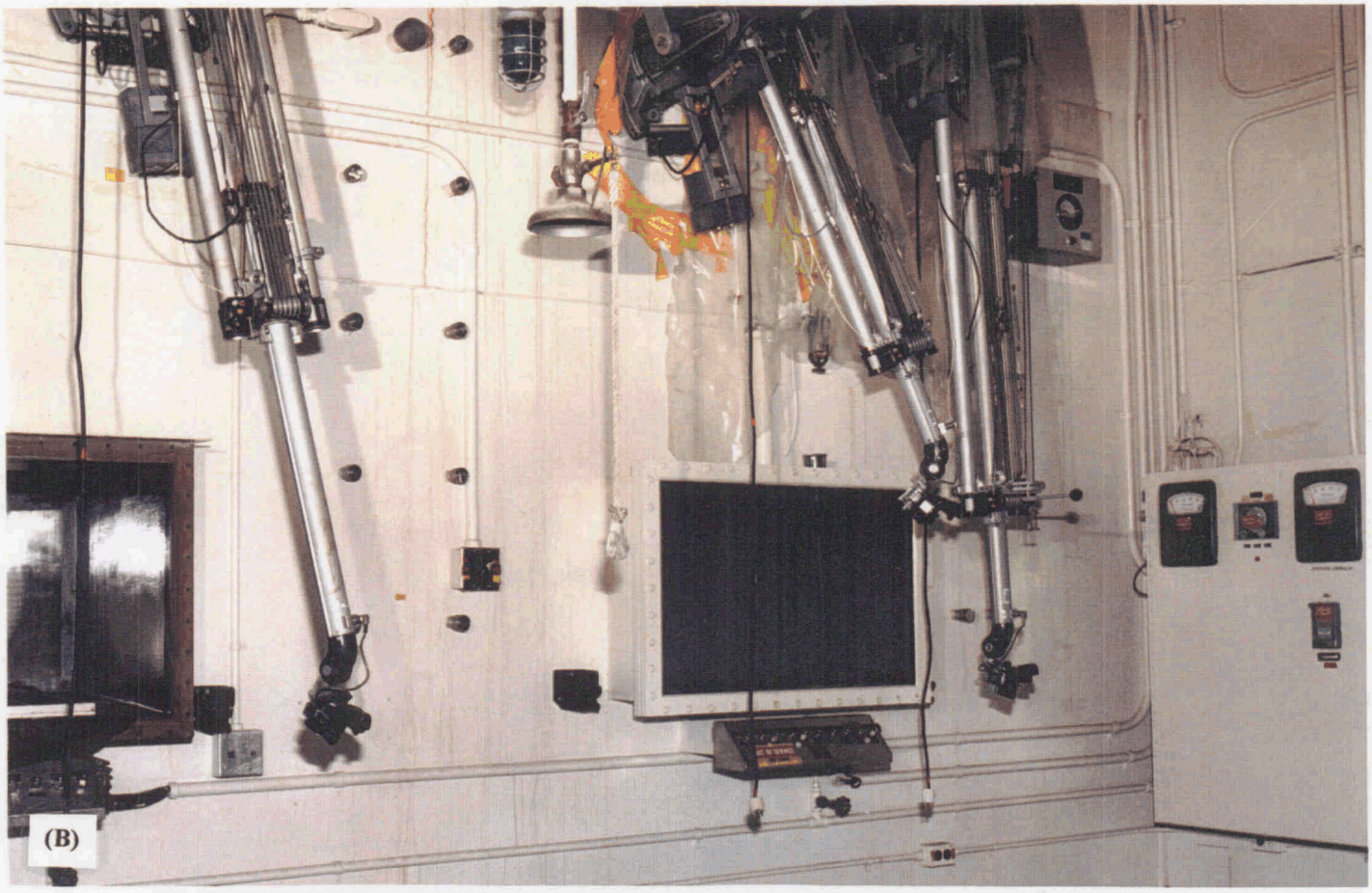
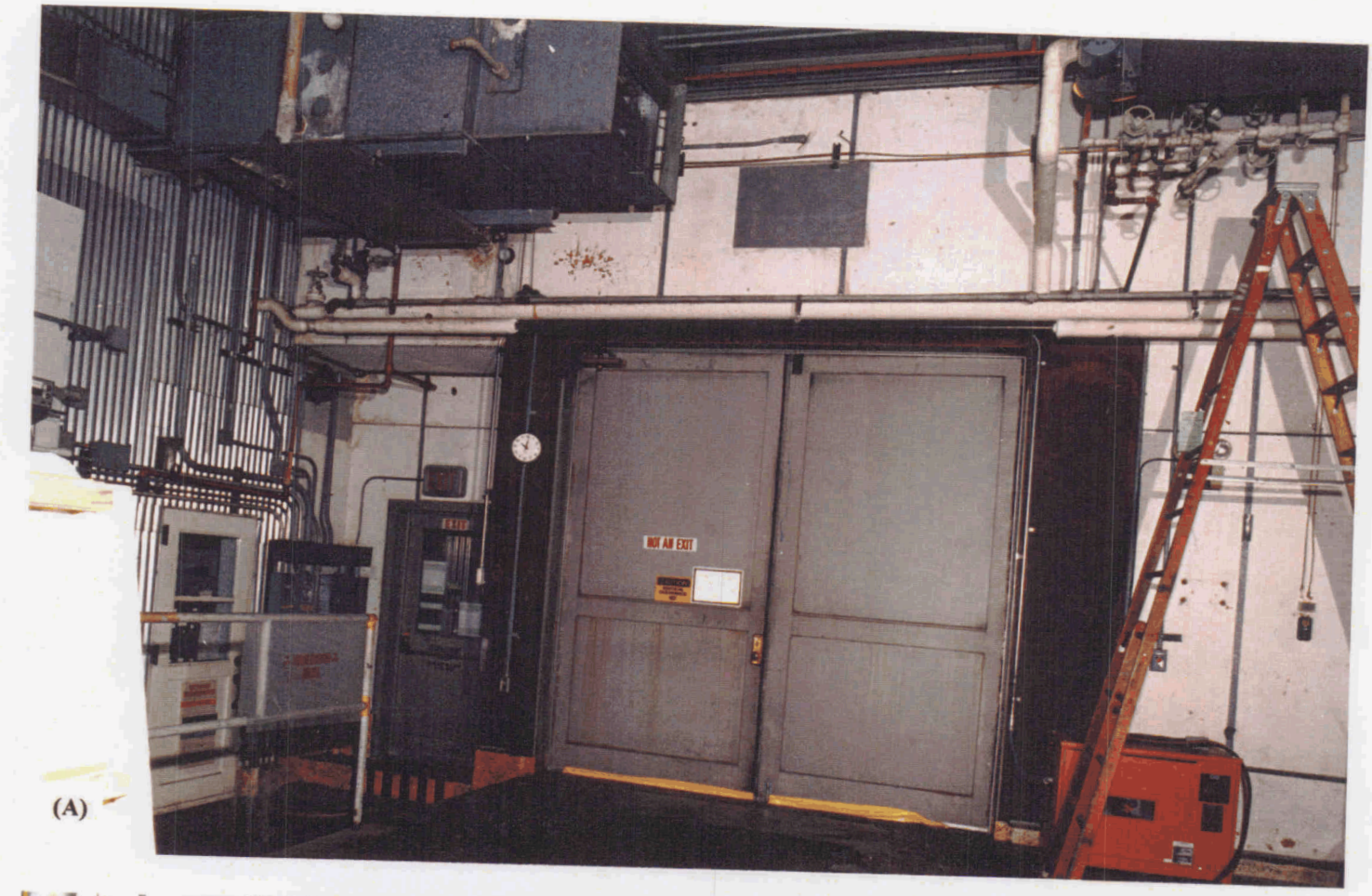


Fig. 2. Work stations in the short-lived fission products operating area: (A) Pre-deactivation view. (B) Post-deactivation view.



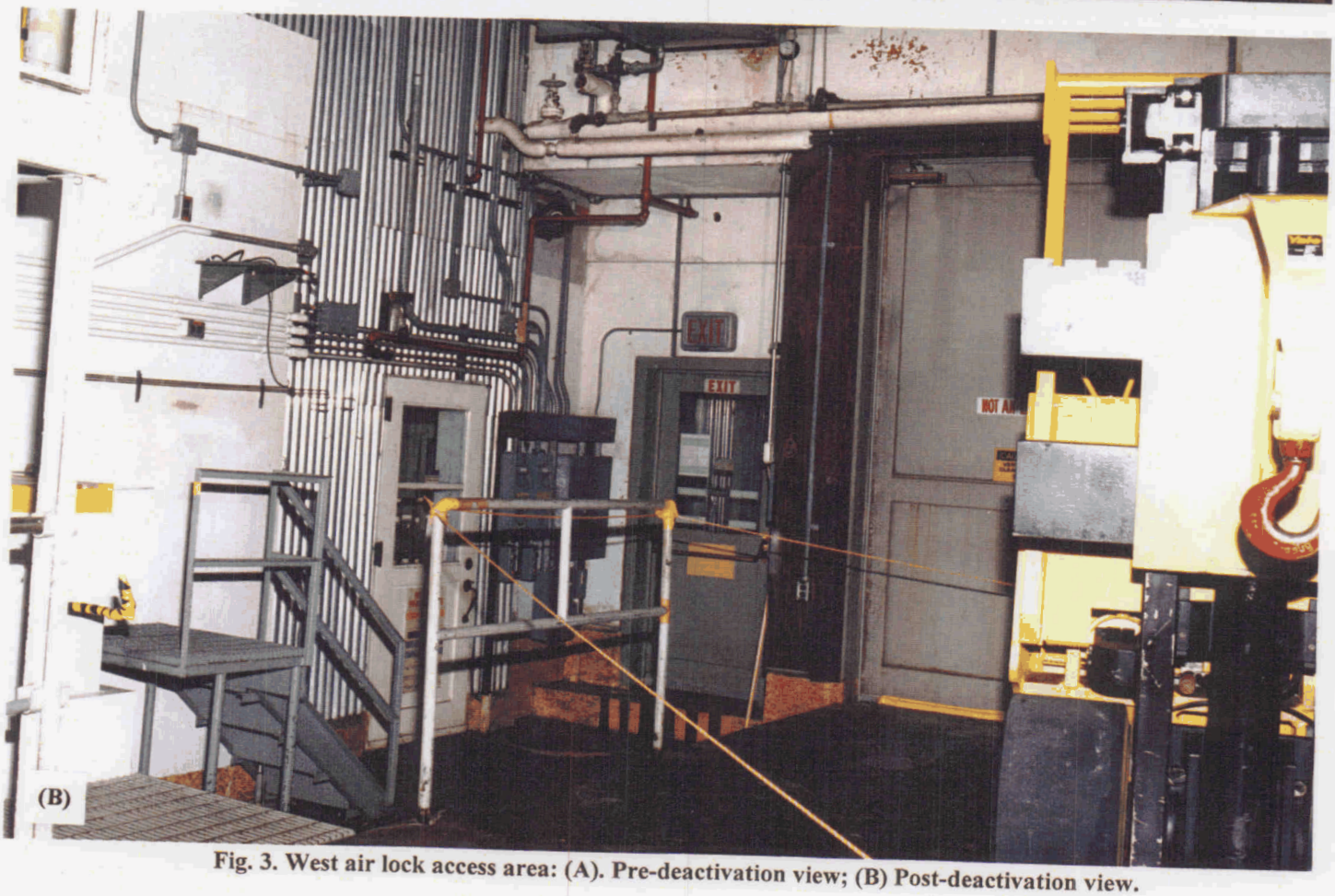


Fig. 3. West air lock access area: (A). Pre-deactivation view; (B) Post-deactivation view.

Fig. 4. West air lock north storage area: (A) Pre-deactivation view; (B) Post deactivation view.

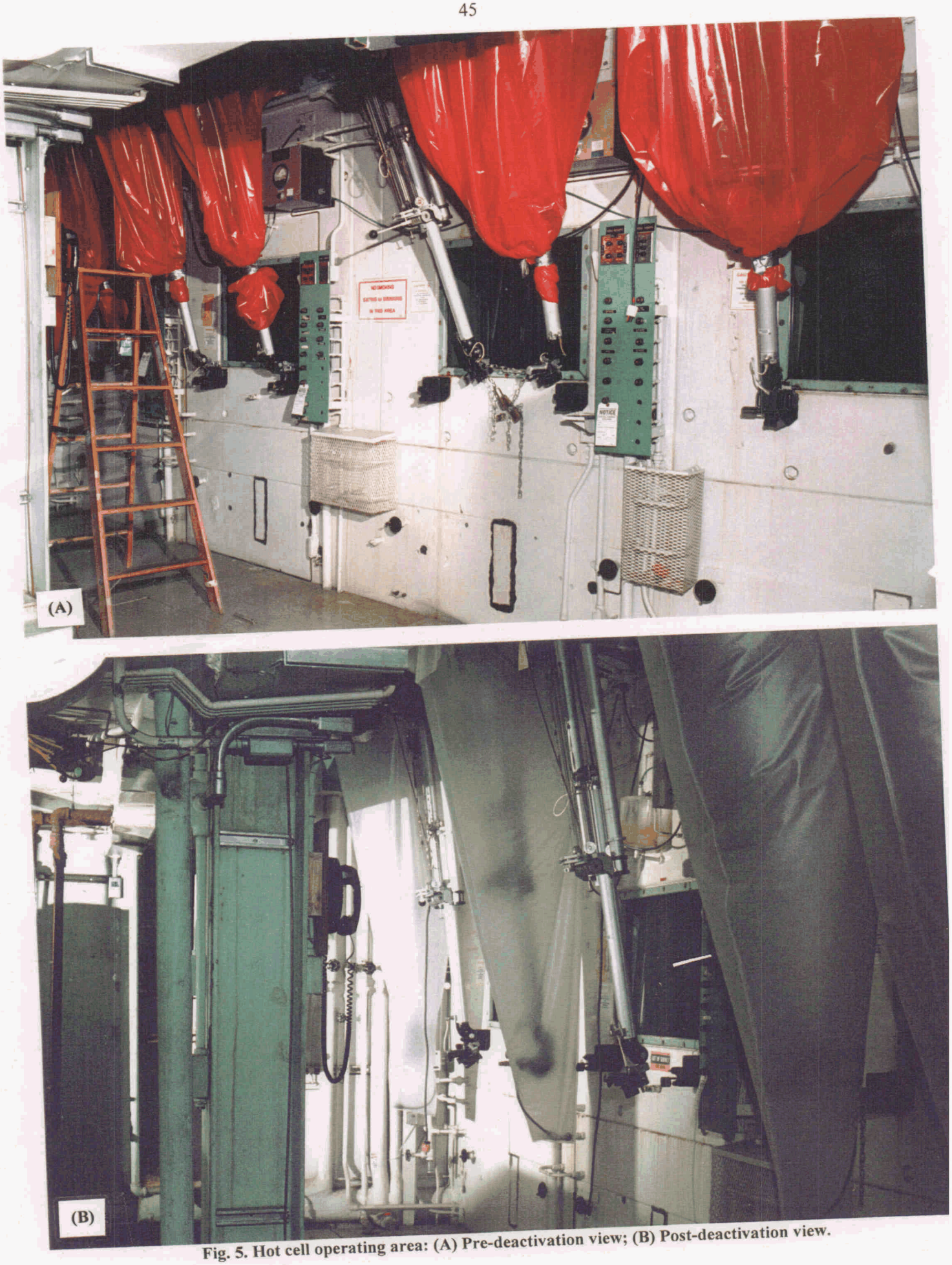
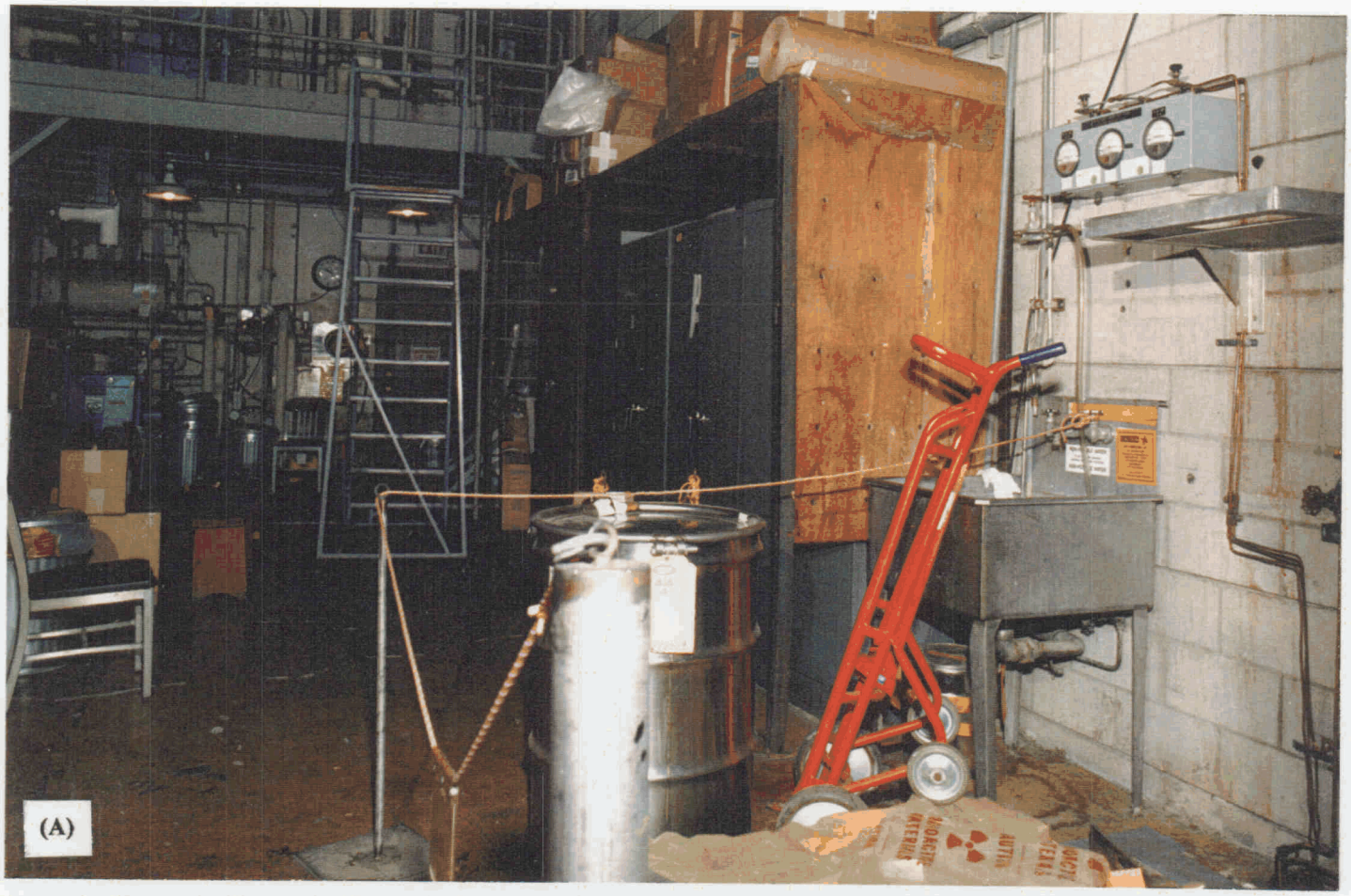


Fig. 5. Hot cell operating area: (A) Pre-deactivation view; (B) Post-deactivation view.



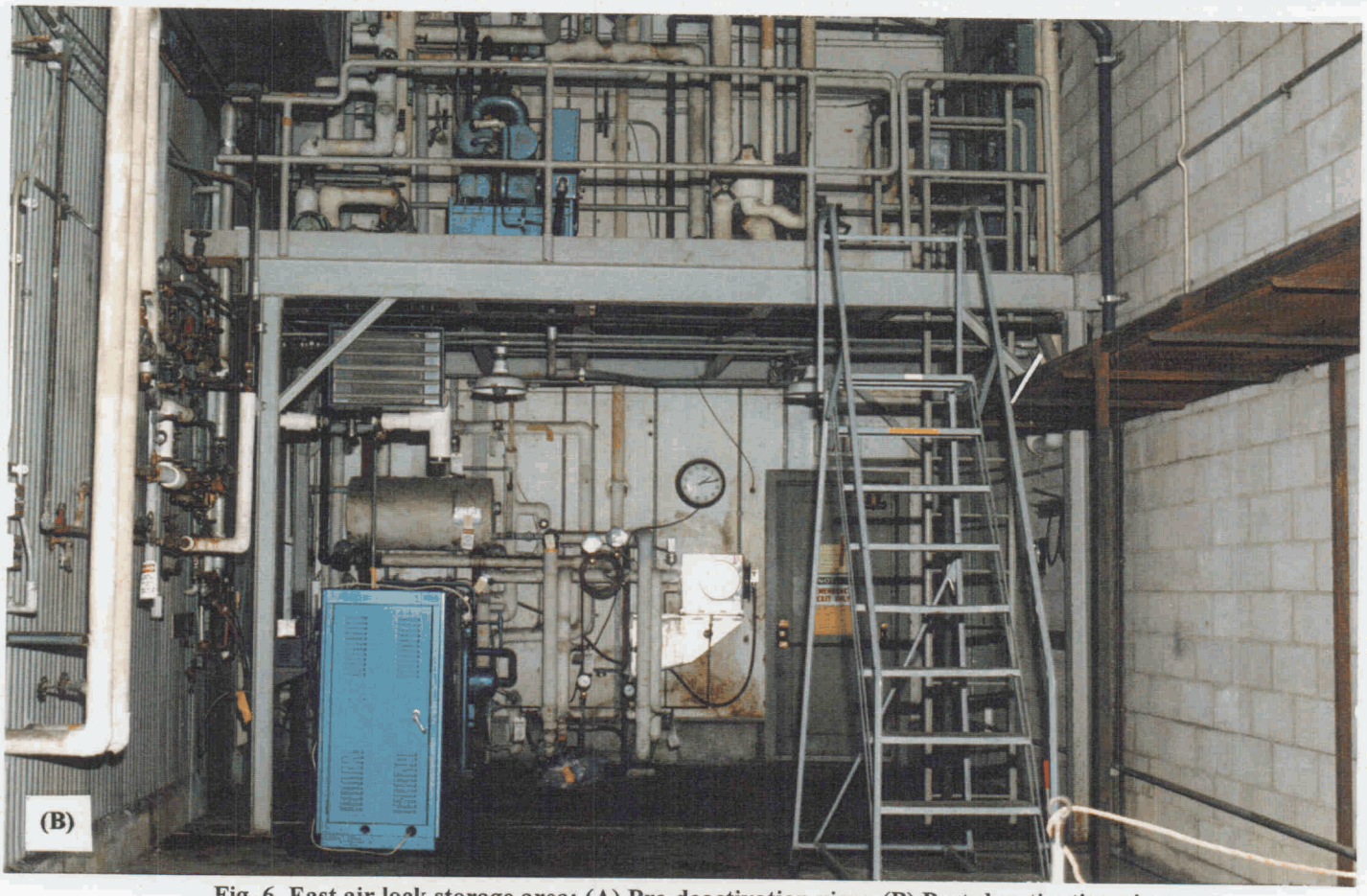


Fig. 6. East air lock storage area: (A) Pre-deactivation view; (B) Post-deactivation view.

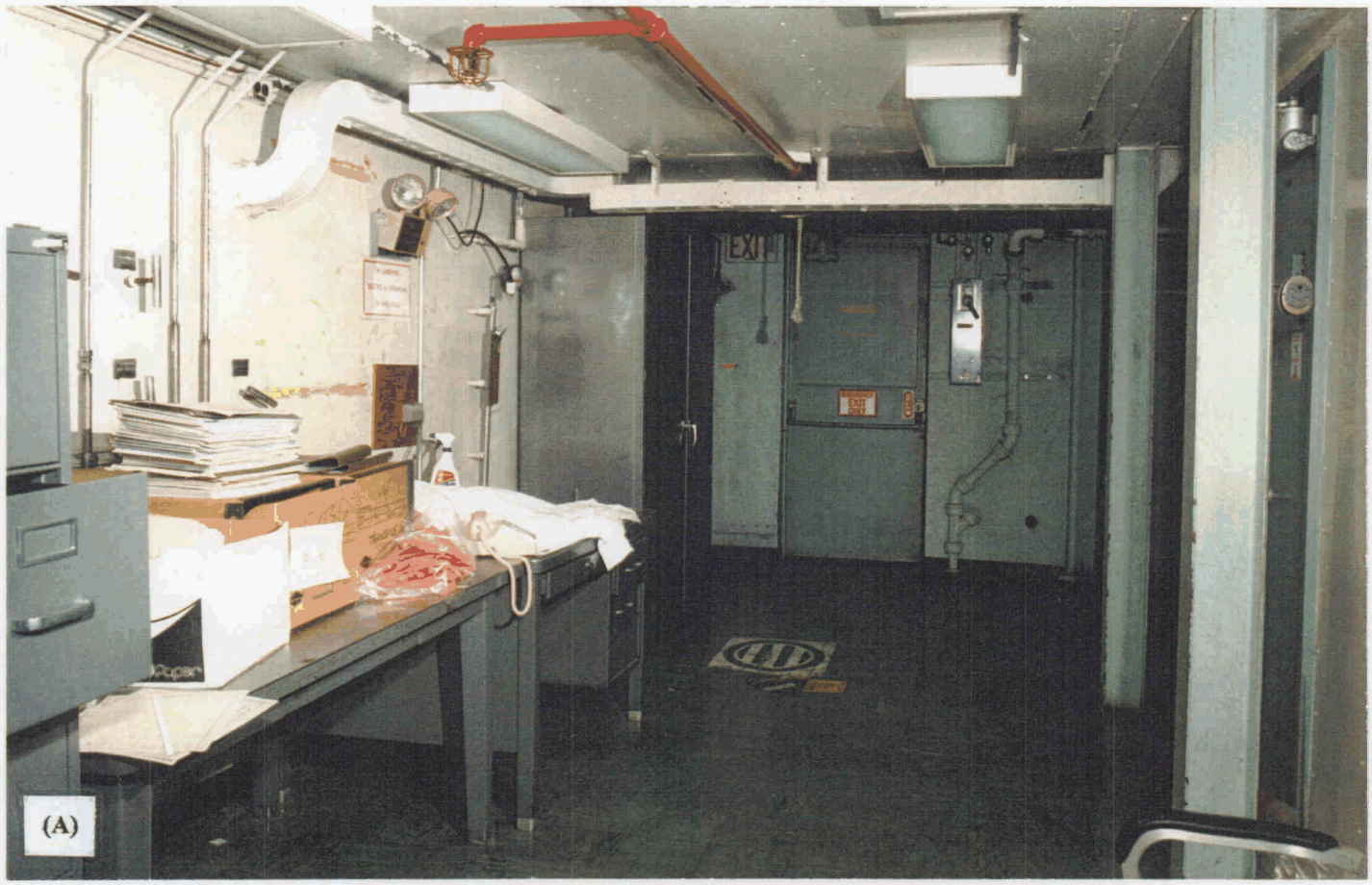


Fig. 7. Hot cell operating gallery: (A) Pre-deactivation view; (B) Post-deactivation view.

Fig. 8. (A) North end of east air lock, pre-deactivation view; (B) Access doors to cell charging area, pre-deactivation view.

10. REFERENCES

Facility Deactivation End Points Handbook; Volume 1: Method and Examples. Draft

Facility Deactivation End Points Handbook; Volume 2: Deactivation Practices. Draft

Decommissioning Resource Manual, DOE/EM-0246. August 1995.

Lockheed Martin Energy Systems, Inc. 1995. *Work Plan for the Isotopes Facilities Deactivation Project at Oak Ridge National Laboratory*, ORNL/ER-249/R2. Lockheed Martin Environmental Restoration Program. August.

Martin Marietta Energy Systems, Inc. 1994. *Local Emergency Manual, Isotope Area.* Revision 94-1. Oak Ridge National Laboratory. January.

Martin Marietta Energy Systems, Inc. 1994. *Building 3028 Hazard Screening.* HS/3028/F/RT-5, Rev. 1. Oak Ridge National Laboratory. December.

APPENDIX A

BUILDING 3028 FLOOR PLANS

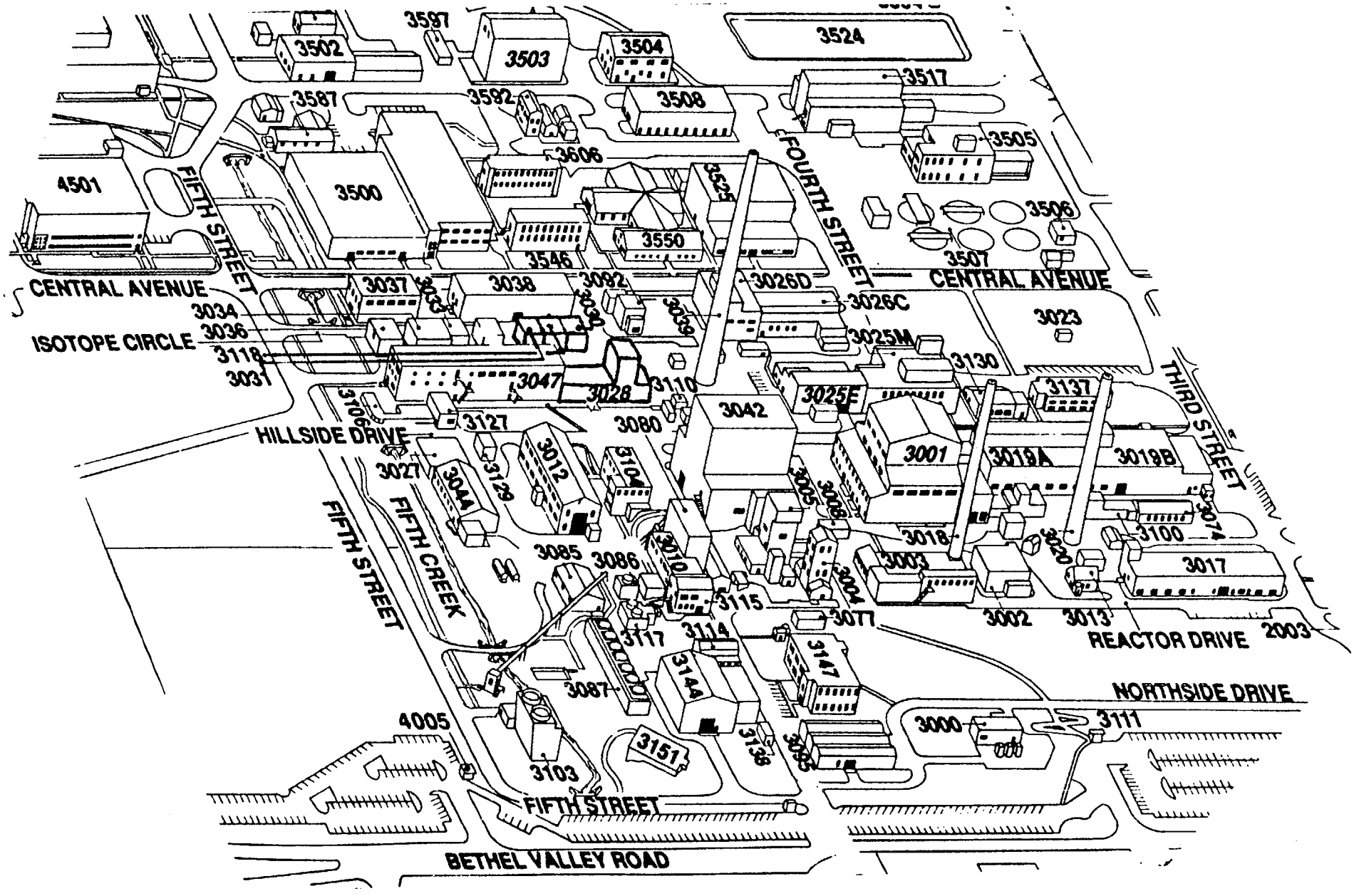
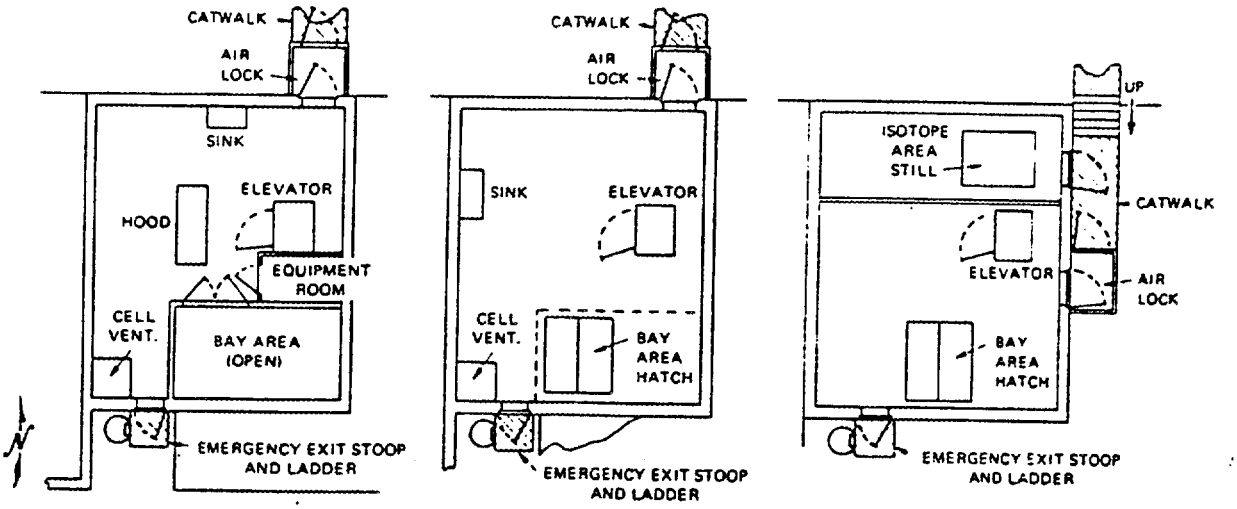


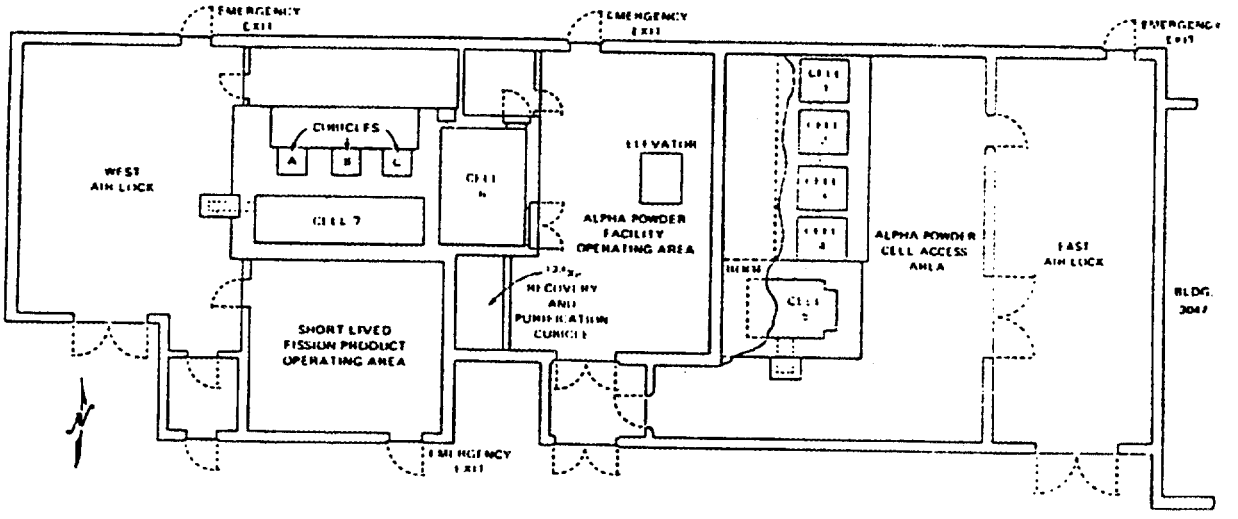
Fig. 1. Location of isotopes facilities at ORNL.

ORNL DWG 90-599



Second Floor Third Floor Fourth Floor

Upper Floors Building 3028



First Floor Building 3028

Fig. 2. Historical floor plan of Building 3028.

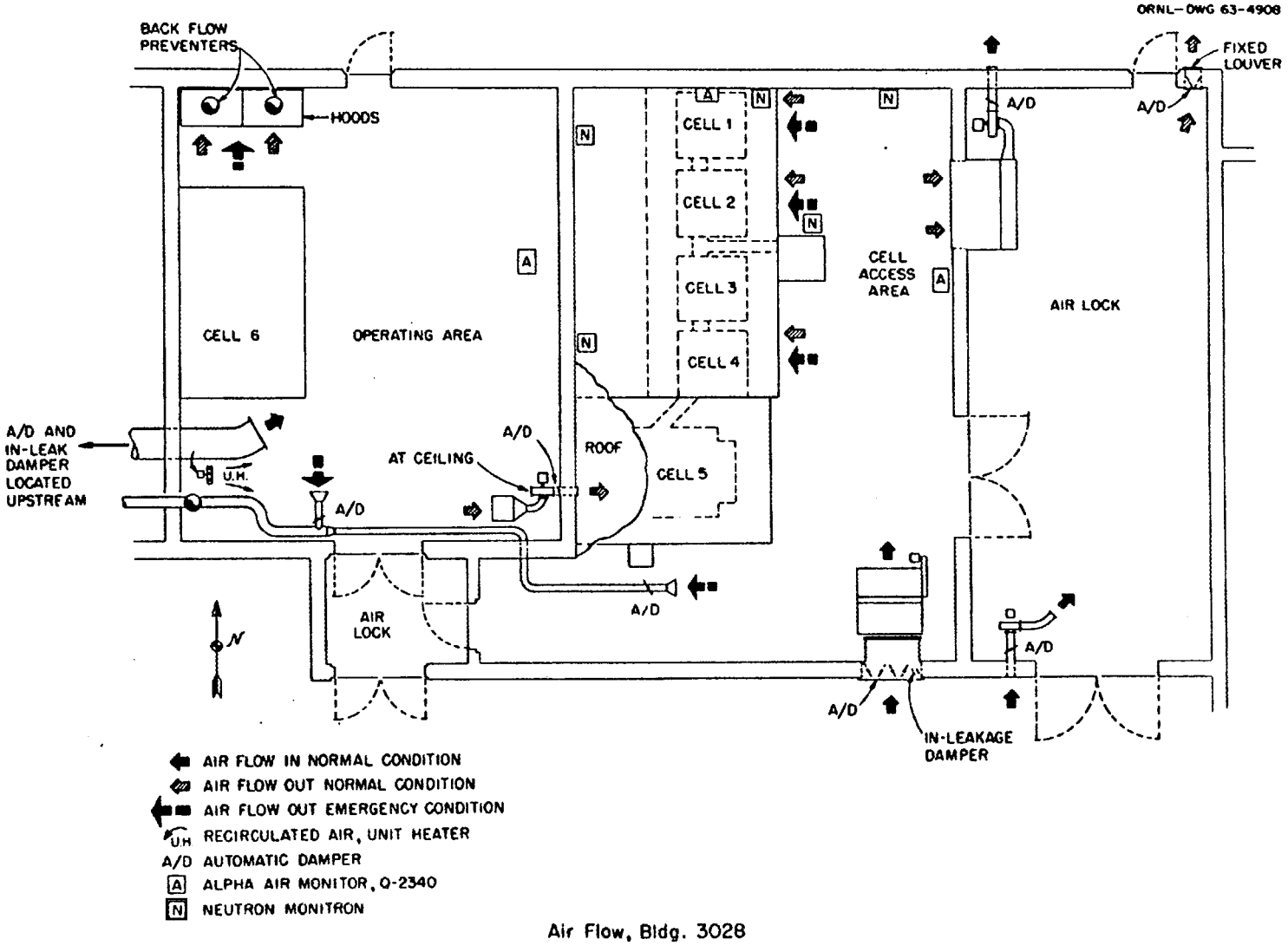


Fig. 3. Air flow diagram of Building 3028.

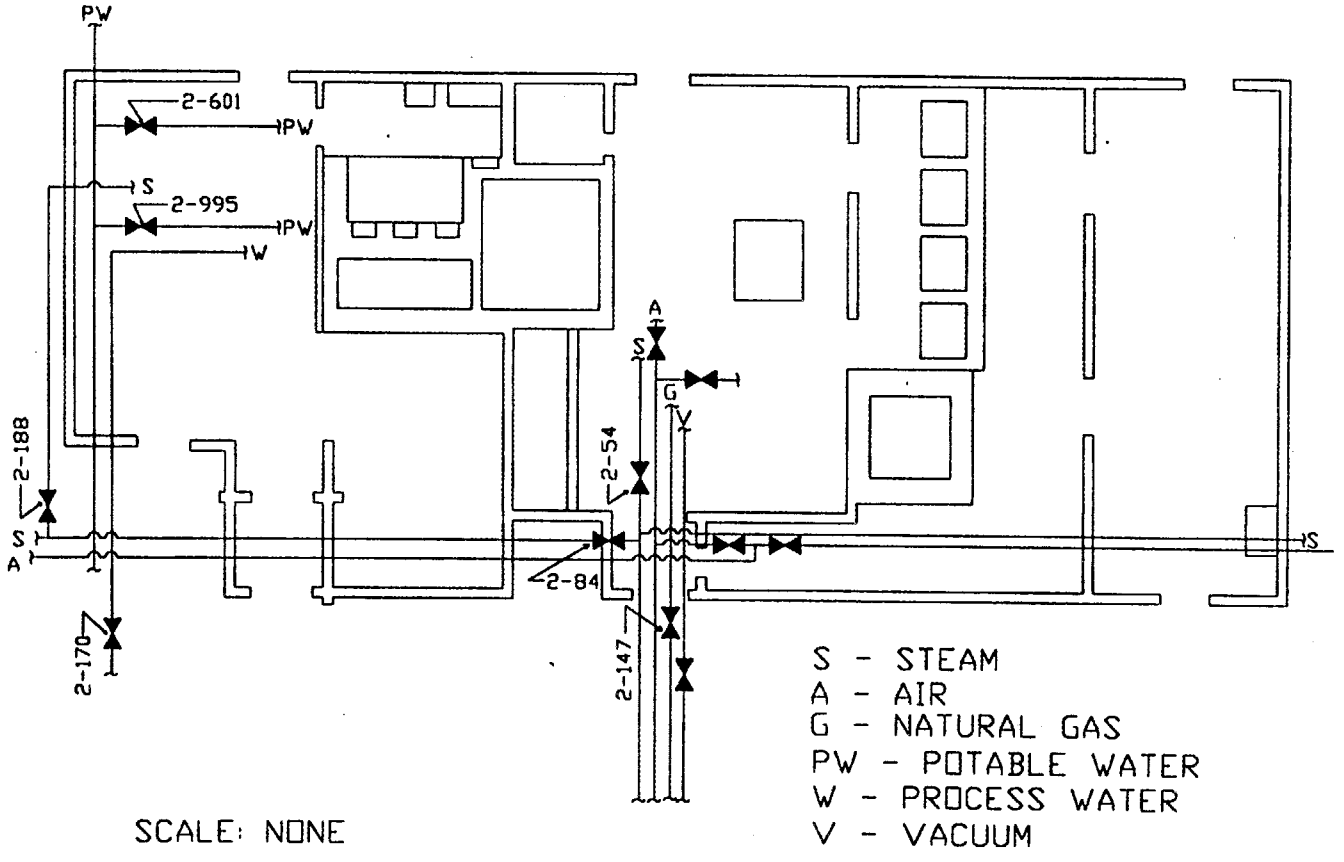
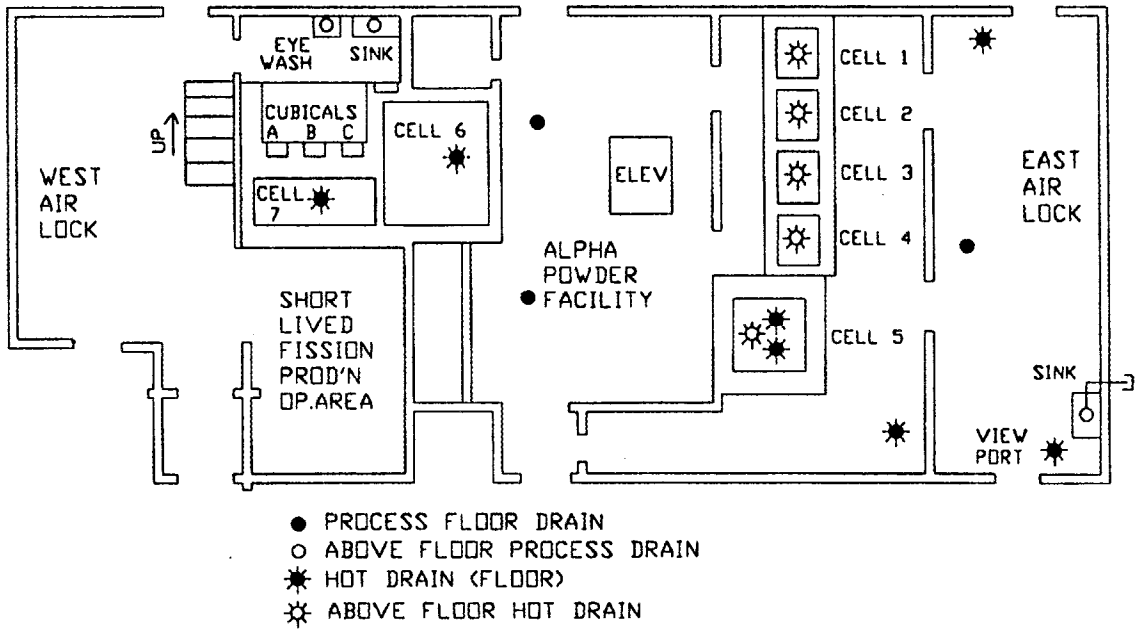


Fig. 4. Building 3028 valve schedule.

FIGURE 5: BUILDING 3028 PROCESS DRAIN AND HOT DRAIN ARRANGEMENTS; 1st FLOOR



SCALE: NONE

Fig. 5. Building 3028 process drain and hot drain arrangements, first floor.

APPENDIX B

TURNOVER PACKAGE CHECKLISTS

ADMINISTRATIVE TURNOVER PACKAGE CHECKLIST

Item Number	Document	Applicable ?
1	Final Deactivation Project Report	Yes
2	Emergency Response Plan	No
3	Safety Documentation (Category III or greater)	No
4	Regulatory Compliance Documentation	No
5	Interagency Agreements Documentation	No
6	Existing Permit Documentation	No
7	Corrective Action Documentation	No
8	Post-Deactivation Punch list	No
9	Deactivation Locks Log and Keys	Yes

TECHNICAL
TURNOVER PACKAGE CHECKLIST

Item Number	Document	Applicable ?
1	End Point Determination Report	No
2	End Points Completion Report	No
3	End Point Technical Information	No
4	Deactivation Work Plans	No
5	Updated Facility Drawing List (arrangement, PID, Loop, etc.)	Yes
6	"As Left" Photos of Spaces and Major Equipment	Yes
7	Hazardous Material Inventory and Survey	No
8	Safeguards and Security Documentation	No
9	Chemical Substance Inventory and Survey	No
10	Radioactive Materials Inventory and Survey	Yes
11	Facility Soil, Surface Water, and Groundwater Condition Report	No

SURVEILLANCE AND MAINTENANCE TURNOVER PACKAGE CHECKLIST

Item Number	Document	Applicable ?
1	Post-Deactivation Surveillance and Maintenance (S&M) Plan	Yes
2	Post-Deactivation S&M Updated Effluent Monitoring Plan	No
3	Post-Deactivation S&M Updated Safety Equipment List	No
4	Post-Deactivation S&M Procedures	Yes
5	Post-Deactivation S&M Recommendations	No
6	Mothballed Systems Lay-up and Restart Documentation	No

APPENDIX C

BUILDING 3028 DRAWING LIST

BUILDING 3028 DRAWING LIST

Document	Revision	Title
A-2635		Master-Slave Manipulator
A-2803	A	Parts List Master-Slave Manipulator Model 8—Boom Tube Sub-Assembly
A-2804	B	Parts List Master-Slave Manipulator Model 8—Boom Tube Sub-Assembly
A-2806	D	Parts List Master-Slave Manipulator Model 8—Tong Motion Schematic
A-2807	B	Parts List Master-Slave Manipulator Model 8—Tape Clamp
A-2808		Parts List Master-Slave Manipulator Model 8—Elevation & Twist Schematic
A-2809	A	Parts List Master-Slave Manipulator Model 8—Z Motion & Balance Schematic
A-2810		Parts List Master-Slave Manipulator Model 8—Azimuth Schematic
A-3646		Parts List Master-Slave Manipulator Model 7—Carriage Sub-Assembly
A-3647		Parts List Master-Slave Manipulator Model 7—Boom Tube Sub-Assembly
A-36617		Radioisotope Area Mod. Expansion Dwg. E
A-36618		Radioisotope Area Mod. Expansion Dwg. F
A-3793		Parts List Master-Slave Manipulator Model 8—Swivel Sub-Assy (Slave)
A-39410		Plot Plan Lab & Bldg. Dwg. A
A-39411		Plot Plan Lab A Bldg. Dwg. B
A-39412		Plot Plan Lab B Bldg. Dwg. A
A-39413		Plot Plan Lab B Bldg. Dwg. B
A-3994	B	Slave End lat. Rot'n. Sub-Assy W/Joint at Master End—Parts List/Manipul.
A-4009	C	Parts List Master-Slave Manipulator—Carriage Sub-Assy (Slave)
A-4068	C	Slave End Lat. Rot'n Sub-Assy W/Joint at Master End—Parts List/Manipul
A-4070	C	Parts List Master-Slave Manipulator Model 8—Trunk Tube Sub-Assy (Slave)
A-4085	D	Parts List Master-Slave Manipulator Model 8—Carriage Sub-Assy (Master)
A-4108		Parts List Master-Slave Manipulator Model 8—Azimuth Sub-Assy (Master)
A-4112		Parts List Master-Slave Manipulator Model 8—Azimuth Sub-Assy (Slave)
A-4132	A	Trunk Tubes & Traveling Counterweights Sub-Assy—Parts List/Manipulator
A-4209	F	Parts List Master-Slave Manipulator—Argonne Removable Tong Mod. 2 Assy
A-4249		Parts List Master-Slave Manipulator—Argonne Removable Tong Jig. Assy.
A-4250		Parts List Master-Slave Manipulator—Argonne Removable Tong Jig Assy.
A-4381		Master-Slave Manipulator Model 8—Braided Cable Protector Assembly
A-4449		Master-Slave Manipulator Model 8—Indexing Cable Protector Assembly
A-4454	B	Parts List Master-Slave Manipulator Model 8—Handle Sub-Assy
A-4455	C	Parts List Master-Slave Manipulator Model 8—Handle Sub-Assy
A-4456	C	Parts List Master-Slave Manipulator Model 8—Handle Sub-Assy
A-4524	A	Parts List Master-Slave Manipulator Model 8—Roller Tube Assy

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Document	Revision	Title
A-4535	C	Parts List Master-Slave Manipulator Model 8—Wrist Joint—Sub-Assy
A-4536	B	Parts List Master-Slave Manipulator Model 8—Wrist Joint—Sub-Assy
A-4574		Master-Slave Manipulator Model 8—Wire Lengths & Trimming Dimensions
A-4596		Parts List Master-Slave Manipulator—Laminated Rad. Shield Sub-Assembly
A-4652	A	Parts List Master-Slave Manipulator—Swivel Sub-Assembly (Master)
A-4653	A	Parts List Master-Slave Manipulator Swivel Sub-Assy (Master)
A-4654	H	Parts List Master-Slave Manipulator Swivel Sub-Assy (Master)
A-4655	C	Parts List Master-Slave Manipulator Swivel Sub-Assy (Master)
A-4656	F	Parts List Master-Slave Manipulator Swivel Sub-Assy (Master)
A-4692	C	Parts List Master-Slave Manipulator Tong Adapter Sub-Assembly
A-4699	A	Parts List Master-Slave Manipulator Argonne Removable Tong Model 2
A-5179		Master-Slave Manipulator Model 8—Cables Used With Low Volt. Trigger Switch.
A-5227		Parts List Master-Slave Manipulator Swivel Sub-Assembly (Master)
A-5367		Master-Slave Manipulator Model 8—Relay Box Assembly
A-54331		Plot Pl.
A-54332		Floor Plan
A-54333		Sect. B-B Modif. To Bldg.
A-54340		Plot Plan Curium Equip.
A-54341		Cubicle Plan Curium Equip.
A-54342		Sect. A-A Curium Equip.
A-5667		Parts List Master-Slave Manipulator Mod. 7—Motion Lock X, Y, & Z
A-5668		Parts List Master-Slave Manipulator Mod. 7—Motion Lock X, Y, & Z
A10883B-003-PA		Process Cells Plan
A10883B-004-PA		Process Cells Sect. A-A
A10883B-005-PA		Process Cells Sect. B-B
A20360EB-002-D	2	Allowable Flr. Load Signs
A20360EB-003-D	2	Allowable Flr. Load Signs
A20360EB-004-D	1	Target Fab. Fac. Partition Elev. 818 Ft.
A20360EB-005-D	1	Target Fab. Fac. Doors 20, 30, 40 Frg. Dets. Door Schedu.
A20360EB-006-D	1	Target Fab. Fac. Removable Hatch Dets.
A20360EB-016-D		Target Fab. Fac. Dwg. Index
A20360EB-018-D		Target Fab. Fac. Elev. Encl. Plans Typical Wall Sect.
A20360EB-021-D		Renovation Proc. Cells Flr. Plan at Cell Roof
A20360EB-022-D		Renovation Proc. Cells Sects. AA, BB, Dev. Plan Legend
A20360EB-024-D		Renovation Proc. Cells Misc. Bldg. Dets.

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Document	Revision	Title
A20360EB-025-D		Renovation Process Cells Dets.
A20360EB-026-D		Renovation Proc. Cells Comb. Pb Gl ZnBr2 View Window
A20360EB-027-D		Renovation Proc. Cells Comb Lead Gl ZlBr2 View Window
A20360EB-028-D		Renovation Proc. Cells Manip. Serv. Slv. Rf. Hatch Plug
A20360EB-029-D		Renovation Proc. Cells Rf Access Door Alt.
A20360EB-031-D		Renovation Process Cells Loading Port. Sects. Det.
A20360EB-032-D		Renovation Proc. Cells Loading Port Lead Shield Sht. 1
A20360EB-033-D		Renovation Proc. Cells Loading Port Lead Shield Sht. 2
A20360EB-034-D		Renovation Proc. Cells Loading Port Lead Shield Sht. 3
A20360EB-035-D		Renovation Proc. Cells Loading Port Track Dets.
A20360EB-036-D		Renovation Proc. Cells Loading Port Dolly Pos. Rod Det.
A20360EB-039-A		Roof Maint. Plan Bldg. 3028
A20360EF-001-D		Floor Plans at Elevs. 810, 818, 826, 834 Lab A
B-5439		Platform Loading
C-14614		Iodine 131 Valve Specifications
C-15502		C.W.S. Filter Pit Removable Top Slab
C-19131		Prod. Btl. Filling Carrier
C-31235		Supports 3T Monorail Roof Deck Plan
C-40124		PM 147 Cell Add Drilling West Panel
C-40136		Iodine 131 Shielded Enclosure Plan Sect. & Det.
C-4608	A	Master Slave Manipulator—Laminated Rad. Shiel Sub-Assembly
C-4693		Master Slave Manipulator—Swivel—Sub-Assembly (Slave)
C-4721	B	Master Slave Manipulator—Handle Sub-Assembly (Slave)
C-54325	A	Ang Fac. Proposed Air-Flow Diagram
C-9776		Iodine 131 Vessels-Fabrication & Specs.
C-9785		Iodine 131 Foot Tank Barometric Leg
C-9786		Iodine 131 Stem Gen.
C20360EA-001-D		Argon Distribution System Plot Plan & Sects.
C20360EA-002-D		Argon Distribution System Grading Plan
C3E-20360-A003		Reroof 3028 Loc. & Index P
C3E-20360-A004		Reroof 3028 Const. & Oper. P
D-10044		Alt. Air Filter System Roof Plan Bldgs. A-B-C-D-E-F
D-10045		Alt. Air Filter System Bldg. A-B-C-D-E-F
D-10046		Alt. Air Filter System Filter Casing & Louver Dets.
D-11996		Roof Drain Al3 Bldgs. 3029-30-31-32-33-34-36
D-11997		Roof Drain Al3 Bldgs. 3028-3038 Plan

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Document	Revision	Title
D-12416	1	Iodine 131 SS Liner Dets. Sht. 1
D-12417	1	Iodine 131 SS Liner Dets. Sht. 2
D-13135		Iodine 131 HTS for Oper. Gallery
D-13186	2	Iodine 131 Equip. Layout Sht. 2
D-13187		Iodine 131 Reflux Condenser Dissolver
D-14328	1	Iodine 131 Access Pad Plan
D-14330	2	Iodine 131 CWS Filter Clamping Mech. Assy.
D-14331		Iodine 131 Filter Clamping Mech. Assy.
D-14332		Iodine 131 Filter Clamping Mech Sub-Assy.
D-14367	1	Iodine 131 Access Pad Sect. & Dets.
D-14604		Iodine 131 Caustic Make-up Tank & Nitric Acid Tank
D-14613	1	Iodine 131 Valve Legend
D-14615	1	Iodine 131 Proc. Piping Legend Sht. 2
D-14619		Iodine 131 Lead Casement Top of Cell 2
D-14625		Iodine 131 Filter Pit Drain
D-16726		Top Level Floor Extension Framing Plan & Dets.
D-16845		Short-lived Fission Prod. Dwg. Index
D-16846		Short-lived Fission Prod. Piping Line List
D-16847		Short-lived Fission Prod. Btl. Filler & Pos.
D-16848		Short-lived Fission Prod. Typical Piping DP Cells
D-19125		Proc. Finishing Sep. Flowsheet
D-19126		Carrier Dolly Assy & Dets.
D-19127	1	Dooly Trak Assy & Dets.
D-19128		Zirconium Resin Col.
D-19129		Col. & Head Tank Dets.
D-19130		Vacuum Filter Flask & Precipitator Flask Det.
D-19132		Fuming Vessels & Distillate Receiver Dets.
D-19133		RU Scrubber & RU Distill. Flask Det.
D-19134		Manip. Assy & Dets.
D-19135		Head & Foot Tank & Mixed Prod. Flask
D-19136		Arrgmt & Dets. Of Equip. Rack
D-19137		Dets. Degasser & Distill. Receiver
D-19138		Elect. Plan & Sect.
D-19400		Short-lived Fission Prod. Det. UNH Feed Tank 60 Liter
D-19401		Short-lived Fission Prod. 50 Liter TBP Storage Tank
D-19402		Short-lived Fission Prod. Glassware Cubicle Shielding

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Document	Revision	Title
D-19403		100 Liter TBP Storage-Extractor & Strip Tank Det.
D-19404		Short-lived Fission Prod. 50 Liter Storage Tank Det.
D-19405		Short-lived Fission Prod. Equipment Layout Plan
D-19406		Short-lived Fission Prod. Sampler Dets.
D-19407		Short-lived Fission Prod. Access Sleeve Designations
D-19408		Products Takeout Manip.
D-19410		Piping Plan
D-19411		Piping Elev.
D-19413		Serv. Piping Isometric
D-19414		Funnel Support Dets.
D-19415		Sampler Piping Layout & Dets.
D-19417		Dip Tube Elevator
D-19822		Top Level Fl. Exten. Piping Plan & Sects
D-20332		Short-lived Fission Prod. Elec. Services
D-20350	1	Short Life Fission Prod. Flowsheet
D-20352		Short Life Fission Prod. Top & Bottom Settling Sect.
D-20353		Short Life Fission Prod. Top & Bottom End Sect.
D-20354		Short Life Fission Prod. Col. Ctr. Sects.
D-20355		Det. Of UNH Vacuum Feed Tank 50L
D-20356	1	Varsol Storage Tank & Silica Gel Col. Dets.
D-20357		Col. Rack Dets.
D-20358		Col. & Rack Assy
D-20359	1	Det. Of UNH Holdup. Tank
D-20360	1	Det. Of Organic Storage Tank 200L
D-20361	2	Det. Of Alkaline Earth & Rare Earth Evaporators
D-20362	1	Evaporator Dets.
D-20363	1	Mixing Tank Dets. 25 Liters
D-20364		Equip. Sht.
D-20365	1	Equip. & Piping Layout Plan & Elev. Sht. 1
D-20366		Equip. & Piping Layout Plan & Elev. Sht. 2
D-20367		Isometric Piping Diagram
D-20368	1	Sampler & Sampler Shielding
D-20458	1	Canopy for 2nd Fl. Plan Sect. & Det.
D-20468	1	Canopy for West Entrance Door Plan Sect. & Det.
D-21890		Outside Services Steam & Air Piping Supports
D-23449		Relocation Chiller Equip. Pipe & Structural Det.

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Document	Revision	Title
D-23450		Relocate Chiller Equip. Water Chiller Enclosure
D-23474		Ladder Plan, Elevs. & Sects.
D-26934		Vent Chemical Make-up Tank Duct Plan & Elev.
D-28497		Xenon 133 Lead Shielded Cubicles Plans & Sect.
D-28498		Xenon 133 Lead Shielded Cubicles Doors & Covers
D-29698		Xenon 133 Elec. Services
D-29935		Vent Chemical Make-up Tank Duct Dets.
D-30249	1	Support 3T Monorail Sects. & Dets.
D-30267	2	Support 3T Monorail New Roof Supports
D-30528		Support 3T Monorail Locality Map
D-30925		Xenon 133 Lead Shielding & Misc. Dets
D-30926		Xenon 133 Lead Shielding. Misc. Dets.
D-30927		Xenon 133 Mech. Raise & Lower Dewar Flasks
D-30928		Xenon 133 Charcoal Filler Col.
D-30929		Xenon 133 Charcoal Trap
D-30930	2	Xenon 133 Lithium Metal Trap & Cold Trap
D-31876		Iodine 131 Removal Sta. Instl. Det. Sht. 1
D-31877		Iodine 131 Removal Sta. Instl. Det. Sht. 2
D-31878		Iodine 131 Removal Sta. Instl. Det. Sht. 3
D-31879		Iodine 131 Removal Sta. Instl. Det. Sht. 4
D-31881		Iodine 131 Removal Sta. Instl. Det. Sht. 6
D-31882		Iodine 131 Removal Sta. Elec. Instl.
D-31952		Flowsheet Ion Exchange Col. Purification Rm. 147
D-31953		Assy. Lead Shielded Col. Addn.
D-31954		Dets. Lead Shielded Col. Addn.
D-31955		Dets. 2-in. ID Glass Col.
D-31956		Piping Arrgmt. At Valve Box
D-31957		Modif. Of 12-Gal. Solution Btl.
D-31958		Equip. & Pipe Inside Cell Elev. 817-5 & Sec. A-A
D-31959		Equip. & Pipe Inside Cell Sect. B-B & C-C
D-31960		Equip. North Cell Wall Elev. D-D & Sects.
D-31961		Equip. Outside West Cell Wall Elev. E-E & Sect.
D-31962		Assy. Dip Tube Pos. 200ml Btls.
D-31963		Det. Dip Tube Pos. 200ml Btls.
D-31964		Assy. Dip Tube Pos. 12-Gal. Btls.
D-31965		Det. Dip Tube Pos. 12-Gal. Btls.

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Document	Revision	Title
D-31966		Equip. & Pipe Inside Cell Elev. 813-5
D-32618		4-in. Lead Shielded Ion Exch. Col. Elec. Plan
D-33246		Pm 147 Plan & Sects. Elec. Htg.
D-33247		Pm 147 Htr. Arrgmt.
D-3459	B	Master-Slave Manipulator Mod. 7—Swivel & Boot Sub-Assembly (Slave)
D-35169		View Window & Snare Type Manip. Instl.
D-35170		Promethium 147 Window Frame Dets.
D-35171		Promethium 147 Snare Type Manip. Assy
D-35172		Promethium 147 Snare Type Manip. Sht. 1
D-35173		Promethium 147 Snare Type Manip. Sht. 2
D-35301		Pm 147 Col. Shield Assy.
D-35302		Pm 147 Col. Liner Dets.
D-35340		Promethium 147 Manip. Cell Plan
D-35730	1	Isotope Area Waste Hold-up Tank Piping
D-35755	3	Flowsheet Ion Exc. Equip. Purif. Promethium 147
D-35758		Pm 147 3-in. Col. Assy. & Dets.
D-35759		Pm 147 2-in. Col. Assy. & Dets.
D-35760		Pm 147 Make-up Tank Fabric. Dets.
D-35762		Pm 147 Product Removal Arrgmt.
D-35763		Pm 147 Product Loading Arrgmt.
D-35765		Pm 147 16-Ounce Plastic Btl. Rack
D-35766		Pm 147 Hot Drain Piping Plan & Sect.
D-35767		Pm 147 Product Removal Sta. Dets.
D-35768		Pm 147 Product Btl. Shield Assy.
D-35769		Pm 147 Top End Plate 3-in. Ion Exch. Col.
D-35770		Pm 147 Storage Btl. Rack & Fill Sta.
D-35771		Pm 147 Drum Platform Location & Dets.
D-35772	1	Pm 147 Product Btl. Nozzle Dets.
D-35773		Pm 147 Make-Up Tank & Feed Tank
D-35774		Pm 147 2-gal. Plastic Btl. Support Det.
D-35776		Pm 147 Exch. for Ion Col.
D-35777	A	Pm 147 Shielded Prod. Carriers 3 & 6 Liter
D-35779		Pm 147 Cell Piping Plan & Sect. Sht. 1
D-35780	1	Pm 147 Waste Receiver R-2
D-35781		Pm 147 Feed Pump Layout Valve Arrgmt.
D-35782		Pm 147 Pipe Supports & Misc. Dets.

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Document	Revision	Title
D-35783		Pm 147 Valve Support Dets.
D-35784		Pm 147 Piping Thru Cell Walls & Valve Ext. Handles
D-35794		Pm 147 Feed Pump Mounting Dets.
D-36005	1	Pm 147 Piping Arrgmt. Top Tantalum Cols.
D-36009		Pm 147 3-in. SST Ion Exchange Col. Assy & Det.
D-36010		Pm 147 Col. Shield Addn. Plan
D-36014		Pm 147 Piping Arrgmt. Top 3-in. SST Col.
D-36015		Pm 147 Transfer Vessel Assy & Det.
D-36016		Pm 147 Cell Piping Plan & Sect. Sht. 2
D-36017	2	Rare Earth Sep. FP-6 Ion Exh. Process Scheme
D-36018		Pm 147 Agitator Support Frame & Plate
D-36019	1	Pm 147 4-1/2 inch Exch. Col. Assy.
D-36021		Pm 147 Manip. Cell Plan & Sects.
D-36468	5	Irradiation Specimen Holder Assy. & Dets.
D-36482		Xenon 133 Shielding Layout & Dets.
D-36483	1	Xenon 133 Schematic Piping Arrgmt.
D-36484		Iodine 131 Ten Liter Dissolver
D-36485		Iodine 131 Cubicle B Piping & Equip. Arrgmt.
D-36486		Iodine 131 Cubicle B Piping Dets.
D-36487		Iodine 131 Mod. Slug Chute Funnel & Plug
D-36488	1	Iodine 131 Carrier Assy.
D-36489		Iodine 131 Carrier Dets.
D-36536		Intermediate Waste Hold-Up Tank Plot Plan
D-36608		Pm 147 Manip. Cell Plan & Sects.
D-37619		Special Cell for Pm 147 Filter Box Dets.
D-37911	2	Special Cell Promethium 147 Drainage Piping
D-37912		Special Cell Promethium 147 Serv. & Wash Down Pipe
D-37913		Special Cell Promethium 147 Air Piping Hoist
D-37914		Special Cell Promethium 147 Hot Off-Gas Piping
D-37915		Special Cell Promethium 147 Cell Vent.
D-37982		Contam. For Explosive Release Plan
D-38014		Pm 147 Special Cell Foundation Plan & Det.
D-38015		Pm 147 Special Cell Horiz. Sect. & Curb Det.
D-38016		Pm 147 Special Cell Vertical Sects.
D-38017		Pm 147 Special Cell Roof Plan S&E Elevs.
D-38018		Pm 147 Special Cell Plugs—Sleeves & Misc.

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Document	Revision	Title
D-38019		Pm 147 Special Cell Working Level Plan & Det.
D-38020	2	Pm 147 Special Cell Dets Lead Glass Window
D-38021	1	Pm 147 Special Cell Steel Panel Dets
D-38220		Pm 147 Special Cell Conc Access Pad Plan
D-38395		Pm 147 Special Cell Elec Plan & Elev
D-38396		Pm 147 Special Cell Elec Elev & Sect
D-38397		Pm 147 Special Cell Legend & Wiring Diag
D-38607		Pm 147 Special Cell Remote Control Air Hoist
D-38608		Pm 147 Special Cell Cell Door Assy
D-38609		Pm 147 Special Cell Cell Door Det Sht 1
D-38610		Pm 147 Special Cell Cell Door Det Sht 2
D-38611		Pm 147 Special Cell Manip Boot Adaptor
D-38613		Pm 147 Special Cell Roller Tube Assy
D-38614		Pm 147 Special Cell Roller Tube Dets
D-39091	1	Iodine 131 Off-Gas Scrubber Instl
D-39092		Iodine 131 Off-Gas Scrubber Col Assy
D-39093		I131 Off-Gas Scrubber Caustic Hold-up Tank & Plug
D-39094		I131 Off-Gas Scrubber Col & Pump Support
D-39442		Backflow Preventer Hood Exh Duct
D-39689		Water Washdown Pipe Plan Sect & Dets
D-3981	B	Master-Slave Manipulator Mod 8—Slave End Lateral Rotation Sub-Assy
D-39840		Design Hot Drain System Plan & Det.
D-39843		Hot Drain System Piping to Steam Jet
D-39847		Hot Drain System Alt. & Pipe to Jets—Cell 3
D-39848		Hot Drain System Alt. Drain Lines—Cell 3
D-40251		Iodine 131 Cell 1 Glassware Flowsheet
D-40263		Iodine 131 Containment Shield Assy.
D-40266		Iodine 131 Glassware
D-4223		Master Slave Manipulator—Argonne Removable Tong Jig—Model 5 Assembly
D-4282	2	Modif. Elec. 1st Fl. Plan
D-42830	2	Modif. Elec. Interior Platform Plans
D-42831	3	Modif. Elec. Ext. Platform Stairs Plan
D-4471	B	Master-Slave Manipulator Model 8—Roller Tube Assembly MSM-8-1695
D-44799	2	Site Preparation Plns. & Sects.
D-44824		CM Program Cell Vent & Irrad. Schematic

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Document	Revision	Title
D-44865		CM Program Cell Exh. Plan & Sect.
D-44866		CM Program Cell Exh. Filter Can Dets.
D-44867		CM Program Air Intake Plan & Sect.
D-44868		Ventilation Air Intake Filter Can Det. Equip. CM Prog.
D-44869		CM Program Vent. Transfer Tunnel
D-44870		CM Program Exh. Manifold Tie-In Plan
D-44871		CM Program Vent Indication Panels Dets.
D-44872	1	CM Program Exh. Line Sect. & Dets.
D-44873		CM Program Air Intake Filter Can Dets.
D-44874		Bldg. Modif. Site Prep. Plan & Sect.
D-4558	A	Master Slave Manipulator Mod. 8—W/Lateral Rotation Installed Assembly
D-4645	B	Master Slave Manipulator Mod. 8—Slave End Shown Wrist Joint Sub-Assy
D-4651	B	Master Slave Manipulator Mod. 8—Swivel Sub-Assembly (Master)
D-4723		Master Slave Manipulator Mod. 8—Removable Tong RCD-447-100
D-50433		Plan Sects. & Dets.
D-50675	1	Lighting & Receptacle Plan
D-50676	1	Conduit Plan Power & Controls
D-50677	1	Elevations & Dets.
D-50678	1	Electrical Cell Lighting Fixture Det.
D-50679		Serv. Panel Layout
D-50680	1	Service Panel Wiring Diagram
D-50681	1	Alarm & Control Wiring Diagram
D-50682	2	Electrical Schematic Diagrams
D-50683	1	Elevation & Equipment Legend
D-50922		Ang. Handling Shipping Cask Assy.
D-50923		Ang. Handling Shipping Cask Det. Sht. 1
D-50924		Ang. Handling Shipping Cask Det. Sht. 2
D-51986		Serv. & Drainage Piping Alterations Plan
D-51987		Serv. & Drainage Piping Alterations Sect.
D-51988		Outside Steam & Air Lines Plan & Profiles
D-51989		Outside Steam & Air Lines Support Det.
D-52363	2	Floor Plan-Sect. and Dets.
D-52364	1	Foundation Plan Sects. & Dets.
D-52365		Interior Platforms Plans
D-52367	1	Exterior Platforms & Stairs, Plan, Sect. & Elev.
D-52368		Exterior Platforms & Stairs, Det. Sht. 1 of 2

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Document	Revision	Title
D-52369		Exterior Platforms & Stairs, Det. Sht. 2 of 2
D-52370		Interior/Exterior Platforms Bldg. Steel Alt.
D-52371	3	Lift Motor Housing, Plans, Sects. & Dets.
D-52372	1	Bldg. Addition—Roof Framing Plan & Dtls.
D-52373	1	Bldg. Addition—Steel Framing Dets.
D-52374		Door Schedule & Dets.
D-52393		Pm Cell Shielding Door Assy. & Jamb. Dets.
D-52394	1	Pm Cell Shielding Door—Dets.
D-52395	1	Hardware Det., Sht. 1 of 5
D-52396	1	Hardware Det., Sht. 2 of 5
D-52397	1	Hardware Det., Sht. 3 of 5
D-52398	1	Hardware Det., Sht. 4 of 5
D-52399	1	Hardware Det., Sht. 5 of 5
D-52400		Addnl. Shielding for Pm Cell Plan & Sects.
D-52401	1	Additional Shielding for Pm Sects.
D-52402		Addnl. Shielding for Pm Cell Viewing Window
D-52403		Addnl. Shielding for Pm Cell Dets.
D-52404		Floor & Closure Plates Plans, Sects. & Dets.
D-52405		Cell Shielding Tank Supports, Sects. & Dets.
D-52406		Cell Shielding Tank Supports Plan, Sects. & Dets.
D-52407		Water Shielded Cells Window Instl.
D-52408		Water Shielded Cells, Tanks MK-1A & MK-1B
D-52409		Water Shielded Cells, Tanks MK-2A & MK-2B
D-52410		Water Shielded Cells, Tanks MK-3A & MK-3B
D-52411		Water Shielded Cells Tank MK-4
D-52412		Water Shielded Cells Tank MK-5
D-52413		Water Shielded Cells Tank MK-6
D-52414		Water Shielded Cells Tank MK-7
D-52415		Water Shielded Cells Tank MK-8
D-52416		Water Shielded Cells Sht. 1
D-52417		Water Shielded Cells Sht. 2
D-52418		Cell Shielding Tank Liner Plan Sects. & Dets.
D-52419		Cell Shielding Tank Liner Det. Sht. 1 of 4
D-52420		Cell Shielding Tank Liner Det. Sht. 2 of 4
D-52421		Cell Shielding Tank Liner Det. Sht. 3 of 4
D-52422		Cell Shielding Tank Liner Det. Sht. 4 of 4

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Document	Revision	Title
D-52440		Lined Openings Thru Pm Cell Plan & Sect.
D-52441		Lined Openings Thru Pm Cell Sects.
D-52443		Lined Openings Thru Pm Cell Wall
D-5422		Column Bldg. F Floor Slab Plan Det.
D-54325		Attic Framing Dets.
D-54326		Ang. Fac. Bldg. Modif. Sect. Elev. & Plan
D-54327		Ang. Fac. Bldg. Modif. 3rd-4th & Attic
D-54328		Ang. Fac. Proposed Plan 1st Flr.
D-54329		Ang. Fac. Typical Sect. B-B
D-54334		Facil. Plans
D-54335		Facil. Sect.
D-54336		Exit Transfer Unit Assy
D-54337		Exit Transfer Unit Det. Sht. 1
D-54338		Exit Transfer Det. Sht. 2
D-54339		Exit Transfer Det. Sht. 3
D-54343		Tunnel Extension Assy. & Dets.
D-54356		Enclosure Coupling Test Assy.
D-54357		Enclosure Coupling Test Det. Sht. 1
D-54358		Enclosure Coupling Test Det. Sht. 2
D-54359		Enclosure Coupling Test Det. Sht. 3
D-54360		Enclosure Coupling Test Det. Sht. 4
D-54361		Enclosure Coupling Test Det. Sht. 6
D-54362		Enclosure Coupling Test Det. Sht. 6
D-54365		Ang. Fac. Mockup Water Cell Interior
D-54366		Ang. Fac. Enclosure Mockup Det. & Assy.
D-54367		Ang. Fac. Carrier & Can Mockup Det. & Assy.
D-54368		Ang. Fac. Bellows Det. & Mockup Assy.
D-5437		Master-Slave Manipulator Model 8—Master End Arm Assembly
D-5438	B	Master-Slave Manipulator Model 8—Slave End Arm Assy.
D-54407		Water Cell Configuration
D-54500		Hot Pellet Press Assy.
D-54501	1	Hot Pellet Press Det. Sh. 1
D-54502		Hot Pellet Press Det. Sht. 2
D-54503		Hot Pellet Press Det. Sht. 3
D-54504		Drawing Index Bldg. Modif. & Service
D-55651	1	CM Program Drainage & Underground Piping Plan

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Document	Revision	Title
D-55652	1	CM Program Drainage & Piping Sect. & Det.
D-55653	1	CM Program Underground & Vacuum Lines Cell 3
D-55654	3	CM Program Service Piping Sects.
D-55655	2	CM Program Service Piping Det. Sht. 1
D-55657		CM Program Instr. Air Piping Plan
D-55658		CM Program Chilled Water & Cell Tank Fill Piping
D-55659		CM Program Cell Tank Fill Piping Sects.
D-55660		CM Program Fill Tank & Chiller Tank Dets.
D-55661	1	CM Program Service Piping Plan Sht. 2
D-55662	1	CM Program Service Piping Sects. & Dets.
D-55663	1	Underground Vacuum Lines to Cell III Plan & Sects.
D-55664	2	CM Program Flowsheet of Chiller System
D-55665		CM Program Piping Flowsheet
D-55666	1	CM Program Serv. Headers for Cubicles
D-55667	1	CM Program Branch Piping for Cubicles
D-55668	1	CM Program List of Items—Gen. Notes & Specs.
D-55768		Hangling-Scrap Removal Shield Window 1
D-55769		Ang. Handling Scrap Removal Shield Window 2
D-55779		Equip. CM Prog. Trans. Unit Cell 4 5 Assy.
D-5578		Sheilding Discs
D-55780		Equip. CM Prog. Trans. Unit Cell 4-5 Det. 1
D-55781		Equip. CM Prog. Trans. Unit Cell 4-5 Det. 2
D-5635	1	Portable Column Shielding Type 1
D-56351		Column Bldg. 910 Port Col. Shielding Type 1
D-56428		Sample Unloading Manip. Assy.
D-56429		Sample Unloading Manip. Det. Sht. 1
D-56430		Sample Unloading Manip. Det. Sht. 2
D-56431		Sample Unloading Manip. Det. Sht. 3
D-56433		Loading Port Det. Sht. 1
D-56434		Loading Port Det. Sht. 2
D-56435		Loading Port Det. Sht. 3
D-56436		Loading Port Det. Sht. 4
D-56437		Loading Port Det. Sht. 5
D-54638		Loading Port Det. Sht. 6
D-56439		Loading Port Det. Sht. 7
D-56441		Scraper Drive Cartridge Assy & Det.

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Document	Revision	Title
D-56442		Bottle Push Rod Assy & Det.
D-56444		Transfer Chamber Det.
D-56445		Tunnel Door Cells 2 5 S Wall Inst. Ang. Handling Fac.
D-56583		Manip. Decont. Fac. Assy.
D-56584		Manip. Decont. Fac. Det. Sht. 2
D-56585		Manip. Decont. Fac. Det. Sht. 2
D-56586		Manip. Decont. Fac. Det. Sht. 3
D-56753		Control Platform Reducer Det. Sh.
D-56754		Scraper Det. Sht. 1
D-56755		Waste Cask Assy
D-56756		Waste Cask Det. Sh. 1
D-56757		Waste Cask Det. Sh. 2
D-56758		Cell Maint. Plate Assy. & Installation
D-56759		Cell Maint. Plate Det. Sht. 1
D-56760		Cell Maint. Plate Det. Sht. 2
D-56761		Glove Port Cover Assy. & Instl.
D-56762		Glove Port Cover Dets.
D-56765		Sample Btl. Holder Assy. & Dets.
D-56771		Welding Support II
D-56772		Waste Container Truck Proposal
D-56775		Exit Transfer Unit Drive Assy & Det.
D-56777		Waste & Sample Discharge Facil.
D-56778		Sample Removal Cask Assy. & Det.
D-56781		Sample Cask Elevator Assy. & Det.
D-56782		Sample Cask Elevator Det. Sht. 1
D-56783	1	Bottom Shielding Panels
D-56784	1	Front Fixed & Front Removable Shielding Panels
D-56785	1	Top & Sides Shielding Panels
D-56786		Waste Cask Containment Dets.
D-56787		Waste Cask Containment Instl.
D-56788		Waste & Sample Discharge Facil.
D-56825		Tunnel Doors Assy. & Instl.
D-56826		Tunnel Doors Det. Sht. 1
D-56827		Tunnel Doors Det. Sht. 2
D-56828		Pressure Pot Welder Parts List
D-56829		Pressure Pot Welder Assy. Plan View

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Document	Revision	Title
D-56830		Pressure Pot Welder Assy. Elev.
D-56831		Pressure Pot Welder Assy. Sects. Z-Z & X-X
D-56832		Pressure Pot Welder Det. Sht. 1
D-56833		Pressure Pot Welder Det. Sht. 2
D-56834		Pressure Pot Welder Det. Sht. 3
D-56835		Pressure Pot Welder Det. Sht. 4
D-56836	1	Pressure Pot Welder Det. Sht. 5
D-56837		Pressure Pot Welder Det. Sht. 6
D-56838		Pressure Pot Welder Det. Sht. 7
D-56839		Pressure Pot Welder Det. Sht. 8
D-5684		Master-Slave Manipulator Mod. 7—Motion Lock Assembly
D-56840		Pressure Pot Welder Det. of Serv. System
D-56841		Pressure Pot Welder Serv. System
D-56842		Pressure Pot Welder Det. of Accessories
D-56843		Pressure Pot Welder Accessories
D-56848		Transfer Unit Cell 1—2 & 3—4 Assy. Det.
D-56849		Transfer Unit Cell 1—2 & 3—4 Det.
D-56850		Misc. Structural Det. Det. Sht. 1 of 2
D-56854		Misc. Structural Det. Det. Sht. 1 of 2
D-56855		Misc. Structural Det. Det. Sht. 1 of 2
D-56856		Misc. Structural Det. Det. Sht. 2 of 2
D-5757		Isotope Process Bldges. 902-905-906-910 Hood Glazing
D-6526		Service Requirement & Location Isotope Process Area
D-6529	4	Isotope Processing Area Site Plan
D-6536	6	Isotope Processing Area Roadways Drainage
D-6543		Isotope Processing Area Roadways Sect. & Det.
D-6547	3	Isotope Processing Area Roadways Plan
D-6608	1	Process Bldgs. A-B, F Eqpt. Layout
D-6611	4	Col. A, B Bldg. Drainage Hot Semi. Hot
D-6620	3	Process Bldgs. E, F Plan
D-6624	3	Process Bldgs. Column Bldg. Floor Plan Typ. Sect.
D-6625	A	Power, Comm. & Fire Alarm Pl.
D-6625	4	Process Bldg. E, F Power Comm. Fire Alarm Plan
D-6632	3	Column Bldg. F Htg. Exhaust System
D-6633	3	Column Bldg. Service Piping Plans
D-6634	2	Column Bldg. Framing Plan Sect. Det.

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Document	Revision	Title
D-6635	2	Column Bldg. Elevations Det.
D-6636	A	Service Bldg. Power Layout
D-6636	1	Service Bldg. Power Layout
D-6638	2	Column Bldg. Framing Elevations Det.
D-6639	A	Conduit Dets. Sh. 1
D-6639	3	Process Bldgs. Conduit Dets. Sh. 1
D-6641	2	Column Bldg. Platform Framing
D-6642	4	Process Bldgs. A Thru E Service Bldg. Elevations
D-6643		Process Bldgs. Conduit Dets. Sht. 2
D-6645	1	Column Bldgs. Stairs Platforms
D-6646	1	Process Bldgs. Sect. Dets.
D-6647	2	Process Bldgs. Service Bldg. Eqpt. Plan
D-6650		Proc. Bldg. A-B-C-D-E Col & Serv. Flr. Slab
D-6651	3	Service Bldg. Framing Plan Elevation Dets.
D-6652	4	Service Bldg. Piping Drainage
D-6654	3	Decontamination Bldg. Plan Sect. East West Walls
D-6658	3	Column Bldg. Service Piping Sects.
D-6659	1	Column Bldg. Ceiling Framing Plan Det.
D-6662	4	Column Bldg. Service Piping Sect. Det. Sh.
D-6663	1	Process Bldgs. Drainage Dets.
D-6664	3	Canopy Dets. Office Analytical Process Bldgs.
D-6671	5	Area Electrical Distribution
D-6674		Electrical Distribution Det. Transformer Station
D-6679		Col. Bldg. Serv. Piping Typical Supports
D-6684	A	I.P.A./Gen. Area-Exhaust System Pl. Bldgs. 3028 (Except 3035)
D-6684	5	General Area Exhaust System Plan
D-6685		Gen. Area Exh. System Conc. Juntion Box
D-6686	2	General Area Exhaust System Plan Sect. Det.
D-6687		Waste Drainage Junction Box Dets.
D-6688	3	General Area Exhaust System Profiles Dets.
D-6689	1	Isotope Processing Area-Waste Drain-Distribution Box
D-6689		Waste Drainage Distribution Box
D-6691	3	General Area Service Piping Supports
D-6692	1	General Area Service Piping Supports Sh. 1
D-6693	3	General Area Service Piping Plan
D-6694	2	General Area Service Piping Support Sht. 2

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Document	Revision	Title
D-6695	1	General Area Utility Distribution Sh. 1
D-6696	2	General Area Utility Distribution Sect. Det.
D-6697	5	Waste Road Drains Sanitary Sewer General Area
D-6698	5	Waste Drains Profiles Dets. General Area
D-6699	3	General Area Hot Drains
D-6700	2	Hot Waste Jet Pit Instr. Cabinet Collecting Tanl.
D-6701	2	Hot Waste Collect Sta. Pipe Steam Ejector Sampling
D-6702	1	Waste Drain Sanitary Sewer to Pond Septic Tank
D-6702A	2	Hot Waste Collect Sta. Instru. Piping
D-6703	2	General Area Condensate Lines
D-6704		Waste Drain Distr. Box
D-8207		Addn. Cell & Flr. Trays Plan & Sect.
D-8383		Platform Addn. Plan Sect. & Det.
D-8402		New Cell Serv. Piping & Drain Plan
D-8403		New Cell Exh. Duct Plan—Sect. & Det.
D-8417		Addn. Cell & Flr. Tray Lighting & Pwr. Plan
D-8667	3	Waste Tank Pump Pit Plan Sect. Det.
D-8668	1	2 in S.S. Line Plan Profile
D-8687		Serv. Piping Lab Tables Plan, Sect. & Det.
D-8764		Proposed Proc. Cells Flr. Pln.
D-8774		Preliminary Plan & Sects.
D-9751		Iodine 131 Conc. Foundation Pln. & Det.
D-9752		Iodine 131 Bldg. Structure Ground Flr. Pln.
D-9753		Iodine 131 Bldg. Structure 2nd Flr. Pln.
D-9754		Iodine 131 Bldg. Struc. Sect. & Dect.
D-9755		Iodine 131 Structural Steel Framing Pln.
D-9756		Iodine 131 Bldg. Structure Stair & Window Det.
D-9757		Iodine 131 Bldg. Struc. Door Dets. Sht. 1
D-9758		Iodine 131 Bldg. Struc. Door Dets. Sht. 2
D-9759	1	Iodine 131 Concrete Cell Block Plans Det.
D-9760		Iodine 131 Conc. Cell Block Sect. & Det. Sht. 1
D-9761		Iodine 131 Conc. Cell Block Sect. & Det. Sht. 2
D-9762		Iodine 131 Conc. Cell Block Lead Door Det. Sht. 1
D-9763		Iodine 131 Conc. Cell Block Lead Door Det. Sht. 2
D-9764		Iodine 131 Still Condenser
D-9765		Iodine 131 Nitric Acid Tank

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Document	Revision	Title
D-9766		Iodine 131 Drainage Piping Plan & Det. Sht. 2
D-9767	2	Iodine 131 Drainage Piping Plan Det. Sh. 1
D-9768	2	Iodine 131 Service Piping Plan
D-9769	1	Iodine 131 Service Piping Sect. Det.
D-9770		Iodine 131 Cell Vent Plan-Elev.-Det.
D-9771	2	Iodine 131 Outside Services
D-9772	2	Iodine 131 Process Piping Plan Sh. 1
D-9773	2	Iodine 131 Process Piping Legend Sh. 1
D-9774	1	Iodine 131 Evaporator
D-9775		Iodine 131 Evaporation Condenser
D-9777		Iodine 131 Process Piping North Wall
D-9778		Iodine 131 Catch Tank
D-9779		Iodine 131 Lead Casement Top Cell Block N. Wall
D-9780	1	Iodine 131 Caustic Scrubber
D-9781		Iodine 131 Dissolver Condenser
D-9783		Iodine 131 Bubble Cap Col. Dets.
D-9784	1	Iodine 131 Eqpy. Layout Sh. 1
D-9787		Iodine 131 Distillate Receiver
D-9788		Iodine 131 Piping Decont. System
D-9792		Iodine 131 Still Assy.
D-9793	1	Iodine 131 Process Piping Plan Sect. Sh. 2
D-9794	2	Iodine 131 Process Piping Sect. Sh. 1
D-9795	1	Iodine 131 Process Piping Sect. Sh. 3
D-9796		Iodine 131 Dissolver Supports
D-9797		Iodine 131 Still Rectifying Col.
D-9798	2	Iodine 131 Piping Floor Drains Cells 1, 2, 3
D-9799		Iodine 131 Solution Addn. Funnels
D-9800		Iodine 131 Cell Equip. Expansion Chamber
D-9801		Iodine 131 Serv. Rack Plan & Sect.
D-9802	3	Iodine 131 Process Pipe Slug Chute Funnel Plug
D-9803	3	Iodine 131 Process Cells Dwg. Index
D-9804		Iodine 131 Lighting & Pwr. Pln.
D-9805		Iodine 131 Sect. Elevs. & Elec. Dets.
DD37619		Special Cell for PM 147 Filter Box Dets.
D4-778		PC2 Thru PC15 (Single) Package Chillers—for Heat-X Literature
D5-DGM435		Wiring Diagram—208/220V—30-60V—Less Pump

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Document	Revision	Title
E-19300		Assy. of Dissolver
E-19301		Dets. of Dissolver
E-19409	1	Short-lived Fission Products Separation Process Flow
E-19412		Isometric Piping Layout
E-30620	1	Redesign Isotope Package Eqpt. Storage Tank
E-31875		Removal Sta. Instl.
E-31880		Removal Sta. Instl. Det. Sht. 2
E-39425	1	Piping Penetration Dets.
E-39426	1	Piping Plans & Isometric Dets.
E-39427	1	Piping Valve Penetration Locations Sht. 1
E-39428	2	Piping Valve Penetration Locations Sht. 2
E-39429	2	Architectural Foundation Plan & Sects.
E-39430	2	Architectural Plans & Sects.
E-39431	2	Architectural Elevations, Sect. & Det.
E-39432	2	HVAC Plans
E-43516		Distilling Tank Area Plan Sect. & Dets.
E-5181		Master Slave Manipulator Model 8—Wiring Diagram
E-51816	1	Curium Shipping Cask Assy.
E-51817	1	Cask Dets.
E-51818	1	Cask Dets.
E-51819	1	Plug Dets.
E-51820	1	Shipping Skid
E-51821	1	Machining Dets.
E-51822	1	Capsule Basket Dets. & Assy.
E-54405	1	Equip. for CM Program Ang. Welder
E-56432		Loading Port Assy. & Parts List
E-9782		Bubble Cap Col. Assy.
E-9789		Flowsheet
E-9790	1	Eqpt. Dissolver Assy.
E-9791	2	Dissolver Assy. Sect.
E20360ED-001-D	1	Target Fab. Fac.—Elec. Power Modifications & One Line Diagram
E20360ED-002-D	1	Target Fab. Fac.—Elec. Floor Plans, First, Second, & Third Floors
E20360ED-003-D	1	Target Fab. Fac.—Electrical 4th Floor Plan—Legend & General Notes
E20360ED-004-D	1	Target Fab. Fac.—Elec.440 Volt Riser Diag.—120/208 Volt Panel Sch.
E20360ED-005-D	1	Electrical Plan & Elevations—Air Conditioning System
E20360ED-006-D		Air Conditioning Electrical Wiring Diagram

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Document	Revision	Title
E20360ED-007-D		Electrical Wiring Diagram for Air Conditioning System, Sheet 1
E20360ED-007-D	1	Target Fab. Fac. Elec. Wiring Diag. A/C System Sht. 1
E20360ED-008-D		Renovation of Process Cells—Electrical Plan & Sections
E20360ED-009-D		Renovation of Process Cells—Electrical Sections & Schematic Diagrams
E20360ED-010-D	1	Target Fab. Facility—Electrical Wiring Diagram for A/C System, Sheet 2
E20360ED-011-D		Emergency Power to Radiation Monitors, First Floor Plan
E20360ED-012-D		Emergency Power to Radiation Monitors, 2nd, 3rd, & 4th Level Plans
E3D-020360-D030		H.P. Instruments Upgrade—Building 3028—Instrument Location Plan
E3D-20360-D013		Elec. Plan
E3E-020360-D015		Bldg. 3028 Floor Plan Equipment Layout First Floor
E3E-020360-D016		Bldg. 3028 Floor Plan Equipment Layout 2nd, 3rd, and 4th Floors
E3E-020360-D017		Bldg. 3028 Floor Plan Power and Receipt Plan First Floor
E3E-020360-D018		Bldg. 3028 Floor Plan Power and Receipt Plan 2nd, 3rd, 4th Floors
E3E-020360-D019		Building 3028 480 Volt One Line Diagram
E3E-020360-D020		Building 3028 120/208 Volt One Line Diagram
H20360EG-001-D	1	A/C Chilled Water System Gen. Notes Spec.
H20360EG-002-D	1	A/C Chilled Water System Flow Diag.
H20360EG-003-D	1	A/C Chilled Water System Piping Isometric Dets.
H20360EG-004-D	1	Target Fab. Fac. A/C Exh. System Plan 1st Fl.
H20360EG-005-D	1	Target Fab. Fac. A/C Exh. System Plan 2nd, 3rd, 4th Fl.
H20360EG-006-D	2	Target Fab. Fac. A/C Equip. Ductwork Sects. 1st
H20360EG-007-D	2	Target Fab. Fac. A/C Equip. Ductwork 2nd, 3rd Fl.
H20360EG-008-D	2	Target Fab. Fac. A/C Equip. Ductwork Elev. 4th Fl.
H20360EG-009-D	1	Target Fab. Fac. A/C Equip. Ductwork Plan Sects.
H20360EG-010-D		Target Fab. Fac. Containm. Cont. A/C Temp Diag.
H3D-20360-G001		Charcoal Filter Instl. Filter & Off-Gas Duct
H3D-20360-G011		Tritium Cylinder Decont. Fac. Plan & Notes
H3D-20360-G012		Tritium Cylinder Decont. Fac. Control Diag.
H3E-20011-G022		3028 RF Cell Vnt. & Off-Gas
H3E-20011-G031		3028 Flr. Cell Vnt. & Off-Gas
H3E-20011-G040		3028 Sec. Cell Vnt. & Off Gas
H3E-20011-SK7		3028, 3047 Demo. CV & OG
H3E-20360-G001	A	Charcoal Filter Install.--Filter and Off-Gas Duct. Plan & Elev.—Study
I3E-20011-0002		3028 Off Gas ISD Cell. Vac.
I3E-20011-0005		CV & OG Installation Dets.

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Document	Revision	Title
M11144EF-001-D		Alpha Handling Fac.—Curium Hot/Cold Glove Box
M11144EF-002-D		Alpha Handling Fac.—Curium Hot/Cold Glove Box Base & Air Lock Details
M20360EN-001-D		Cupium Cap Test Sift-Toss Temp. Distr.
M30360EN-002-D		Cupium Cap Test Grid for Temp. Distr.
M90017F-001-D		SFF Blender Tank Drive Assy. Dets.
M90017F-002-D		SFF Blender Sub Assy Dets.
N3E-020360-A001		Building Ventilation, Roughing Filter Holder Assy. and Dets.
N3E-020360-A003		Water Shielded Cells Sheilding Tank Lifter Weldment Details
N3E-020387-A004		Isotope Shipping Remote Bottle Capper Assembly
N3E-020387-A005		Isotope Shipping Remote Bottle Capper Details Sheet 1
N3E-020387-A006		Isotope Shipping Remote Bottle Capper Details Sheet 2
N3E-020387-A007		Isotope Shipping Remote Bottle Capper Control Box Details
PAC-0419-0		Air Cooled Condensers
PAC-0419-1A		Receiver
PWC-0419-0A		Hermetic Water Chillers for Remote Condensers
P10146C-001-D		Flow Diag. Valve Handle Orientation Off Gas System
P10146C-002-D		Serv. Piping Plan Sects. Prim. Off Gas System
P10146C-003-D		Filter Assy. Dets. Prim. Off Gas System
P10211A-001-D		As. Built Plan Gen. Arrgmt. Underground Piping CM Prog.
P10211A-002-D		As. Blt. Plan Sect. AA Cell Vent. Drains Pump Piping
P10211A-003-D		Lyt. Dim. Trans. Lines Off Gas Piping CM Prog.
P10211A-004-D		Lyt. Dimen. Vacuum Hot Drain Cond. Piping
P10211A-005-D		As. Built Plan Lyt. Dimen. Liq. Level Samp. Piping
P20007EC-011-D		Modify Steam & Air Serv. To WC-19 Jet Pit-Steam Line
P20360EC-001-D	1	Target Fab. Fac. Serv. Drainage Piping 1st Fl. Plan
P20360EC-002-D	1	
P20360EC-003-D	1	Target Fab. Fac. Serv. Drainage Piping 4th Fl. Plan
P20360EC-004-D	1	Target Fab. Fac. Serv. Drainage Piping Sect. AA
P20360EC-005-D	1	Target Fab. Fac. Serv. Drainage Piping Sect. DD
P20360EC-006-D		Target Fab. Facility Service Drainage Piping
P20360EC-007-D	2	Serv. & Drainage PP Attic Pln. & Dets. Target Fab. Fac.
P20360EC-008-D	1	Target Fab. Fac. Serv. Drainage Piping Dets.

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Document	Revision	Title
P20360EC-013-D		Target Fab. Facility Re. Routed LPSTM Cond. Lines
P20360EC-014-D		Target Fab. Fac. Outside Steam Air Line Alt.
P20360EC-015-D		Target Fab. Fac. Serv. Drainage Piping Sect. BB Sect. CC
P20360EC-016-D		Target Fab. Fac. Re. Routed LP Steam Condensate Plan
P20360EC-019-D		Argon Distribution System Piping Instl. Dets.
P20360EC-900-D		Spr. System Suply. Plan Sprk. System 1st. Fl. Piping Pln. Al. Va.
P20360EC-901-D		Sprkl. System Set Dets. Al. Va. Piping
P20360EC-902-D		Sprkl. System 2nd., 3rd., 4th. Flr. Piping
P20360EC-903-D		Spr. System Modif. 1st. Flr. Piping Plan Target Fac.
P20360EC-904-D		Spr. System Modif. 2nd. & 3rd. Fl. Piping Plan Target Fac.
P20360EC-905-D		Spr. System 4th. Flr. Piping Plan Target Fab. Fac.
P20360EC-906-D		Spr. System Modif. Sect. KK Target Fab. Fac.
P20360EC-019-D		Argon Distr. System Piping Instl. Dets.
SK-S-77		Monorail Layout Column Building
S10146B-001-D		Modif. Cell 3 Pl. Elev. Dets. Prim. Off Gas System
S10883B-002-A	P	Process Cells Plot Plan
S20360EB-001-D	1	Target Fab. Fac. Foundation Plan Dets.
S20360EB-007-D	1	Target Fab. Fac. Steel Framing Pl. 826 Ft. 6 In. Elev. Det.
S20360EB-008-D	1	Target Fab. Fac. Steel Frg. Plan. Elev. 834 Ft. 6 In. Sects.
S20360EB-009-D	1	Target Fab. Fac. Steel Framing Plan Elev. 834 Ft. 6 In.
S20360EB-010-D	1	Target Fab. Fac. Dr. Framing Elev. Cell Top 4 Conc. Floor
S20360EB-011-D		Target Fab. Facility Stairs No. 1 Plan Sects. Det.
S20360EB-012-D		Target Fab. Facility Stairs No. 2 No. 3 Plans Sect. Det.
S20360EB-013-D		Target Fab. Facility Stairs No. 4 Plan Sects. Det.
S20360EB-014-D	1	A/C Chiller Support Platform Plan Elev. Dets.
S20360EB-015-D	1	A/C Cooled Condensers Roof Sup. Dets.
S20360EB-017-D		Target Fab. Fac. Emer. Exit Plate Ladder Typical Plan
S20360EB-019-D		Renovation Proc. Cells Bldg. Ext. Fdn. Pln. Sects. Det.
S20360EB-020-D		Renovation Proc. Cells Bldg. Ext. Str. Steel Framing Det.
S20360EB-023-D		Renovation Proc. Cells Sect. CC Dr. Det. Dr. Sched.
S20360EB-030-D		Renovation Proc. Cells Rf. Access Ladder Platform
S20360EB-037-D		Handrails—Curium Cells—Roof Plan, Elevation & Details
S20360EB-038-D		Handrails Curium Cells Ladder Dets.
S3D-20360-B040		Monorail Instl., Plan, & Sects.
S3E-20011-B005		Duct Support Details—Sheet 2
S3E-20360-B041		Reroof 3028 Roof Plan Sectp.

Building 3028 Drawing List (continued)

Document	Revision	Title
S3E-20360-B042		Reroof 3028 Sect. & Detailsp.
W-1185	3	Radiation Shielding Window—Sheet 1 of 4
W-284		Housing- Sheet 2 of 4
W-284		Trim Frames and Spacers & Mtg. Brkt.—Sheet 3 of 4
W-284		Expansion Tank for Window- Sheet 4 of 4
W-284	1	Radiation Shielding Window
1-4379		Aluminum Doors & Hardware
10054L-005-D	1	Cell 1 Equip. Level Indicator Dets
10054L-006-D		Cell 1 Equip. Precipitator MK P 11
10054L-007-D	1	Cell 1 Equipment Schematic Flow Diagram
10054L-008-E	1	Cell 1 Equip. Installation Sht No 1
10054L-009-E	1	Cell 1 Equip. Installation Sht No 2
10054L-010-D	1	Cell 1 Equip. Det. Sht. 1
10054L-010-D	1	Cell 1 Equip. Det. Sht. 2
10054L-011-D	1	Cell 1 Equip. Det. Sht. 3
10054L-012-D		Cell 1 Equip. Det. Sht. 4
10054L-013-D		Cell 1 Equip. Det. Sht. 5
10054L-014-D		Cell 1 Equip. Det. Sht. 6
10054L-015-D	1	Cell 1 Equip. Det. Sht. 7
10054L-017-D	1	Cell 1 Equip. Schematic Flow Diagram
10206J-001-D		Hazards Report Isometric of Cells Fab. Fac.
10206J-002-D		Hazards Report Bldg. Evacuation Rt. Source Fab. Fac.
10206J-003-D		Hazards Report Cell Plan Source Fac.
10206J-004-D		Hazards Report Sect AA Source Fab. Fac.
10206J-005-D		Hazards Report Cell Vent Plan Source Fab. Fac.
10206J-006-D		Hazards Report Air Flow Pl. Source Fab. Fac.
10880J-001-D		Chill Block Platinum Sphere Dets. Equip. CM Prog.
10880J-002-D		Chill Block Tungsten Capsule Dets. Equip. CM Prog.
10880J-003-D		Chill Block Molybdenum Capsule Assy. Equip. CM Prog.
10880J-004-D		Pellet Chill Block Assy. Dets. Equip. CM Prog.
10880J-005-D		Capsule Trans. Tongs Assy. Dets. Equip. CM Prog.
10949L-001-E	1	Glove Box Assy.
10949L-002-D		Glove Box Glass Panels Support Stand Det. Fenn. Mill
10949L-003-D		Glove Box Mill Mod. Misc. Dets. Fenn. Rolling Mill
10949L-004-D		Glove Box Shaft Seal Assy. Misc. Det. Fenn. Rolling Mill
10949L-005-D		Glove Box EXH Filter Dets. Fenn Rolling Mill

Building 3028 Drawing List (continued)

Document	Revision	Title
10949L-006-D		Glove Box Inlet Filter Dets. Fenn Rolling Mill
2017029	C	Wiring Diagram—Starter Panel
2076		Refrigeration Circuit- Sheet 1 of 2
2076		Refrigeration Circuit- Sheet 2 of 2
2132		Refrigerator Machine Sections, Water Cooler
81X-19356		List of Sub-Assys. Prts. Lists, Sub Assy Dwgs., Master-Slave Manipulator- Sheet 1 of 6
81X-19356		List of Sub-Assys. Prts. Lists, Sub Assy Dwgs.,
81X-19356		List of Sub-Assys. Prts. Lists, Sub Assy Dwgs.,
81X-19356		List of Sub-Assys. Prts. Lists, Sub Assy Dwgs.,
81X-19356		List of Sub-Assys. Prts. Lists, Sub Assy Dwgs.,
81X-19356		List of Sub-Assys. Prts. Lists, Sub Assy Dwgs., Master-Slave Manipulator- Sheet 6 of 6
D-6684	5	General Area Exhaust System Plan
D-6684	A	I.P.A./Gen. Area-Exhaust System Plan Bldgs. 3028

APPENDIX D

BUILDING 3028
HAZARDS SCREENING DOCUMENT
HS/3028/F/RT-5/REV. 1

RT8-DHC

Document No.: HS/3028/F/RT-5
Revision No.: 1
Date: December 20, 1994

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PHASE I SAFETY DOCUMENTATION

RADIOISOTOPE LABORATORY A

BUILDING 3028

HAZARD SCREENING

APPROVAL

PHASE I SAFETY DOCUMENTATION

RADIOISOTOPE LABORATORY A

BUILDING 3028

HAZARD SCREENING

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ACRONYMS AND ABBREVIATIONS . . . . . v [2]

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[2]Pages in this appendix have been numbered according to Appendix D format. When looking for materials listed on this contents page, please use section numbers and/or titles.

3.2.2 Present Processing

All process operations in Building 3028 have been shut down, all inventory has been removed, and the building is in safe standby. All S&M and decontamination activities, including those required for facility stabilization, are covered by approved, written procedures.

3.3 HAZARD SOURCE INFORMATION

A legacy of the many programs and processes previously conducted in this facility since its construction remains primarily as residual surface contamination of cells and process equipment (vessels, piping, vent ducts, etc.). A list of substances and hazardous materials that may be located within the facility (Table 1) was developed from historical information based on facility inventory records for all isotopes facilities and from operational information for this specific facility. Quantities of the residual materials present have been estimated from recent Health Physics (HP) surveys of the facility. (See Appendix A.) An inventory of the contamination, based on these estimates, is attached in Appendix B. [Table 1 was developed from the data presented in Appendices A and B.]

A review of Table 1 resulted in the determination that the only unusual hazard present in the facility is due to small quantities of residual surface radioactive contamination present in the facility. The radioactive contamination is not considered significant due to the small amount of material involved, the immobility of the fixed contaminants, the identification and isolation of the small amounts of transferable contamination remaining, and the lack of personnel access to and activity (i.e., operations) in these areas.

Table 1. Characteristics of residual contamination in Building 3028

Radioisotope(s)	Quantity (percent of Category 3 thresholds)
Alpha - not identified by individual isotope (known to be mostly ^{241}Am)	~ 30 (^{239}Pu equivalent)
^{147}Pm; beta/gamma unidentified	< 1 (included with ^{60}Co equivalent)
^{60}Co	< 1 (total beta/gamma equivalent)

The amount of radioactive material remaining within the facility (as stated in the inventory) has been estimated based on the HP average smearable levels of alpha and beta-gamma in the facility (see summary in Appendix A) over the entire free surface of the facility. Estimates of in-cell activity are included with those outside of the cell areas to obtain an overall inventory value.

No significant hazards are attributed to the small quantities (less than the 29 CFR 1910.1000 laboratory quantities) of chemicals currently used in the facility.

Facility utilities include plant air (less than the screening criterion of 3,000 psig), steam for heating (less than the screening criteria of 3,000 psig and 250°C), and electrical power (less than the screening criterion of 600 V); thus, these are equivalent to any utilities found on any industrial site. No fans or pumps are unique; these are equivalent to those found in any industrial area. All utility and equipment hazards have been classified as SIHs; and, therefore, no significant hazards are attributed to these items.

4. HAZARD SCREENING

All hazard screening has been developed using two reports for guidance. Those references are: The Safety Analysis Report Update Program: Overview and Phase I Implementation (Revision 2), Report No. ES/CSET-1/R2, August 1991; and The Safety Analysis Report Update Program: Hazard Screening Application Guide, Report No. CSET-2, December 1990 [hereafter referred to as CSET-1,2]. All information and data utilized for this screening have come from facility operators and management and the existing documentation for the facility.

In addition, DOE-1027, 5502-94, and 5480.11 have also been utilized for inventory estimation and facility categorization. Since the facility inventory is the basis for categorization, no accident analysis has been made for this facility.

4.1 HAZARD IDENTIFICATION

4.1.1 Preliminary Hazard Identification Matrix

The completed Preliminary Hazard Identification Matrix can be found in Appendix C. Residual surface radioactive contamination is the only non-industrial hazard identified; all other (non-radioactive) materials/hazards were evaluated and can be classified as Standard Industrial Hazards (SIHs). Examples of these SIHs are small quantities of acids, hydraulic fluids, and other chemicals; vacuum pumps; utilities; and instrumentation.

4.1.2 Preliminary Hazards Analysis Worksheet

The completed Preliminary Hazards Analysis Worksheet will be found in Appendix D. The major hazard is radioactive contamination and can lead to only one significant consequence, which is local exposure of facility personnel to the radiation.

4.2 INITIATING EVENT IDENTIFICATION AND SELECTION

No HAZOP (Hazard and Operability) Worksheet was completed for this facility Functionally, the hazards and consequences can be developed from the past documentation. Only natural phenomena are considered credible as an accident source. Fire is not considered credible due to lack of combustible materials. Chemical and mechanical initiation of an accident is not credible since all operations are shut down. No accident analysis has been made for this facility.

4.3 SCENARIO DEVELOPMENT

The Hazard Classification Input Form was not developed for this facility. No accident analysis has been made for this facility.

4.4 CONSEQUENCE DETERMINATION

No evaluations were made for the Phase I report since classification has been completed utilizing DOE-1027, 5502-94, and 5480.11. No significant release of radioactive material from the facility is possible.

4.5 INITIAL HAZARD CLASSIFICATION

Using the DOE-1027, 5502-94, and 5480.11 guidelines, Building 3028 should be considered RADIOLOGICAL. There is no potential for other than negligible impact to any individual on-site or off-site.

The remaining inventory, as residual surface radioactive contamination, is the determining factor for classification as defined in DOE-1027 and 5480.11. This basis is supported by the release limits defined in 5502-94.

5. SAFETY DOCUMENTATION REQUIREMENTS

No further hazards evaluation is planned for this facility. All source and past operational information for the building is currently well documented. No radioactive material storage will be permitted within the facility complex in the future. No operations, other than S&M and decontamination activities, will be permitted.

6. MATERIALS AND HAZARDS THAT COULD AFFECT OTHER FACILITIES

There are no accident consequences that could affect adjacent facilities. No adjacent facilities would be expected to impact Building 3028.

APPENDIX A

SUPPORTING HEALTH PHYSICS SURVEY INFORMATION

Supporting Health Physics Survey Data

November 1993 and July, August, September, and October 1994 Reports

A.1. REMAINING INVENTORY

No inventory as 'discrete' or 'individual' items remains within Building 3028. No single sources of radioactive material, including waste, are left in the facility. The only 'inventory' remaining is fixed and transferable surface contamination (radioactive material).

A.2. CONTAMINATION LEVELS

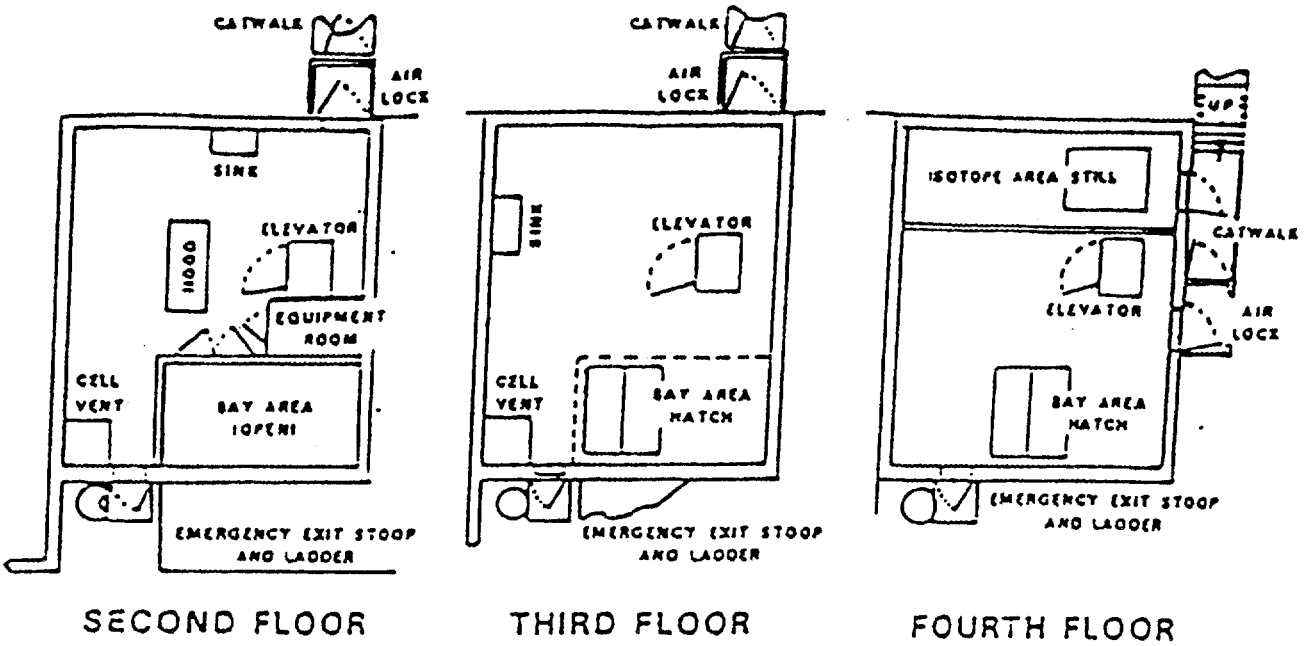
Overall contamination levels within the facility have been determined and are updated with new surveys at least once a quarter except for the hot cells. Smears give the levels of transferable surface radioactive material, and radiation surveys give the levels of transferable plus fixed surface radioactive material as a total. Smears generally are reported as disintegration count rates that are easily converted into Curies (Ci) of radioactive material. Radiation surveys are normally reported as dose rates that are easily converted into Roentgen-equivalent-man (Rem) of radiation dose to humans. No quantitative identification by isotope of either type of surface material contamination (fixed or transferable) is feasible. [See Fig. A-1 for those areas considered to be contaminated.]

The hot-cell interiors have very high radiation levels and pose a great potential hazard for exposure and contamination of individuals if they enter the hot cells or stand before the opened entries. As a result, attempts to obtain quantitative and representative information on contamination levels and resulting inventories in the hot cells is difficult even with the utilization of manipulators since the smears must be transferred out of the hot cells to personnel. Smears from the same area could differ by a factor of five to seven (or more), and the resulting inventory calculations could differ by an order of magnitude or more. Smears from a hot cell can be so contaminated with radioactive material that only a dose rate can be determined from them: they cannot be counted if too hot.

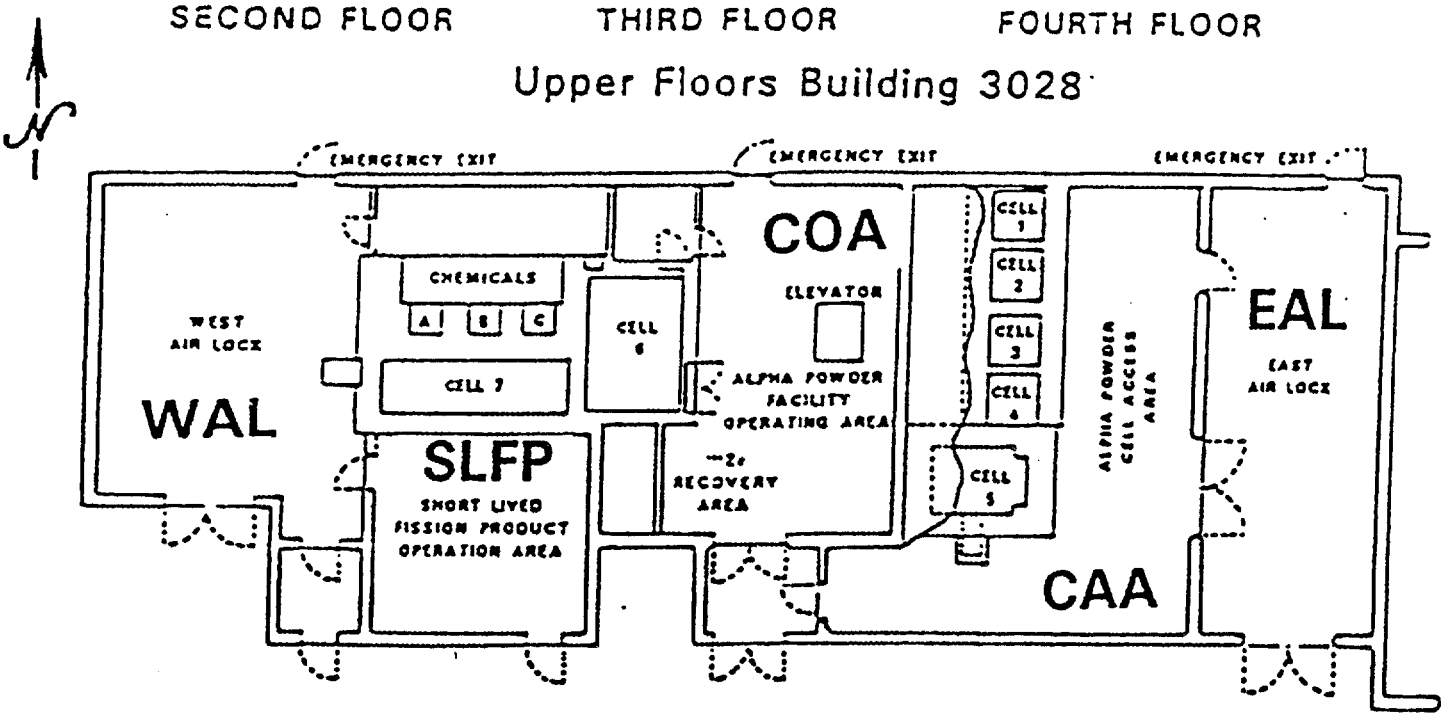
Total Radiation Levels. Fixed and transferable contamination, as a total, give radiation survey levels that remain relatively constant over time if no decontamination work is done within the facility. There is little variance in the results for the overall facility or in any specific area with time although some areas may be more contaminated with radioactive material than others. The 5480.11 limit of radiation level for a 'radiologically acceptable' facility is <= 5 mRem (milli-Roentgen-equivalent-man, a radiation dose equivalent defined for determination of radiation effect on human beings) per hour at a distance of 30 cm from the surface (referred to as mRem/hr @ 30 cm) (and if transferable and fixed contamination levels are below the 5480.11 limits and inventory levels are below the Category 3 limits); otherwise, the facility is defined as 'radiologically contaminated'.

The results by area in the facility for radiation levels (fixed plus transferable contamination) are as follows:

First floor; west air lock --	all <= 1.0 (one hot spot about 3) mRem/hr @ 30 cm
SLFP area --	all <= 1.0 mRem/hr @ 30 cm
Cell 6 operating area --	all < 1.0 mRem/hr @ 30 cm
East air lock --	all <= 15 mRem/hr @ 30 cm
Cell access area --	all < 1.0 mRem/hr @ 30 cm
Hot cells --	unknown; probably very high
Second floor --	all < 0.1 (except one reading = 0.6 and one = 20, both due to beta) mRem/hr @ 30 cm
Third floor --	all < 0.05 mRem/hr @ 30 cm
Fourth floor --	all < 0.1 mRem/hr @ 30 cm



Upper Floors Building 3028



First Floor Building 3028

Contaminated Areas:

First Floor	West air lock (WAL on diagram); SLFP area; Cell 6 operating area (COA); east air lock (EAL); cell access area (CAA); and each hot cell [the east end of the facility is generally more contaminated with alpha material (and lower levels of beta/gamma) and the west end of the facility with beta/gamma (and lower levels of alpha)].
Second Floor	Several hot spots; general low-level beta/gamma contamination.

Fig. A-1. Contaminated Areas of Building 3028

Table A-1. Summary of facility contamination estimate for Building 3028

Estimated background	Comments
Smear Results (transferable, dpm/100 cm^2)	
<20 alpha	All of first floor except hot cells and cell access area; all of third floor; all of fourth floor
<200 beta/gamma	All of first floor except hot cells and cell access area; all of third floor; all of fourth floor
<300 alpha	All of second floor
<1,000 beta/gamma	All of second floor
<2,100 alpha	Cell access area (excluding cell interiors); range from <300 to 2,100; average over the entire cell access area is ~ 500 (counting all <300 as 300)
<1,000 (one hot spot at 8,000) beta/gamma	Cell access area (excluding cell interiors) (all <1,000 counted as 1,000; 8,000 averaged with others)
$>>10^7$; assumed to be $\sim 10^8$ alpha	Hot Cells 1 and 2 (smears from inside hot cells too hot to be counted)
beta/gamma masked by alpha; low	Hot Cells 1 and 2
1 to 10 times 10^6; assumed to be 5 times 10^6 alpha	Hot Cells 3, 4, and 5
beta/gamma masked by alpha; low	Hot Cells 3, 4, and 5
alpha masked by beta/gamma; low	Hot Cells 6 and 7
$>10^7$; assumed to be 10^8 beta/gamma	Hot Cells 6 and 7
Radiation Levels (all contamination present)	
<=1.0 mRem/hr @ 30 cm	All of first floor except air locks; all of third floor; all of fourth floor
<=20. mRem/hr @ 30 cm	Air locks on first floor; all of second floor; all <0.1 except one at 0.6 and one at 20
unknown; probably very high	All hot cells

[This information has been reviewed by another professional who is competent to perform the verification and was not directly involved in preparing any portion of this document including the specific calculations found within this subsection (4.4).]

Smear Results. Transferable contamination results, although relatively stable while no decontamination work is done in the facility, do tend to vary 'up and down', especially small, isolated, individual hot spots (a hot spot is defined as a small area that shows much greater contamination than the surrounding areas). The variances are due to such uncontrollable variables as how 'hard' a person presses when obtaining a smear, the adherence of the contamination to the surface, how closely the smeared area corresponds to exactly 100 cm^2 (more or less), uneven distribution of the contamination over the surface, etc. It is not unreasonable to expect significant variations in areas of greater contamination. However, when an entire area shows little or no signifcant transferable contamination, that is a reliable indication that the area can be accurately called 'clean' (per the 5480.11 guidelines). The 5480.11 limits for transferable contamination have been given for a 'radiologically acceptable' facility as $< \approx 20$ dpm/100 cm^2 for unidentified isotopes emitting alpha (worst case) and $< \approx 200$ dpm/100 cm^2 for unidentified isotopes emitting beta/gamma (worst case) (and if the radiation levels are below the 5480.11 limits and the inventory levels are below the Category 3 limits). [The term dpm/100 cm^2 is disintegrations per minute per 100 square centimeters of surface area.] [The respective limits for fixed plus transferable contamination are 300 dpm/100 cm^2 and 1,000 dpm/100 cm^2 (for alpha and beta/gamma, respectively). The facility levels of fixed and transferable as total contamination (for comparison with the 5480.11 limits) are not available from the HP reports.] If the facility levels are greater than these limits, the facility is classified as 'radiologically contaminated'. Results for Building 3028 are as follows (transferable contamination only):

First floor; west air lock --	alpha - all < 20 dpm/100 cm^2 beta/gamma - all < 200 dpm/100 cm^2
SLFP area --	alpha - all < 20 dpm/100 cm^2 beta/gamma - all < 200 dpm/100 cm^2
Cell 6 operating area --	alpha - all < 20 dpm/100 cm^2 beta/gamma - all < 200 dpm/100 cm^2
East air lock --	alpha - all < 20 dpm/100 cm^2 beta/gamma - all < 200 dpm/100 cm^2
Cell access area --	alpha - < 300 to 2,100 dpm/100 cm^2 beta/gamma - all < 1,000 (except one hot spot of 8,000) dpm/100 cm^2
Hot Cell # 1 --	alpha - >> 10^7 (assumed to be 10^8) dpm/100 cm^2 beta/gamma - unknown; assumed to be low (masked by the alpha)
Hot Cell # 2 --	alpha - >> 10^7 (assumed to be 10^8) dpm/100 cm^2 beta/gamma - unknown; assumed to be low (masked by the alpha)
Hot Cell # 3 --	alpha - 1 to 10 x 10^6 (assumed to be 5 x 10^6) dpm/100 cm^2 beta/gamma - unknown; assumed to be low (masked by the alpha)
Hot Cell # 4 --	alpha - 1 to 10 x 10^6 (assumed to be 5 x 10^6) dpm/100 cm^2 beta/gamma - unknown; assumed to be low (masked by the alpha)

Hot Cell # 5 --	alpha - 1 to 10 x 10^6 (assumed to be 5 x 10^6) dpm/100 cm^2 beta/gamma - unknown; assumed to be low (masked by the alpha)
Hot Cell # 6 --	alpha - unknown; assumed to be low (masked by the beta/gamma) beta/gamma - > 10^7 (assumed to be 10^8) dpm/100 cm^2
Hot Cell # 7 --	alpha - unknown; assumed to be low (masked by the beta/gamma) beta/gamma - > 10^7 (assumed to be 10^8) dpm/100 cm^2
Second floor --	alpha - < 20 (most readings) and < 300 (about one-third of the readings) dpm/100 cm^2 beta/gamma - < 200 (most readings) and < 1,000 (about one-third of the readings) [one hot spot found 11/3/93 not included here] dpm/100 cm^2
Third floor --	alpha - all < 20 dpm/100 cm^2 beta/gamma - all < 200 dpm/100 cm^2
Fourth floor --	alpha - all < 20 dpm/100 cm^2 beta/gamma - all < 200 dpm/100 cm^2

Individual Isotopes. Tentative identification of the individual isotopes present in the facility as residual surface radioactive contamination has been determined from the operational history of the facility. [It is not feasible to identify the isotopes from the HP smears due to the low levels of contamination generally found throughout the facility.] Most, if not all of the SLFPs [short-lived fission products] have decayed away; ^{147}Pm would be the prominent remaining beta activity. Based on a worst case for beta/gamma activity, ^{60}Co probably represents as descriptive a typical contaminant as can be found in the isotopes facilities. Therefore, beta/gamma residual surface radioactive contamination is represented by two predominant categories:

^{147}Pm; beta/gamma unidentified (included then in the ^{60}Co equivalent)
^{60}Co; beta/gamma (equivalent listing for all residual surface radioactive contamination)

Most of the alpha is suspected to be and probably is ^{244}Cm. The Cm material cells, after all processing was completed, were partially decontaminated. However, the alpha, based on a worst case, is best represented by:

^{239}Pu; alpha unidentified (^{239}Pu equivalent listing for all residual surface radioactive contamination)

^{239}Pu, as a worst case equivalent, is probably an adequate representative equivalent for all remaining alpha contamination including the ^{244}Cm and other transuranic isotopes.

A.3. INVENTORY ESTIMATE

Balance of the Facility (Excluding the Hot Cells). The surface area of the first floor is about 400 m^2 [quoted as 4,000 ft^2]. The height of each of the floors is about 3 m. Those areas that consistently show smears and radiation readings below the 5480.11 limits have been assumed to be clean (relatively uncontaminated). [This assumption is also considered prudent due to the much larger relative contribution from the contaminated areas that do not fit this criterion.] These areas (assumed to be clean) are: the first floor (excluding the cell access area and the hot cells), the third floor, and the fourth floor. Those areas assumed to be contaminated with significant residual surface radioactive contamination are: the hot cells and the cell access area of the first floor and the second floor (both alpha and beta/gamma as indicated above). The cell access area measures about 8 m by 12 m (area of about 100 m^2 floor area and about 320 m^2 total surface area - walls, ceiling, and floor - the floor is expected to be the most contaminated, but for purposes of this document, the entire surface area is assumed to be equally contaminated). With an average floor contamination level of approximately 500 dpm alpha/100 cm^2 and ~ 1,300 dpm beta/gamma/100 cm^2 [these levels of contamination were chosen by assuming the entire surface of the cell access area was 300 dpm alpha/100 cm^2 where readings were < 300 dpm alpha/100 cm^2 and obtaining an average approximation of all other readings; the single 8,000 dpm beta/gamma/100 cm^2 hot spot was considered in the beta/gamma average since it added about 300 dpm beta/gamma/100 cm^2 to the 1,000 dpm beta/gamma/100 cm^2 chosen as the average of the other 24 readings], total contamination within the cell access area is estimated to be about 8 μCi of alpha and about 20 μCi of beta/gamma. (NOTE: this is microCuries.) The second floor areas are respectively: 60 m^2 (floor surface) and 220 m^2 (total surface). Utilizing average floor contamination levels of < 120 and < 500 dpm/100 cm^2 for alpha and beta/gamma, respectively, the contamination levels on the second floor are estimated to be about 1 μCi and 5 μCi, respectively. The total balance of facility inventory levels for alpha and beta/gamma are then estimated to be:

Alpha = ≈ 10 μCi
Beta/gamma = ≈ 25 μCi

Hot Cell Estimate. The best hot-cell-inventory estimate has been calculated as follows. All cells are estimated to be about 2 m high. The first four cells have interior dimensions of about 1.5 m by 1.5 m. Each has a floor area of about 2 m^2 and a total interior surface area of about 15 m^2. Cells 5, 6, and 7 are about 3 m by 1.5 m, 3 m by 4 m, and 6 m by 1.5 m, respectively. The floor areas of the three cells are about 5, 12, and 9 m^2, respectively. The estimated, total interior surface areas are about 30, 50, and 50 m^2, respectively. Utilizing the contamination levels in Table A-1, the alpha inventory estimates for Cells 1, 2, 3, 4, and 5 (Cells 6 and 7 are assumed to have, in comparison, negligible alpha inventory, as does the balance of the facility) are about 0.07, 0.07, 0.003, 0.003, and 0.006 Ci, respectively. The total alpha inventory is then best rendered (with the best information now available) as about 0.15 Ci. This represents less than the Category 3 threshold value for ^{239}Pu, equivalent. Again, utilizing Table A-1, the beta/gamma inventory estimates for Cells 6 and 7 (Cells 1, 2, 3, 4, and 5 are assumed to have, in comparison, negligible beta/gamma inventory, as does the balance of the facility) are about 0.22 Ci each for a total of about 0.45 Ci beta/gamma. This represents less than one percent of the Category 3 threshold limits with a ^{60}Co equivalence. Thus, the total facility inventories are estimated to be (including the hot cells):

Alpha = ~ 0.15 Ci (^{239}Pu equivalent)
Beta/gama = ~ 0.45 Ci (^{60}Co equivalent)

Category 3 Threshold Limits. The Category 3 Threshold Limits for ^{239}Pu and ^{60}Co were applied to the inventories and Building 3028 has about the following equivalence to the limits:

Alpha = ~ 30 percent
Beta/gamma = < 1 percent

Total facility = ~ 30 percent

A.4. HISTORICAL RESULTS FOR THE PAST TWO YEARS

Total Radiation Levels. By area, the following historical perspectives are available.

First floor; west air lock --	all < = 1.0 mRem/hr @ 30 cm
SLFP area --	all < = 1.0 mRem/hr @ 30 cm
Cell 6 operating area --	all < 1.0 mRem/hr @ 30 cm
East air lock --	Varies from < 10 to 15 mRem/hr @ 30 cm
Cell access area --	All < 1.0 mRem/hr @ 30 cm
Hot cells --	No readings
Second floor --	All < = 20 mRem/hr @ 30 cm
Third floor --	All < = 0.05 mRem/hr @ 30 cm
Fourth floor --	All < = 0.1 mRem/hr @ 30 cm

Smear Results. By area, the following historical perspective has been evaluated for the facility.

First floor; west air lock --	alpha - all < 20 dpm/100 cm^2 beta/gamma - most < 200 (up to 560) dpm/100 cm^2
SLFP area --	alpha - all < 20 dpm/100 cm^2 beta/gamma - all < 200 dpm/100 cm^2
Cell 6 operating area --	alpha - most < 20 (up to 34; one spurious reading unduplicated at 1,100) dpm/100 cm^2 beta/gamma - most < 200 (up to 610) dpm/100 cm^2
East air lock --	alpha - all < 20 dpm/100 cm^2 beta/gamma - all < 200 dpm/100 cm^2
Cell access area --	alpha - most < 300 (up to 21,000 - one or two hot spots) dpm/100 cm^2 beta/gamma - most < 1,000 (up to 13,000 - one or two hot spots) dpm/100 cm^2
Hot cells --	alpha - >> 10^7 dpm/100 cm^2 (one check only) beta/gamma > 10^7 dpm/100 cm^2 (no measurements)
Second floor --	alpha - all < 300 dpm/100 cm^2 beta/gamma - all <1,000 (except a single measurement of 380,000) dpm/100 cm^2 ^3H (tritium) - all < 1,000 dpm/100 cm^2
Third floor --	alpha - all < 20 dpm/100 cm^2 beta/gamma - all < 200 dpm/100 cm^2
Fourth floor --	alpha - all < 20 dpm/100 cm^2 beta/gamma - all < 200 dpm/100 cm^2

Older data have not been averaged with newer data in determining surface-radioactive-material-contamination levels for several reasons. First, some hot spots, especially the worst ones outside the hot cells, have been cleaned and contamination levels reduced. Second, repetitive hot spot smears are not consistent. Third, the overwhelming surface area of the facility outside the hot cells has much less contamination than the hot spots would indicate.

A.5. HP REPORTS: DATA UTILIZED IN THIS REPORT

The latest reports were utilized for calculation and reporting purposes. The sources of data were from HP reports on file in the Building 3047 Field Office and are as follows:

First floor; west air lock --	smears - 10/17/94 radiation - 9/15/94 historical - 8/17; 7/21; 6/17; 4/29; 3/31; 2/16; 1/14/94; 12/9; 10/12; 9/3; 7/9; 6/4; 4/28; 3/31/93; 12/31, 1/92
SLFP area --	smears - 10/14/94 radiation - 9/15/94 historical - 8/17; 7/21; 6/15; 4/7; 3/10; 1/31/94; 12/15; 11/22; 10/13; 9/4; 7/9; 6/4; 4/28/93
Cell 6 operating area --	smears - 10/17/94 radiation - 8/17/94 historical - 7/22; 6/17; 5/5; 3/30; 2/18; 1/14/94; 12/15; 11/22; 9/13; 7/15; 6/4; 5/7; 3/16; 1/28, 5/93; 11/30/92
East air lock --	smears - 10/31/94 radiation - 8/19/94 historical - 7/22; 6/13; 4/19; 3/18; 2/11; 1/6/94; 11/15; 10/18; 9/4; 7/16; 6/4; 5/7; 4/2; 1/28/93; 12/31; 11/30/92
Cell access area --	smears 9/9/94 radiation - 9/9/94 historical - 2/3/94; 7/26/93; 11/19/92
Hot Cell # 1 --	smears - 11/17/93 radiation - none historical - none
Hot Cell # 2 --	smears - 11/17/93 radiation - none historical - none
Hot Cell # 3 --	smears - 11/17/93 radiation - none historical - none
Hot Cell # 4 --	smears - 11/17/93 radiation - none historical - none
Hot Cell # 5 --	smears - 11/17/93 radiation - none historical - none
Hot Cell # 6 --	smears - none (verbal estimate from HP responsible for the area) radiation - none historical - none
Hot Cell # 7 --	smears - none (verbal estimate from HP responsible for the area) radiation - none historical - none
Second floor --	smears - 8/8/94 radiation - 8/8/94 historical - 5/12; 2/2/94; 11/3; 8/4; 4/20; 1/27/93; 10/9/92

Third floor --	smears - 7/15/94 radiation - 7/15/94 historical - 3/10/94; 12/10; 9/1/93
Fourth floor --	smears - 9/7/94 radiation - 4/7/94 historical - 6/7; 2/11/94; 11/3; 8/4/93

A.6 RATIONALE FOR ASSUMPTIONS/CALCULATIONS

Isotope Identification. No attempt at specific isotope identification is feasible. Therefore, no particulate (alpha. beta) energy has been determined; and no specific gamma-ray energy is available. As a result, no radiation measurements can be converted into equivalent decay/Ci contents.

Surface Contamination Levels: Balance of Facility: Alpha. This is the primary form of radioactive material contamination in the east end of Building 3028. There is virtually no alpha contamination in the facility except in the cell access area (and the first five hot cells) on the first floor and the second floor. The alpha-material-inventory estimate for the cell access area is based on an average alpha contamination level found by adding all smear results together (count < 300 as 300 dpm/100 cm^2) and dividing by the total number of smears. The average obtained from the smear results is ~ 500 dpm/100 cm^2. With a total surface area of ~ 320 m^2, the total alpha content in the cell access area is about 1.6×10^7 dpm, which, when divided by 60 s/min and 3.7×10^{10} dps/Ci, gives a value of about 8 μCi of alpha in the cell access area. A similar calculation for the second floor (the < 300 and < 20 dpm/100 cm^2 values were combined for the second floor - one-third of 300 and two-thirds of 20 to give ~ 120 dpm/100 cm^2) can be calculated to about 2.6×10^6 dpm, which, in turn, converts to about 1 μCi of alpha contamination on the second floor. Thus, the balance of facility alpha contamination inventory is about 10 μCi.

Surface Contamination Levels: Balance of Facility: Beta/Gamma. Althought the beta/gamma contamination should be limited to the west end of the facility, decontamination efforts have cleaned the west end of the facility (excluding the last two hot cells) to the point where no significant beta/gamma contamination is found in this part of the facility. The areas of greater beta/gamma contamination in the balance of the facility are found in the cell access area and on the second floor. The cell access area average contamination value is found by taking the 8,000 dpm/100 cm^2 hot spot and adding it into the other 24 readings of 1,000 (by assuming < 1,000 is 1,000) dpm/100 cm^2. The average is ~ 1,300 dpm/100 cm^2. This taken over the entire surface area yields about 20 μCi of beta/gamma. The second floor value is found the same way (by assuming < 300 for two-thirds and < 1,000 for one-third is ~ 500 dpm/100 cm^2). There are no unreasonable historical data except for a single hot spot found once in the survey of 11/3/93 - a fixed contamination point of a total quantity equal to 380,000 dpm (not per 100 cm^2, although the area does not matter, only the total). If the entire 380,000 dpm is converted to material content, it represents only about 10 μCi. This spot has not be counted since it has been assumed to be a fluke - it does not show up in the any later surveys.

Surface Contamination Levels: Hot Cells: Alpha. The alpha contamination levels in the first two hot cells had to be estimated since the smears were too hot to be counted. The best estimate for the contamination comes from the HP responsible for the area - the smears are estimated as being "much greater than 10×10^6 dpm/100 cm^2". [For each hot cell, four smears were taken by manipulator and passed out to the personnel for counting. The four areas smeared were at the top, bottom, right, and left sides of the hot cell. No front or back smears were taken.] The smears from Cell # 2 read about 1.2 mRem/hr at contact. [The alpha produces intense x-rays similar to beta-induced Bremmstrahlung (x-rays) - more so than the beta due to higher particle energy and shorter particle range. Because alpha particles don't penetrate the skin and are considered harmless outside the human body and alpha material is usually not handled at as high activity levels as beta material, this aspect of alpha decay is normally ignored.] A value ten times the "much greater" contamination level suggested by the HP was chosen as an estimated upper limit for the contamination level in the first two hot cells; namely, 10^8 dpm/100 cm^2. Because of the potential radiation doses to personnel who would take the smears and handle them, no further smears of these cells has been attempted. The HP personnel do not believe any further refinement of existing information is possible.

There is no overwhelming technical reason for choosing the value selected; it becomes a matter of judicious experience. There is no evidence for or against selecting a greater, or for that matter a lower contamination value. In the case of the next three hot cells, the value of alpha contamination selected is the approximate average of the range listed (1 to 10 x 10^6 dpm/100 cm^2).

When the assumed contamination levels are converted to activity levels, the total alpha inventory in the hot cells is estimated to be ~ 150 mCi. Thus, the hot cell inventory is very much greater than the ~ 10 μCi for the balance of facility.

Surface Contamination Levels: Hot Cells: Beta/Gamma. The last two hot cells are contaminated with high levels of beta/gamma radioactive material. The best estimate of these levels is a verbal estimate from the HP responsible for the area of "greater than 10^7 dpm/100 cm^2". As was the case for the first five alpha hot cells, a prudent estimate of the average contamination levels was made; namely, 10^6 dpm/100 cm^2. Applying this estimate to the surface areas in the hot cells yields a final value of about half a Curie of beta/gamma material. Again, this is very much greater than the balance of facility inventory estimate of ~ 25 μCi.

Calculations: Accuracy and Precision. All calculations are to the nearest, single, significant digit. No estimates of accuracy or precision are possible. Based on the historical data, smear data maxima, for any given large surface area, may range over factors of from five to seven; but, the surface averages vary much less than a factor of two (usually by a factor of about 1.25 or less when the surveys cover the same areas). Variability in radiation levels is low except in a location where radioactive waste material may be packaged and levels compared when waste is present to after it has been removed. More historical data for an area enhance the confidence that an area is clean or, conversely, increase the confidence in the correctness of observed surface contamination levels.

The greatest uncertainties are in the cell contamination levels. For Cells 6 and 7, this uncertainty is not critical since an increase in the contamination levels by several orders of magnitude would not change the final conclusions drawn in the report. The contamination levels in Cells 3, 4, and 5 could be critical if more than an order of magnitude error (increase in contamination levels) is present in these cells. The contamination levels in Cells 1 and 2 are critical to the outcome of this report's conclusions; there is only a factor of three available in adjustment of the contamination levels before the conclusions would have to be adjusted.

APPENDIX B

NUCLEAR MATERIAL INVENTORY

(Residual Contamination Only)

Nuclear Material Inventory

in Curies

Sheet 1 of 1

Facility Number: 3028 Facility Name: Radioisotope Laboratory A

The following isotopes have been determined as possible contributors to the residual surface contamination.

Table B-1. Nuclear Material Inventory

Isotope	Inventory (in Ci)	Cat 2 Threshold	Cat 3 Threshold	% of Cat 3 Threshold
^{239}Pu [alpha]	<1.5 E -01	5.60 E +01	5.20 E -01	~3.0 E +01
^{147}Pm [beta/gamma]	<1.0 E +00	8.40 E +05	1.00 E +03	<1.0 E +00
^{60}Co [beta/gamma]	<1.0 E +00	1.90 E +05	2.80 E +02	<1.0 E +00

For each Isotope, indicate the maximum amount that may be present within the facility in the foreseeable future (within 1 year of preparation of this report). Indicate on the worksheets the percentage of each quantity of the isotope compared to the highest threshold value. (This does not need to be performed for Category 1 facilities.) Indicate the highest category obtained (Cat 2, Cat 3, or RAD) and the isotope summation in the spaces provided below.

RAD _____ Category

~ 30 _____ % of Next Higher Category

Note: All inventory as listed refers to residual surface radioactive contamination. No discrete individual "items" or "units" of inventory remain within the facility.

Completed form will be maintained by Facility Manager. A copy will be sent to DOR/FB, 4500N, MS-6238.

APPENDIX C

PRELIMINARY HAZARD IDENTIFICATION MATRIX FORM

PRELIMINARY HAZARD IDENTIFICATION MATRIX

DATE: 11/94
FACILITY: Building 3028

HAZARD TYPE

Item No.	System/Subsystem Description	Special Nuclear Material	Radiation Sources	Toxic Corrosive/ Reactive Materials	Flammable Materials	Explosive/ Pyrophoric Materials	Electrical Energy	Thermal Energy	Kinetic Energy	Potential Energy	Other	Remarks
1.	Hot cells		✓	✓			✓					Contamination; most fixed in place, some isolated transferable
2.	Balance of facility		✓	✓			✓	✓	✓			Contamination; most fixed in place, some isolated transferable

APPENDIX D

PRELIMINARY HAZARDS ANALYSIS WORKSHEET FORM

PRELIMINARY HAZARDS ANALYSIS WORKSHEET

DATE: 11/94
FACILITY: Building 3028

Item No.	System/Subsystem Description	Hazard Type	Consequence	Initiating Event	Standard Industrial Hazard Y or N	Justification for Std. Ind. Hazard and Comments
1.	Hot cells	Radiation sources	Personnel exposures	Human error or natural phenomenon	N	
		Toxic, Corrosive/Reactive materials	Personnel exposures to chemicals, burns, injury	Same	Y	All quantities less than 29 CFR 1910.1000 laboratory amounts
		Electrical energy	Shock, burns, physical injury	Same	Y	All sources <600 V
2.	Balance of facility	Radiation sources	Personnel exposures	Human error or natural phenomenon	N	
		Toxic, Corrosive/Reactive materials	Personnel exposures to chemicals, burns, injury	Same	Y	All quantities less than 29 CFR 1910.1000 laboratory amounts
		Electrical energy	Shock, burns, physical injury	Same	Y	All sources <600 V
		Thermal energy	Burns, physical injury	Same	Y	No excessive temperature (steam)
		Kinetic energy	Physical injury	Same	Y	No unique equipment

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