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Estimation and Characterization of Decontamination and Decommissioning Solid Waste Expected from the Plutonium Finishing Plant

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EXECUTIVE SUMMARY

This study was designed to characterize and estimate the amounts of equipment and other materials that are candidates for removal and subsequent processing in a solid waste facility when the Hanford Site's Plutonium Finishing Plant is decontaminated and decommissioned. The building structure itself and any contaminated soil are not part of this study; it is most probable that they will be dealt with in situ.

The estimates presented are based on available information from documentation, including facility engineering drawings, and from interviews with key PFP personnel. A walkdown was conducted to verify the information gathered from the research.

This information is required to support planning activities for current and future solid waste treatment, storage, and disposal facilities and operations. It also will be included in the Solid Waste Program Technical Baseline Description. Previous estimates of decontamination and decommissioning wastes were quite sketchy and general in nature; little facility-specific detail was available. This report, and others performed for additional 200 Area facilities, are the most accurate and comprehensive to date. The results will be used in waste projection estimates and as part of interface definition between the Solid Waste Division and decontamination and decommissioning generators.

The results of the solid waste characterization indicate that a total of approximately 5,500 m^3 of solid waste is expected to result from the

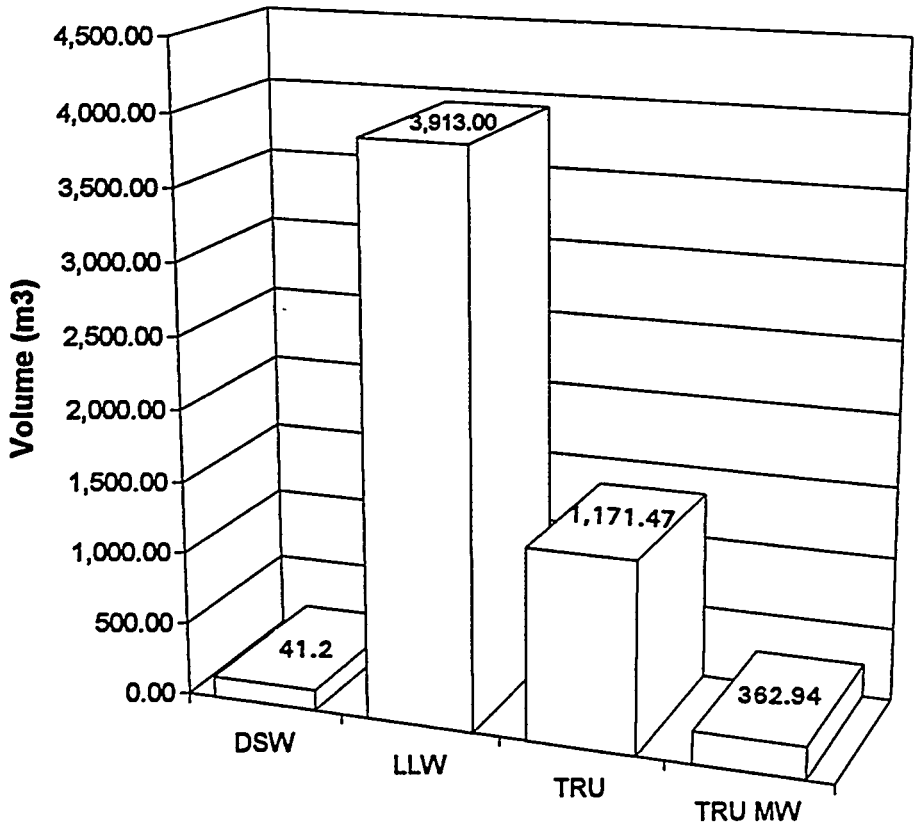
decontamination and decommissioning of the Plutonium Finishing Plant. The volumes and percentages of waste by category are presented in Table ES-1. Figure ES-1 provides a visual comparison of the relative volumes of solid waste expected. The largest volumes of waste are low-level and transuranic (71 percent and 21 percent, respectively).

Assuming that tanks containing regulated chemicals will be removed from the gloveboxes before decontamination and decommissioning begins, all of the gloveboxes and hoods have been classified as transuranic wastes instead of transuranic mixed wastes. Mixed wastes are mainly from the tanks and pipe work. The large amount of low-level waste (3,913 m^3) is mainly from the ventilation systems, which are assumed to be uncompacted.

Table ES-1. Total Solid Waste Volumes Expected to Result From the Decontamination and Decommissioning of the Plutonium Finishing Plant.

Waste category	Solid waste expected (m^3)	Percentage of total solid waste expected (m^3)
Dangerous solid waste	41	1
Low-level waste	3,913	71
Transuranic waste	1,171	21
Transuranic mixed waste	363	7
Total	5,488	100

Figure ES-1. Relative Volumes of Solid Waste Expected to be Generated During the Decontamination and Decommissioning of the Plutonium Finishing Plant.



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CLCS	closed loop cooling system
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DST	double-shell tank
DSW	dangerous solid waste
HEPA	high-efficiency particulate air
LLW	low-level waste
LLMW	low-level mixed waste
LLWTF	Low-Level Waste Treatment Facility
NDA	nondestructive assay
PCW	primary closed cooling (loop)
PFP	Plutonium Finishing Plant
PPSL	Plutonium Process Support Laboratory
PR	product removal
PRF	Plutonium Reclamation Facility
PUREX	Plutonium-Uranium Extraction (Facility)
RMA	Remote Mechanical A (Line)
RMC	Remote Mechanical C (Line)
SCW	secondary closed cooling (loop)
SNM	special nuclear material
TEDF	Treated Effluent Disposal Facility
TRU	transuranic
TRU MW	transuranic mixed waste
TSD	treatment, storage, and disposal
Z Plant	Plutonium Finishing Plant

LIST OF CONVERSIONS

Factors for Unit Conversions.

Quantity	Equivalent values
Mass	1 kg = 1,000 g = 0.001 metric ton = 2.20462 lb_m = 35.27392 oz 1 lb_m = 16 oz = 5 x 10^{-4} ton = 453.593 g = 0.453593 kg
Length	1 m = 100 cm = 1,000 mm = 10^6 microns (μm) = 10^{10} angstroms (Å) = 39.37 in. = 3.2808 ft = 1.0936 yd = 0.0006214 mile 1 ft = 12 in. = 1/3 yd = 0.3048 m = 30.48 cm
Volume	1 m^3 = 1,000 liters = 10^6 cm^3 = 10^6 ml = 35.3145 ft^3 = 220.83 imperial gallons = 264.17 gal = 1056.68 qt 1 ft^3 = 1728 $in.^3$ = 7.4805 gal = 0.028317 m^3 = 28,317 L = 28.317 cm^3
Force	1 N = 1 kg·m/s^2 = 10^5 dynes = 10^5 g·cm/s^2 = 0.22481 lb_f 1 lb_f = 32.174 lb_m·ft/s^2 = 4.4482 N = 4.4482 x 10^5 dynes
Pressure	1 atm = 1.01325 x 10^5 N/m^2 (Pa) = 101.325 kPa = 1.01325 bars = 1.01325 x 10^6 dynes/cm^2 = 760 mm Hg at 0 °C (torr) = 10.333 m H_2O at 4 °C = 14.696 $lb_f/in.^2$ (psi) = 33.9 ft H_2O at 4 °C = 29.921 in Hg at 0 °C
Energy	1 J = 1 N·m = 10^7 ergs = 10^7 dyne·cm = 2.778 x 10^{-7}· Kw·h = 0.23901 cal = 0.7376 ft·lb_f = 9.486 x 10^{-4} Btu
Power	1 W = 1 J/s = 0.23901 cal/s = 0.7376 ft·lb_f/s = 9.486 x 10^{-4} Btu/s = 1.341 x 10^{-3} hp

Example: The factor to convert grams to lb_m is $\left[\frac{2.20462\ lb_m}{1000\ g}\right]$.

ESTIMATION AND CHARACTERIZATION OF DECONTAMINATION AND DECOMMISSIONING SOLID WASTE EXPECTED FROM THE PLUTONIUM FINISHING PLANT

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this report is to characterize and estimate the amount of solid waste that will be generated during the decontamination and decommissioning (D&D) of the Hanford Site's Plutonium Finishing Plant (PFP). This characterization is to include estimates of waste volume, dose rate, hazardous constituents, radionuclide content, and dimensions of bulky equipment or structures for the following classes of waste (Pottmeyer et al. 1994).

- **Transuranic Waste** — Without regard to source or form, transuranic (TRU) waste is waste that is contaminated with alpha-emitting transuranium radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g of waste matrix. Transuranium radionuclides are radionuclides having an atomic number greater than 92. In addition to TRU radionuclides, radium sources and ^{233}U in concentrations greater than 100 nCi/g of waste matrix are managed as TRU waste.

- **Transuranic Mixed Waste** — TRU mixed waste (TRU MW) is waste that meets the definition above for TRU waste and contains dangerous waste in addition to the radioactive components. Dangerous wastes are defined in the Washington Administrative Code (WAC 173-303-040).

- **Low-Level Waste** — Low-level waste (LLW), as defined in U.S. Department of Energy (DOE) Orders 5820.2A and 5400.3, is radioactive waste not defined as high-level waste, TRU waste, spent nuclear fuel, or byproduct material. All LLW is also classified according to Category 1, 3, and greater than Category 3 concentration limits. These limits are based on a similar waste classification system developed by the U.S. Nuclear Regulatory Commission in 10 CFR 61 and are explained in more detail in the *Hanford Site Solid Waste Acceptance Criteria* (Willis 1993).

- **Low-Level Mixed Waste** — Low-level mixed waste (LLMW) is LLW that contains dangerous waste as defined in WAC 173-303-040.

- **Nonradioactive Dangerous Solid Waste** — Any nonradioactive solid waste that has been contaminated by hazardous chemicals as defined in WAC 173-303-040 is regulated as dangerous solid waste (DSW).

The waste volume and characterization information gathered in this study will support planning activities for current and future solid waste treatment, storage, and disposal (TSD) facilities and operations.

1.2 BACKGROUND

The PFP, located in the 200 West Area within DOE's Hanford Site in south-central Washington State, was designed prior to 1946 and completed in 1949. Additional process facilities were completed between 1949 and 1992. The facility consists of eight main buildings and associated support buildings. These buildings include the following:

- PFP, 234-5Z
- Plutonium Reclamation Facility (PRF), 236-Z
- Liquid Waste Disposal Facility, Building 241-Z
- Ventilation Exhaust Facility, Building 291-Z
- Plutonium Storage Facility, 2736-Z Complex
- Waste Treatment Facility, 242-Z (americium recovery)
- Incinerator, Building 232-Z
- Low-Level Waste Treatment Facility (LLWTF), 243-Z.

The principal PFP structure, Building 234-5Z, was completed in 1949 to purify plutonium nitrate solutions, reduce the nitrate to plutonium metal, and fabricate plutonium metal parts. The 234-5Z Building houses plutonium processing operations, the Analytical Laboratory (Engineering Laboratory), the Plutonium Process Support Laboratory (Development Laboratory), and the major service and support facilities. The 241-Z Liquid Waste Disposal Facility and the 291-Z Building, which houses ventilation exhaust fans and mechanical service equipment, were built at the same time as the 234-5Z Building. A metal building was constructed over the 241-Z sump tanks in 1978.

The original design of the PFP complex provided for locating all of the planned operations and laboratories within the 234-5Z Building except for waste collection and disposal. However, with increases in production, storage, and scrap recovery requirements, four major additions were made. The Waste Incinerator Facility, Building 232-Z, was designed to recover plutonium from combustible scrap and was completed in 1961. The PRF, Building 236-Z, and the 242-Z Waste Treatment Facility were completed in 1964. The Plutonium Storage Facility, 2736-Z, and the 2736-ZA Building, which houses ventilation exhaust fans and mechanical service equipment, were built in 1971. The Product Shipping and Receiving Facility, 2736-ZB, and the 2721-Z Building, which houses backup diesel generators, were built in 1979 and 1982, respectively. Recently, the LLWTF and the Closed Loop Cooling System (CLCS) were completed as a part of the Hanford Site's waste minimization program.

The PFP was used to conduct diversified plutonium processing, storage, and support operations. Operations conducted at the PFP included the following:

- Processing of plutonium-containing materials from which it was economical to recover plutonium and convert it to specification nitrate and metal forms

- Storing, and preparing for shipping, special nuclear materials (SNM), primarily plutonium

- Performing development work for processes involving SNM

- Purifying plutonium nitrate solutions to meet specifications for conversion to solid form (PRF)

- Converting purified plutonium nitrate solutions to a plutonium metal or plutonium oxide (Remote Mechanical A [RMA] and Remote Mechanical C [RMC] Lines)

- Fabricating plutonium metal (function transferred to Rocky Flats during the 1970's)

- Managing all of the plutonium inventory at Hanford, including receipt, storage, and shipment.

The PRF processed material with economically recoverable quantities of plutonium to provide purified plutonium nitrate solutions; the RMA and RMC Lines converted the solutions to metal buttons; the 2736-Z complex received, stored, packaged, and shipped plutonium solids (including oxide powder and button products); and the 234-5Z Building laboratories provided the space and equipment to perform development work.

Although production processes at the PFP have shut down, plutonium-bearing materials remain in the plant. Chemically reactive materials expose workers to radiation and present an unnecessary risk to the public. The DOE has recently decided that these plutonium-bearing materials may be treated on a case by case basis as waste if that would reduce worker exposure and public risk. In response to public concerns, DOE has ordered an Environmental Impact Statement that will cover remediation activities and the actions necessary to make the facility ready for D&D. In addition, DOE plans to take immediate actions to improve the conditions that are safety concerns for PFP workers.

The Pacific Northwest Laboratory is currently studying ways to stabilize the various plutonium-bearing materials in both the PFP process and vault storage areas. Until materials are moved out of the PFP process areas, the plant cannot be cleaned out and deactivated.

Current activities at the PFP, driven by safety concerns, are detailed below. These actions were selected by DOE because they do not produce a pure product, nor do they release carbon tetrachloride to the air or discharge liquids to the ground. They also generate smaller amounts of liquid waste, relative to other projects considered, to be sent to Hanford's double-shell tanks (DSTs) (WHC 1994b).

- **Stabilize sludge in gloveboxes** — Much of the plutonium-bearing sludge stored in PFP gloveboxes can be heated and converted to an impure stable solid that can be stored safely in PFP's vaults for many years. Because storage of the resulting material doesn't require constant handling, having the material stabilized reduces radiation exposure to workers. An environmental assessment is being prepared to review potential environmental impacts from this operation. This process would use two small new laboratory furnaces, in glovebox HC-21C, to heat the sludge to about 500 °C and then to 1000 °C (900 °F to 1800 °F) over several hours. This process converts the plutonium compounds to plutonium oxide, drives off the moisture, and results in a stable oxide powder. Other

chemicals not driven off by the heating process will remain as stable solids. This stabilization process has been operated in the past at the PFP using older furnace designs.

- **Eliminate the risk of leaks of chemical solutions stored in "10-L" containers** — Some storage containers, known as "10-Ls," holding plutonium-bearing chloride solutions need to be repackaged or to have the solutions stabilized. The plastic bottles holding the solutions inside these containers are expected to be brittle from exposure to radiation and are at risk of cracking in the future. These solutions will be put in safe, new storage containers. Some or all of the solutions will be used in the Plutonium Process Support Laboratory to test future processing options to support the environmental impact statement. The chloride solutions were not considered for the PRF stabilization run because they would have damaged the processing equipment.

- **Download solutions from the PRF to eliminate the risk of tank leaks** — Chemical solutions used for training PRF facility operators are no longer needed. The nitrate solutions, which are low in plutonium content, have been transferred to the Hanford Site's DSTs. Organic solutions were drained from the tanks, put in glass bottles with absorbent pads, packaged in steel drums, and disposed of as solid waste. This effort is complete.

- **Remove duct work and clean up surface contamination** — Portions of the PFP's ventilation duct work and piping that add to radiation exposure risk will be dismantled and cleaned out to remove plutonium holdup. This ducting and piping is no longer used in the plant. Areas of surface contamination will be cleaned to reduce the risk of worker contamination. Removed materials will be packaged as solid waste.

- **Reduce plutonium inventory in the 232-Z Building** — The removal of unnecessary ducting and pipe from 232-Z will likewise be conducted. This building is not seismically qualified and presents the greatest risk of releasing radioactivity in case of an earthquake at Hanford. Cleanout of the ducts will remove the bulk of the plutonium and will prepare the building for final D&D.

1.3 SCOPE

The major sections of this document and the topics they cover are outlined briefly below.

Section 2.0 provides a physical description of the PFP emphasizing the potentially contaminated areas related to the processes performed at the facility throughout its history.

Section 3.0 describes the PFP processes performed over the facility's history and refers to contaminated process areas within the plant. It also helps to explain the plant layout and how the various processes fit together.

Section 4.0 explains the methodology used to estimate the solid waste types and volumes expected to be processed by solid waste TSD facilities as a result of D&D activities. The uncertainties and assumptions implicit in the estimation methodology are also presented.

Section 5.0 presents the results of the study. Volumes and waste types are given by natural physical category (i.e., gloveboxes and hoods, tanks, pipes, duct work, and miscellaneous equipment).

Section 6.0 summarizes the solid waste volumes for the facility by waste type (i.e., DSW, LLW, LLMW, TRU, and TRU MW).

Section 7.0 lists the references used during the project.

Appendix A includes the data used to classify the PFP Buildings and rooms. This classification was then used to focus the project on the contaminated areas of the facility. The data are presented in a table for reference.

Appendix B includes the data and spreadsheet calculations used to estimate the amount of piping that is likely to be removed during the D&D of the PFP.

Appendix C includes the data and spreadsheet calculations used to estimate the amount of duct work (and other ventilation items) that is likely to be removed during the D&D efforts.

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2.0 PLANT DESCRIPTION

The PFP, more familiarly known as Z Plant, is a collection of facilities that primarily has been used for the production of plutonium and plutonium-containing materials to support national defense activities. The SNM that formed the feed for PFP processing included, but was not limited to, plutonium-bearing caps, incinerator ash, silicon nitride crucibles, polystyrene cubes, plutonium-uranium mixtures, slag and crucible fragments, unirradiated fuel rods, plutonium-beryllium sources, and unique plutonium-bearing solutions (e.g., plutonium nitrate solution from the Plutonium-Uranium Extraction [PUREX] Facility).

The PFP used separate process lines to handle each of these unique feed streams, resulting in a number of rooms and buildings within the plant dedicated to a particular process. Varying demand by the defense industry, as the war and post-war eras progressed, resulted in numerous changes in the processes that took place at the PFP as well as in the types of equipment required to support these processes. The purpose of this section is to describe the main process building and the process support buildings that comprise the facility. A detailed process history of the plant is provided in the following section with references to these buildings so that solid waste volume estimates from each area can be compared to the generating process to determine the expected contamination.

2.1 LOCATION

The PFP is located within DOE's Hanford Site in south-central Washington State (Figure 2-1). It is situated in the west-central region of the Hanford Site within the 200 West Area (Figure 2-2). The location of the PFP in relation to the other facilities in the 200 West Area is shown in Figure 2-3. An aerial photograph of the PFP facility can be found in Figure 2-4.

2.2 PLUTONIUM FINISHING PLANT — PHYSICAL PLANT

The buildings that comprise the PFP are shown in Figure 2-5. The primary process and support buildings include 232-Z, 234-5Z, 236-Z, 241-Z, 242-Z, 291-Z, 2736-Z, and 2736-ZB. A physical description of each of these buildings follows. As some processes within the PFP Buildings are no longer operational, the status of each of the above mentioned buildings is provided based on the following criteria.

- **Active** — An active process is currently operating or is scheduled for future operation.
- **Standby** — A standby process is not currently operating, but is operable with the appropriate repairs or upgrades. Facilities on standby have no future operations currently scheduled.
- **Layaway** — A layaway process is not operable without major repairs or upgrades, and no operations are planned. This category is scheduled for terminal cleanout operations/D&D.

Figure 2-1. Location of the Hanford Site.

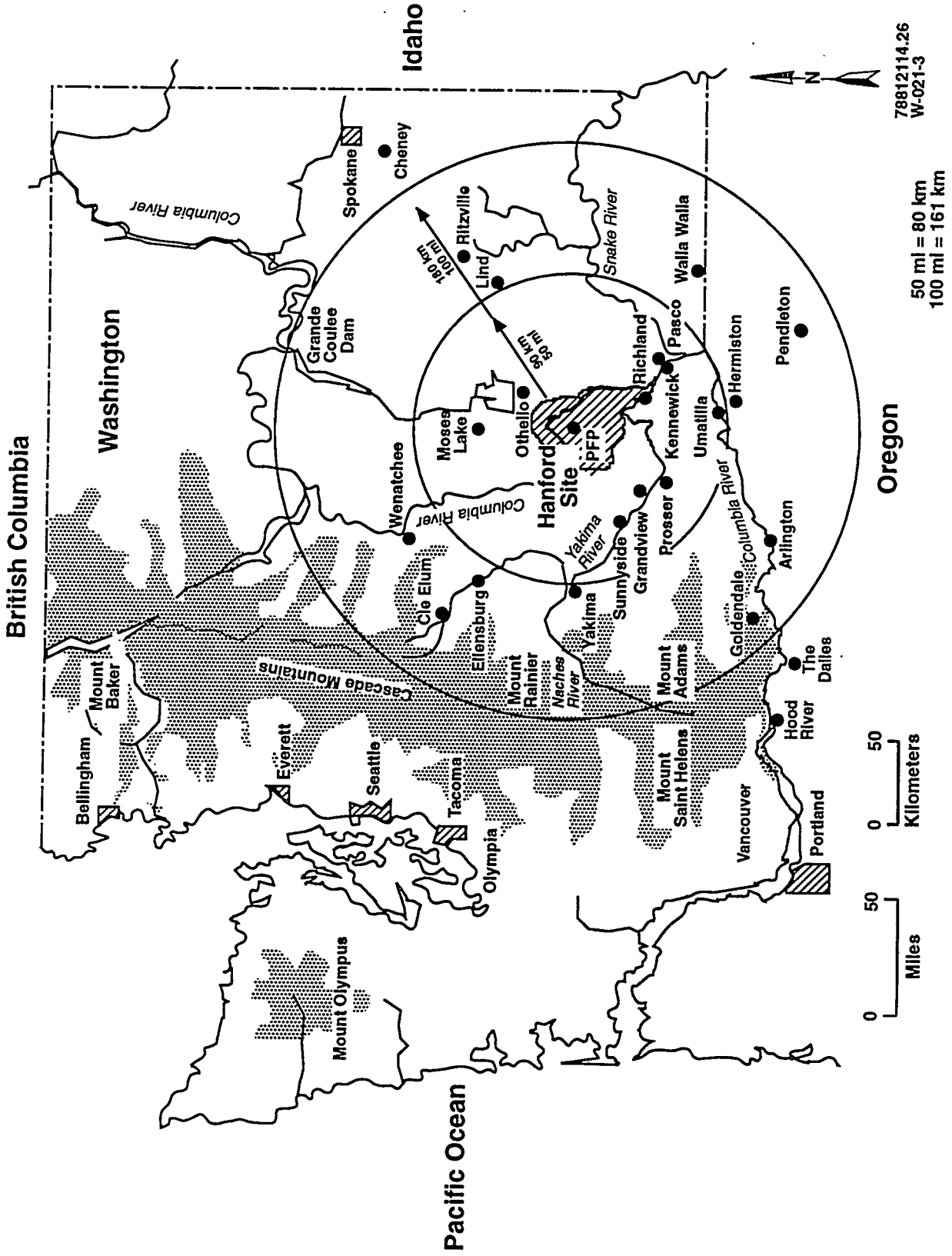


Figure 2-2. Hanford Site Map.

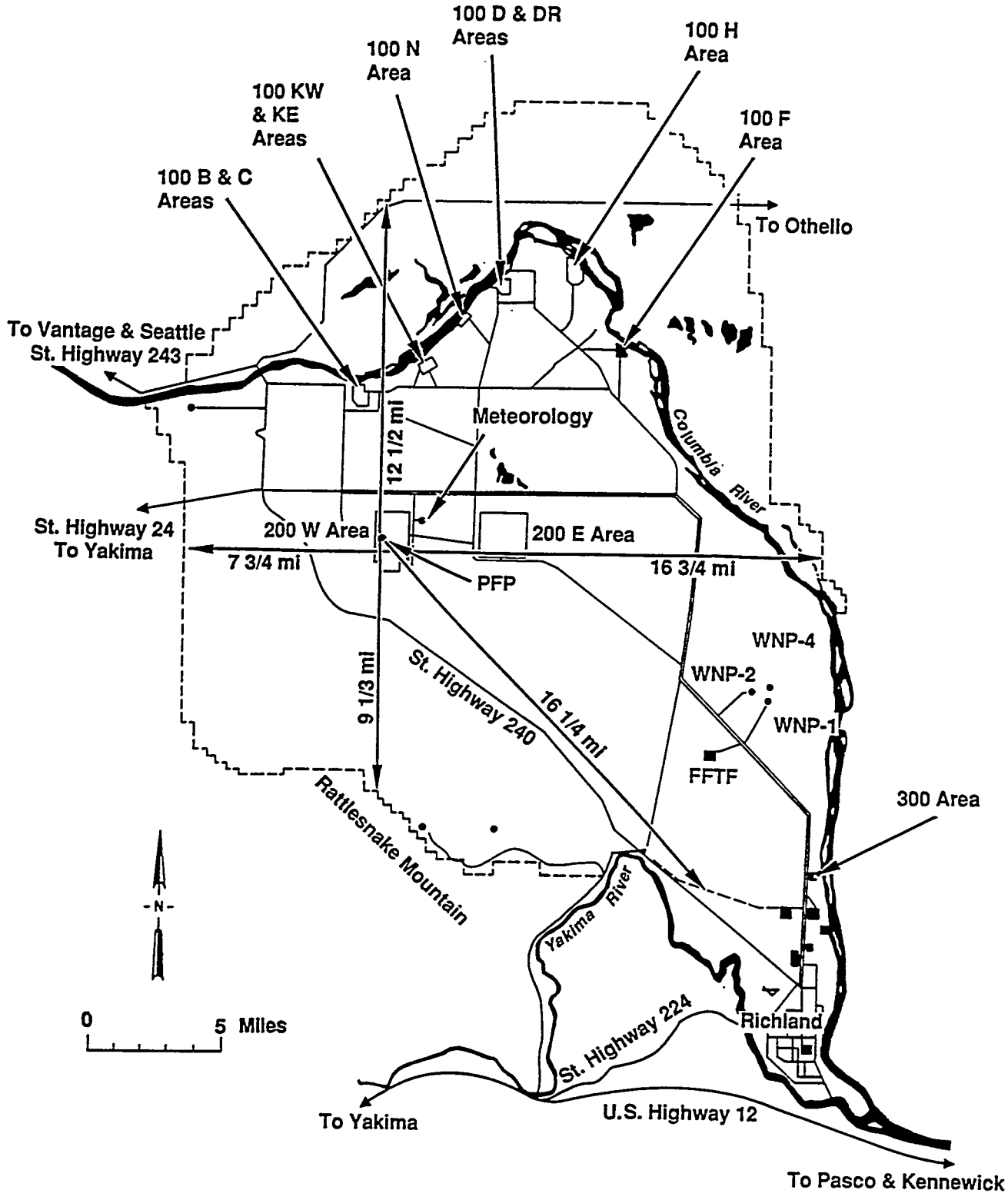


Figure 2-3. 200 West Area.

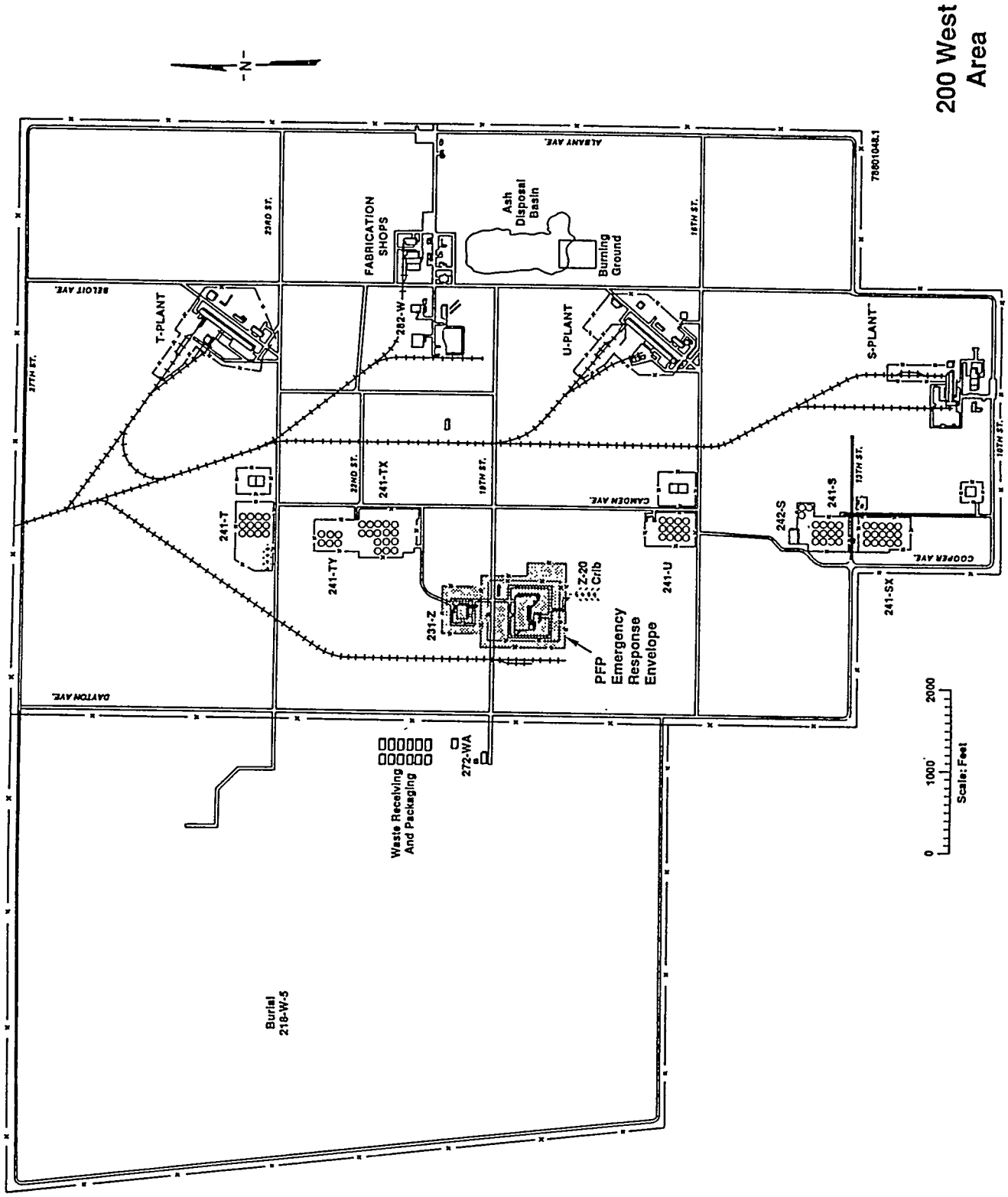


Figure 2-4. Aerial Photograph of the Plutonium Finishing Plant.

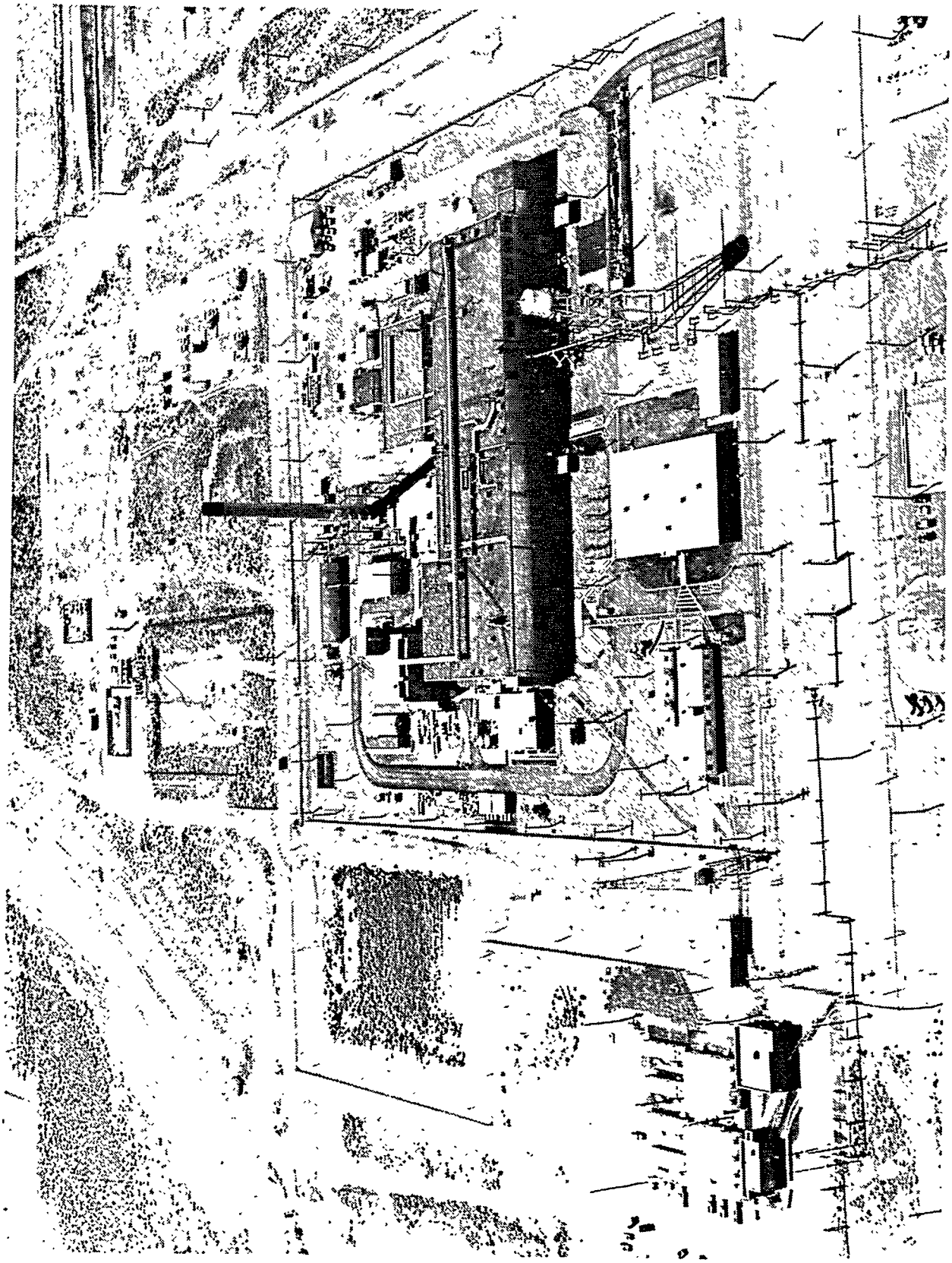
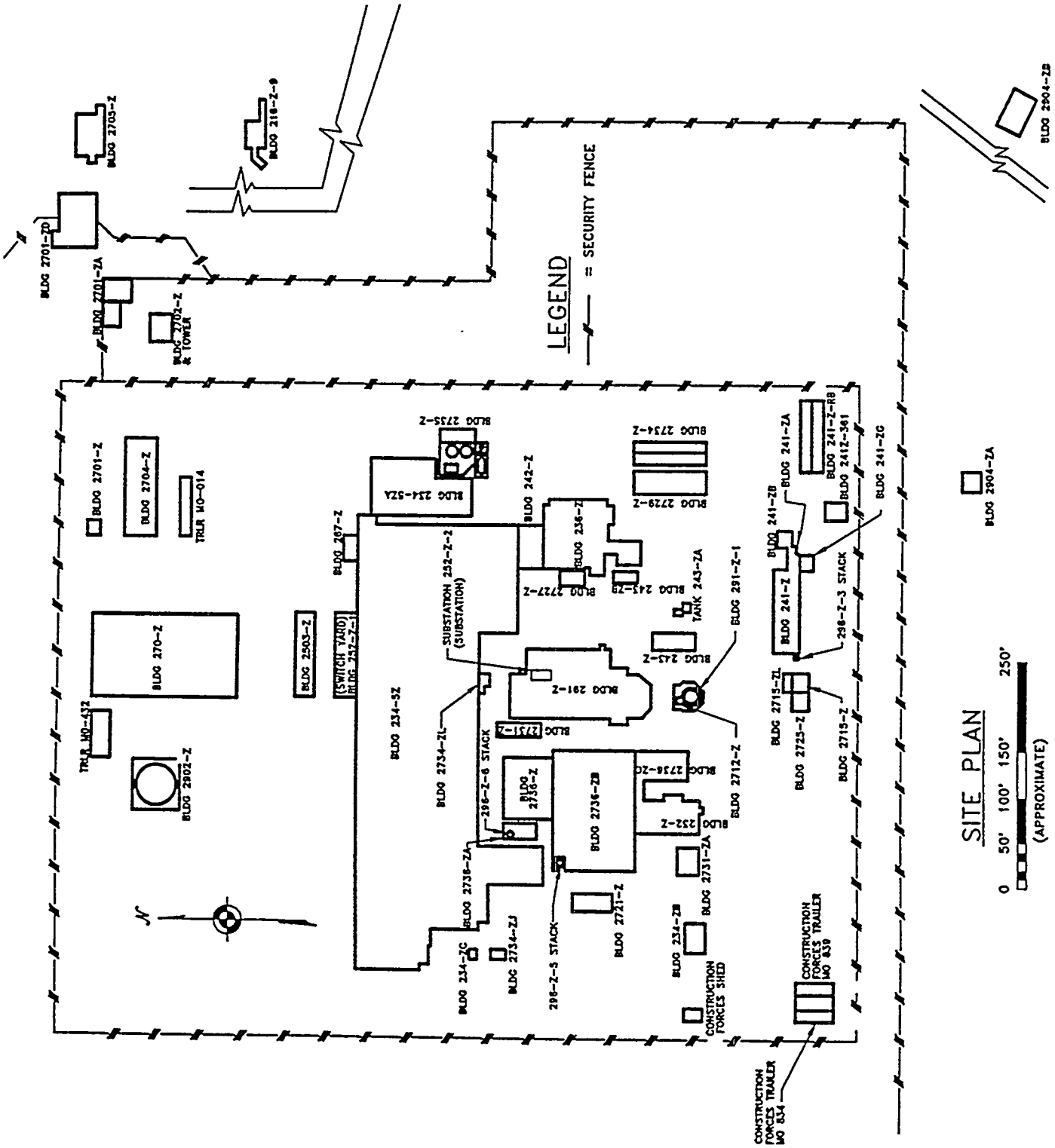


Figure 2-5. Main Plutonium Finishing Plant Structures.



2.2.1 234-5Z Building (Active)

The 234-5Z Building is approximately 55 m (180 ft) wide by 152 m (500 ft) long and extends from 3 m (9.5 ft) below grade to 8 m (26.8 ft) above grade. Floor levels are designated as tunnel, first floor, duct level, second floor, and roof level.

The 234-5Z tunnel mostly consists of pipe tunnels carrying drain piping to the 241-Z sumps. The first floor houses the two plutonium processing lines (RMA and RMC Lines) and their control rooms; scrap stabilization gloveboxes; plutonium storage vaults; the plutonium nitrate feed load-in/load-out, blending, and storage facilities; the Analytical Laboratory; the Plutonium Process Support Laboratory; the instrument maintenance shops; and rest rooms and office spaces. The duct level contains most of the service piping, ventilation ducts, and some filterboxes. The lunchroom, conference room, materials storage room, chemical feed preparation and aqueous makeup rooms, locker rooms with change facilities and rest rooms, and office spaces are on the second floor. Also on the second floor are exhaust air duct works, including filterboxes and filter rooms. The fan room, located on the northwest corner of the second floor, houses the ventilation supply fans, the steam inlet and distribution system, air dryers, the distilled water still, air chilling units (now inactive), and the power control room.

2.2.2 236-Z Building (Standby)

The 236-Z Building is located at the southeast corner of the 234-5Z Building and is connected to it by the 242-Z Building (see Figure 2-5). The 236-Z Building, built as the CAC-880 Project, houses the PRF. It is also referred to as 880, PRF, Plutonium Nitrate Production Facility, and 236.

The building is essentially a four-story structure surmounted by a two-story penthouse. It dimensions are about 24 m (79 ft) wide by 22 m (71 ft) long. Its outstanding internal structural feature is a single process equipment cell that is 10 m (32 ft) wide by 16 m (52 ft) long.

Maintenance shop facilities are located on the service (east) side of the building on the ground floor. The second floor of the service side is used for a maintenance glovebox and ventilation exhaust filters. Building service equipment and electrical switch gear are on the third floor of the service area. The fourth floor was used for chemical preparation and miscellaneous treatment, and contains the operating control room, slag and crucible dissolver equipment, and a column room in which vertical sections of two liquid-liquid extraction columns, penetrating the room from above and below, are housed in a glovebox. The first four floors are served by a service elevator located within the east side of the building.

The process cell has a 0.6-m- (2-ft-) thick concrete wall between the cell and the "access" hoods. These access hoods are stainless steel paneled hoods containing glass viewing windows and Hypalon[1] hood gloves. Located on both sides of the cell on the first two floors, the hoods contain process

[1] Hypalon is a trademark of E. I. du Pont de Nemours & Company.

piping, pumps, valves, flow meters, and other equipment that requires frequent maintenance. The cell floor is covered with a stainless steel liner extending 46 cm (18 in.) up the side wall. The remaining cell wall and ceiling surfaces are covered with chemical-resistant coatings. Water-filled viewing windows on the third floor have adjacent remote control stations for the cell crane.

2.2.3 232-Z Building (Layaway)

The 232-Z Building houses the layaway Contaminated Waste Recovery Process, also known as the "incinerator." It was constructed by Project CGC-013, Plutonium Recovery Process, and was partially decontaminated and decommissioned in 1984.

The 232-Z Building is located about 61 m (200 ft) south of the main portion of the 234-5Z Building and about 31 m (100 ft) west of the 291-Z stack. Its approximate dimensions are 11 m (37 ft) wide by 17 m (57 ft) long. It is divided into areas for process, storage, change room, chemical preparation, ventilation, and electrical equipment. Except for ventilation supply and exhaust filtration, it uses services from the 234-5Z Building. The 232-Z Building exhaust ventilation system has been isolated from the 291-Z Building although it was connected in the past.

Currently, the 232-Z Building is being cleaned out to remove unnecessary contaminated ducts and pipes in order to reduce the risk of radiation exposure. Additionally, areas of surface contamination are being cleaned to reduce the risk of worker contamination. Cleanout will remove the bulk of the plutonium holdup and prepare the building for final D&D (WHC 1994b).

2.2.4 241-Z Building (Active)

The 241-Z Building is designated as the Waste Treatment Facility. It is commonly called the 241-Z sumps and in the past was called the 216-Z large waste sump tanks. It is a buried structure, with a sheet metal enclosure over the top that houses a hoist for removing cell covers. It consists of five separate enclosures, or ventilated cells, each containing a tank, with a capacity of 15,900 L (4,200 gal), used to accumulate the liquid wastes generated in the PFP before transfer to the tank farms. Built of reinforced concrete, its approximate dimensions are 6 m (20 ft) wide by 28 m (92 ft) long.

At the southwest corner of the 241-Z vault deck is the equipment for the 241-Z vessel vent and vault ventilation system. The 7-m- (24-ft-) high stack, 296-Z-3, and its associated fans, filters, and controls are located on a 4.3-m (14-ft) by 5.5-m (18-ft) concrete pad.

2.2.5 242-Z Building (Layaway)

The 242-Z Building houses portions of the Waste Treatment and Americium Facility, which are in layaway and planned for future D&D. Built primarily by Project CGC-912, this building is referred to as 912 or WT.

The 242-Z structure is between the southeast corner of the 234-5Z Building and the 236-Z Building. Along its east side runs a corridor connecting the 234-5Z, 242-Z, and 236-Z Buildings. At its west end is an entrance enclosure for outside entry into both 242-Z and the Analytical Laboratory in the 234-5Z Building.

The building's approximate dimensions are 12 m (40 ft) wide, 8 m (26 ft) long, and 7 m (23 ft) high. The south portion, approximately 12 m (40 ft) wide by 3 m (10 ft) long, is the tank room (tank cell). This room extends the full inside building height. The north portion, designated the control room, has a mezzanine over its west half for chemical addition tanks.

The tank room in the 242-Z Building houses large process vessels, which are piped to the process gloveboxes of the control room. The 242-Z Building shares the main ventilation system in common with the 234-5Z and 236-Z Buildings and is equipped with the other PFP utilities and services.

The function of the 242-Z facility was to treat waste streams from the PRF for americium recovery and further plutonium reclamation. On August 30, 1976, there was an explosion of the W-14A column in glovebox WT-2 caused by the introduction of concentrated nitric acid onto a degraded cation exchange resin loaded with americium. This explosion grossly contaminated the facility. The process was terminated and the gross contamination cleaned up. Remaining contamination was stabilized and isolated to some extent. Entries were made into the 242-Z process area/control room on December 11, 1984, and into the 242-Z tank room on February 1, 1985, to establish current contamination levels, dose rates, facility configuration, and facility conditions. It was found that contamination was leaching through the fixative in the process area/control room and was loose and widespread throughout the tank room. The dose rate around glovebox WT-2 ranged from 100 to 350 mrem/h but was significantly less in the remainder of the facility. The general condition and cleanliness of the facility was poor, especially in the tank room, where a slimy, "organic" layer covered a majority of the floor (Duncan 1985).

2.2.6 291-Z Building (Active)

The 291-Z Building, also known as the Exhaust Fan House, Exhaust Air Stack Building, and Compressor and Fan House, is a reinforced-concrete structure located approximately 16 m (53 ft) south of the central part of the 234-5Z Building. Of irregular shape, its approximate dimensions are 23 m (74 ft) wide by 44 m (143 ft) long. Its overall height is approximately 7 m (23 ft) with only 1.2 m (4 ft) above grade. This building houses the exhaust fans, the mechanical service equipment, and the substation. Auxiliary to the 291-Z Building is the 61-m- (200-ft-) high 291-Z-1 stack.

2.2.7 2736-Z Building (Active)

Building 2736-Z is the primary PFP Plutonium Storage Facility. The 2736-Z Building is approximately 20 m (65 ft) long by 17 m (56 ft) wide. It is constructed of reinforced-concrete walls, 36 cm (14 in) thick, supported by a cast-in-place concrete slab, 17 cm (6.5 in) thick. The building consists of

four rooms for the storage of SNM and is divided by a corridor running the width of the building. Each storage room is approximately 8.5 m (28 ft) by 8.5 m (28 ft) in size. Rooms 1, 3, and 4 contain storage cubicles, while room 2 has steel shelves and open floor storage.

2.2.8 2736-ZB Building (Active)

Building 2736-ZB, located immediately south of 2736-Z, is approximately 40 m (132 ft) by 27 m (90 ft) with reinforced-concrete walls (except for administrative areas) and roof.

The 2736-ZB shipping and receiving areas each provide approximately 93 m^2 (1,000 ft^2) of floor space to accommodate a maximum of 100 shipping containers the size of 208-L (55-gal) drums. Containers are spaced to meet Westinghouse Hanford Company's criticality prevention and personnel exposure specifications as well as to allow corridor access to staging areas. The two areas are physically separated by a wall. The majority of shipping containers handled contain PuO_2 powder, plutonium metal, or miscellaneous solid scrap materials from various onsite and offsite sources.

2.2.9 243-Z Building (Active)

In May 1994 the LLWTF, located in the 243-Z Building, began receiving very low activity waste from various parts of the PFP via manhole 4, treating it, and discharging it to manhole 6. The purpose of the LLWTF is to lower the effluent very low activity waste concentration so that it can be sent to the 200 Area Treated Effluent Disposal Facility (TEDF). The TEDF will be accepting all processed very low activity waste from the PFP on or before September 30, 1995. Until the liquid TEDF comes on-line, liquid effluent is being discharged to the 216-Z-20 crib.

The average daily flow rates through the facility have varied from 19.7 to 75.7 L/min (5.2 to 20 gal/min) depending upon the weather conditions with 113.6 L/min (30 gal/min) being the maximum set single train flow rate.

3.0 PROCESS DESCRIPTION

The PFP, or Z Plant, began operations in late 1949 to process plutonium and prepare plutonium products. Before 1949 all plutonium nitrate solutions had been shipped to other onsite facilities or offsite for further processing.

Plutonium was brought into the PFP as a liquid nitrate solution. The plutonium was precipitated as the oxalate, converted to the fluoride, and reacted at high temperature with metallic calcium, forming the metal. The slag and crucible were routed to a plutonium recovery process; in later years, the buttons were remelted and cast into the finished shape. Certain finishing operations were performed: the shape was coated with nickel and polished, enabling it to be handled without spreading plutonium contamination. Up to this point, all of the plutonium operations were conducted in tightly sealed enclosures (gloveboxes and hoods).

At startup, the finishing operations were very labor intensive. After 1953, much of the process was automated to reduce worker exposure. Plutonium recovery operations started in 1955 at the Recuplex facility (234-5Z, room 221).

The following is a timetable of the key operations performed at the PFP (Ballinger and Hall 1991):

1949 Start-up of plutonium finishing in 234-5Z Building

1953 Original process automated to reduce worker radiation exposure

1955 Startup of Recuplex (234-5Z, room 221); recovery of plutonium from finishing plant liquid waste

1961 Startup of incinerator and leach facilities (232-Z) to recover plutonium from solid waste

1962 Criticality accident in Recuplex; facility shutdown

1964 Startup of PRF to replace Recuplex

1965 Americium recovery starts in 242-Z

1971 Startup of plutonium oxide blending and production in 234-5Z

1973 Incinerator and leach facilities shutdown

1976 Americium ion exchange explosion; americium recovery shutdown; 234-5Z shutdown

1978 Restart of 234-5Z operations

1979 High stack release; PRF shutdown; plutonium metal and oxide production ends

1984 PRF started up

1985 PRF shutdown

1987 Plutonium metal line started up

1989 The PFP production processes shutdown.

Processing at the PFP handled three types of feed materials in order to produce plutonium metal. Each of the feed types was handled differently, depending on the process lines. The purpose of initial feed processing was to prepare a purified plutonium nitrate solution that could be processed through a solvent extraction step and subsequently reduced to product. Processing at the PFP also included fabrication of plutonium metal into useful parts.

Liquid waste from the PFP contained only minor amounts of fission products. However, it did contain low concentrations of plutonium and other TRU elements and was high in metallic nitrates. Initially, this waste was discharged via cribs to soil columns, which sorbed the TRU elements and kept them close to the point of discharge. Later, waste from the PFP was stored in underground tanks (Ballinger and Hall 1991).

The PFP process had seven main components. They were

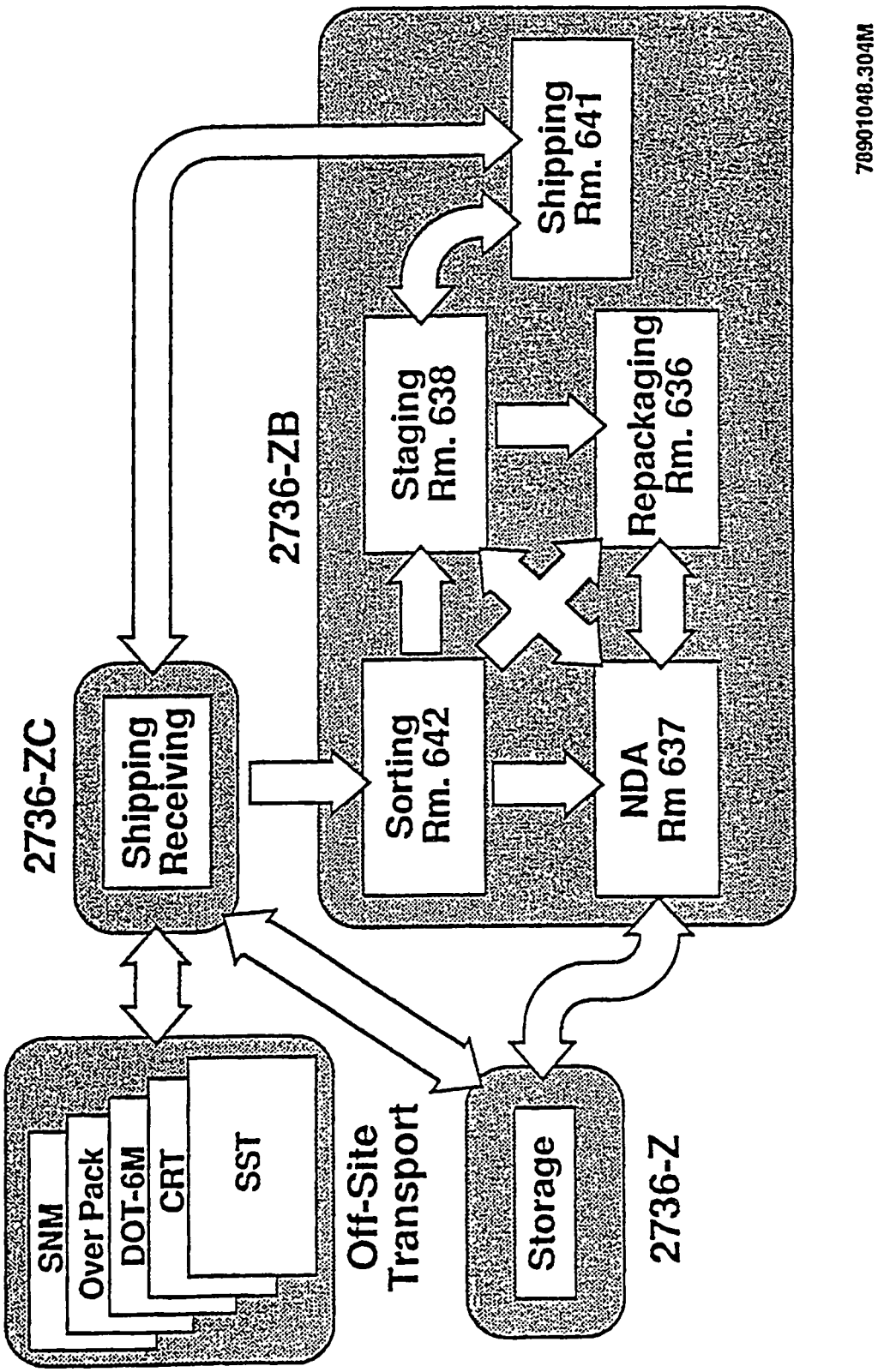
- Receiving/shipping
- Sorting
- Storing
- Repackaging
- Waste disposal
- Plutonium recovery/purification
- Plutonium conversion.

In addition, the PFP facility supported the Plutonium Process Support Laboratory and the Analytical Laboratory. The purpose of this section is to describe the processes that took place in the areas and laboratories described above, as well as to relate these processes and the areas they took place in to the buildings that were discussed in the previous section on the physical plant.

3.1 RECEIVING/SHIPPING

Solid plutonium material was received at the 2736-ZC loading dock, and nitrate solutions were received at the west loading dock (234-ZC) of the 234-5Z Building. The containers were brought into Building 2736-ZB for inspection, weighing, and nondestructive assay (NDA) measurement of fissile material contents. If the materials were determined to be unstable (e.g., gas evolution, liquid), a recovery plan was developed and implemented that provided interim safe storage and stabilization. Stable, solid materials were moved to 2736-Z for storage until final disposition. See Figure 3-1 for a complete description of the 2736-Z support facility's solid fissile material handling. For a physical description of the 234-5Z, 2736-Z, and 2736-ZB Buildings, see Section 2.0, "Physical Plant."

Figure 3-1. 2736-Z Support Facility Solid Fissile Material Handling Flow Diagram.



Nitrate solutions, such as $Pu(NO_3)_4$, were shipped and received from the 2734-ZC dock. Load-in/load-out was accomplished in room 227 of Building 234-5Z in glovebox HC-227S and hood HC-227T. Glovebox HC-227S was used to blend and sample plutonium nitrate and to transfer solutions to the PRF or to nitrate staging tanks in glovebox HC-4. Room 227 was a dual-purpose facility that supported both the RMC Line and plutonium recovery in the PRF. The solutions were sampled and analyzed for plutonium as well as contaminants. The amount of SNM received was calculated from volume and analytical data. The solutions normally were sent to the RMC Line, although they may have been sent to PRF for purification and/or concentration.

Product removal (PR) containers, marked "Mark IV/V, Emergency," were transported to 234-5Z, room 236, and vault 192-A for storage.

Fuel-grade PuO_2 from PUREX was also received at 2736-ZC and stored in Building 2736-Z before shipment to the Savannah River Plant or other DOE Sites. The oxide could be repackaged in 2736-ZB if necessary.

Only solid, stable, plutonium-bearing materials were shipped offsite. The final products of the RMC Line were referred to as metal buttons. The cans containing metal buttons, after they had been held in storage for an extended period of time, were transferred to room 636, Building 2736-ZB, and moved into the repackaging glovebox. Each plutonium metal button was removed from the package, inspected, and if loose oxide was present, it was removed by brushing with a paint brush. The button was weighed, recanned, and bagged out into a food pack can.

The packages to be shipped were placed in shipping containers and moved to the 2736-ZC dock where they were placed in cargo restraint transporters that were secured in trucks for shipment.

3.2 SORTING

Material containers were transferred to room 642, 2736-ZB Building, for sorting. Sorted containers were transferred to staging room 638 where they were prepared for repackaging, shipping, or storage in Building 2736-Z. Staging area activities included inspection and weighing; pneumatic, hydrostatic, and leak testing of shipping containers when necessary; and decontamination of empty shipping containers.

Plutonium-bearing materials that were known to be reactive were moved to an appropriate glovebox in 234-5Z Building. The material was confined within a ventilated control barrier until it could be processed to a stable form.

Plutonium bearing-material with insufficient characterization to confirm that it was stable was defined as potentially unstable. It was inspected in gloveboxes in 2736-ZB, and the source data were reviewed to determine whether it should be handled as reactive or stable material.

3.3 STORING

Extraordinary precautions were taken in the handling and storage of SNM because of its unique properties. Varying quantities of plutonium metal, PuO_2, plutonium compounds, recoverable plutonium-bearing material, salts, and unirradiated reactor fuel were stored in vault and "vault-type" rooms at the 234-5Z, 2736-Z, and 2736-ZB Buildings. Also, drums containing TRU waste were temporarily stored. The areas for storage of SNM were:

234-5Z		2736-Z	2736-ZB
Room 174	Room 192-B	Vault 1	Room 637
Room 175	Room 192-C	Vault 2	Room 638
Room 190	Room 225	Vault 3	Room 641
Room 192-A	Room 236	Vault 4	Room 642

The stable/shippable materials, such as plutonium metal and PuO_2, were stored in vaults 1 through 3 in the 2736-Z Building.

3.4 REPACKAGING

Containers that either failed in storage or had been damaged in transit were repackaged in Building 2736-ZB, room 636. The source containers, type 3-L, were opened, and using remote handling devices, the sources were withdrawn and verified. Repackaging also occurred in Building 234-5Z, rooms 235-C and 230-A. Glovebox HC-21-C in room 230-A was used to repackage PuO_2 and plutonium-bearing materials. Glovebox 235-B2 in room 235-C was routinely used to repackage large containers (i.e., 208-L [55-gal] drums) that did not fit into the other gloveboxes. Glovebox 235-B2 was also used to dismantle and repackage high-efficiency particulate air (HEPA) filters.

3.5 WASTE DISPOSAL

Combustible glovebox waste was sealed out of gloveboxes, bagged, and loaded in 22.7-kg (50-lb) lard cans. These containers measure 30.48 cm (12 in.) in diameter by 38.1 cm (15 in.) high and have a volume of 0.02 m^3 (0.71 ft^3) (WHC 1993). The cans were then transported to room 637 for NDA measurement by the NaI package counter. Once a plutonium value was assigned to the waste package, it was placed in a 208-L (55-gal) waste drum for interim storage. When the drum was full, or had reached allowable limits for plutonium or hydrocarbon materials, it was sealed and stored pending transport to TRU waste storage and disposal.

Room waste, as generated, was held in waste drums in several rooms throughout the PFP. These drums were intended for the disposal of non-TRU waste and only low-level plutonium contamination was allowed in them. When a drum was full, it was sealed and transported to room 637 for NDA and staged in room 638 for disposal.

Rags were used, particularly in PRF, for clean-up operations. The rags generally had a considerable amount of plutonium nitrate and acid on them. Rinsing them removed the plutonium nitrate and neutralized the acid. A rag rinsing station was provided in the 200 East Area glovebox in sections EL and EM.

Noncombustible wastes were placed in specially designated waste drums, one for glovebox waste and another for room waste.

3.6 PLUTONIUM RECOVERY/PURIFICATION

The plutonium recovery process converted various plutonium-bearing materials and aqueous feeds to a purified plutonium nitrate product suitable for conversion to plutonium metal or PuO_2. Most of the processes were located in the PRF in the 236-Z Building. Some of the miscellaneous processing took place within 234-5Z Building of the PFP. Sections 2.2.1 and 2.2.2 provide a physical description of Buildings 234-5Z and 236-Z, respectively.

Most of the operating equipment in the PRF cell was controlled from the central control room, room 44, on the fourth floor of the 236-Z Building.

Recovery of plutonium in aqueous solution, from plutonium-scrap materials (PuO_2 powders, incinerator ashes, sludge, and miscellaneous solutions) that were suitable for the solvent extraction process, took place in gloveboxes in the PRF and in the 234-5Z Buildings. Several processes, known as miscellaneous treatment, were contained within a complex of five gloveboxes in room 41 of the PRF. The gloveboxes in room 41 are numbered one through six (glovebox MT-2 has been removed). The first glovebox was used for inspection and batch dissolver charge mixing. Glovebox 3 was used to dissolve bulk metallic plutonium in HNO_3 using electrolytic dissolvers. Glovebox 4 could be used for residue stabilization and recovery of PuO_2 by distilling polystyrene cubes and burning residual carbon. Glovebox 5 was used for dissolution and leaching of plutonium-leachable solids. Glovebox 6 was used for clarifying dissolver solution and cementing the solid residues (after NDA) for waste disposal; it also contained the vacuum system used for transferring solution. In addition, glovebox HA-23S in the 234-5Z Building was used for storage of reactive scrap.

Two nearly identical continuous dissolver/condensers, used as slag and crucible dissolvers, are installed in the 236-Z Building canyon. Each dissolver is equipped with an acid feed system and an offgas treatment system. However, either dissolver may be valved to any of the acid feed or offgas treatment systems. Both dissolvers may be operated simultaneously if desired.

Feed solutions were transferred into the feed storage tanks from a number of sources including miscellaneous treatment, aqueous waste processing, and aqueous plutonium nitrate scrap loaded into 234-5Z glovebox 227-S from PR cans. In feed preparation, chemicals were added to the plutonium aqueous solution to produce a feed solution suitable for processing by solvent extraction.

The plutonium extraction and stripping function took place in two columns, the CA column and the CC column. The lower section of each column is

in the 236-Z process cell, and the upper sections extend up through gloveboxes on the fourth, fifth, and sixth floor penthouse of the building. These columns were generally used for extraction of plutonium from a feed solution of plutonium nitrate. However, the two columns could be used for the coextraction of plutonium and uranium from a mixed plutonium-uranium feed.

Product concentration was designed to increase the plutonium content in the aqueous product from the solvent extraction CC column from a nominal value of 50 g/L to about 300 g/L. To remove trace amounts of tributyl phosphate, the plutonium nitrate solution first flowed to a tank for deentrainment. In this tank the aqueous solution passed through CCl_4 to remove any residual organic entrained in the solution.

There are two gloveboxes located in the 234-5Z Building that were used for scrap stabilization. Glovebox HC-60, located in room 230C, was used for hydrolysis of scrap containing high organic concentrations. Glovebox HA-40F, located in room 169, was used for calcining ash from the incinerator at the Rocky Flats Plant in Colorado.

Glovebox HC-46F, located in room 170 of Building 234-5Z, was designed for inspection, sampling, screening, dissolution clarification, product transfer, and waste handling of plutonium-bearing solids containing less than 20 percent organic material. It contains equipment for dissolving plutonium-bearing solids. Glovebox HA-21I, in room 235B, contains furnaces that also could be used for calcining hydrolyzed scrap.

Several NDA systems were available for package evaluation. The NDA Laboratory is located in room 637, Building 2736-ZB.

3.7 PLUTONIUM CONVERSION

The RMC Line conversion of plutonium nitrate to plutonium metal started with a lot of nitrate solution selected from various sources, such as the PUREX Facility, the PRF, and stored PR cans, to find the right mix of plutonium isotopes. The lot was loaded into the glovebox HC-227S bank tanks via the HA-227T load-in facility (see Figure 3-2).

The solutions were blended by circulating through the HC-227S bank tanks. Samples were taken and analyzed to ensure that the desired blend was obtained. The blending could also be done in tanks in glovebox HC-4, which served as a staging glovebox for feed to the RMC Line after the solutions were transferred from HC-227S. For a complete overview of the RMC process see Figure 3-3.

The final product of the RMC process was a metal button. After the material was processed, the button was picked up with tongs and placed in the chute leading to glovebox HC-17SBB where it was pickled in acid. After pickling approximately 15 buttons, the acid became saturated with slag particles. The solution was then transferred to the aqueous catch tank in glovebox HC-7. Eventually it was transferred to the PRF for plutonium recovery. After 24 hours, the button was again moved out, via conveyor HC-2, to glovebox HC-21C, where it was canned.

Figure 3-2. Load-In/Load-Out Operations Flow Diagram.

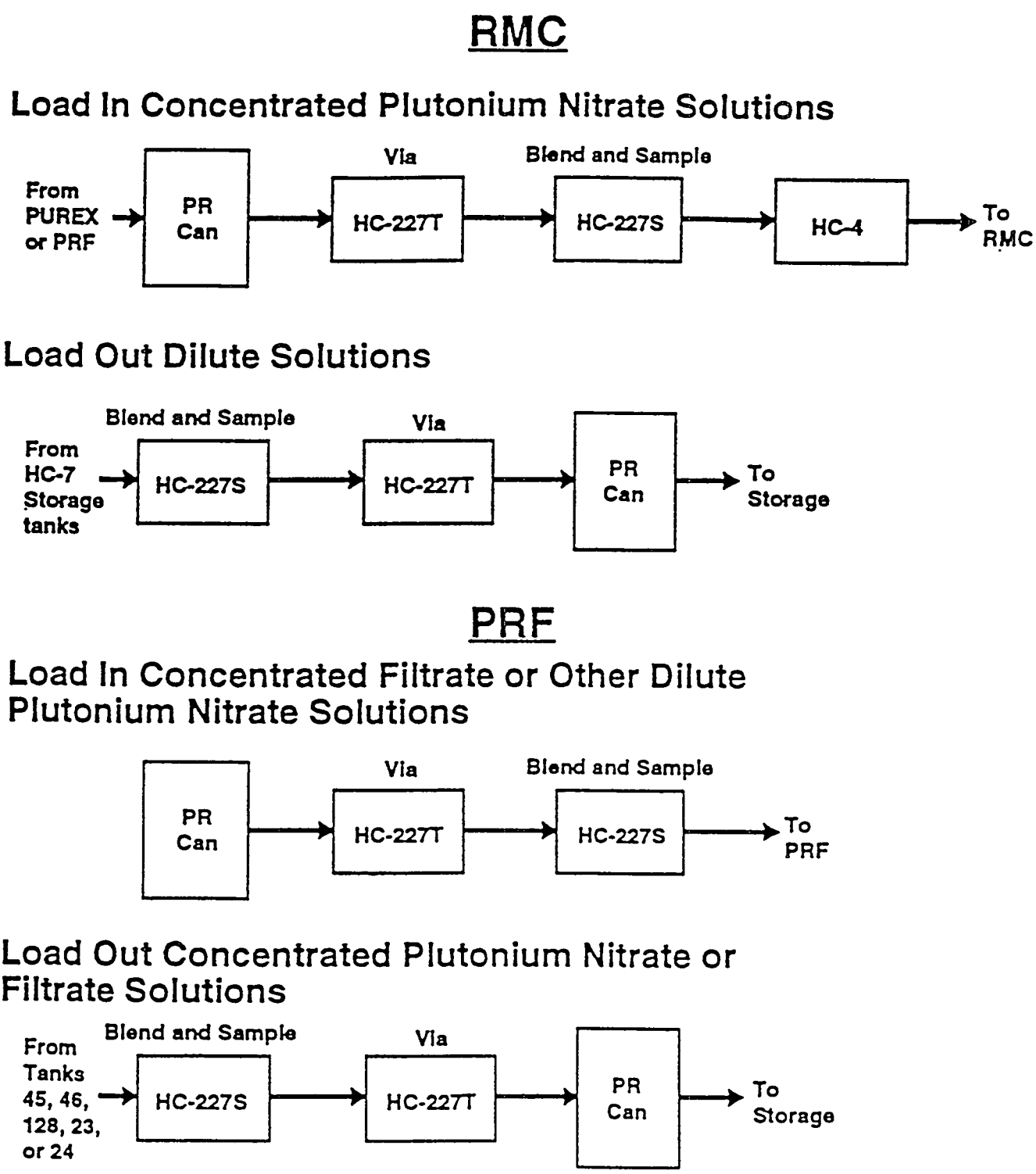
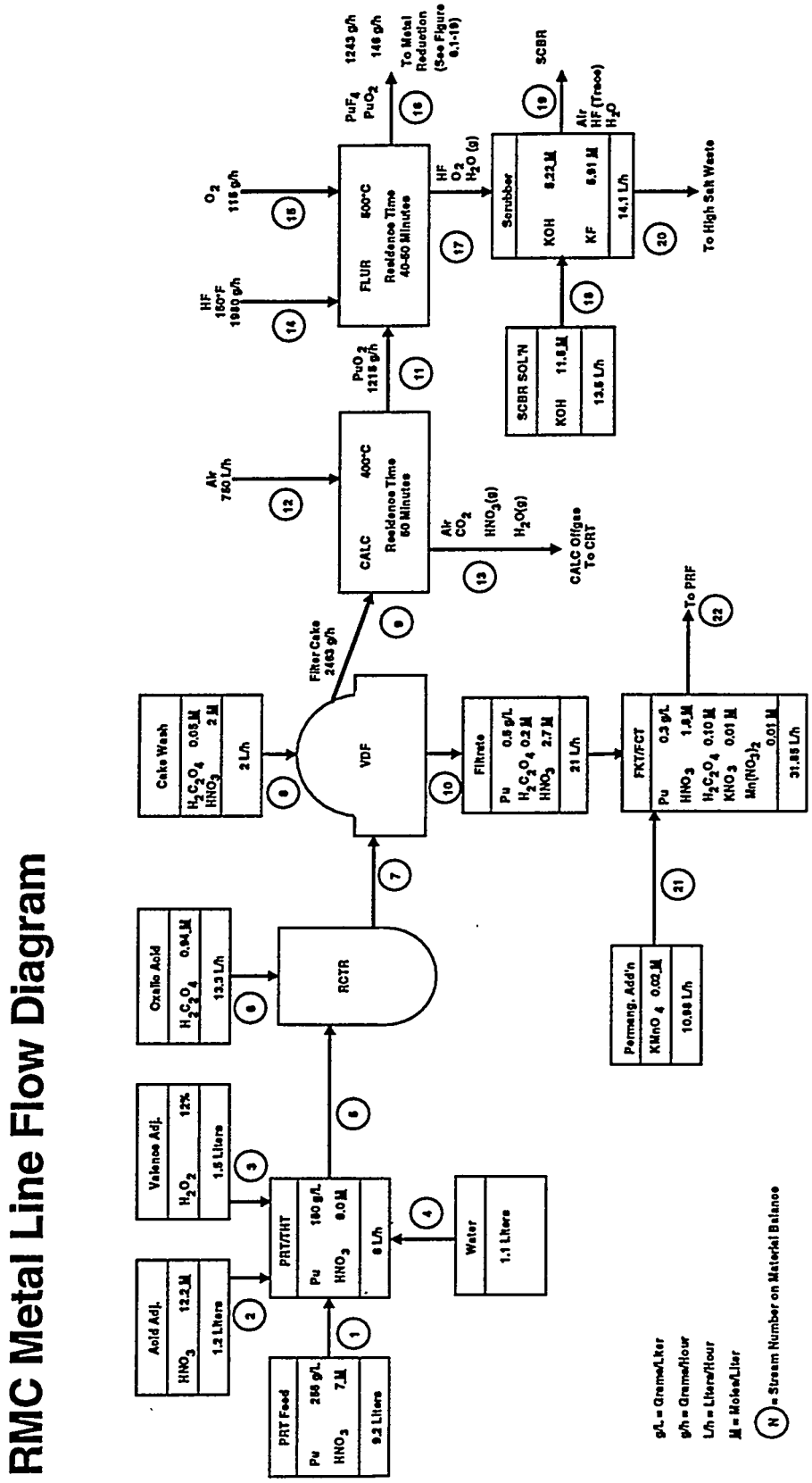


Figure 3-3. Remote Mechanical C Line Flow Diagram, Nitrate Solution Through Plutonium Fluoride Production.



The RMC Line was semi-remotely operated from the RMC control room in room 229, adjacent to most of the RMC Line gloveboxes. Most of the operations in the gloveboxes starting from glovebox HC-7 through HC-18BS (the button line) could be seen directly through the viewing windows of the control room.

3.8 PLUTONIUM PROCESS SUPPORT LABORATORY

The Plutonium Process Support Laboratory is located on the first floor of 234-5Z in the southwest corner of the building. Section 2.2.1 provides a detailed physical description of the 234-5Z Building.

The Plutonium Process Support Laboratory was chartered to operate nonradioactive and radioactive chemical-oriented demonstration laboratories and equipment to support numerous programs across the Hanford Site and, on occasion, other DOE Sites.

The specific laboratory rooms within the PFP and their capabilities are as follows.

- Room 179 contains a particle counter and a thermograviametric analysis instrument. The thermograviametric analysis instrument is located in a dedicated glovebox; three other gloveboxes and three hoods are available for general alpha-radioactive chemistry projects. One of the gloveboxes was occupied by and reserved for the TRU extraction process demonstration pilot plant.

- Room 180 contains the inductively coupled plasma spectrometer for rapid determinations of plutonium isotopes as well as other radioactive element determinations, including beta radioactive elements.

- Room 182 contains a scanning electron microscope for examining minute quantities of solids, sometimes alpha-radioactive.

- Room 183/185 was used for the scintillation counting equipment and waste drum storage.

- Room 187 contains one mobile ultraviolet/visible-light spectrometer used to identify unknown materials and five hoods for small, general, radioactive chemistry projects. Two of the hoods are connected to the radioactive D-4 drain line.

- Room 188 contains one glovebox for general alpha-radioactive chemistry projects.

- Room 189 contains a cold ion chromatograph, currently on a tabletop. Future plans include installing it in a glovebox for use with hot materials.

- Room 190 is a vault-type room used for storing stable SNM not currently needed for ongoing projects and demonstrations.

- Room 191 is a nonradioactive chemistry laboratory used for general chemistry projects and chemical preparation.

3.9 ANALYTICAL LABORATORY

The Analytical Laboratory, located on the first floor in the east end of the 234-5Z Building, was used to perform analytical and physical test analyses on plutonium samples. The samples came from the plant operations within the PFP, the research laboratory within PFP, and PUREX, as well as a few special test samples from other locations.

The Analytical Laboratory is located in rooms 131 through 157 of 234-5Z Building, with quality control standards being formulated and dispensed from rooms 221-C, 221-D, and 221-E. Section 2.2.1 provides a detailed physical description of the 234-5Z Building.

- Room 131 was used to analyze samples for plutonium concentration.
- Room 132 is the Mass Spectrometer Laboratory.
- Room 133 contains the grating and camera portions of a two-meter emission spectrograph and equipment for developing the film. No radioactive materials were allowed in this room.
- Room 134 was used to prepare samples for analysis on the mass spectrometer.
- Room 134-A was a weighing room used in support of the mass spectrometer laboratory.
- Room 135 was used to store and mount samples in support of the mass spectrometer laboratory.
- Room 136 contains a spectrophotometer.
- Room 137 contains the arc stand for the two-meter film spectrograph. These instruments were used in trace element analyses of plutonium and uranium product.
- Room 139 contains six interconnected gloveboxes. It was used to process and store all PuO_2 and plutonium metal received by the laboratory for analysis.
- Room 141 was used to analyze cold samples that support the building process.
- Room 142 consists of four vented storage cabinets.
- Room 143 was used for decontamination of equipment for the Radiochemical Standards Laboratory, and the PFP Analytical Laboratory, handling of liquid waste not compatible with the waste recovery system, and disposal of LLW to the D-4 sump in 241-Z.

- Work performed in room 144 provided the primary support for PRF and research and engineering plutonium samples. Among analyses performed were: plutonium concentration, visual percent solids, americium concentration, and acid/base determination.

- Room 145 contains a glovebox, which was used to analyze sinterability, bulk and tap density on PuO_2, and for preparation of PuO_2 standards for the emission spectrometer.

- Rooms 145-A, 147, 150, 151, and 148 are supply and office facilities.

- Room 149 contains an open-faced hood and a hood converted into a glovebox. Relatively large amounts of plutonium compounds were dissolved in the glovebox so the exhaust passes through a scrubber. The room was used for packing and unpacking shipping containers.

- Room 152 contains a load-in hood and a glovebox. It was used to reprocess liquid laboratory wastes.

- Room 153 consists of four open-faced hoods and one glovebox. The glovebox was used for surface area analysis of PuO_2.

- Room 154 contains one glovebox and was used for support of PuO_2. Carbon, sulfur, and nitrogen were analyzed in this glovebox.

- Room 155 contains four hoods and associated equipment that was used to support the PRF, RMA, and PUREX sample schedules.

- Room 156 was dedicated to uranium analyses and support of UO_3 Facility operations.

- Room 157 consists of two gloveboxes with furnaces and a sample cell that were used to support PuO_2 work.

- Room 146 was used for the analysis of plutonium solution and oxide material.

- Room 142 was a small room containing four vaults for radioactive standards storage.

- Room 143 has four open-faced hoods and one glovebox. The glovebox was used to precipitate low concentration plutonium nitrate and oxalate and filter.

Rooms 221-A through 221-G were used for the Recuplex process and were subjected to a criticality in 1962. The walls and floors were cleaned, but the crawl space between the ceiling and the duct level is still highly contaminated. No information is available regarding the contents of this crawl space. The pipeways in the tunnel level leading to the Recuplex have been sealed off and are also highly contaminated as a result of the same criticality.

- Room 221-A (including 221-F and 221-G) is currently used for the Health Physics office.

- Room 221-B contains portable NDA equipment and containerized calibration/standard sources.

- Rooms 221-C, 221-D, and 221-E form the Radiochemical Standards Laboratory.

  - Room 221-C contains a dry air glovebox used for the preparation of ultrapure PuO_2 standards for the engineering laboritories.

  - Room 221-D contains equipment used for makeup of plutonium sheet standards and soil standards and for doing plutonium nitrate characterization.

  - Room 221-E contains equipment for the preparation of thorium and uranium standards.

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4.0 METHODOLOGY

Estimates presented in this report of volumes and waste types that will result from the D&D of the PFP are based on process and facility knowledge, a detailed study of documentation (including H- series engineering drawings), and a walkdown. This section details the approach, methodology, uncertainties, and assumptions considered for this project. The results of this study are presented in Sections 5.0 and 6.0.

4.1 UNCERTAINTIES

The following uncertainties lead to the assumptions listed in Section 4.2.

- In some cases engineering drawing documentation (H- series) was discontinued when processing was shutdown.
- Cleanout and changes subsequent to process shutdown have not been completely documented.
- Because of the historical nature of the processes at the PFP, some of the documentation was conflicting.

4.2 ASSUMPTIONS

It is essential that the reader understands the assumptions made during this project when interpreting or applying the results. The assumptions that apply globally are listed below. Specific assumptions are noted where they apply.

- Data gathered from documentation were assumed accurate when verification by walkdown was not possible.
- All uncontaminated solid waste will be removed prior to D&D activities.
- Previously containerized radioactive and/or hazardous waste in temporary storage locations, such as hallways and vaults, will be removed prior to D&D activities.
- Glovebox gloves will be removed and gloveports will be sealed prior to D&D activities.
- All portable items within a glovebox that can be bagged out will be removed (e.g., hand tools, hot plates, HEPA filters, balances, pans). These items are not included in the volume estimates.
- Gloveboxes shall remain intact. Glovebox volumes are based on the outside dimensions.

- All nonportable items within a glovebox shall remain in the glovebox (e.g., tanks, process piping, manifolds). With the exception of process tanks, glovebox volumes shall include these items. Process tanks have been analyzed for hazardous chemicals and are treated separately to identify waste classification.

- Glovebox light fixtures will be removed prior to D&D activities.

- Items that are either grouted or part of the fixed building structure will not be removed (e.g., nonload bearing walls, doors, equipment support columns, built-in filter racks).

- Alarm and safety support systems will remain in place (e.g., fire, industrial safety).

- Domestic systems will remain in place (e.g., sanitary systems, lighting).

- The most recent revision was given priority in cases of conflicting documentation.

- Areas without documentation regarding contamination were assumed to be uncontaminated.

- All HEPA filters shall be removed from filterboxes and gloveboxes because the Waste Isolation Pilot Plant will not accept them. The filterboxes will be included in the final D&D solid waste volume. Permanent filter racks and filter rooms shall remain with the building structure.

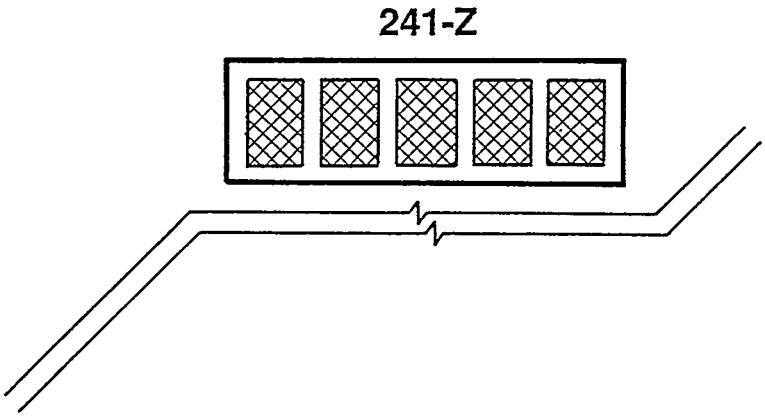
4.3 GENERAL APPROACH

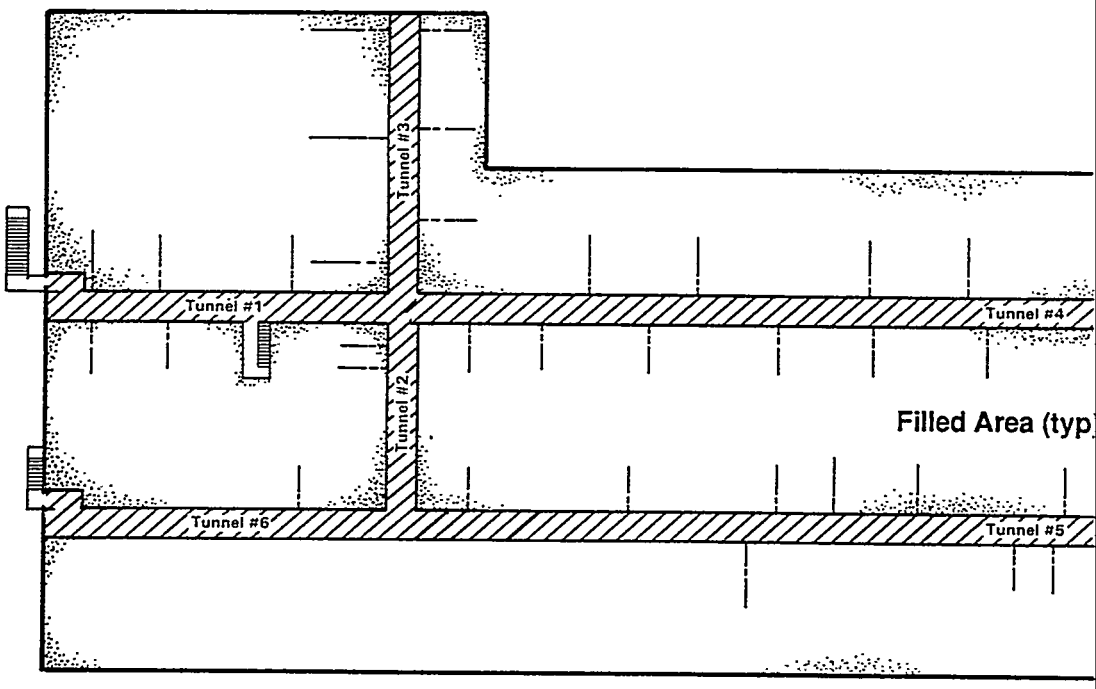
This study was designed to yield an estimate of the volumes and types of solid waste that will result from the D&D of the PFP. A step-wise approach was used during this project. First, the facility was conservatively classified into three areas: "hot" process areas, "cold" process support areas, and uncontaminated areas. For the purposes of this study, "hot" process areas are defined as rooms in which any of the following conditions are met (most conservative for estimation).

- The room is in an area of potential airborne radioactivity according to Figure 8.3-8 in the *Plutonium Finishing Plant Final Safety Analysis Report*, WHC-SD-CP-SAR-021 (WHC 1991) (see Figure 4-1).

- The room has a normal dose level reading of greater than 2.0 mrem/h according to Table 8.4-1 and Figure 8.3-17 in WHC-SD-CP-SAR-021 (WHC 1991) (see Table 4-1 and Figure 4-2).

- The room has a radiation source within it according to Figure 8.3-7 in WHC-SD-CP-SAR-021 (WHC 1991) (see Figure 4-3).

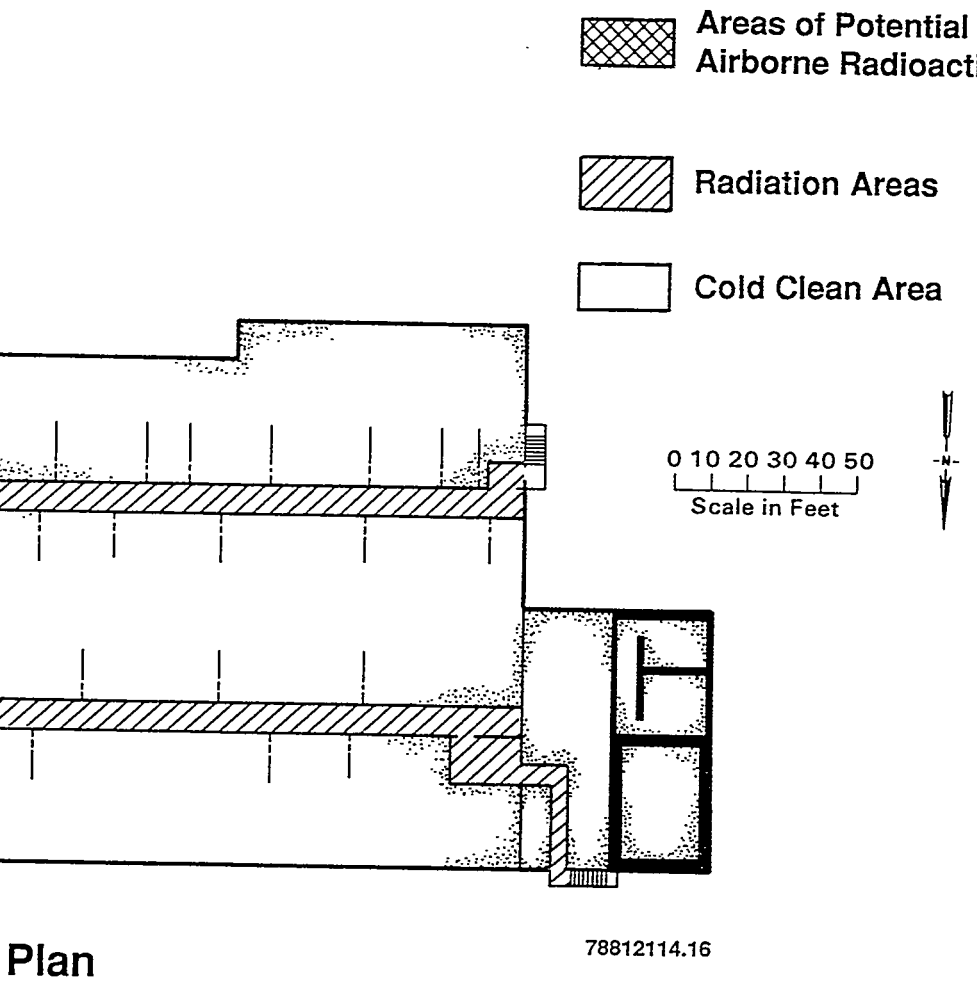


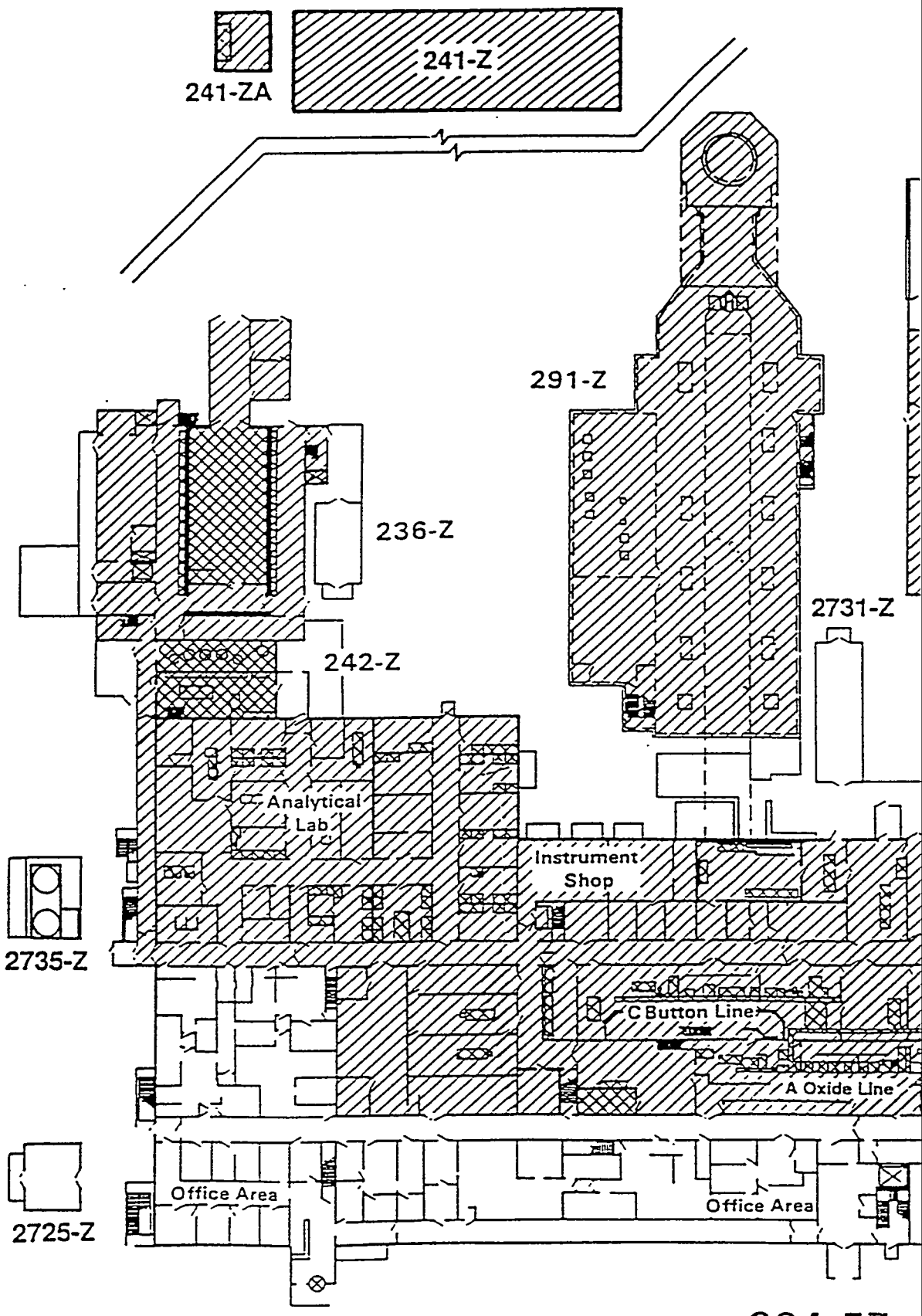


234-5Z

Foundation and Tunne

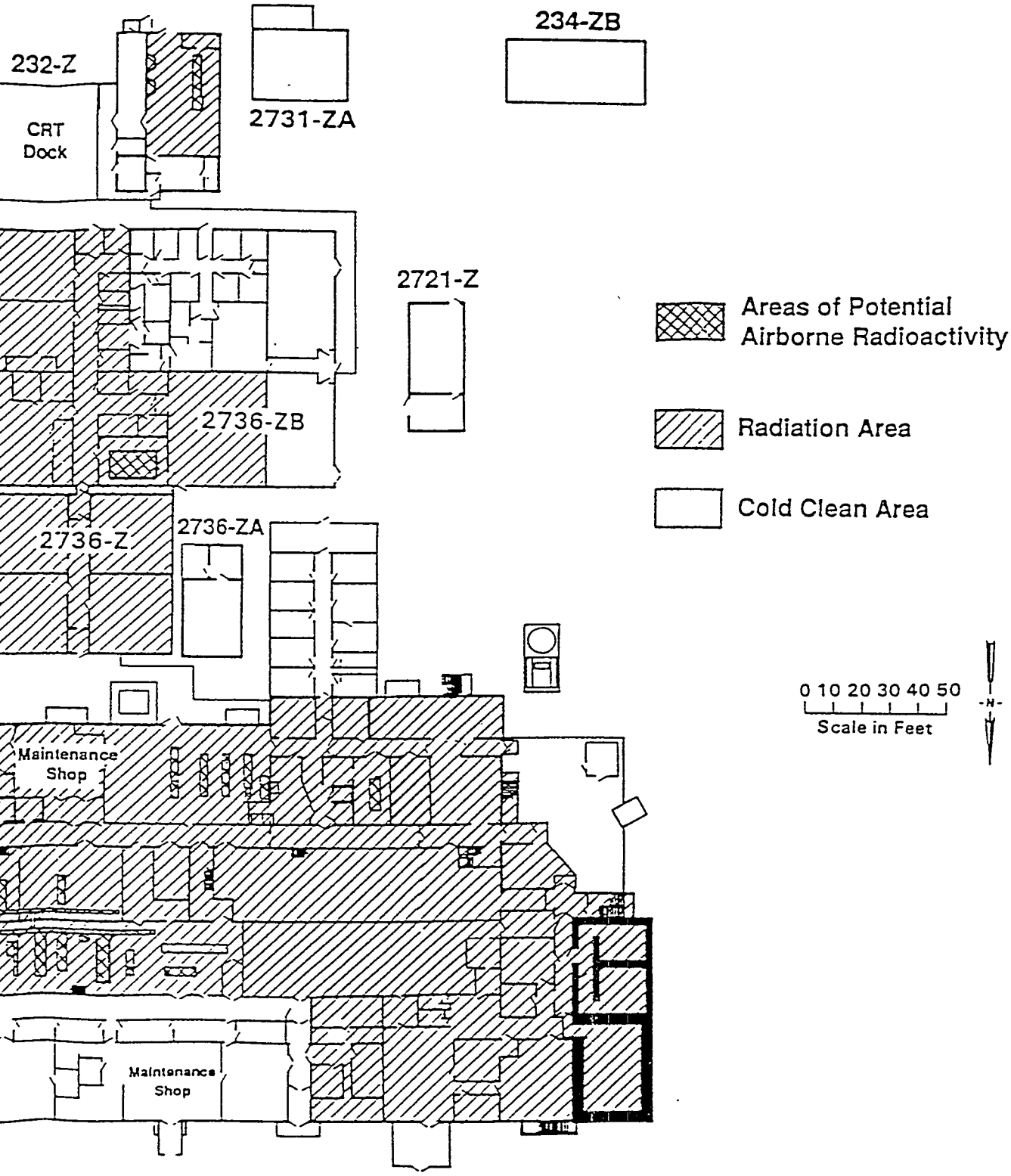
Figure 4-1. Plutonium Finishing Plant Ventilation Control and Radiation Control Areas. (sheet 1 of 5)





234-5Z
First Floor

Figure 4-1. Plutonium Finishing Plant Ventilation Control and Radiation Control Areas. (sheet 2 of 5)



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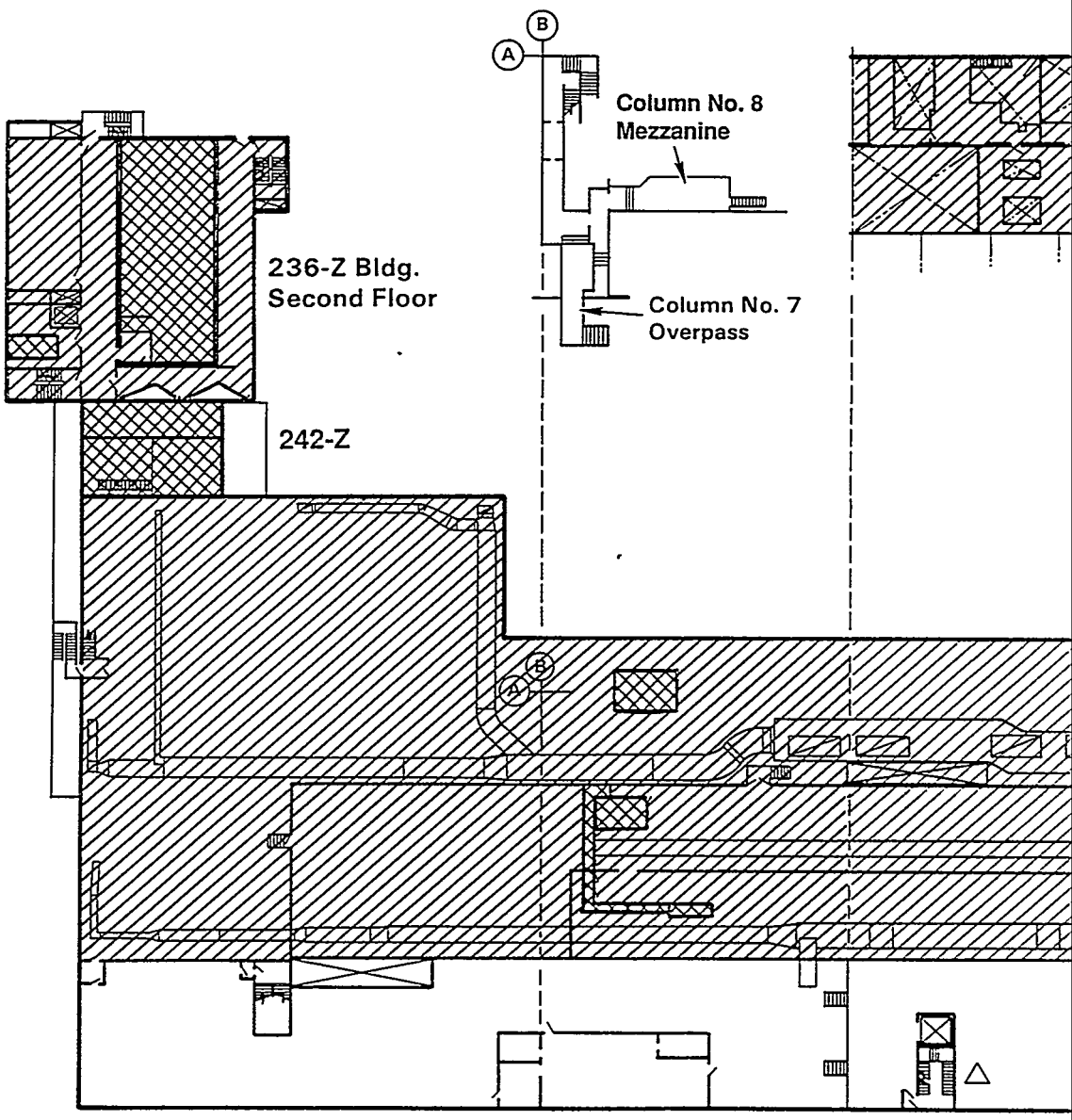
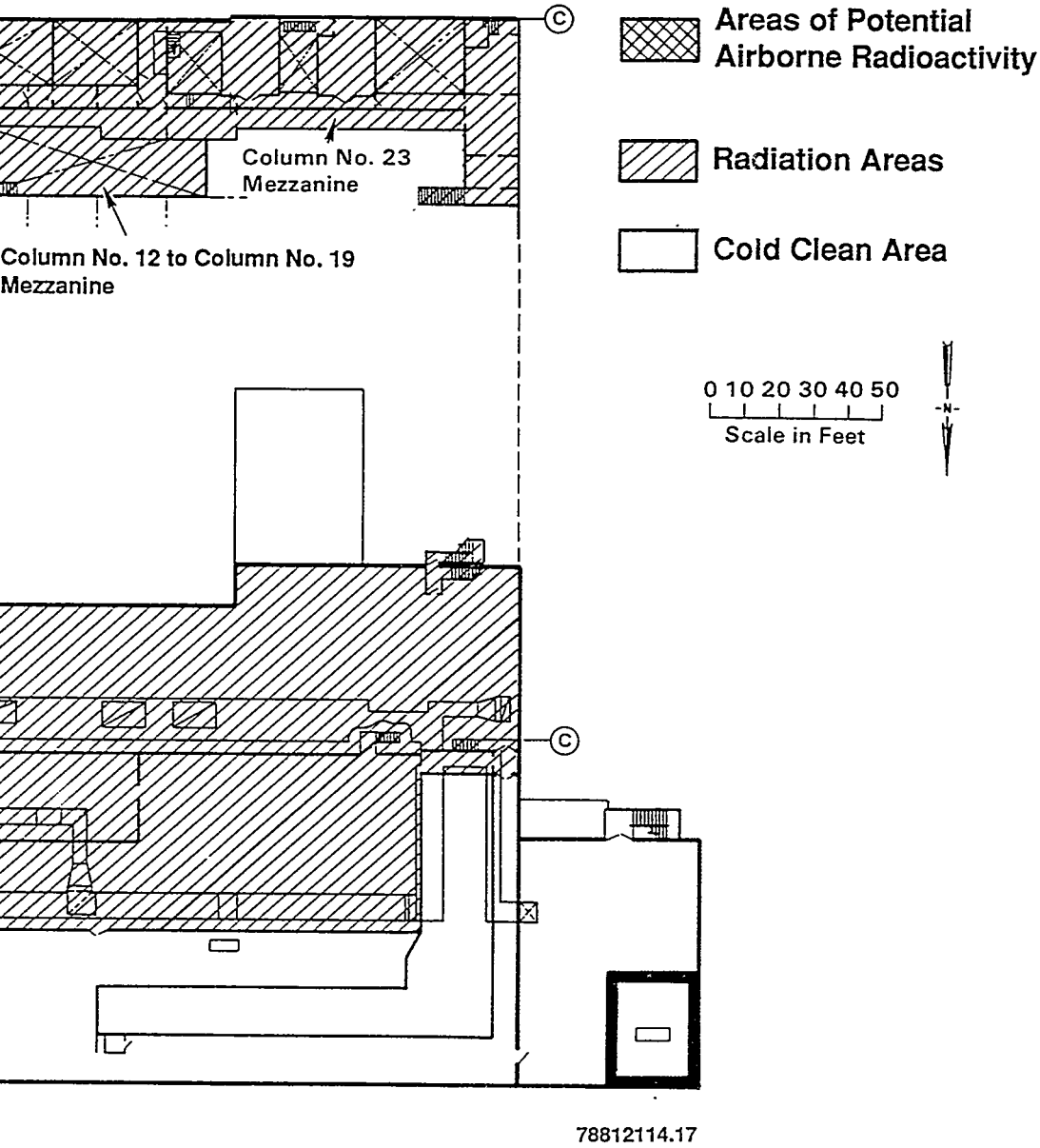
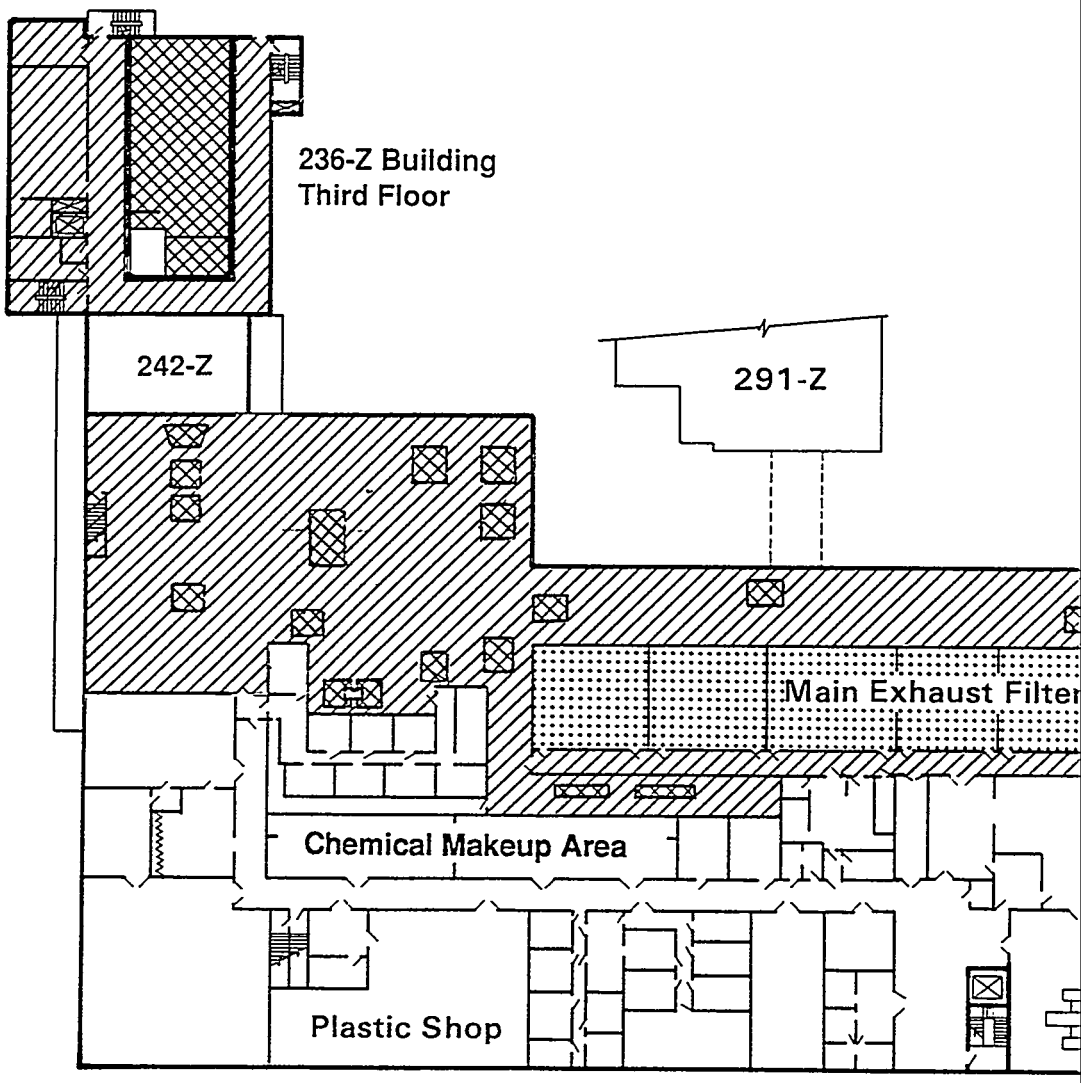


234-5Z
Duct Level

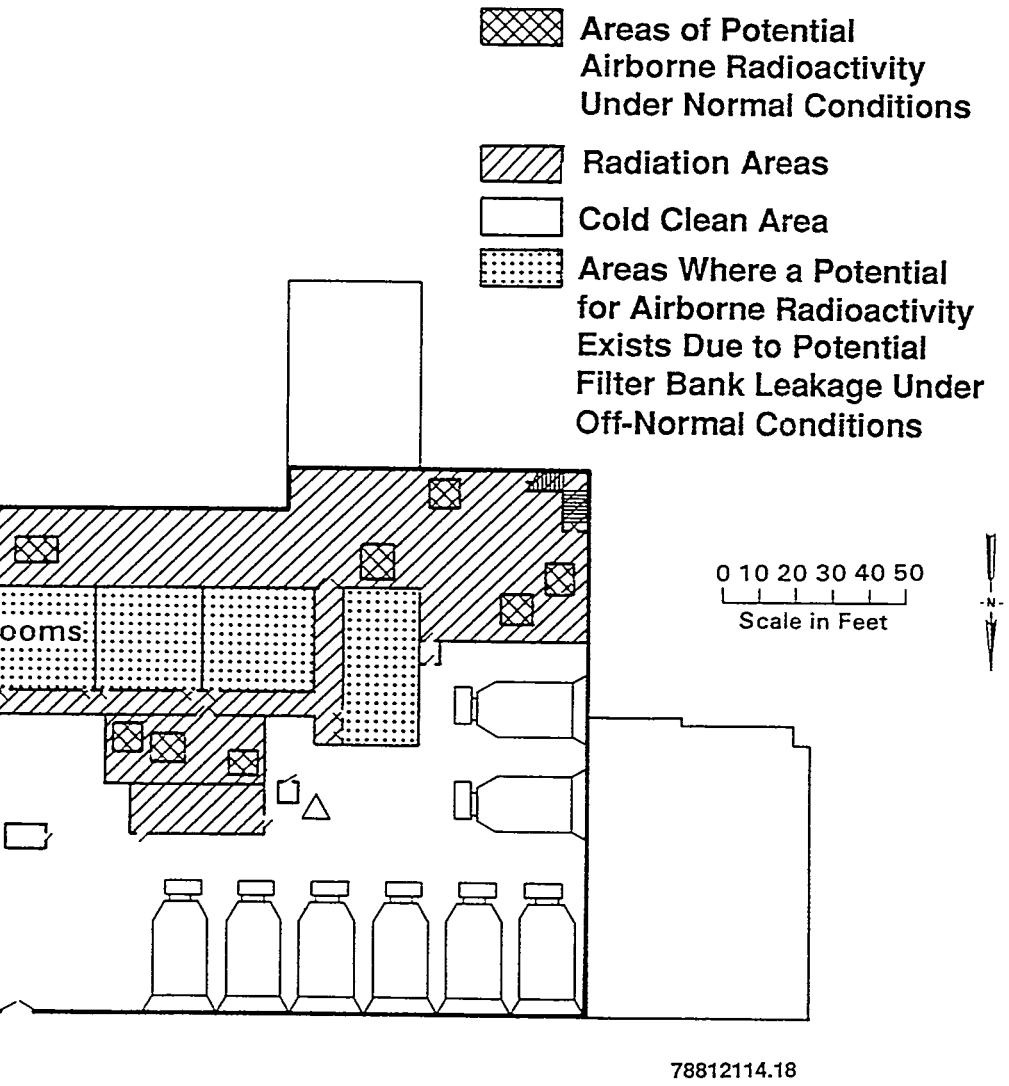
Figure 4-1. Plutonium Finishing Plant Ventilation Control and Radiation Control Areas. (sheet 3 of 5)





234-5Z
Second Floor

Figure 4-1. Plutonium Finishing Plant Ventilation Control and Radiation Control Areas. (sheet 4 of 5)



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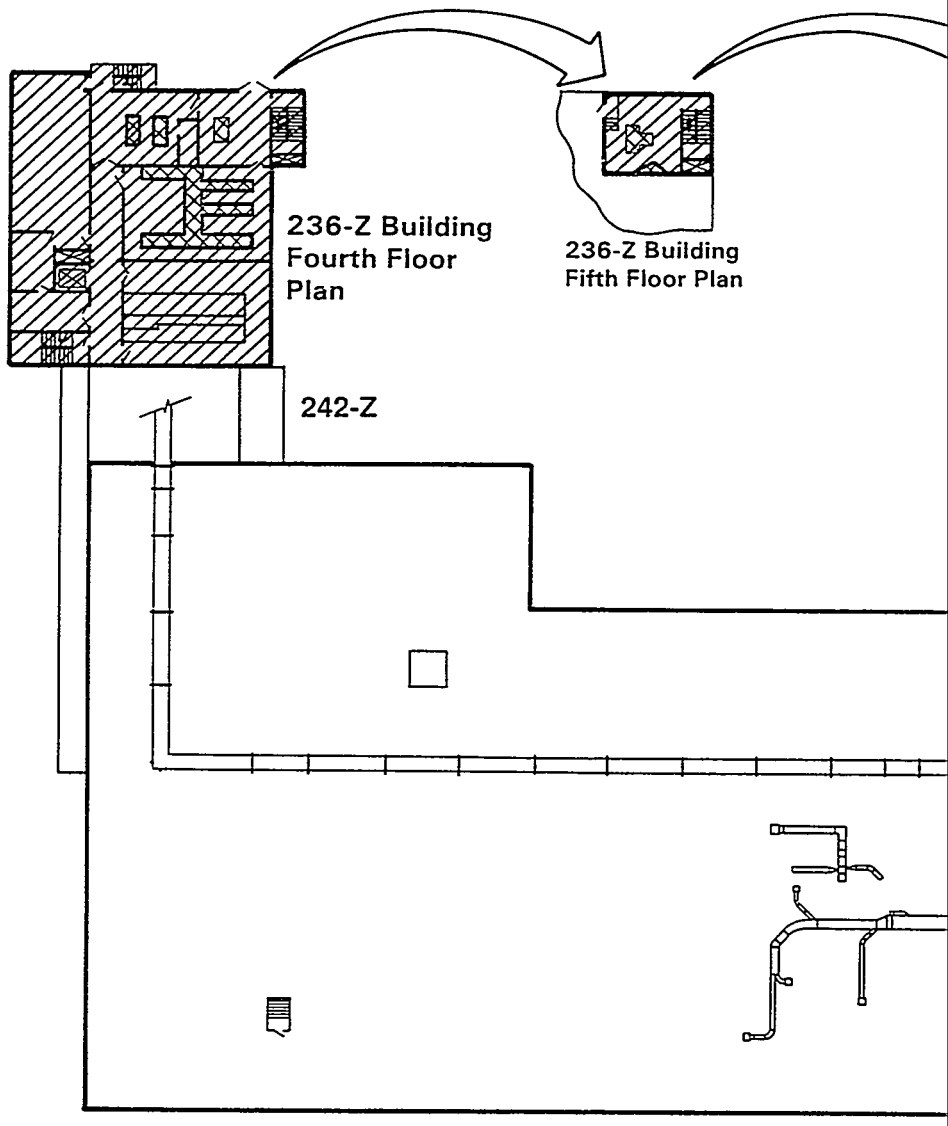

236-Z Building
Fourth Floor
Plan
236-Z Building
Fifth Floor Plan
242-Z

234
Ro

Figure 4-1. Plutonium Finishing Plant Ventilation Control and Radiation Control Areas. (sheet 5 of 5)

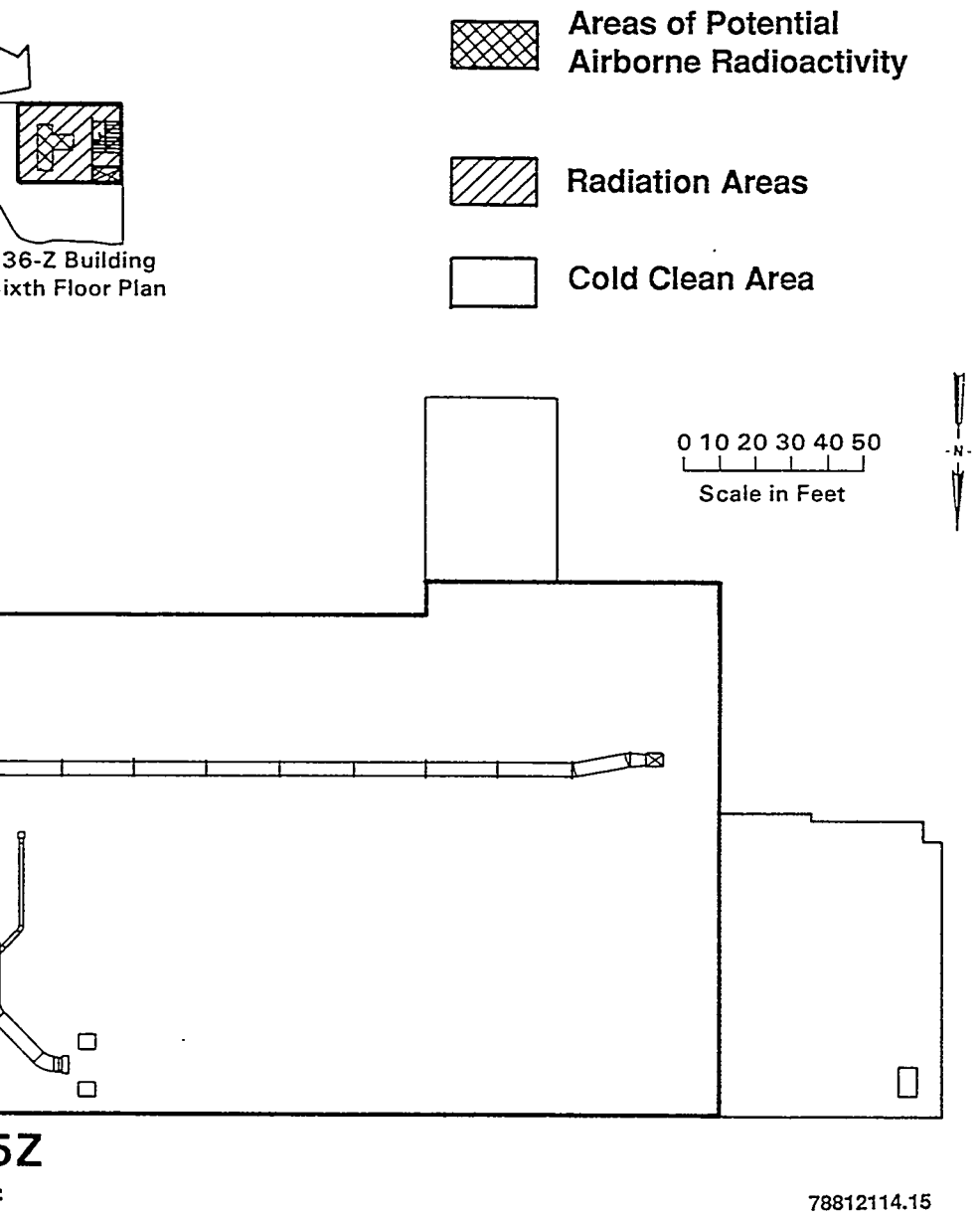


Table 4-1. Area Occupancy Factors of Plant Radiation or Potential Radiation Areas. (8 sheets)

Room number	Operation/description	Normal field readings (mrem/h)	Area occupancy
234-5Z Building			
100-A	RADTU filter room	<2.0	0.25 h/mo
110-A	Womens' laundry hampers	<0.5	4 h/d
112	Men's rest room	<0.5	Full time
116	Men's changeroom	<0.5	Full time
117	Men's laundry hampers	<0.5	4 h/wk
121	Women's rest room	<0.5	Full time
124	Women's changeroom	<0.5	Full time
126	Personnel decontamination facility	<0.5	8 h/d
131	Plutonium assay	<2.0	16 h/d
132	Mass spectrometry	<0.5	16 h/d
133	Dark room	<0.5	1 h/wk
134	Mass spectrometry	<0.5	8 h/d
135	Mass spectrometry	<0.5	8 h/d
136	Emission spectrometry	<0.5	16 h/d
137	Emission spectrometry	<0.5	1 h/wk
139	PuO_2 sample storage	<30.0[a]	16 h/d
140-A	Analytical support services	<0.5	12 h/d
140-B	Laboratory manager	<0.5	8 h/d
140-C	Laboratory staff chemist	<0.5	8 h/d
141	Nonradioactive solution preparation	<0.5	2 h/d
142	Miscellaneous storage	<2.0	1 h/d
143	Waste process	<3.0	2 h/d
144	Process support	<0.5	Full time
145	Physical test	<2.0	Inactive
145-A	Stock room	<0.5	8 h/d
146	WIPP repackaging and sample analysis	<0.5	20 h/d
147	Waste packaging and analysis manager	<0.5	8 h/d

Table 4-1. Area Occupancy Factors of Plant Radiation or Potential Radiation Areas. (8 sheets)

Room number	Operation/description	Normal field readings (mrem/h)	Area occupancy
234-5Z Building (cont.)			
148	Sample analysis	<0.5	2 h/d
149	Sample dissolution	<0.5	<1 h/wk
150	Laboratory shift manager	<0.5	24 h/d
151	Miscellaneous counting room	<0.5	24 h/d
152	Waste concentrator	<2.0	4 h/d
153	Product specification analysis	<1.5	4 h/d
154	Product specification analysis	<0.5	8 h/d
155	Infrared spectrophotometer	<0.5	2 h/d
156	S&C analysis	<0.5	4 h/d
157	Product specification analysis	<0.5	<1 h/wk
158	Instrument shop	<0.5	Full time
159	Instrument shop	<0.5	Full time
159-A	Instrument shop	<0.5	4 h/d
161	RMC shift manager	<0.5	Full time
162	RMC shift manager	<0.5	20 h/d
163	Instruments manager	<0.5	8 h/d
164	RMC shift office	<0.5	Full time
165	Calcium storage	<0.5	Full time
166	RMC batch tanks	<30.0[a]	4 h/d
167	RMC operations storage	<0.5	Full time
168	RMC ready room/storage	<0.5	Full time
169	Ash stabilization	<2.0	16 h/d
170	Ash dissolution	<0.5	<1 h/wk
171	Corridor	<0.5	Full time
172	Maintenance shop (RMC)	<2.0	Full time
173	Maintenance shop	<2.0	Full time
174	SNM storage vault	<30.0	6 h/wk

Table 4-1. Area Occupancy Factors of Plant Radiation or Potential Radiation Areas. (8 sheets)

Room number	Operation/description	Normal field readings (mrem/h)	Area occupancy
234-5Z Building (cont.)			
175	SNM storage vault	<2.0	6 h/wk
179	Process support laboratory	<0.5	8 h/d
180	Isotopic research	<0.5	8 h/d
182	Process support (microscope)	<0.5	8 h/d
183	Specialized processing	<0.5	8 h/d
185	Miscellaneous storage	<0.5	8 h/d
187	Open-faced hoods	<0.5	8 h/d
188	Glovebox/chemical storage	<0.5	8 h/d
189	Equipment storage	<0.5	8 h/d
190	Radioactive material storage	<30.0	1 h/d
191	Product support cold laboratory	<0.5	3 h/wk
192	Drum staging area	<0.5	4 h/d
192-A	SNM storage vault	<30.0[a]	1 h/wk
192-B	SNM storage vault	>30.0[a]	1 h/wk
192-C	SNM storage vault	>30.0[a]	1 h/wk
192-D	PR can storage	<0.5	1 h/wk
192-S	Storage	<0.5	1 h/wk
192-W	NDA storage	<0.5	0.25 h/wk
193	Airlock	<0.5	0.25 h/wk
196	Waste drum storage	<0.5	0.25 h/wk
197	Waste drum storage	<0.	0.25 h/wk
197-A	Mixed waste drum storage	<0.5	0.25 h/wk
221-A	HP office	<0.5	24 h/d
221-B	Sealer repair shop	<0.5	4 h/wk
221-C	Radiochemical standards laboratory	<2.0	8 h/d
221-D	Radiochemical standards laboratory	<2.0	8 h/d
221-E	Radiochemical standards laboratory	<2.0	8 h/d

Table 4-1. Area Occupancy Factors of Plant Radiation or Potential Radiation Areas. (8 sheets)

Room number	Operation/description	Normal field readings (mrem/h)	Area occupancy
234-5Z Building (cont.)			
225	Product handling vault	>30.0[a]	1 h/wk
227	Product LI/LO	<2.0	8 h/wk
228-A	RMC production line	<30.0[a]	Full time
228-B	RMC production line	<30.0[a]	Full time
228-C	RMC production line	<30.0[a]	Full time
230-A	RMC seal-out glovebox	<30.0[a]	4 h/wk
230-B	RMC recoverable powder glovebox	<30.0[a]	4 h/wk
230-C	Glovebox HC-60 hydrolysis	<2.0	4 h/d
232	HF scrubber cell	<2.0	Full time
233	RMA control room	<2.0	8 h/d
234	Trash compactor	<2.0	1 h/wk
234-A	NDA measurement of drums	<2.0	4 h/wk
235-A1	RMA oxide line (inactive)	>30.0[a]	1 h/wk
235-A2	RMA oxide line (inactive)	<30.0[a]	1 h/wk
235-A3	RMA oxide line (inactive)	<30.0[a]	1 h/wk
235-B	Recoverable material stabilization	<30.0[a]	8 h/d
235-C	Waste repackaging	<1.0	8 h/d
235-D	Waste drum storage	<2.0	4 h/wk
236	PR can storage vault	<30.0[a]	2 h/wk
245	Corridor	<0.5	0.5 h/wk
262	Duct level	<2.0	4 h/d
263	Duct level	<2.0	4 h/d
264	Duct level	<2.0	4 h/d
308	Duct level	<0.5	4 h/d
309	E-4 filter room	<0.5	1 d/yr
310	E-4 filter room	<0.5	1 d/yr
311	E-3 filter room	<0.5	1 d/yr

Table 4-1. Area Occupancy Factors of Plant Radiation or Potential Radiation Areas. (8 sheets)

Room number	Operation/description	Normal field readings (mrem/h)	Area occupancy
234-5Z Building (cont.)			
312	E-3 filter room	<0.5	1 d/yr
313	E-3 filter room	<0.5	1 d/yr
314	E-3 filter room	<0.5	1 d/yr
315	E-3 filter room	<0.5	<1 d/yr
316	E-3 filter room	<0.5	<1 d/yr
318	E-3 filter room	<0.5	<1 d/yr
320	Filterboxes	<2.0	<1 d/yr
2736-ZB Building			
616	Women's changeroom	<0.5	4 h/wk
622	Men's changeroom	<0.5	4 h/wk
623	UPS room	<0.5	0.25 h/wk
624	Corridor	<0.5	0.5 h/wk
625	Corridor	<0.5	0.5 h/wk
626	Janitor closet	<0.5	0.25 h/wk
627	Women's rest room	<0.5	1 h/wk
628	Men's rest room	<0.5	1 h/wk
629	Mardix	<0.5	9 h/d
630	Decontamination room	<0.5	0.25 h/wk
631	HP office	<0.5	4 h/d
632	Applied technology chemist's office	<0.5	6 h/d
633	Corridor	<0.5	0.5 h/wk
634	Shift manager	<0.5	2 h/d
635	Operator ready room	<0.5	2 h/d
636	Repackaging glovebox	<30.0[a]	0.5 h/wk
637	NDA laboratory	<30.0[a]	8 h/d
638	Packaging glovebox	<30.0[a]	6 h/wk
639	Safety shower room	<30.0[a]	0.25 h/wk

Table 4-1. Area Occupancy Factors of Plant Radiation or Potential Radiation Areas. (8 sheets)

Room number	Operation/description	Normal field readings (mrem/h)	Area occupancy
2736-ZB Building (cont.)			
640	Supply storage	<30.0[a]	0.25 h/wk
641	Receiving room	<30.0[a]	2 h/wk
642	Shipping room	<30.0[a]	2 h/wk
643	Personnel entry	<0.5	0.25 h/wk
644	Material passageway	<0.5	0.25 h/wk
236-Z Building			
10	Corridor/filterboxes	<10.0	6 h/wk
11	Corridor	<30.0[a]	3 h/d
12	Process cell	>30.0[a]	1 d/yr
13	Corridor	<30.0[a]	4 h/d
14	Corridor	<30.0[a]	4 h/wk
15	Welding shop	<0.5	1 h/wk
16	Maintenance shop (PRF)	<0.5	8 h/d
17	Maintenance manager's office	<0.5	8 h/d
18	Elevator access/storage	<0.5	2 h/wk
19	NDA counting room	<0.5	1 h/d
20	Corridor/filterboxes	<2.0	4 h/wk
21	West corridor	<2.0	4 h/wk
25	East corridor	<2.0	4 h/wk
26	Filter room	<0.5	1 h/wk
27	Maintenance glovebox	<30.0[a]	2 h/d
30	Corridor	<2.0	1 h/d
31	West corridor	<2.0	1 h/d
33	East corridor	<0.5	1 h/d
34	Instrument shop	<0.5	2 h/d
35	Electrical room	<0.5	0.5 h/wk
36	Compressor room	<0.5	1 h/wk

Table 4-1. Area Occupancy Factors of Plant Radiation or Potential Radiation Areas. (8 sheets)

Room number	Operation/description	Normal field readings (mrem/h)	Area occupancy
236-Z Building (cont.)			
37	Storage room	<0.5	1 h/wk
38	Rest room	<0.5	4 h/wk
40	Chemical preparation	<0.5	3 h/d
41	MT	<30.0[a]	24 h/d
42	Column room	<30.0[a]	0.25 h/d
43	S&C gloveboxes	<2.0	0.25 h/d
44	Control room	<0.5	24 h/d
45	Shift manager's office	<0.5	24 h/d
46	Shift engineer's office	<0.5	24 h/d
47	Corridor	<0.5	0.25 h/d
50	Column glovebox	<2.0	0.5 h/d
60	Column glovebox	<30.0	0.5 h/d
291-Z Building			
500	Electrical room	<0.5	4 h/wk
501	Compressor room	<0.5	4 h/wk
502	Exhaust plenum	<0.5	0
509	Fan room	<0.5	2 h/wk
232-Z Building			
Operating area	Storage	<2.0	0.5 h/wk
Changeroom	Laundry (SWPs)	<0.5	1 h/wk
Storage area	Used filters	<0.5	0.25 h/wk
2736-Z Building			
1	Storage of product/recoverable SNM	<30.0	1.5 h/wk[b]
2	Lard can/cubicle SNM storage	>30.0	1.5 h/wk[b]
3	Storage of product/recoverable SNM	>30.0	1.5 h/wk[b]
4	Storage of product/recoverable SNM	>30.0	1.5 h/wk[b]

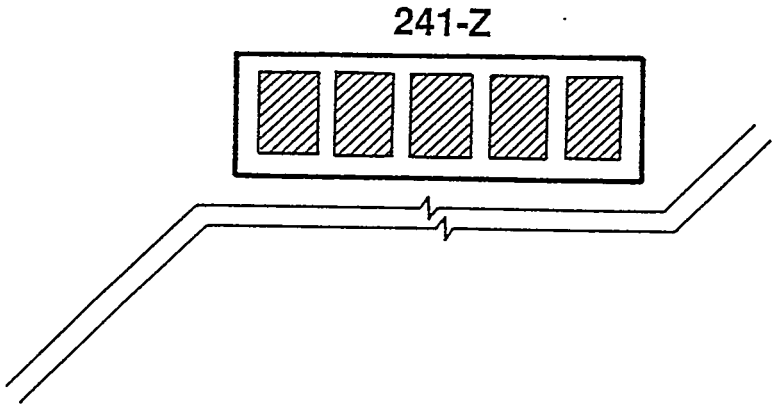
Table 4-1. Area Occupancy Factors of Plant Radiation or Potential Radiation Areas. (8 sheets)

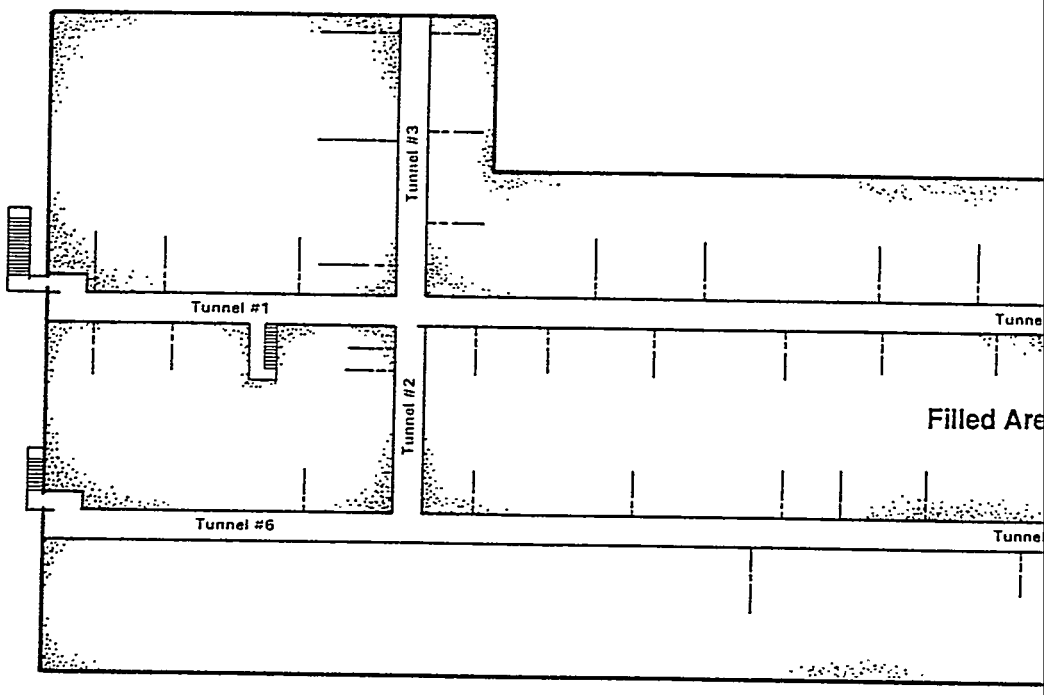
Room number	Operation/description	Normal field readings (mrem/h)	Area occupancy
241-Z/ZA Building			
Sumps	Sump tank waste storage	<30.0	1 d/2 yr
241-Z Building	Ventilation/operating area	<0.5	0.25 h/d
241-Z Building	Sampling glovebox	<2.0	1 h/wk

NOTE: The mrem/h values are gamma (QF=1) plus neutron exposure rates.

[a] Dose rate is associated with the principal work station in the area indicated. General area readings are usually 10 percent or less of this value. The area occupancy is as indicated, but work station occupancy is much lower.

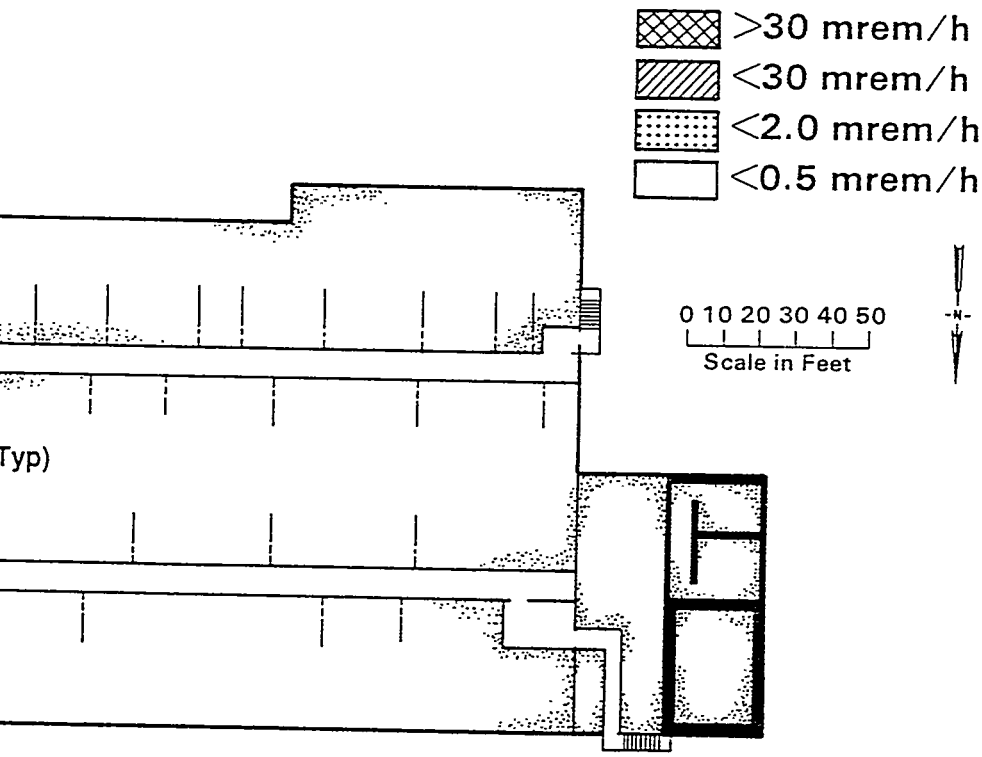
[b] On an as-needed basis.





234-5Z
Foundation and Tur

Figure 4-2. Plutonium Finishing Plant Radiation Dose Levels. (sheet 1 of 5)



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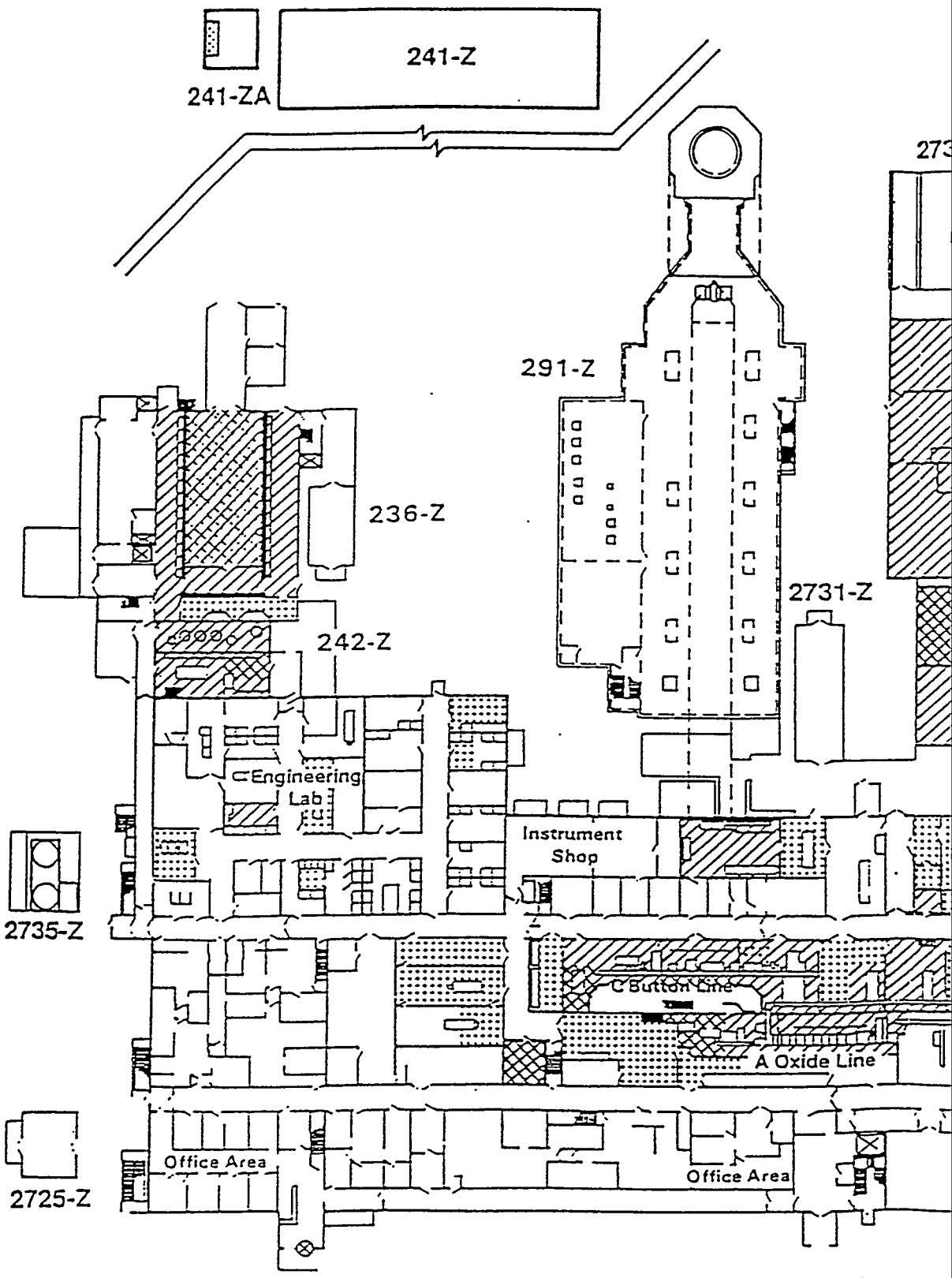
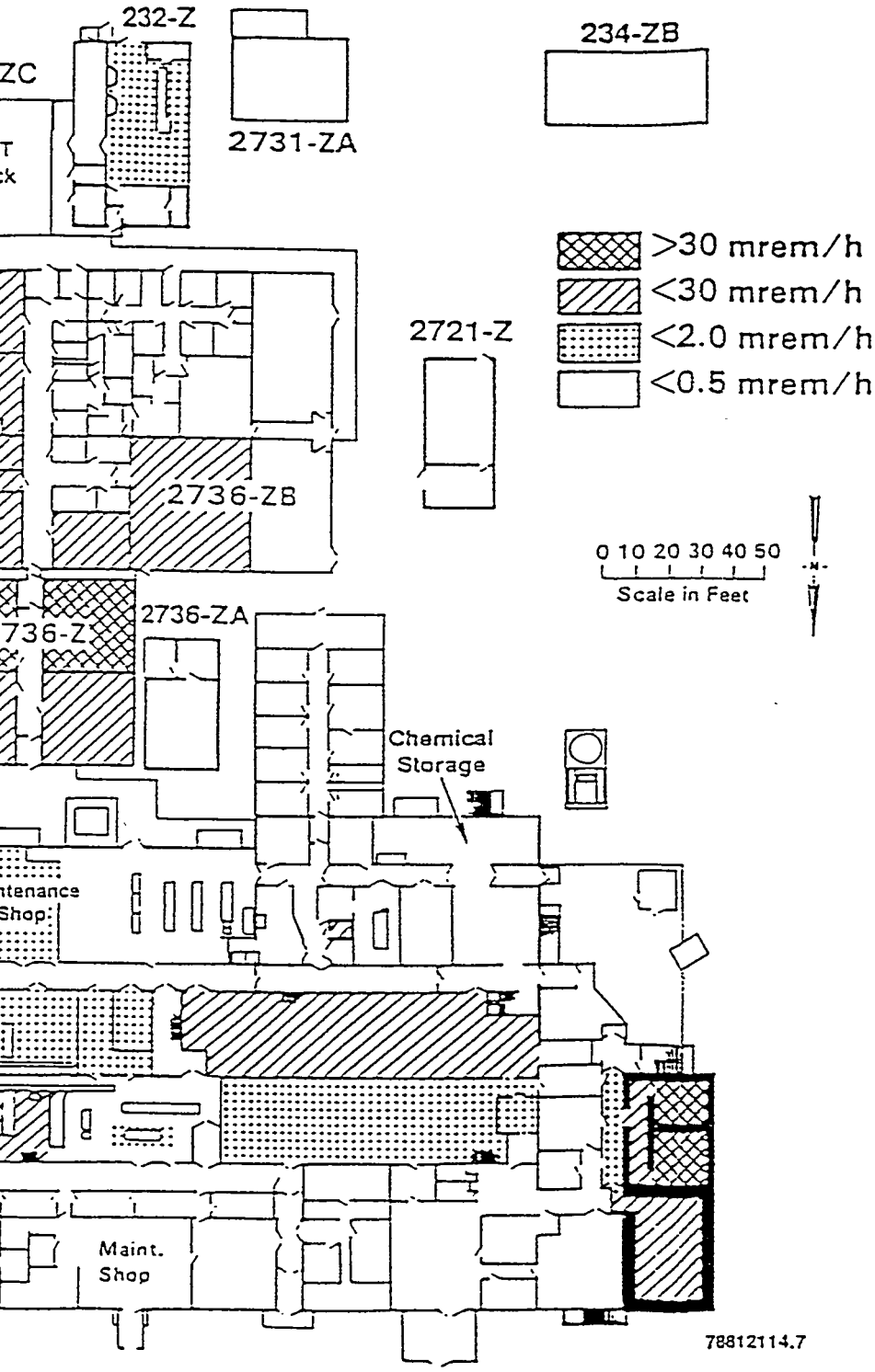
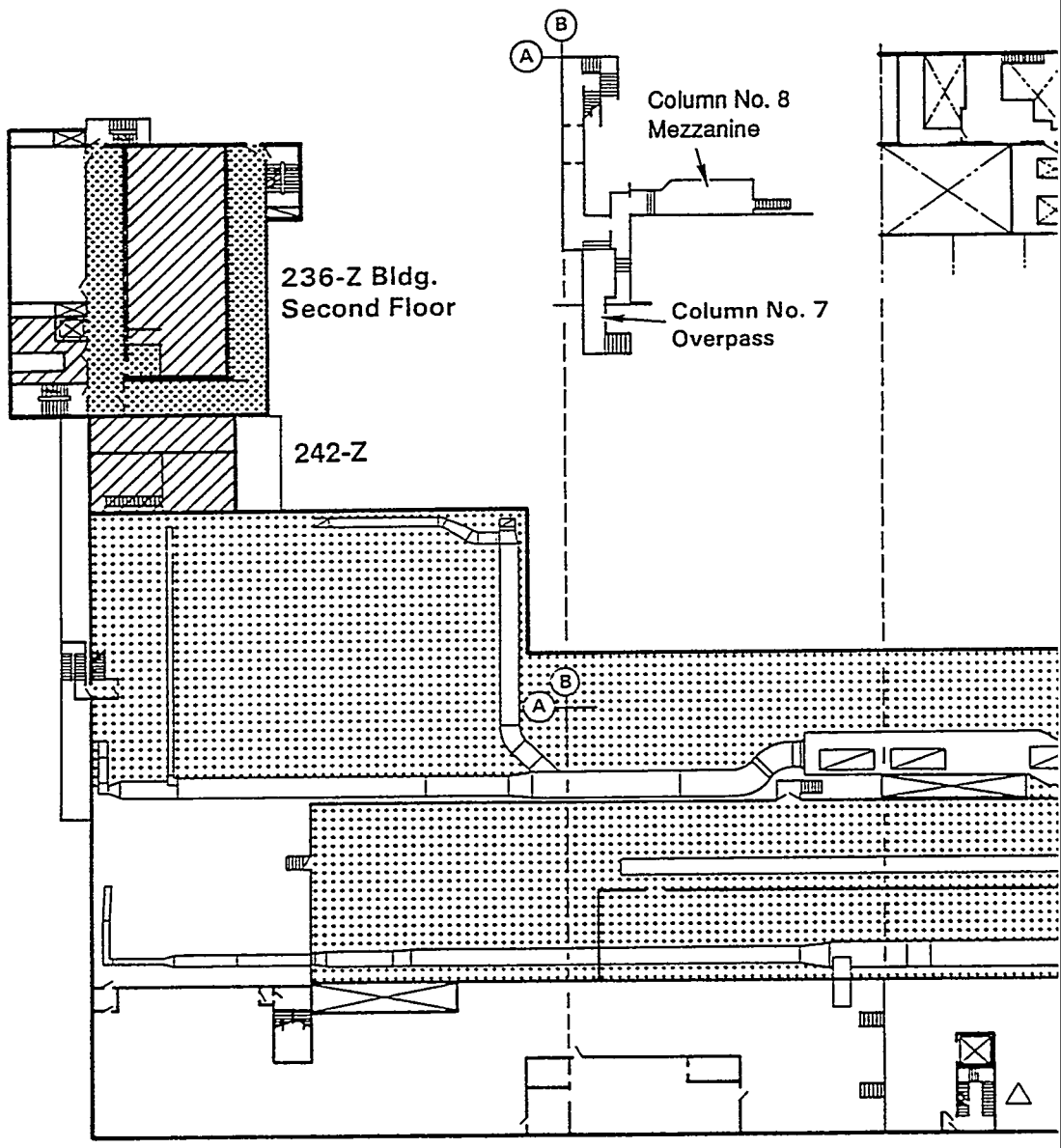
el Plan



234-5Z
First Floor Plan

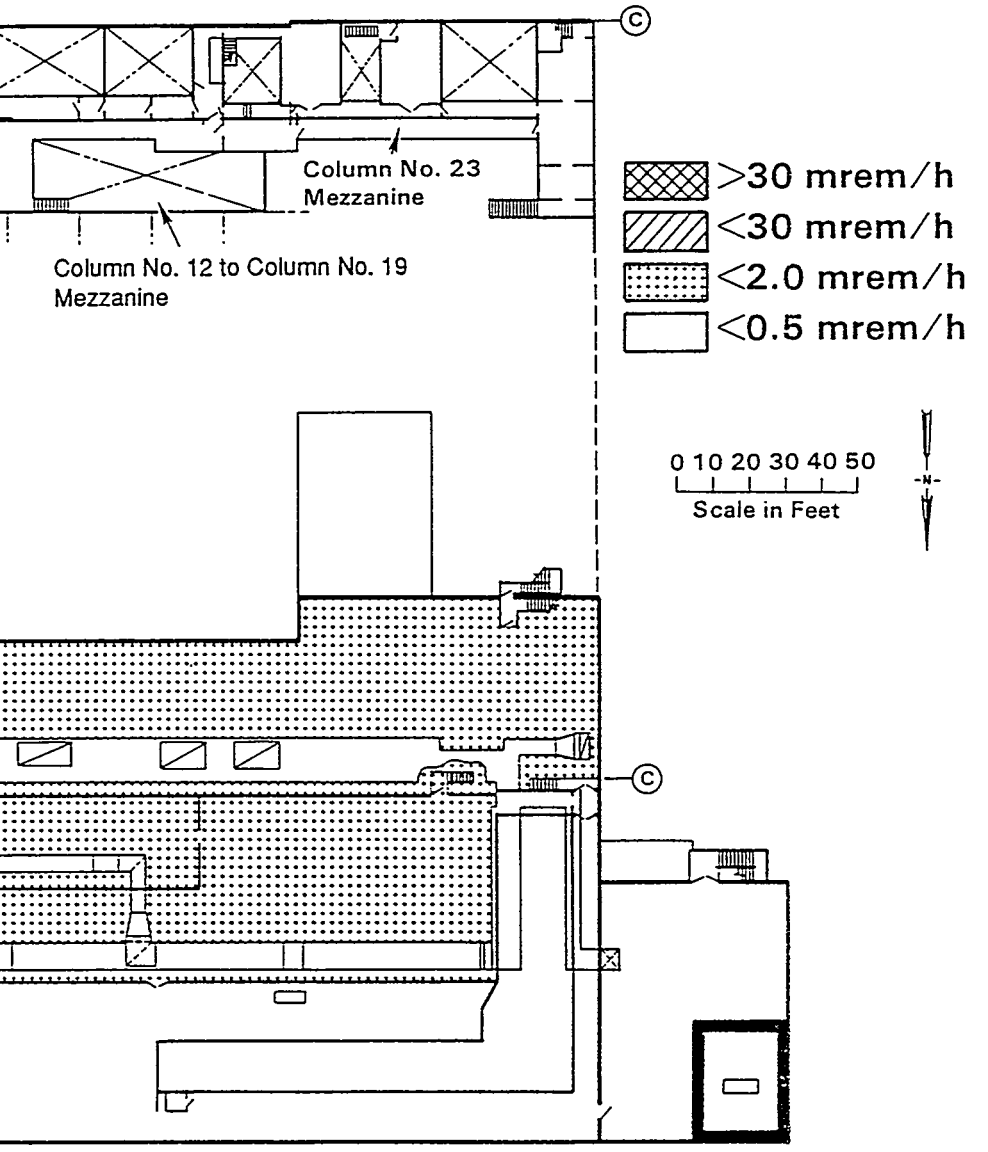
Figure 4-2. Plutonium Finishing Plant Radiation Dose Levels. (sheet 2 of 5)





234-5Z
Duct Level

Figure 4-2. Plutonium Finishing Plant Radiation Dose Levels. (sheet 3 of 5)



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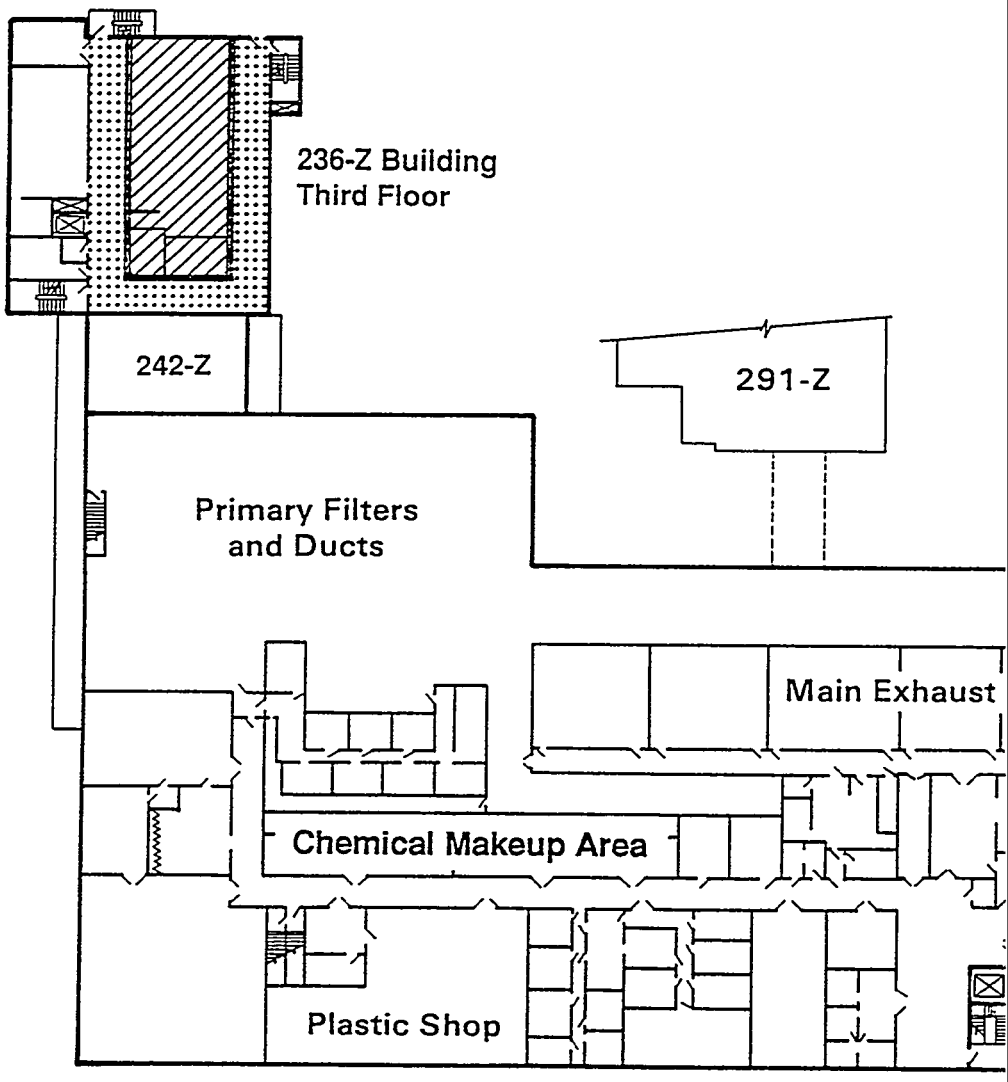
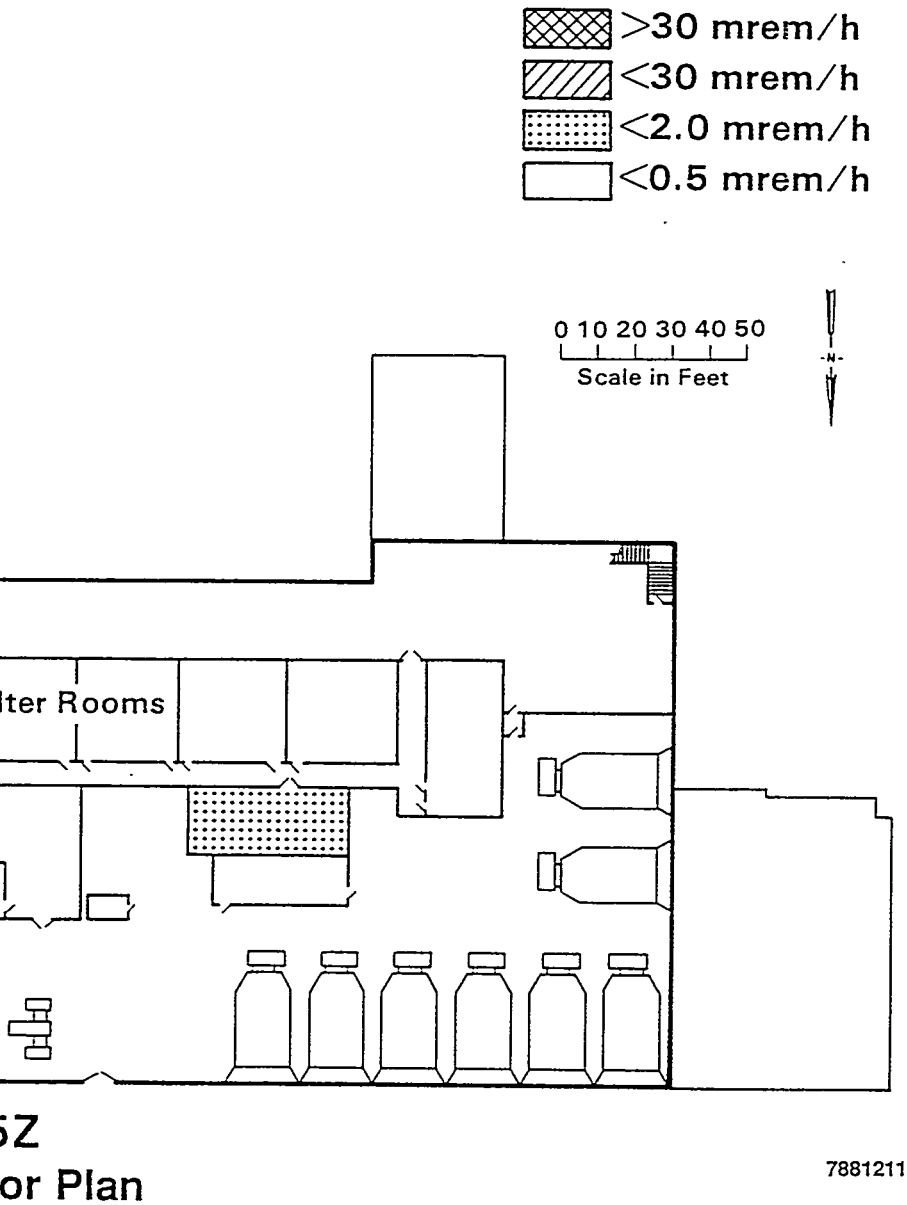
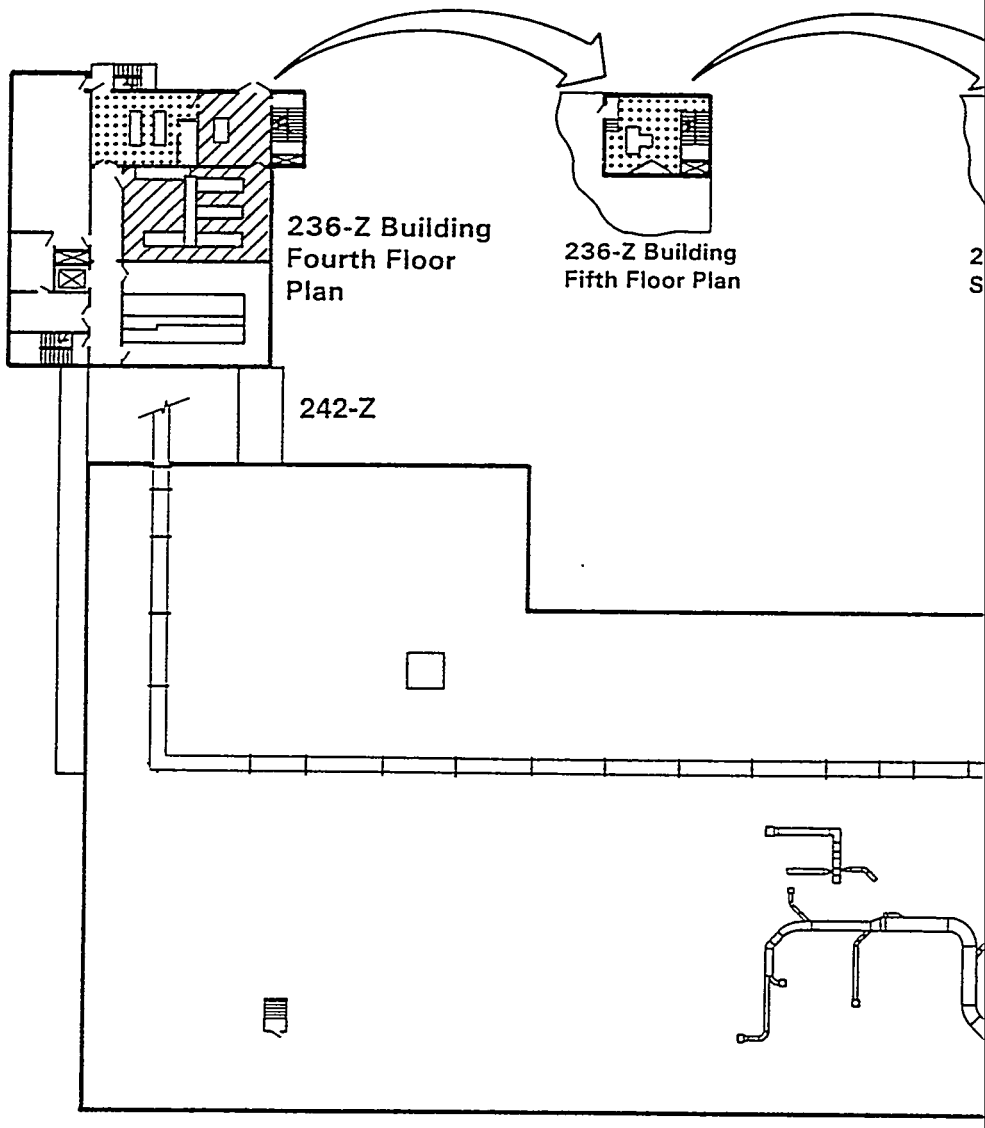


234-
Second Fl

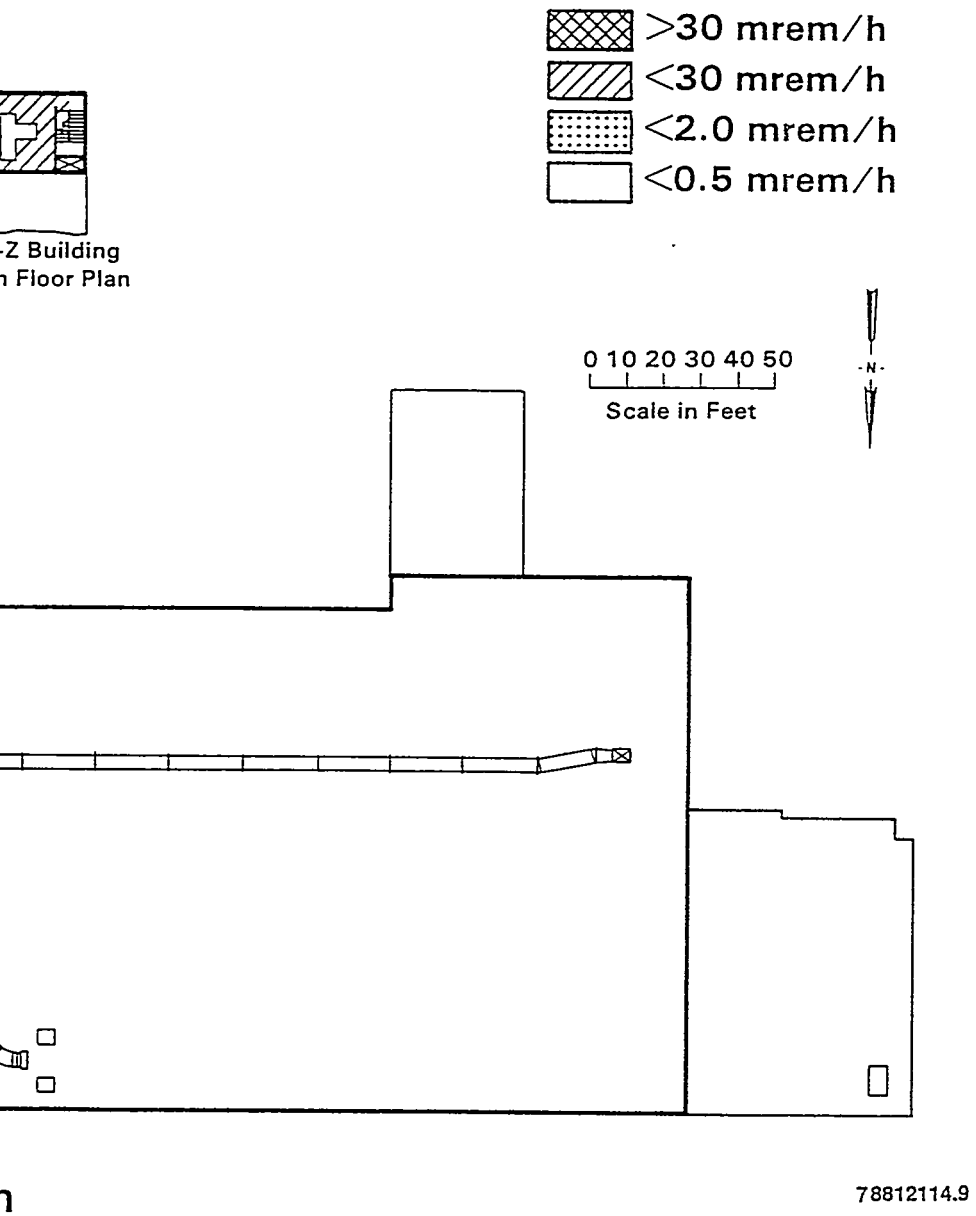
Figure 4-2. Plutonium Finishing Plant Radiation Dose Levels. (sheet 4 of 5)

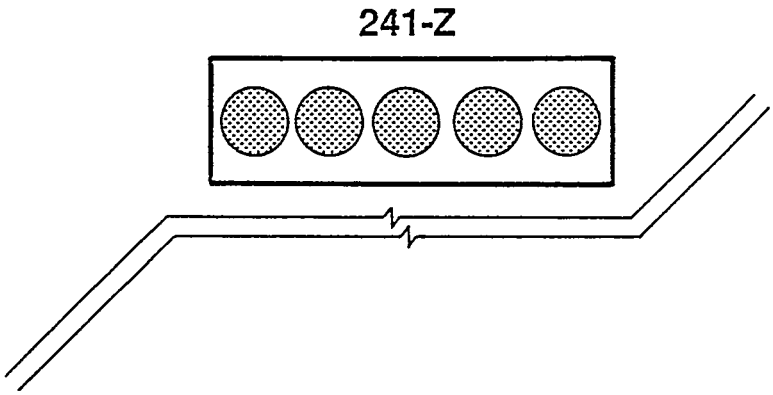


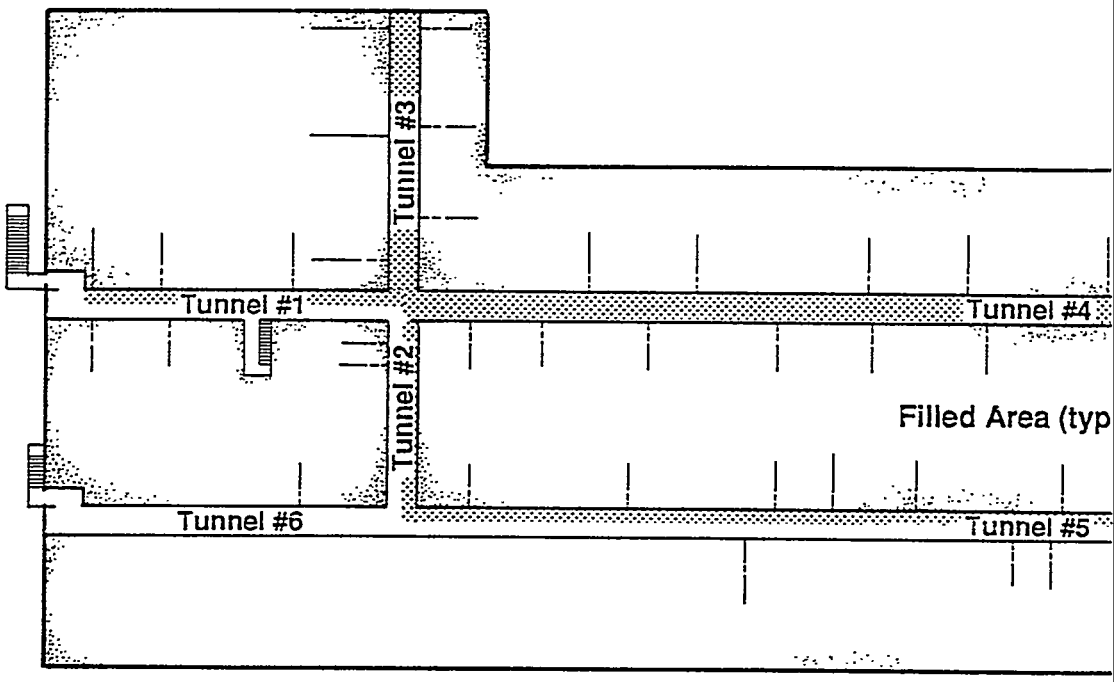

236-Z Building
Fourth Floor
Plan
236-Z Building
Fifth Floor Plan
242-Z

234-5
Roof Pl

Figure 4-2. Plutonium Finishing Plant Radiation Dose Levels. (sheet 5 of 5)



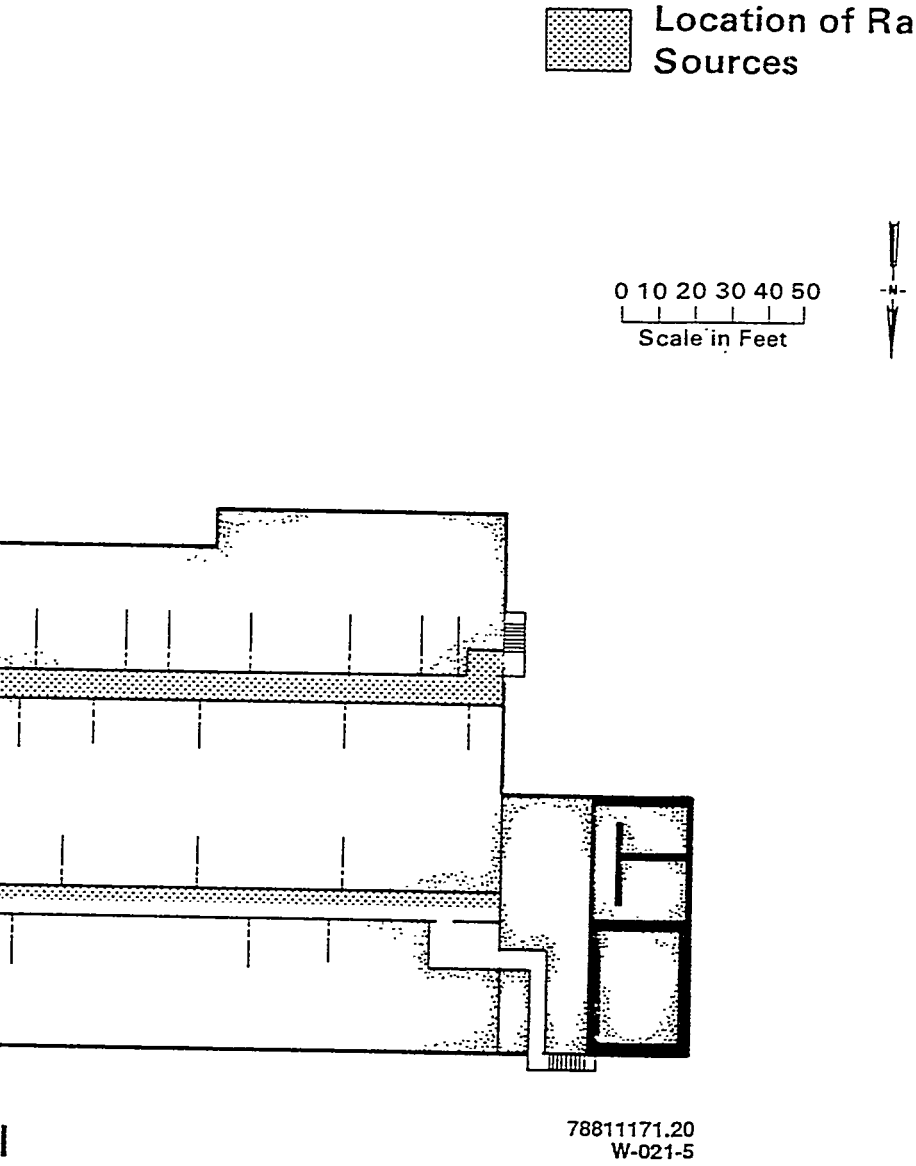


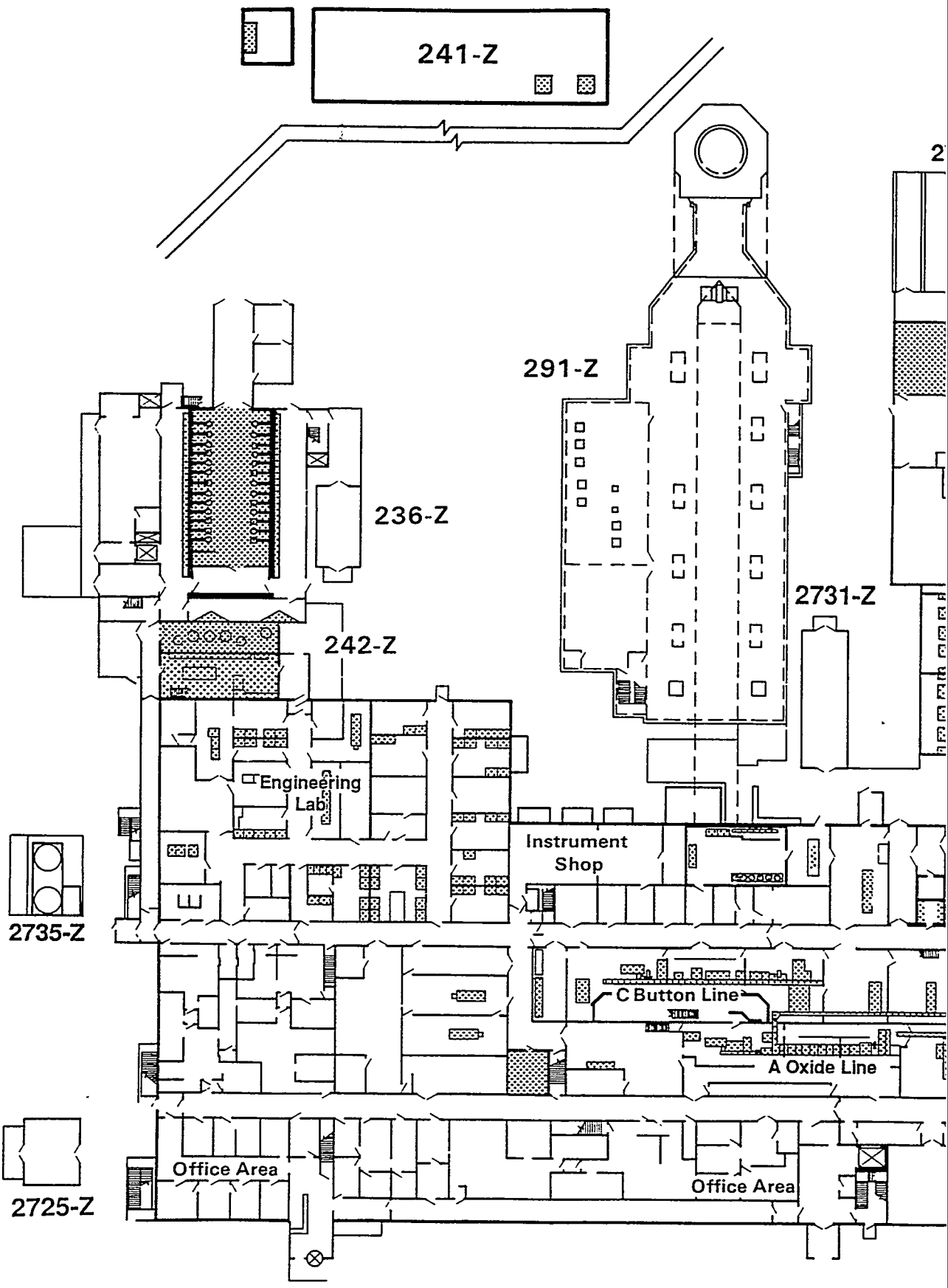


234-5Z

Foundation and Tunr

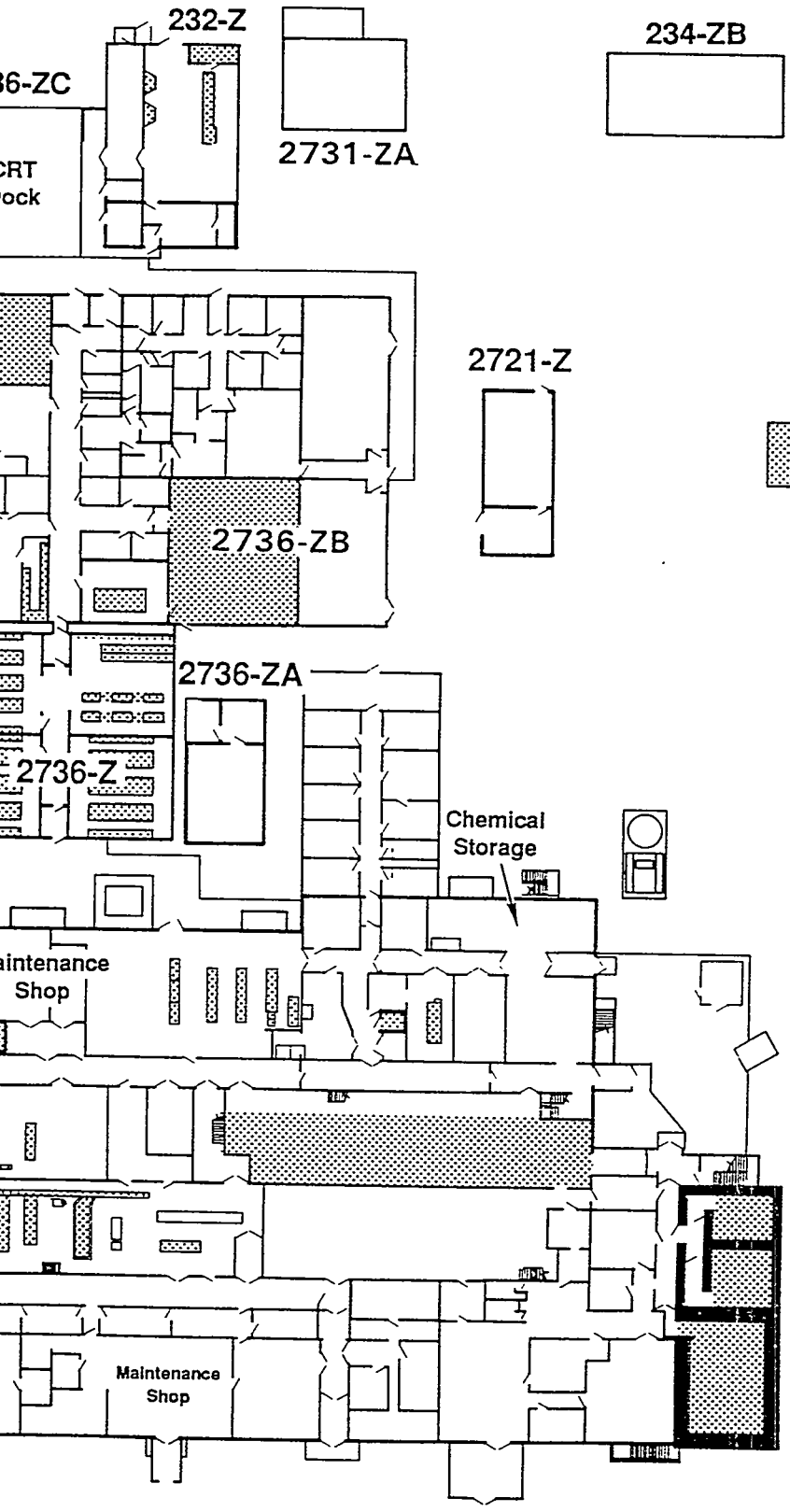
Figure 4-3. Location of Radiation Sources in the Plutonium Finishing Plant. (sheet 1 of 5)





234-5Z
First Floor

Figure 4-3. Location of Radiation Sources in the Plutonium Finishing Plant. (sheet 2 of 5)



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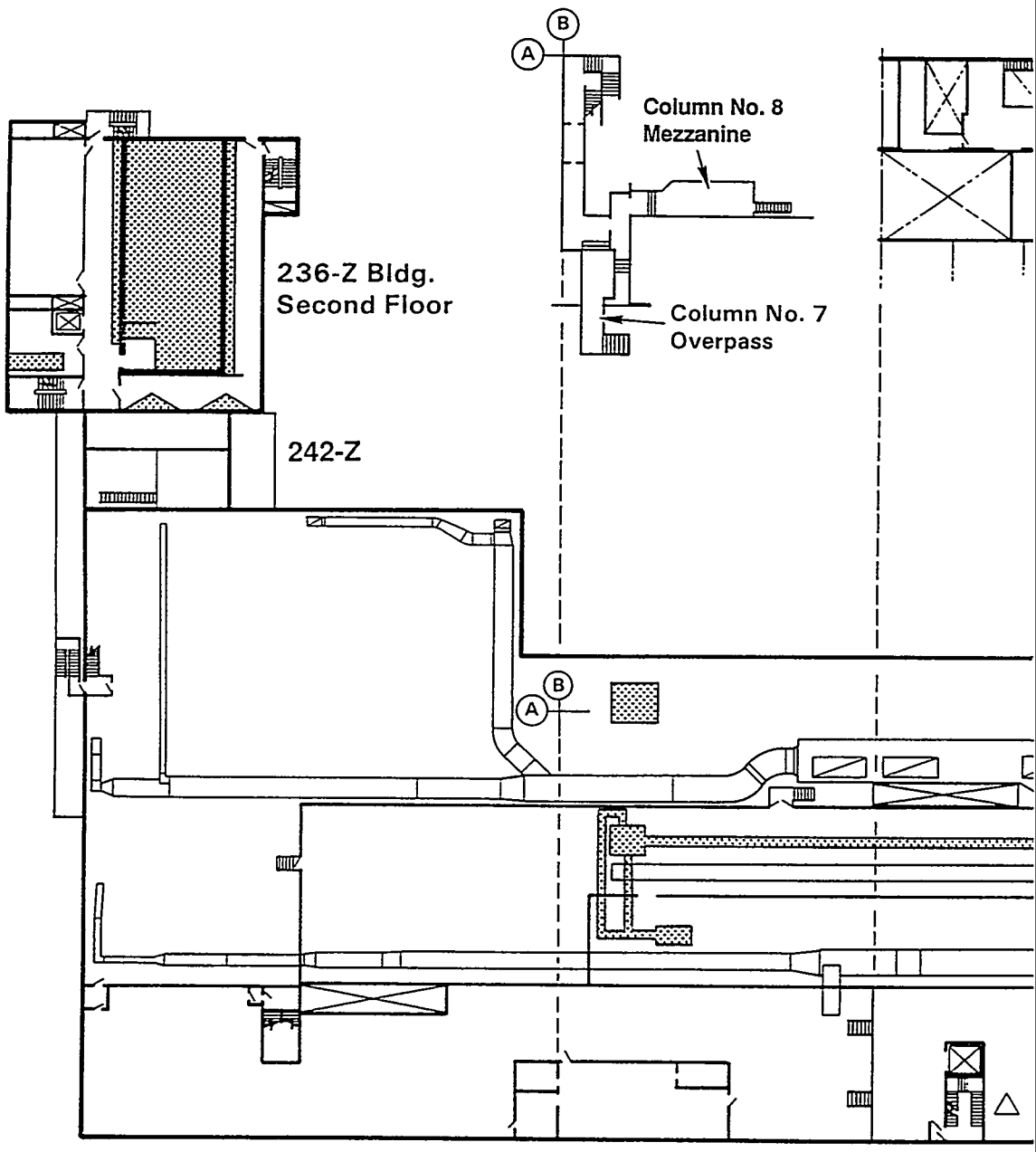
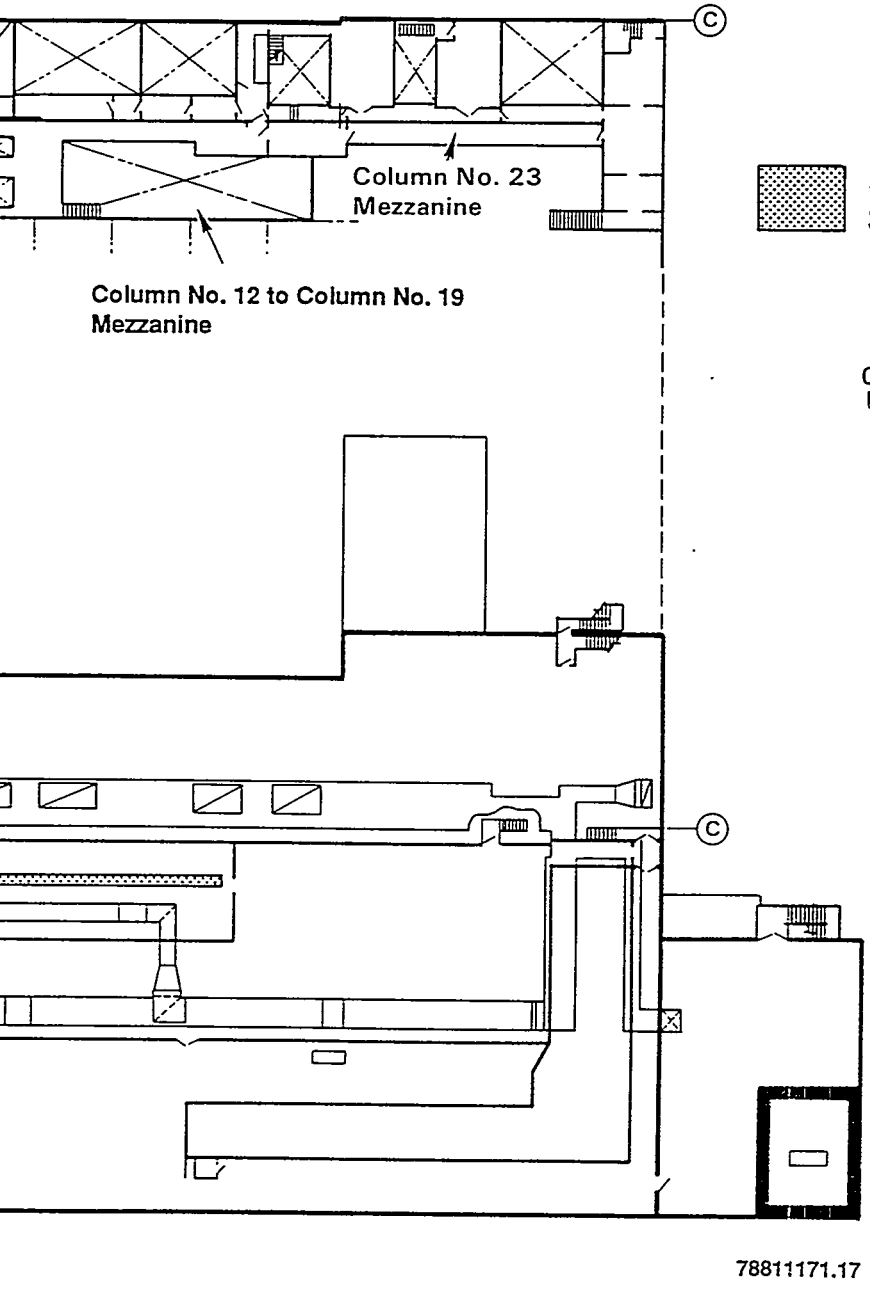


234-5Z
Duct Leve

Figure 4-3. Location of Radiation Sources in the Plutonium Finishing Plant. (sheet 3 of 5)

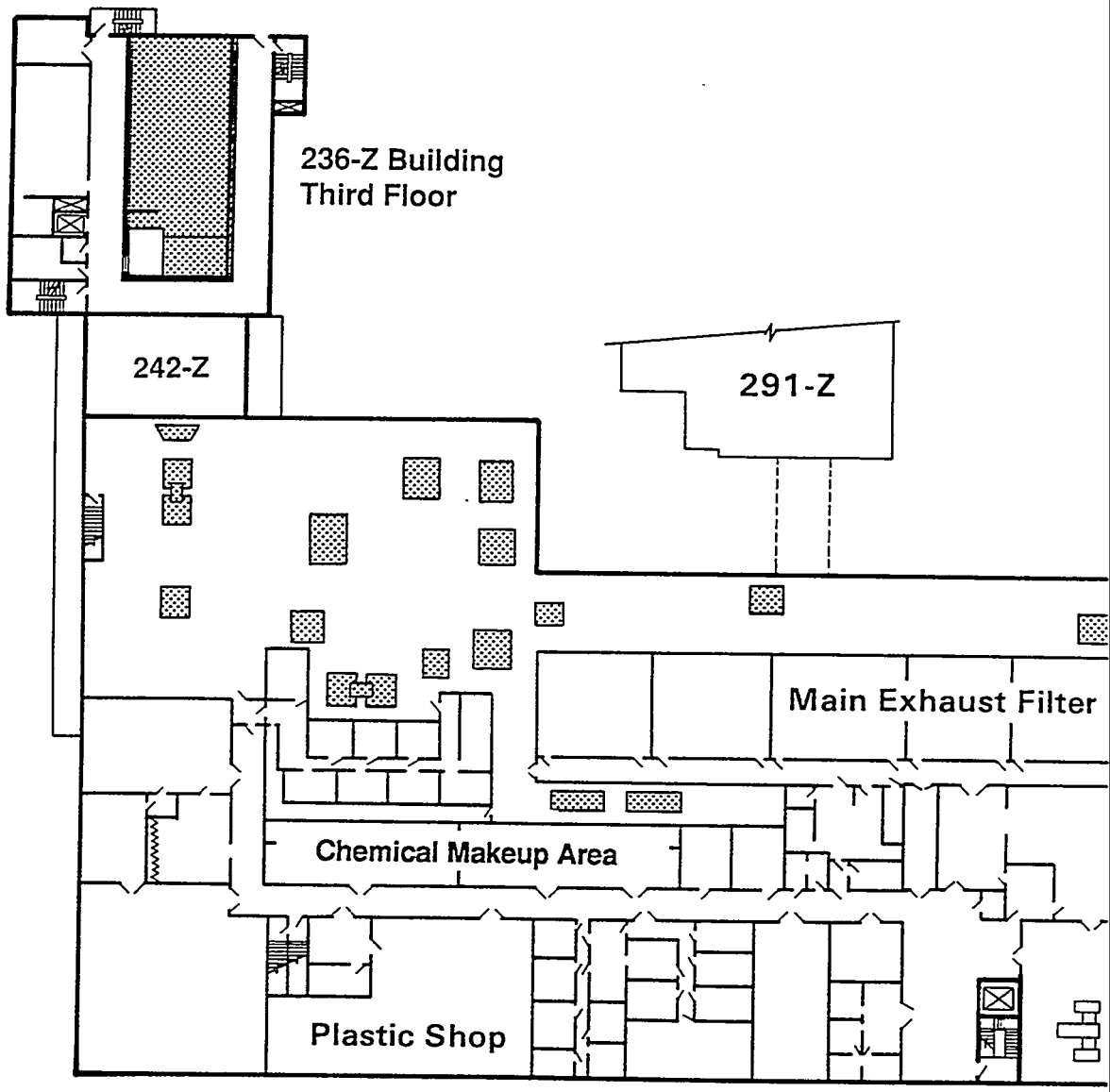


Location of Radiation Sources

0 10 20 30 40 50
Scale in Feet

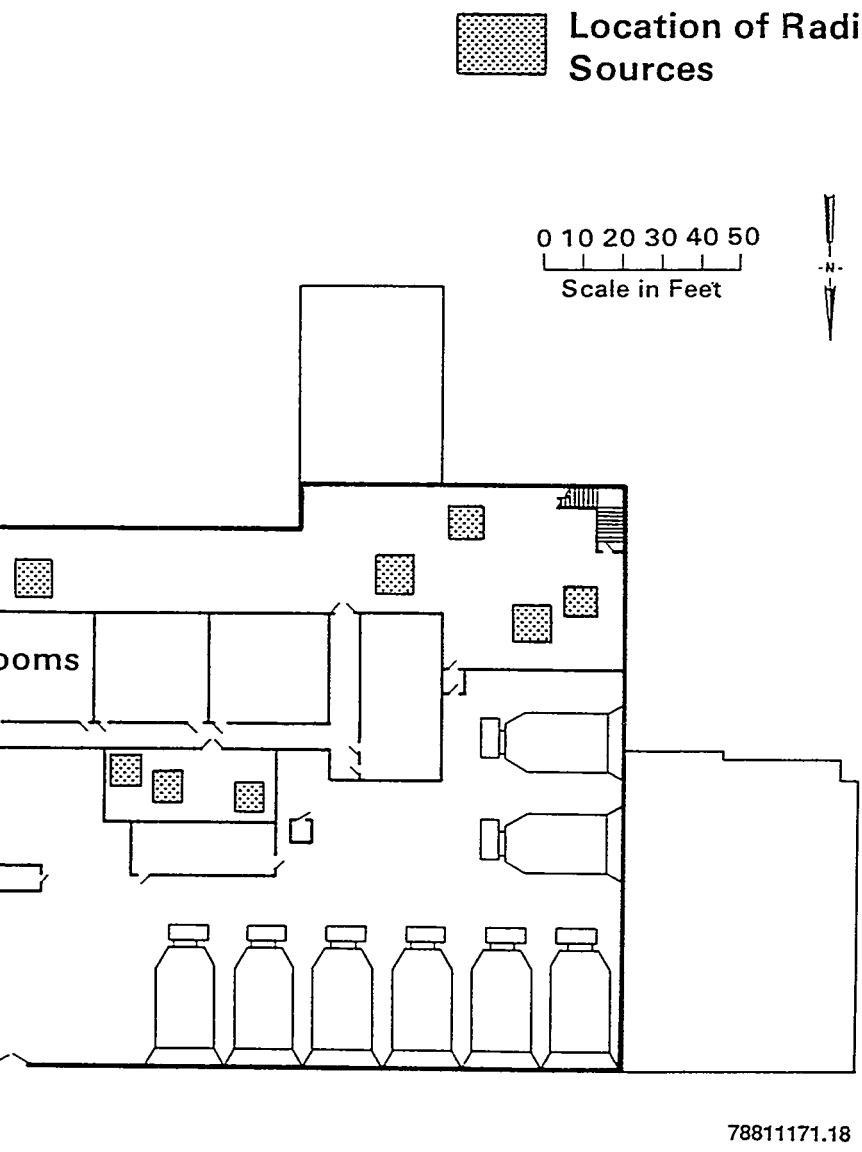
-N-

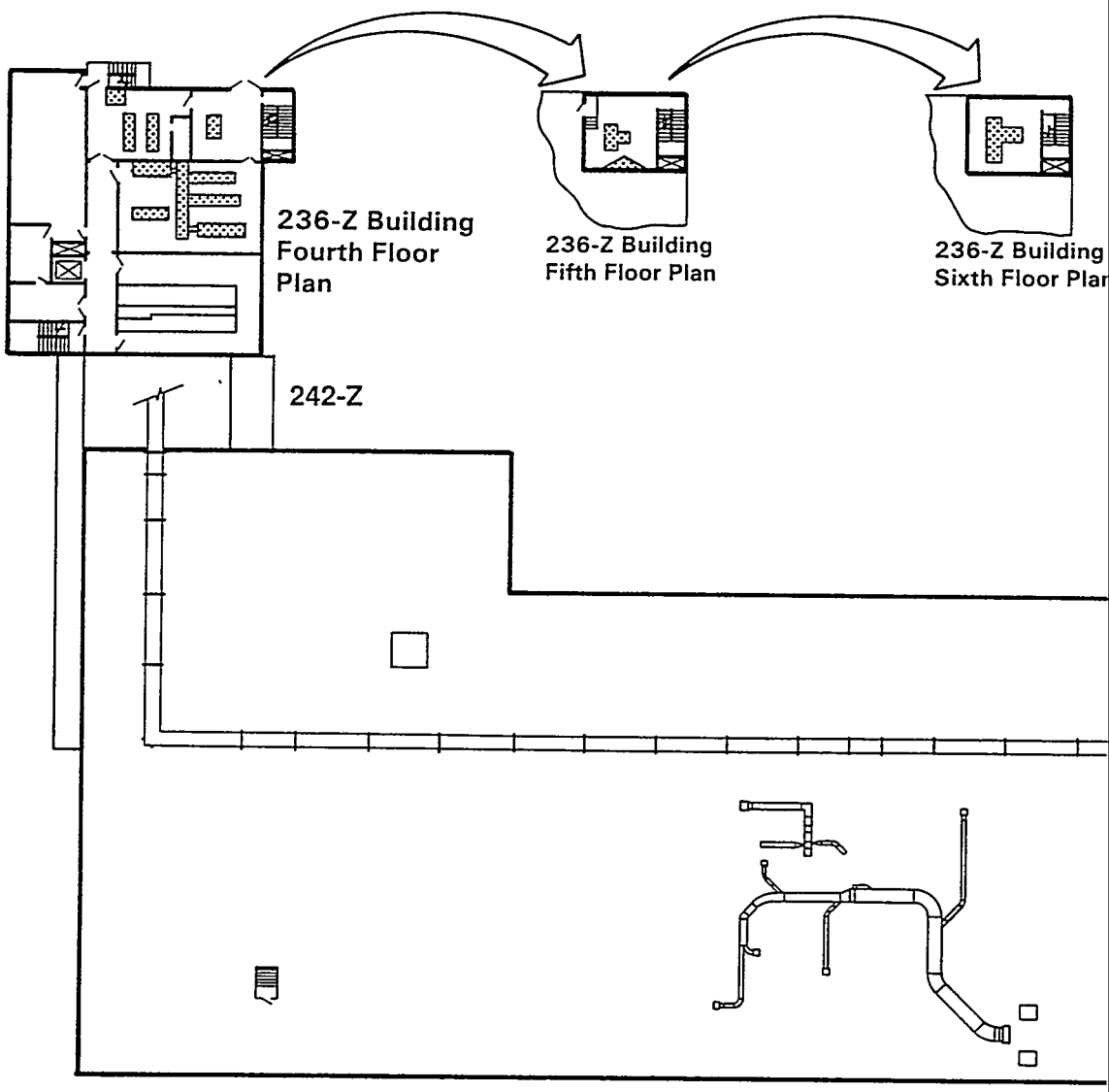
78811171.17



234-5Z
Second Floo

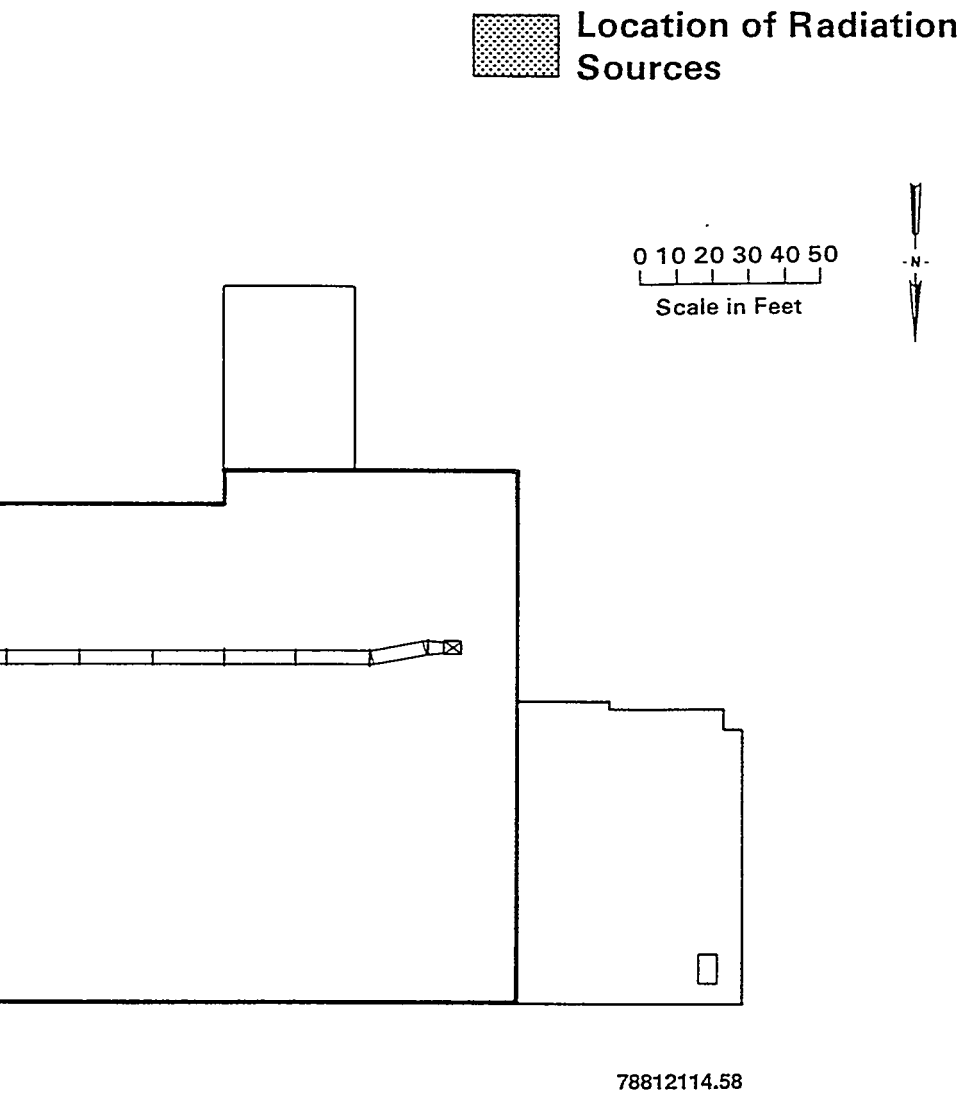
Figure 4-3. Location of Radiation Sources in the Plutonium Finishing Plant. (sheet 4 of 5)




236-Z Building
Fourth Floor
Plan
236-Z Building
Fifth Floor Plan
236-Z Building
Sixth Floor Plan
242-Z

234-5Z
Roof

Figure 4-3. Location of Radiation Sources in the Plutonium Finishing Plant. (sheet 5 of 5)



- The room has a glovebox located within it according to Figure 9.0.2-3 or 9.0.2-4 in WHC-SD-CP-SAR-021 (WHC 1991) (see Figure 4-4).

- The room is classified as a contamination control area according to Figure 8.3-11 in WHC-SD-CP-SAR-021 (WHC 1991) (see Figure 4-5).

- The room is posted as an airborne radioactivity area or a surface contamination area as of January 1994 (see Figure 4-6).

"Cold" process support areas are defined as rooms that are not "hot" process areas, yet any of the following conditions are met.

- The room is in a radiation area according to Figure 8.3-8 in WHC-SD-CP-SAR-021 (WHC 1991) (see Figure 4-1).

- The room has a normal dose level reading of greater than 0.5 mrem/h but less than 2.0 mrem/h according to Table 8.4-1 and Figure 8.3-17 in WHC-SD-CP-SAR-021 (WHC 1991) (see Figure 4-2).

- The room is classified as a controlled access area according to Figure 8.3-11 in WHC-SD-CP-SAR-021 (WHC 1991) (see Figure 4-5).

- The room is posted as a radiological control area as of January 1994 (see Figure 4-6).

NOTE: Uncontaminated areas are all other rooms and will not be considered during this study.

A spreadsheet was created to correlate relevant sources of information and classify the facility by contamination level: building by building, room by room. Sources included Table 8.4-1 and Figures 8.3-7, 8.3-8, 8.3-11, 8.3-17, and 9.0.2-3 from WHC-SD-CP-SAR-021 (WHC 1991) (included in this report as Table 4-1 and Figures 4-1 through 4-6), and the radiological posting for PFP as of January 1994. The classification used for this study is detailed in Table 4-2 and illustrated in Figure 4-7. Complete information used to compile this classification can be found in Appendix A.

Next, a document review was performed. By reviewing all of the Criticality Prevention Specifications for the PFP (WHC 1994a), relevant drawings were found for both "hot" process areas and "cold" process support areas. The reference criticality prevention specifications and relevant drawings were linked to the rooms in the spreadsheet (see Appendix A). From the documentation and drawing information available, a room by room list of contaminated solid waste items and their dimensions was prepared and entered into the spreadsheet, sorted into the following natural physical categories:

- Gloveboxes and hoods (i.e., tanks, process piping, manifolds, and other items contained by the gloveboxes).

- Tanks not in a glovebox (i.e., PRF canyon pencil tanks and columns, tanks in the chemical preparation area, 241-Z waste tanks, and the caustic storage tank).

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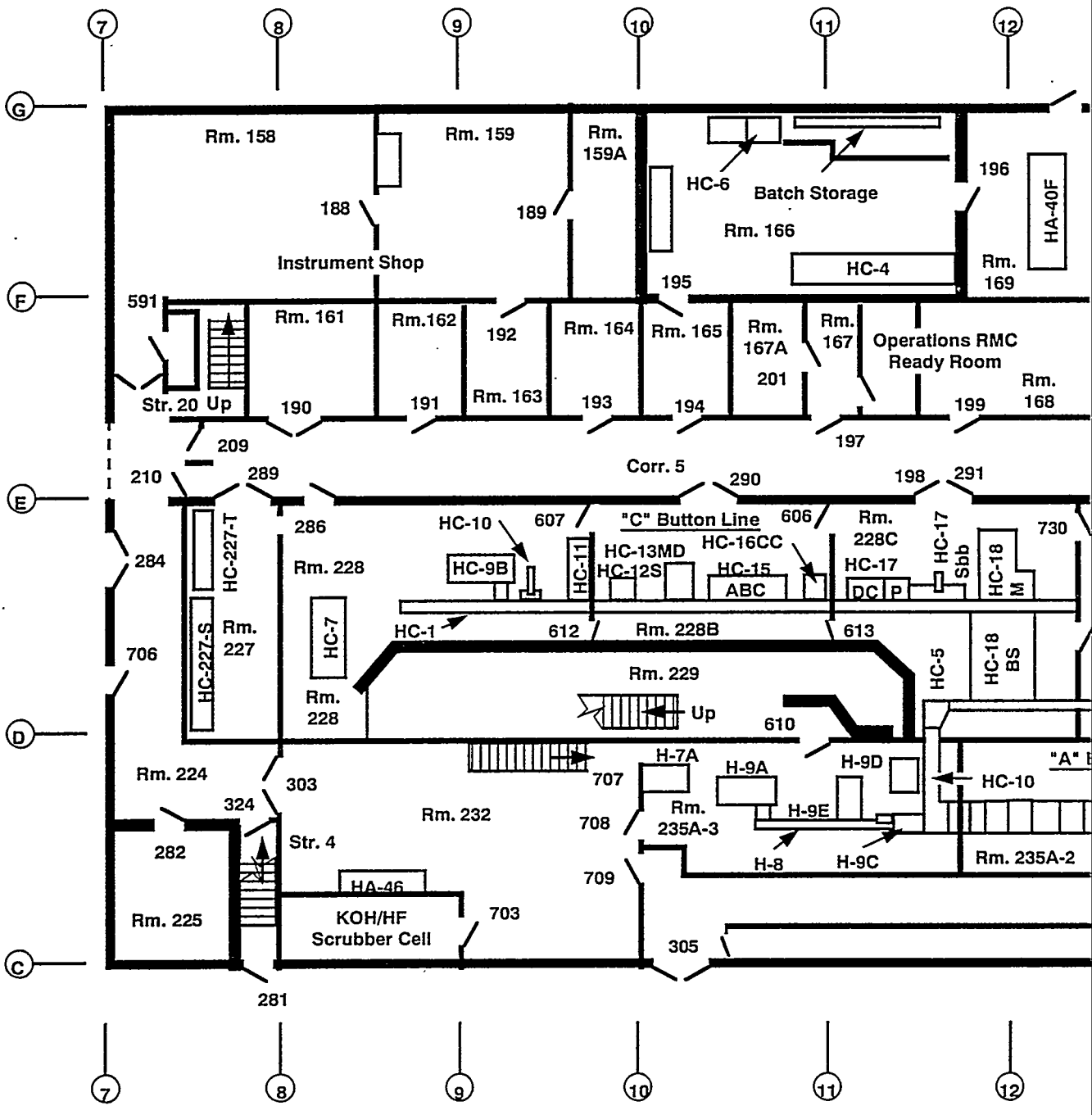
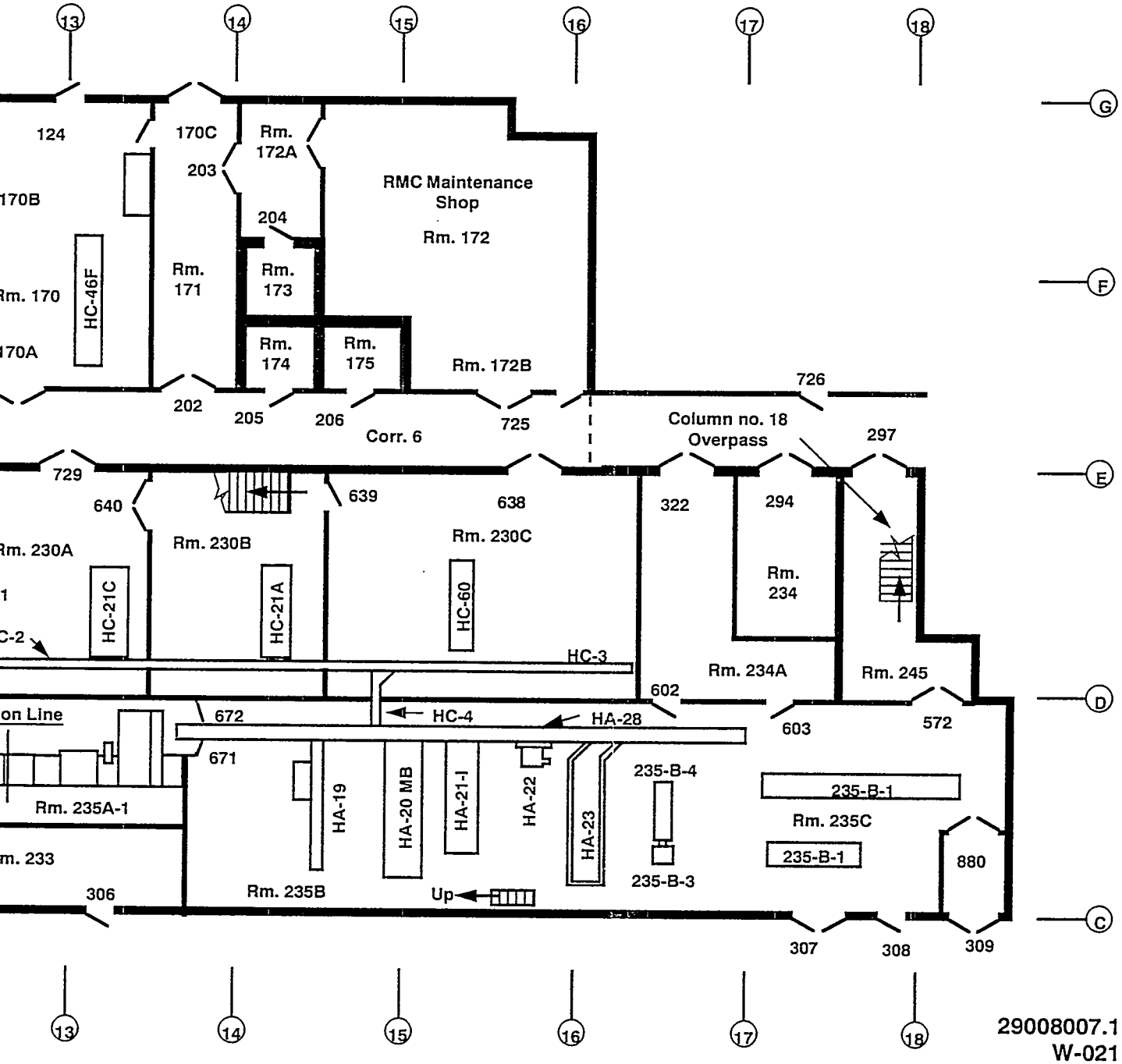
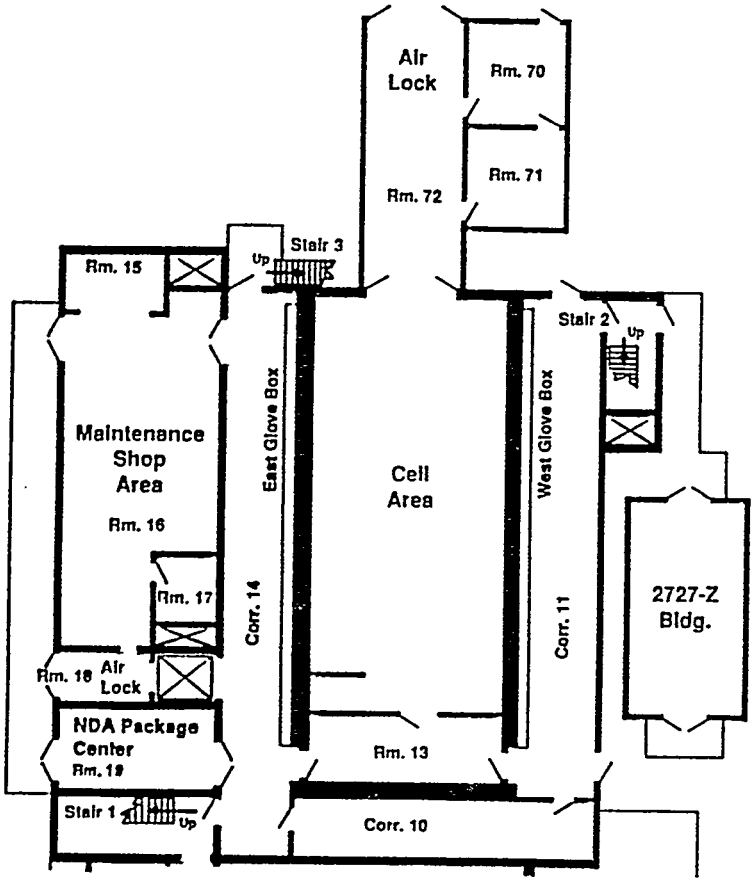

7
8
9
10
11
12
G
F
E
D
C
Rm. 158
Rm. 159
Rm. 159A
HC-6
Batch Storage
196
HA-40F
188
189
Rm. 166
Instrument Shop
HC-4
Rm. 169
195
591
Rm. 161
Rm.162
192
Rm. 164
Rm. 165
Rm. 167A
Rm. 167
Operations RMC Ready Room
201
Str. 20 Up
190
191
Rm. 163
193
194
199
Rm. 168
209
197
210
289
Corr. 5
290
198
291
286
HC-10
607
"C" Button Line
606
Rm. 228C
730
284
Rm. 228
HC-9B
HC-11
HC-13MD
HC-12S
HC-16CC
HC-15
ABC
HC-17
DC
P
HC-17 Sbb
HC-18 M
HC-227-T
HC-227-S
Rm. 227
HC-7
HC-1
612
Rm. 228B
613
706
Rm. 229
HC-5
HC-18 BS
Rm. 228
Up
610
H-7A
H-9A
H-9D
"A" E
Rm. 224
303
707
HC-10
324
Rm. 232
708
Rm. 235A-3
H-9E
282
Str. 4
H-8
H-9C
Rm. 235A-2
709
HA-46
Rm. 225
KOH/HF Scrubber Cell
703
305
281

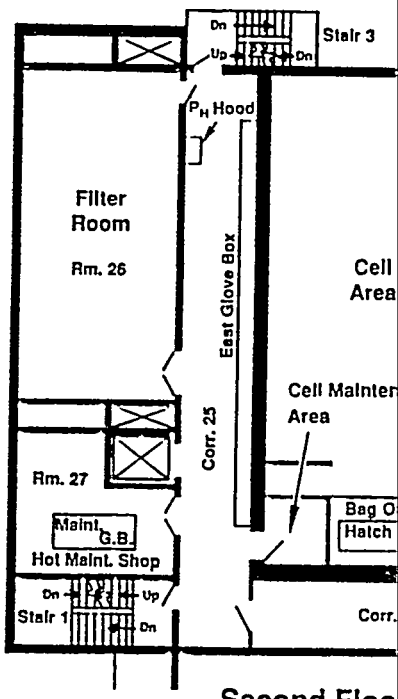
Figure 4-4. Location of Gloveboxes Within Buildings 234-5Z and 236-Z. (sheet 1 of 2)



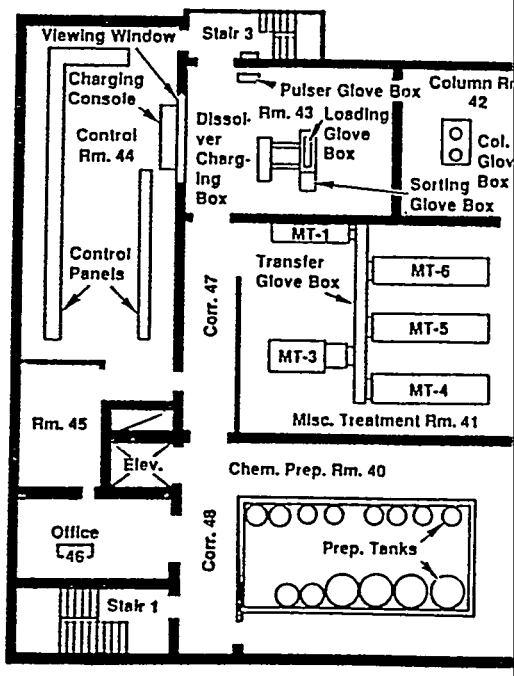
Building 236-Z Floor Plans



First Floor

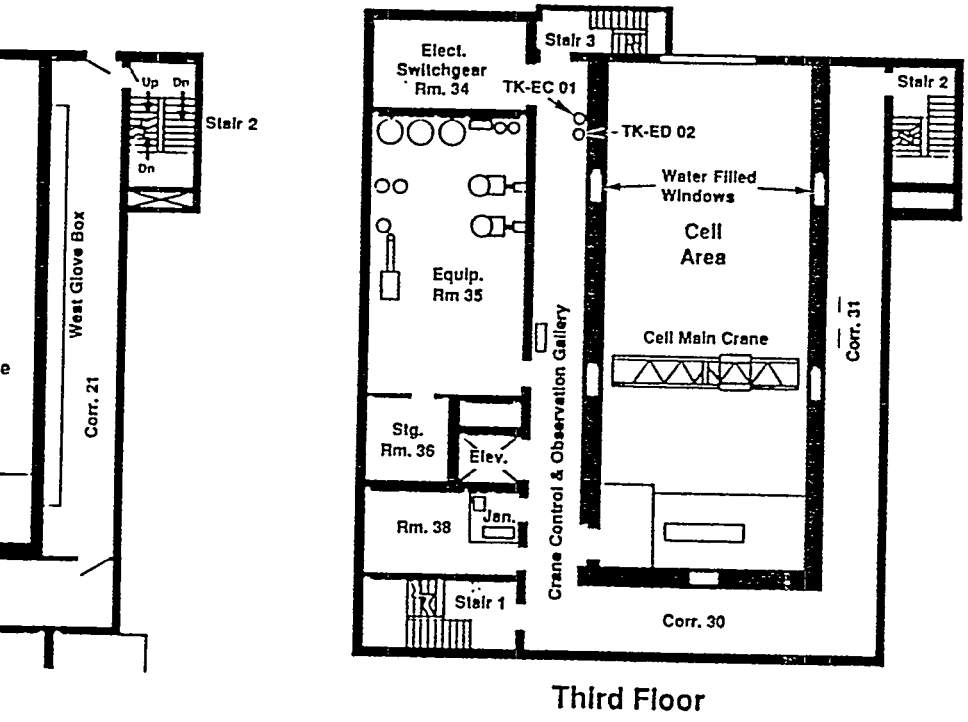


Second Floo

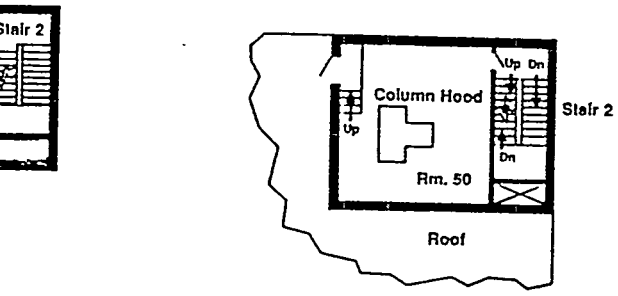


Fourth Floor

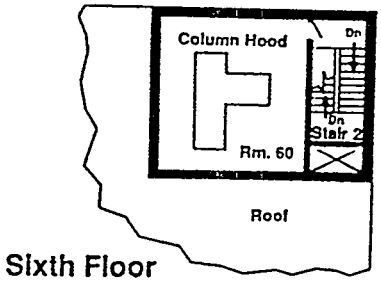
Figure 4-4. Location of Gloveboxes Within Buildings 234-5Z and 236-Z. (sheet 2 of 2)



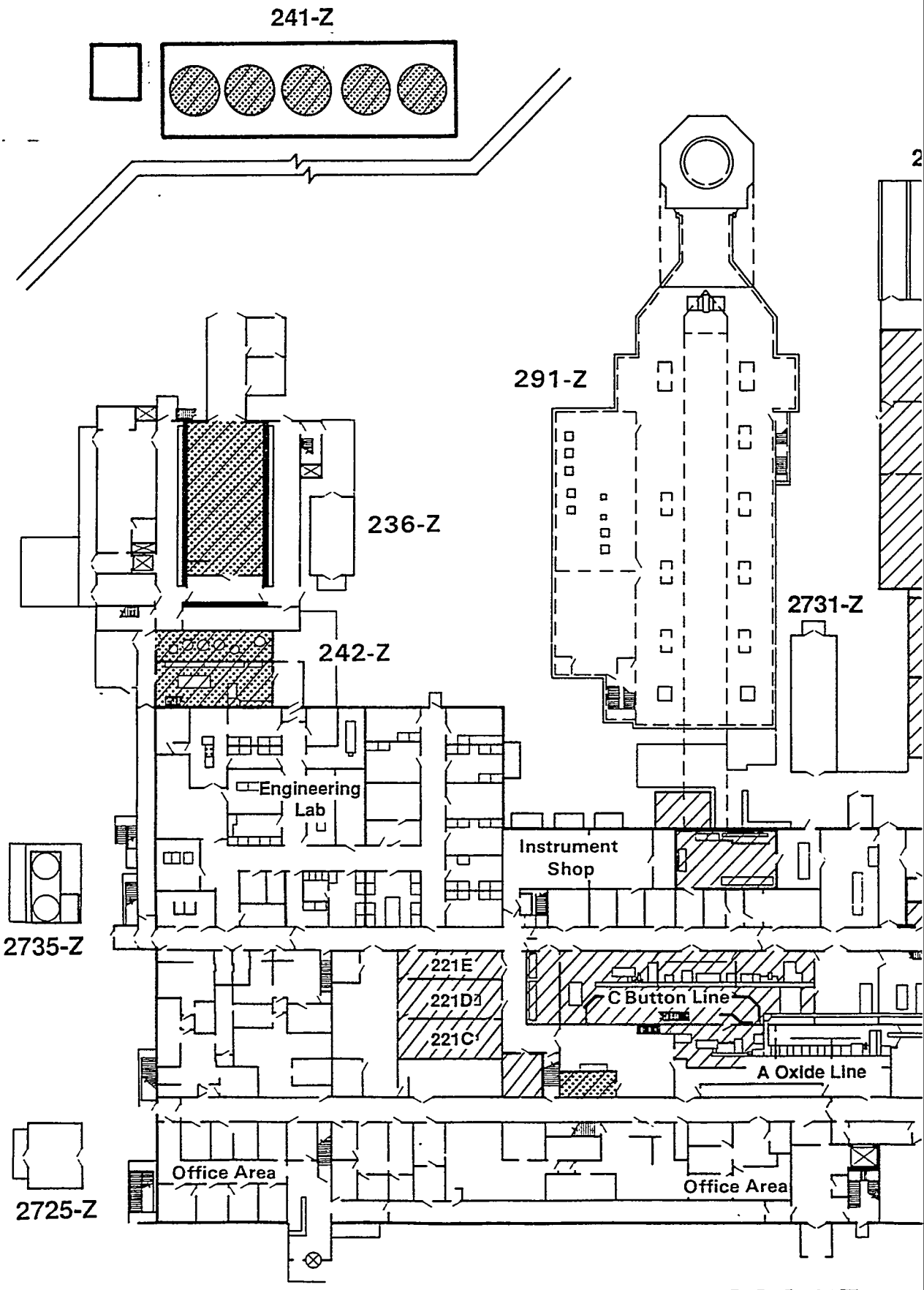
Third Floor



Fifth Floor

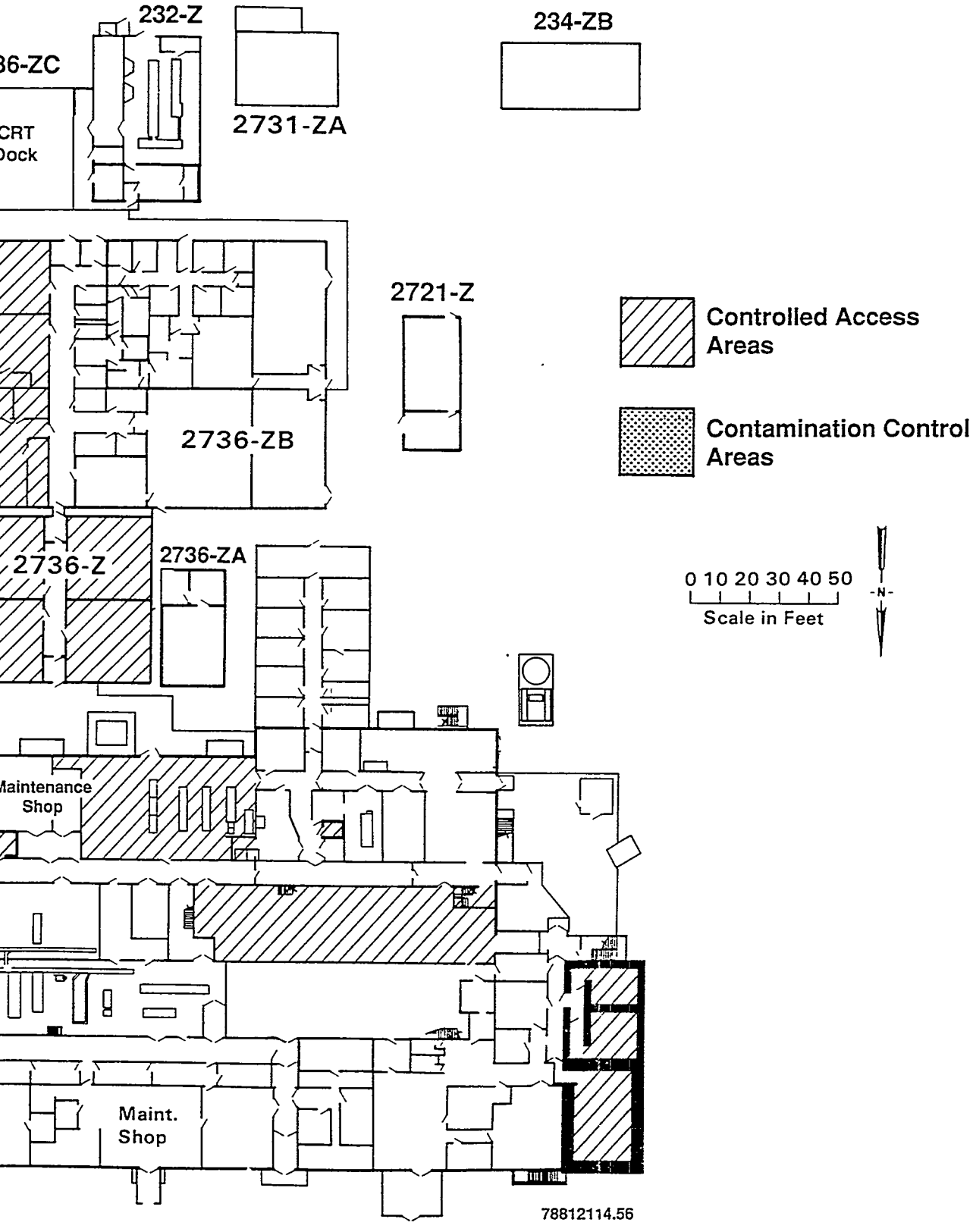


Sixth Floor



234-5Z
First Floor Plan

Figure 4-5. Radiologically Controlled Access Areas in the Plutonium Finishing Plant.



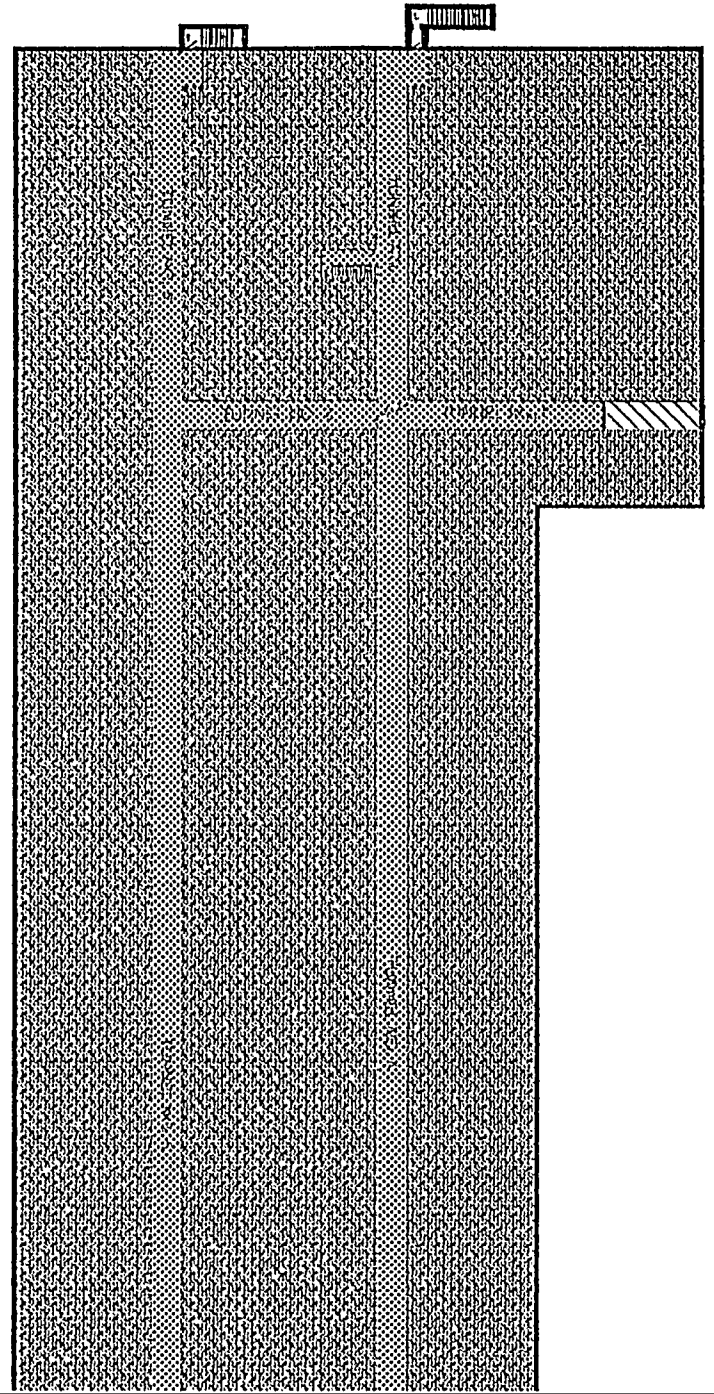
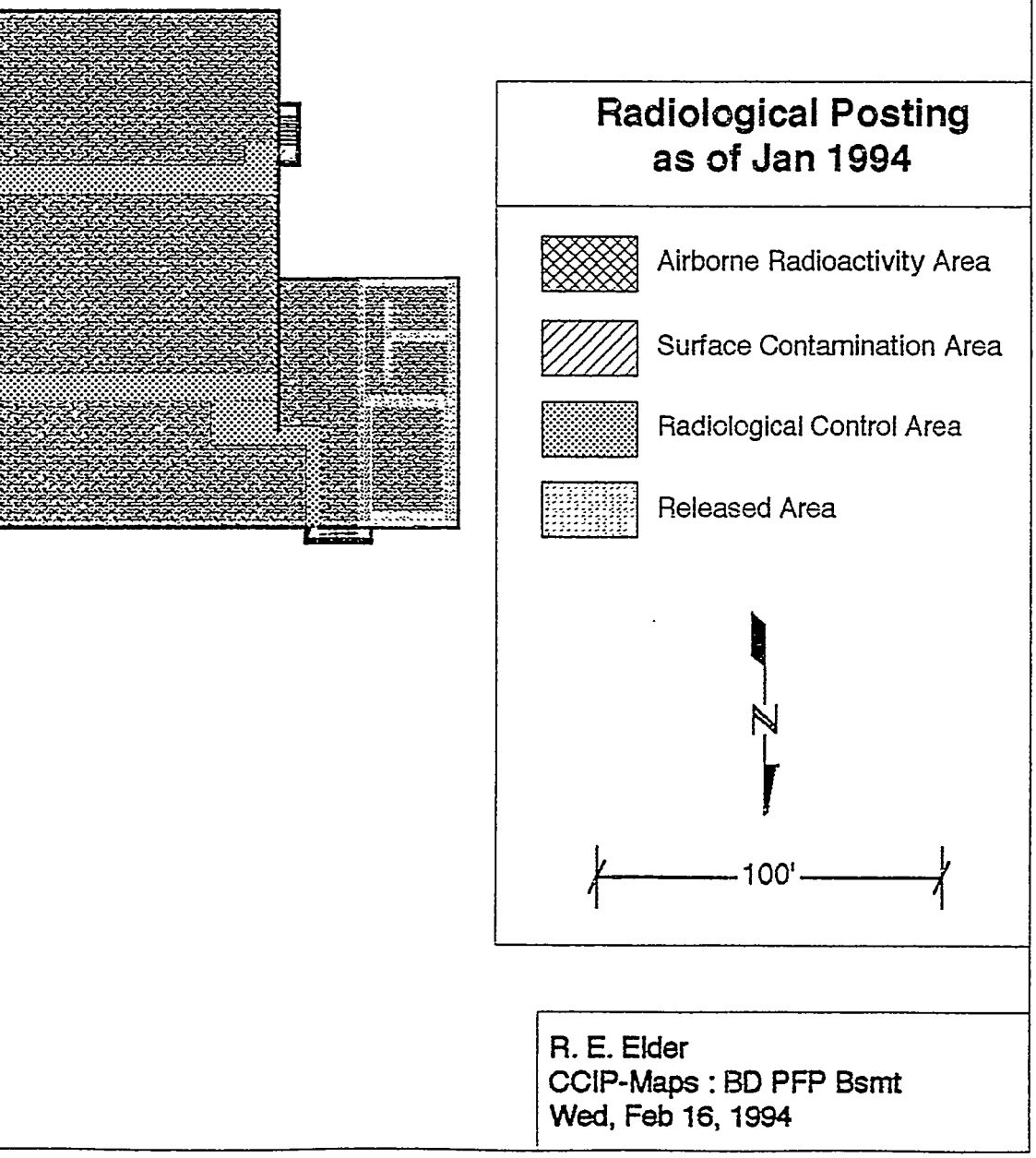
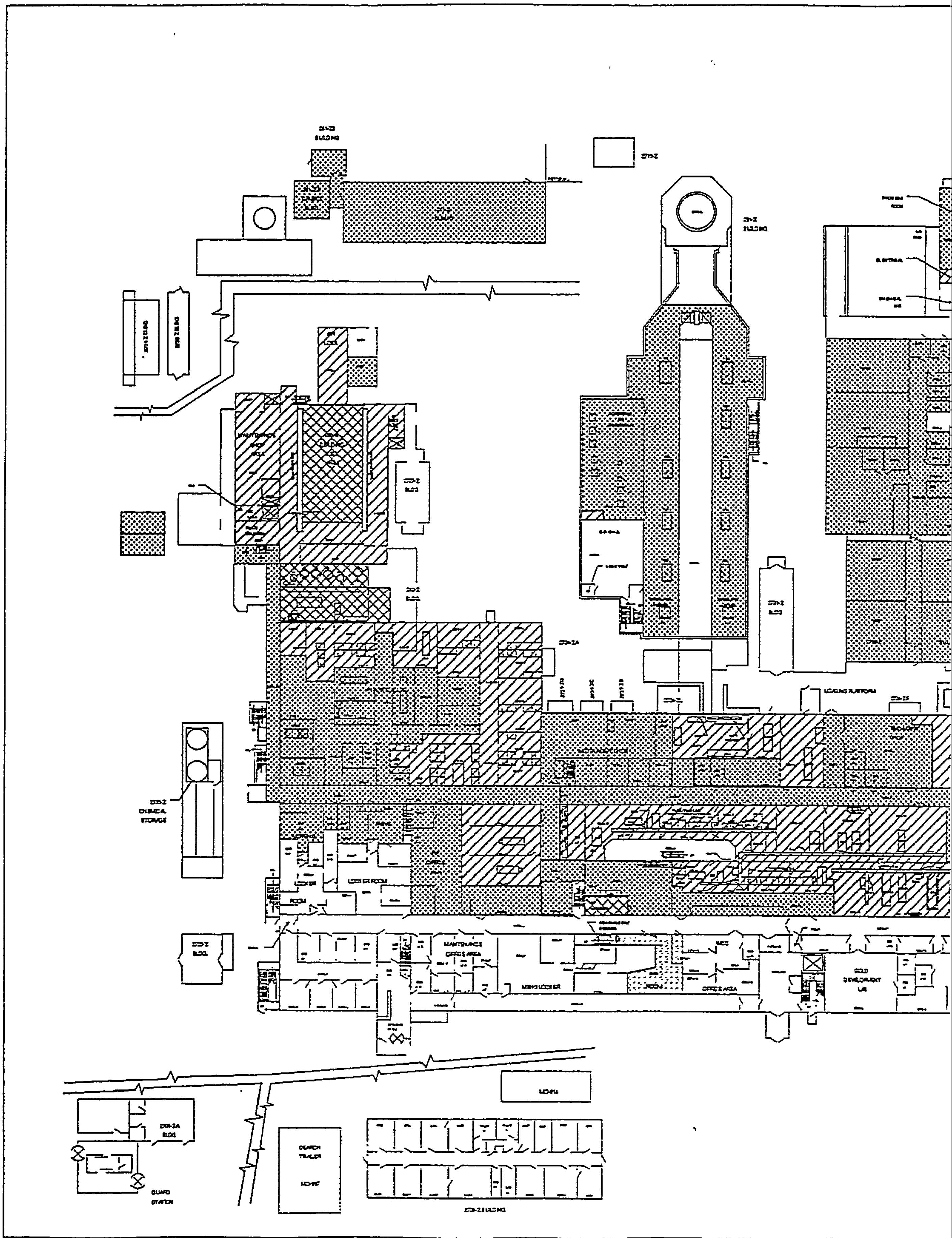


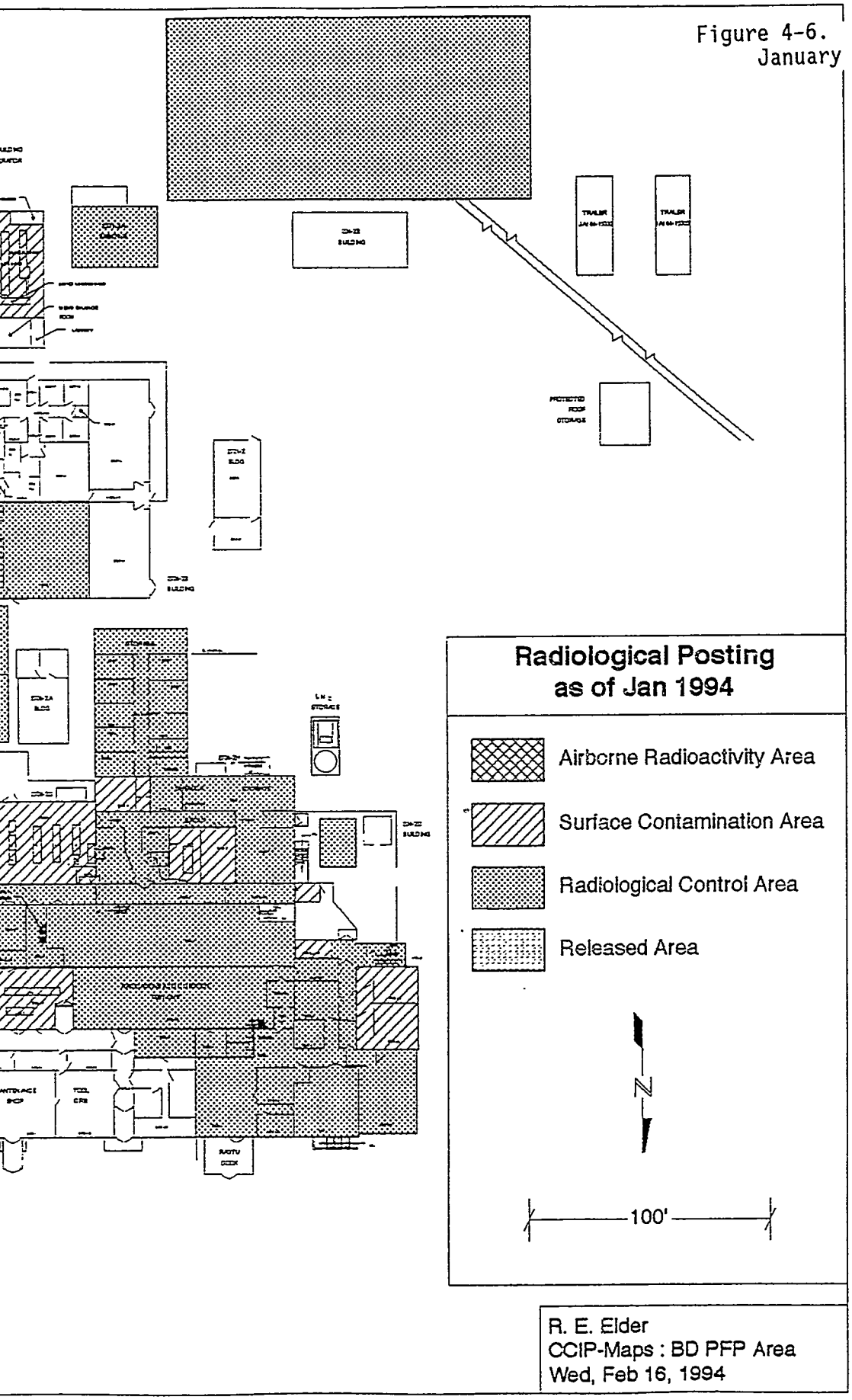
Figure 4-6. Radiological Posting as of January 1994. (sheet 1 of 5)





MAINTENANCE SHOP AREA
CHEMICAL STORAGE
LOCKER ROOM
MAINTENANCE OFFICE AREA
MEN'S LOCKER
OFFICE AREA
COLD DEVELOPMENT LAB
LOADING PLATFORM
SEARCH TRAILER
GUARD STATION

Figure 4-6. Radiological Posting as of January 1994. (sheet 2 of 5)



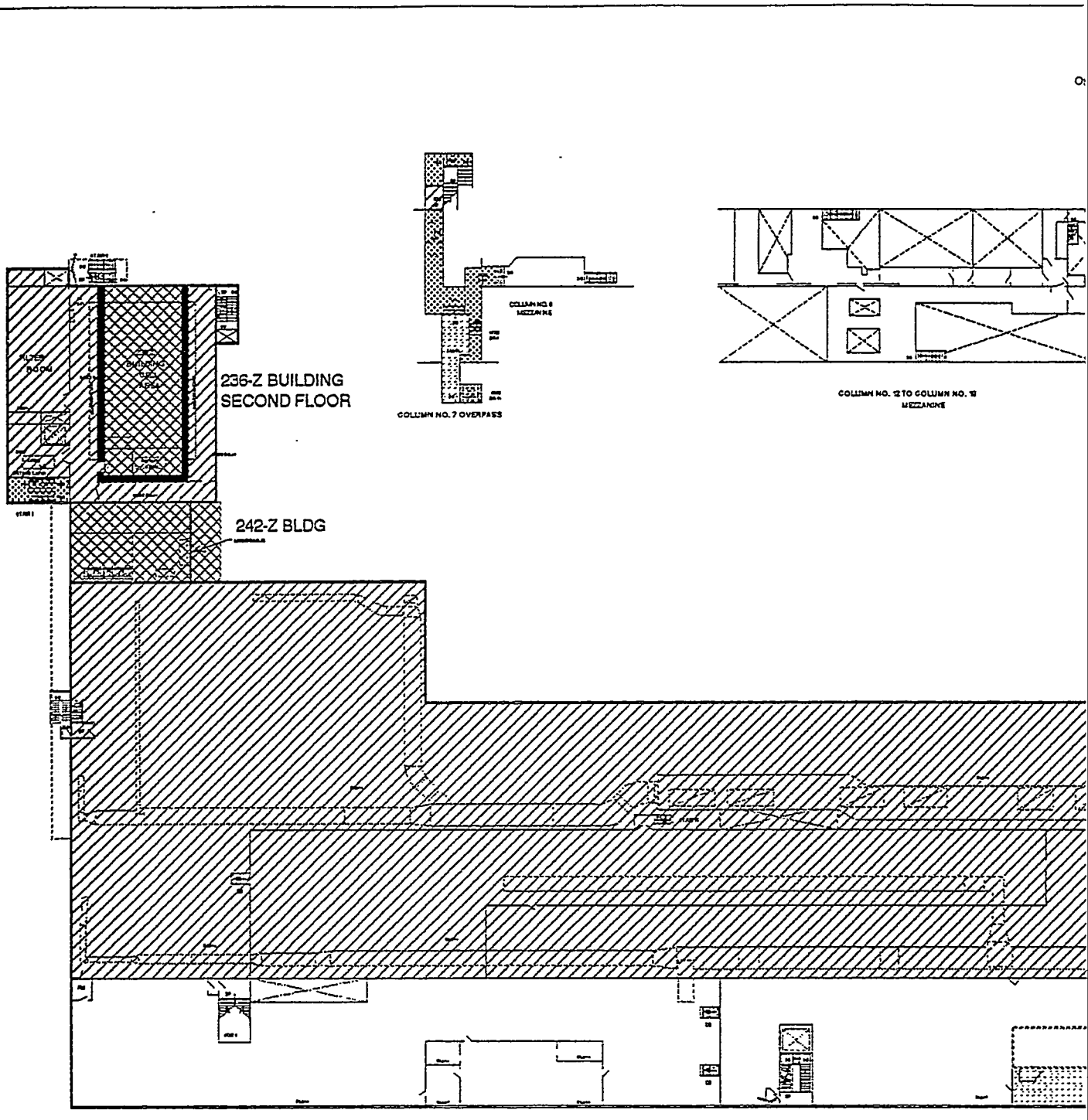
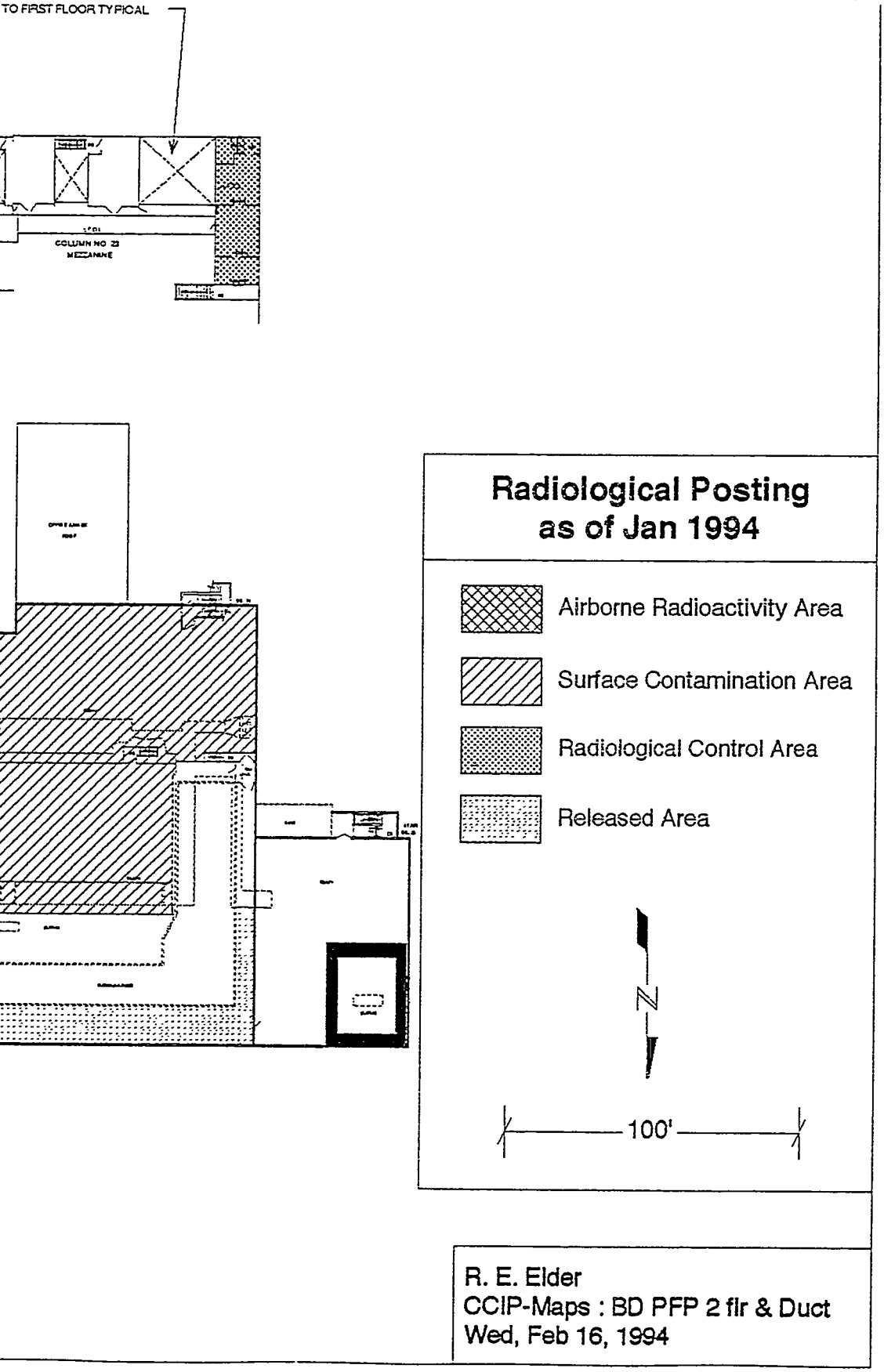

236-Z BUILDING
SECOND FLOOR
242-Z BLDG
COLUMN NO. 7 OVERPASS
COLUMN NO. 12 TO COLUMN NO. 13
MEZZANINE

Figure 4-6. Radiological Posting as of January 1994. (sheet 3 of 5)



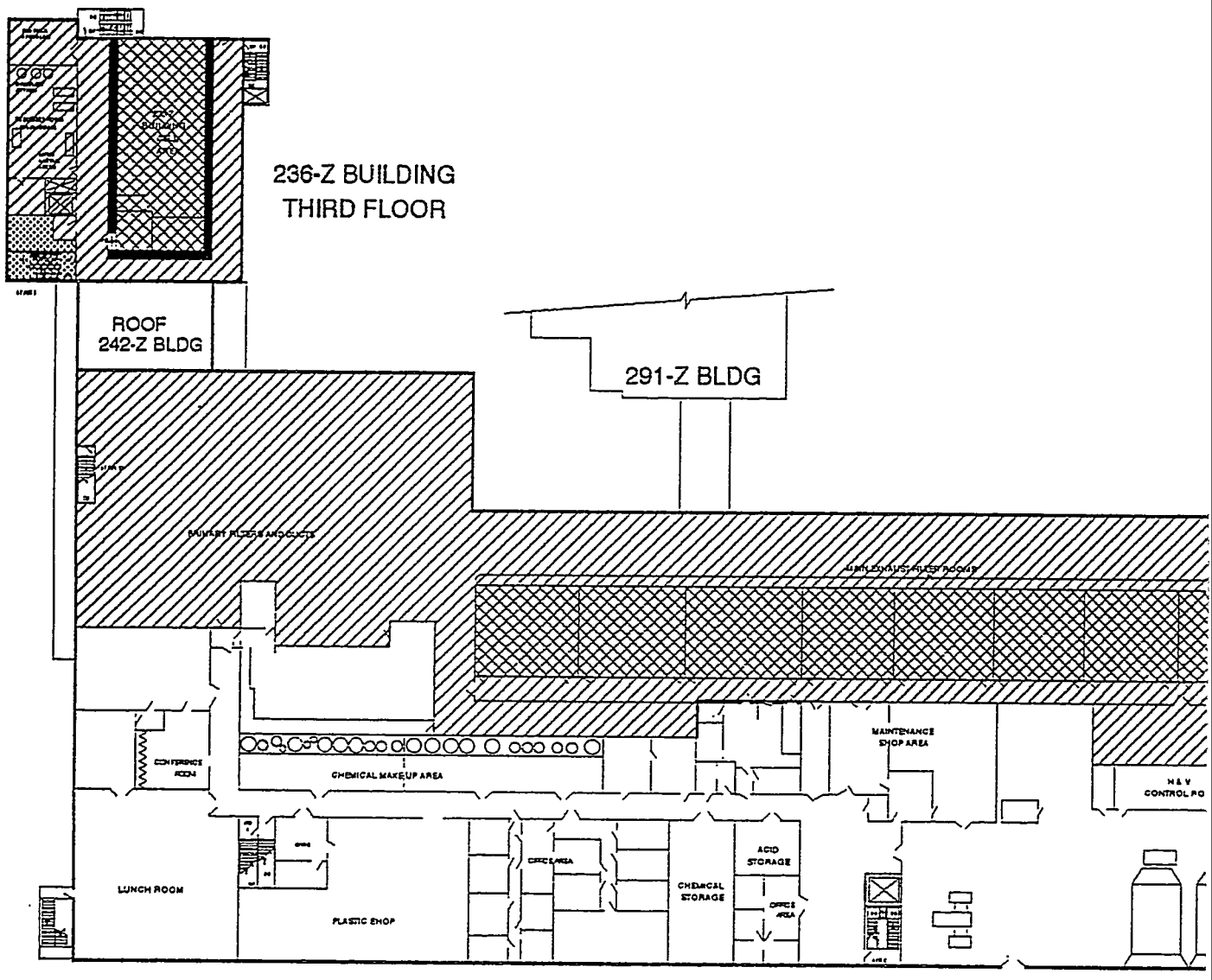
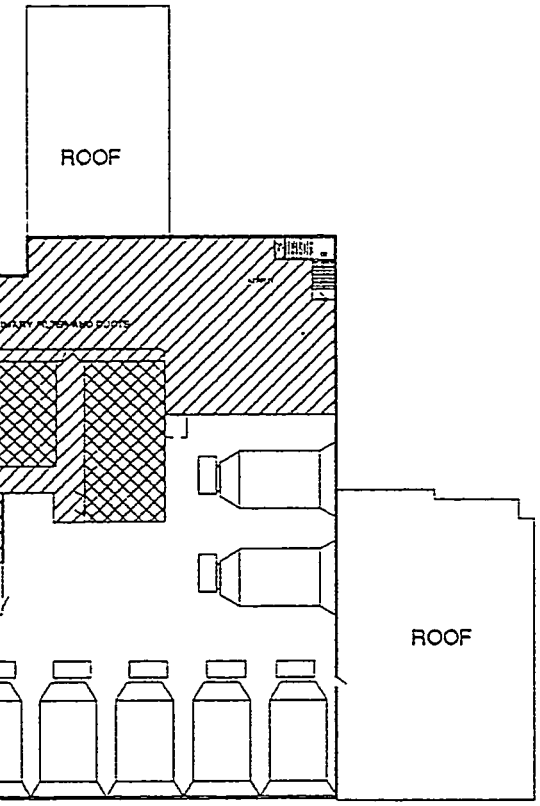

236-Z BUILDING
THIRD FLOOR
ROOF
242-Z BLDG
291-Z BLDG
CONFERENCE ROOM
CHEMICAL MAKEUP AREA
MAINTENANCE SHOP AREA
LUNCH ROOM
PLASTIC SHOP
CHEMICAL STORAGE
ACID STORAGE

Figure 4-6. Radiological Posting as of January 1994. (sheet 4 of 5)



Radiological Posting as of Jan 1994

- Airborne Radioactivity Area
- Surface Contamination Area
- Radiological Control Area
- Released Area

N

100'

R. E. Elder
CCIP-Maps : BD PFP 3rd flr
Wed, Feb 16, 1994

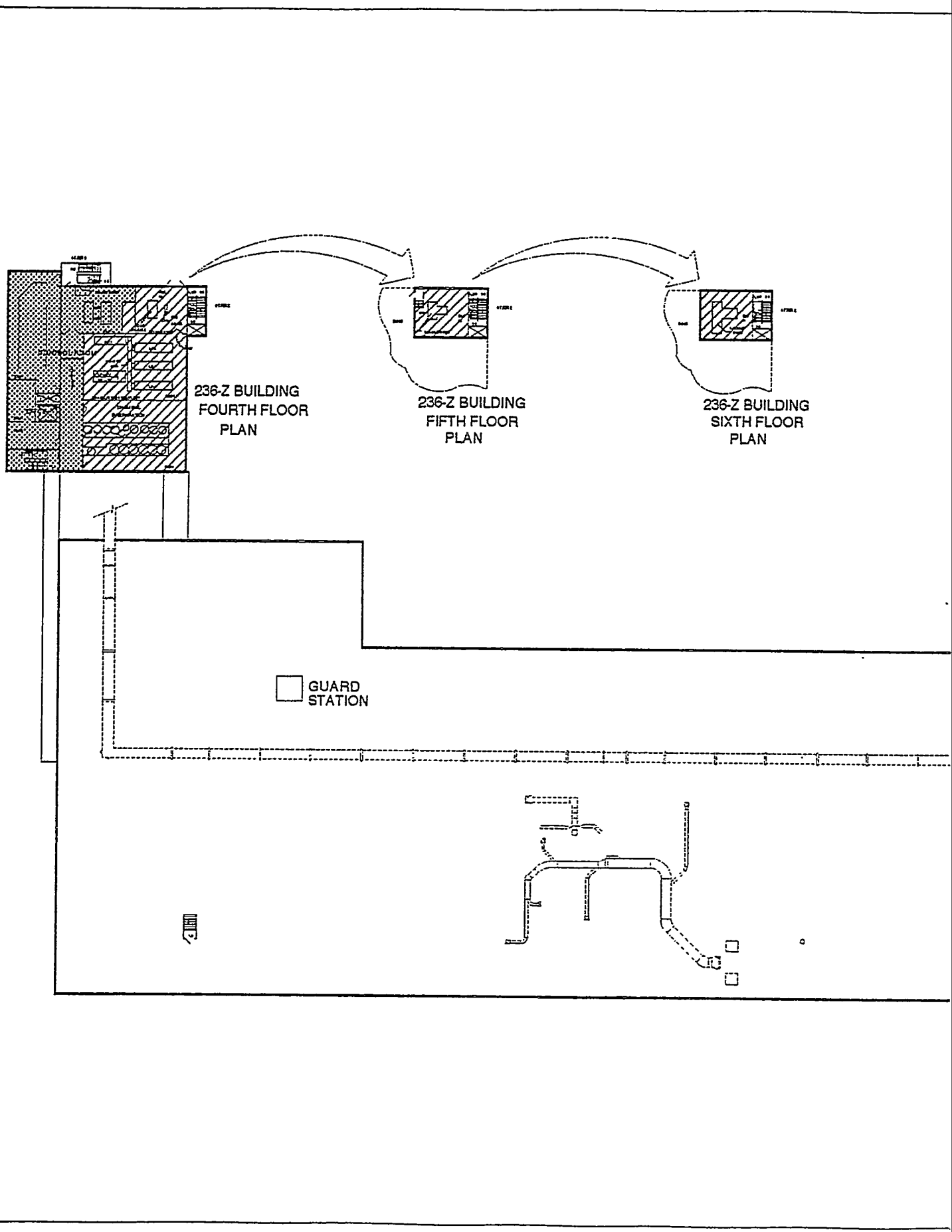

236-Z BUILDING
FOURTH FLOOR
PLAN
236-Z BUILDING
FIFTH FLOOR
PLAN
236-Z BUILDING
SIXTH FLOOR
PLAN
GUARD
STATION

Figure 4-6. Radiological Posting as of January 1994. (sheet 5 of 5)

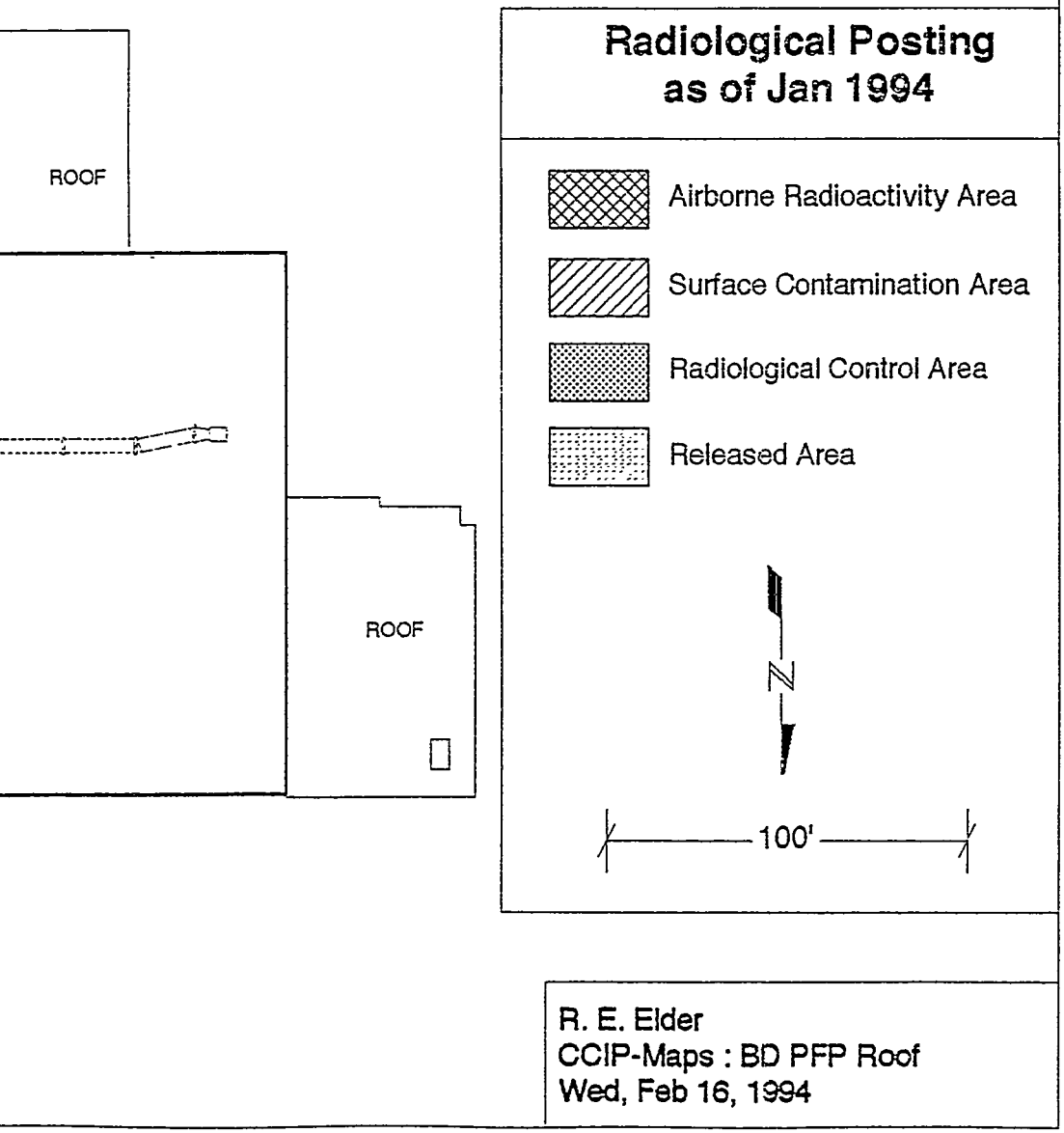


Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
232-Z	Bldg.	Incinerator (lay-away status)	H
	--	(Storage, laundry, used filters)	--
234-5Z	Bldg.	Plutonium conversion facility	H
	--	Air supple plenum chamber	N
	80	Storage	C
	81	Office	C
	82	Office	C
	83	Office	C
	84	Men's rest room	C
	85	Women's rest room	C
	86	Office	C
	87	Office	C
	88	Office	C
	89	Office	C
	90	Office	C
	92	Pipe chase	C
	100-108	Office area	N
	109	Airlock	N
	110	Women's locker room	N
	110-A	Women's laundry hampers	N
	110-B	Women's locker room	N
	111	Men's locker room	N
	112	Men's rest room	N
	113	Men's rest room	N
	114	--	N
	115	--	N
	116	Men's change room	N
	117	Men's laundry hampers	N
	117A	--	--
	120	Women's locker room	N
	121	Women's rest room	N
	122	--	N
	123	Women's shower room	N
	124	Women's change room	N
	126	Personnel decontamination facility	C
	131	Plutonium assay	H
	132	Mass spectrometry	C

Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
234-5Z (cont.)	133	Dark room	H
	134	Mass spectrometry	H
	135	Mass spectrometry	H
	136	Emission spectrometry	C
	137	Emission spectrometry	H
	139	PuO_2 sample storage	H
	140-A	Analytical support services	C
	140-B	Laboratory manager	C
	140-C	Laboratory staff chemist	C
	141	Nonradioactive solution preparation	H
	142	Miscellaneous storage	H
	143	Waste process	H
	144	Process support	H
	145	Physical test	C
	145-A	Stock room	C
	146	WIPP repackaging and sample analysis	H
	147	Waste packaging and analysis manager	H
	148	Sample analysis	H
	149	Sample dissolution	H
	150	Laboratory shift manager	C
	151	Miscellaneous counting room	C
	152	Waste concentrator	H
	153	Product specification analysis	H
	154	Product specification analysis	H
	155	Infrared spectrophotometer	H
	156	Slag and crucible analysis	H
	157	Product specification analysis	H
	158	Instrument shop	C
	158-A	Instrument shop	C
	159	Instrument shop	C
	159-A	Instrument shop	C
	161	RMC shift manager	C
	162	RMC shift manager	C
	163	Instruments manager	C
	164	RMC shift office	C
	165	Calcium storage	C
	166	RMC batch tanks	H

Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
234-5Z (cont.)	167	RMC operations storage	C
	168	RMC ready room/storage	C
	169	Ash stabilization	H
	170	Ash dissolution	H
	171	Corridor	C
	172	Maintenance shop (RMC)	C
	173	Maintenance shop	C
	174	SNM storage vault	H
	175	SNM storage vault	C
	176	Loading platform	N
	179	Process support laboratory	H
	180	Isotopic research	H
	182	Process support (microscope)	C
	183	Specialized processing	C
	185	Miscellaneous storage	C
	186	Storage	C
	187	Open-faced hoods	H
	188	Glovebox/chemical storage	H
	189	Equipment storage	C
	190	Radioactive material storage	H
	191	Product support cold laboratory	C
	192	Drum staging area	C
	192-A	SNM storage vault	H
	192-B	SNM storage vault	H
	192-C	SNM storage vault	H
	192-D	PR can storage	C
	192-S	Storage	C
	192-N	NDA storage	C
	193	Airlock	C
	194	Storage vault	N
	194-A	Material coordinators	N
	194-B	--	N
	195-M	--	N
	195-W	--	N
	196	Waste drum storage	C
	196-A	Tool crib	N
	197	Waste drum storage	C

Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
234-5Z (cont.)	197-A	Mixed waste drum storage	C
	198A	Tool crib	N
	198AL	Airlock	N
	199	Weld shop	N
	198	Maintenance shop	N
	200	Maintenance lockers	N
	200-A	Maintenance manager	N
	201	Plutonium process vault	N
	202	Plutonium process support lab	N
	205	--	N
	208	Work authorization system	N
	208-A	Planner/scheduler	N
	208-B	Planner/scheduler	N
	209	Planner/scheduler	N
	209-A	Planner/scheduler	N
	209-B	Planner/scheduler	N
	210	Men's change room hampers	N
	211	Men's change room	N
	212	Men's rest room	N
	212A	--	N
	213	Airlocks	N
	214	Men's showers	N
	215	Men's rest room	N
	216	Men's change room	N
	217	Analytical lab manager	N
	217-A	Maintenance office	N
	218-A	Maintenance office	N
	218-B	Maintenance office	N
	218-C	Maintenance office	N
	218-D	Maintenance office	N
	218-E	Maintenance office	N
	218-F	Maintenance office	N
	221-A	Health Physics office	C
	221-B	Sealer repair shop	C
	221-C	Radiochemical standards laboratory	H
	221-D	Radiochemical standards laboratory	H
	221-E	Radiochemical standards laboratory	H

Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
234-5Z (cont.)	221-F	Health Physics office	N
	221-G	Health Physics office	N
	224	Corridor	N
	225	Product handling vault	H
	227	Product load-in/load-out	H
	228-A	RMC production line	H
	228-A	RMC production line	--
	228-B	RMC production line	H
	228-C	RMC production line	H
	229	RMC control room	N
	230-A	RMC seal-out glovebox	H
	230-B	RMC recoverable powder glovebox	H
	230-C	Glovebox HC-60 hydrolysis	H
	231	--	C
	232	HF scrubber cell	H
	232A	HF scrubber	H
	233	RMA control room	C
	233A	Electrical Room	C
	234	Trash compactor	C
	234-A	NDA measurement of drums	C
	235	Airlock	C
	235-A1	RMA oxide line (inactive)	H
	235-A2	RMA oxide line (inactive)	H
	235-A3	RMA oxide line (inactive)	H
	235-B	Recoverable material stabilization	H
	235-C	Waste repackaging	H
	235-D	Waste drum storage/RADTU	H
	235-E	RADTU Filter room	H
	236	PR can storage vault	H
	236A	--	C
	236B	--	C
	236C	--	C
	237	--	C
	238	--	C
	239	--	C
	240	--	C
	241	--	C

Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
234-5Z (cont.)	242	Ready room shipping/receiving	C
	242A	Shift manager prod. handling	C
	242B	Shift supervisor prod. handling	C
	245	Corridor	C
	247	--	C
	248	--	C
	249	--	C
	Mezz	Mezzaninie columns 12-22	C
	250	Office/storage	N
	251A	Office/storage	N
	251B	Office/storage	N
	252	Office/storage	N
	253	Office/storage	N
	254	Office/storage	N
	255	Janitors room	N
	260	Duct level	N
	260A	Airlock	N
	261	Storage	N
	262	Duct level	H
	263	Duct level	H
	264	Duct level	H
	265	Duct level	N
	266	Electrical room	N
	267	Telephone switchgear room	N
	268	Storage room	N
	269	Battery storage	N
	270	Duct level	C
	270A	Airlock	N
	271	--	C
	272	Duct level	C
	300	Foyer	N
	301	Maintenance engineers	N
	301-A	Process engineers	N
	301-B	Staff assistant	N
	301-C	Process engineer	N
	301-D	--	N
	302	Chemical storage	N

Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
234-5Z (cont.)	303	Process engineer	N
	303-A	Process engineer	N
	303-B	Process engineer	N
	303-C	Process engineer	N
	303-D	Repository	N
	303-E	Process engineer	N
	303-F	Envir. and effluents engineering manager	N
	303-G	Process engineers	N
	303-H	Process engineers	N
	303-J	Process engineers	N
	303-K	Secretary (engineering)	N
	303-L	Process support manager	N
	303-M	Process control manager	N
	304	Plastic shop	N
	304-A	Store room office	N
	304-B	Property specialist	N
	305	Lunch room	N
	305A	--	N
	306	Conference room	N
	306-A	Computer room	N
	307	Airlock	N
	308	Duct level	H
	309	E-4 filter room	H
	310	E-4 filter room	H
	311	E-3 filter room	H
	312	E-3 filter room	H
	313	E-3 filter room	H
	314	E-3 filter room	H
	315	E-3 filter room	H
	316	E-3 filter room	H
	318	E-3 filter room	H
	319	Supply fans	C
	320	Filterboxes	H
	321	Steam supply	N
	321-A	Power control room	C
	321-B	Power manager	N
	321-C	Change room	N

Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
234-5Z (cont.)	322	Electrical shop	N
	323	Electrical manager	N
	324	Janitor closet	N
	325	Process engineer	N
	326	Airlock passageway	N
	327	Hamper room	N
	328	Men's change room	N
	329	Men's toilet	N
	330	Men's shower	N
	331	Men's locker room	N
	332	Men's locker room entry	N
	333	Men's toilet	N
	333-A	Women's toilet	N
	334	Calcium storage	N
	335	Calcium storage	N
	336	Chemical makeup	N
	337	Chemical makeup	N
	338	Wet chemical storage	N
	339	Men's Shower	N
	340	Instrument shop	N
	341	IRM/SSDM manager	N
	342	Maintenance engineer	N
	343	Maintenance engineer	N
	344	Hallway	N
	344-A	Radiation engineer	N
	345	Activity engineer	N
	346	Administrative specialist	N
	347	IRM/SSDM engineer	N
	348	IRM/SSDM engineer	N
	349	--	N
	350	--	N
	351	Entrance to computer room	N
	390	Airlock	N
	682	Airlock	C
	878AL	Airlock	N
	879AL	Airlock	N

Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
234-5ZA	701	Men's change room	N
	702	--	N
	703	--	N
	704	--	N
	705	--	N
	706	--	N
	707	--	N
	708	Storage	N
	709	Corridor	N
	710	Storage	N
	711	Storage	N
	712	--	N
	713	Fire sprinkler riser room	N
	714	Computer room	N
	715	Health Physics technician WRAM station	N
	716	RWP posting area	N
	717	Self survey station	N
	718	Locker room/lobby	N
	719	Lobby	N
	720	RCA entrance/exit thoroughfare	N
	722	RCA exit security portal	N
	724	RCA exit security	N
	726	RCA entry portal	N
	728	Security check station	N
	730	Corridor	N
	731	Corridor	N
	732	--	N
	733	Corridor	N
	734	--	N
236-Z	10	Corridor	H
	11	Corridor	H
	12	Process cell	H
	12A	Mezzanine	H
	13	Corridor	H
	14	Corridor	H
	15	Welding shop	H
	16	Maintenance shop (PRF)	H

Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
236-Z (cont.)	17	Maintenance manager's office	H
	18	Elevator access/storage	H
	19	NDA counting room	H
	20	Corridor/filterboxes	H
	21	West corridor	H
	25	East corridor	H
	26	Filter room	H
	27	Maintenance glovebox	H
	28	Glovebox room	H
	30	Corridor	H
	31	West corridor	H
	33	East corridor	H
	34	Instrument shop	H
	35	Electrical room	H
	36	Compressor room	H
	37	Storage room	H
	38	Rest room	C
	40	Chemical preparation	H
	41	Miscellaneous treatment	H
	42	Column room	H
	43	Slag and crucible gloveboxes	H
	43A	--	C
	44	Column room	C
	45	Shift manager's office	C
	46	Shift engineer's office	C
	47	Corridor	C
	50	Column glovebox	H
	60	Column glovebox	H
	73	Mechanical Room	C
234-ZB	Bldg.	Miscellaneous storage for construction forces	N
234-ZC	Bldg.	Used for loading dock for waste drums and SNM containers	C
241-Z	Bldg.	Liquid waste collection tanks in an underground concrete vault	H
241-Z-RB	Bldg.	Waste water retention basin (no longer used)	N
241-ZA	Bldg.	241-Z Tank sampling	H
241-ZB	Bldg.	Curbed concrete pad housing the D-9 caustic tank	N
241-ZG	--	Change Room	C
241-Z-361	Bldg.	Underground liquid waste settling tank (no longer used)	N

Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
242-Z	Bldg.	WT Facility (lay-away status)	H
	108	Airlock	N
243-ZA	--	Tank and sump pit	C
243-Z	401	--	C
	402	--	C
	403	--	C
	404	Drum washer	C
	405	Drum storage	C
243-ZB	--	Cooling equipment pad	C
252-Z-1	Bldg.	Electrical transformers	N
252-Z-2	Bldg.	Electrical transformers	C
267-Z	Bldg.	Valve house for water supply to a 234-5Z sprinkler system	N
270-Z	Bldg.	PRF support facility (office building)	N
291-Z	Bldg.	Ventilation exhaust fan house	C
	--	Cable vault	C
	500	Electrical room	C
	501	Compressor room	C
	502	Exhaust plenum	C
	503	--	N
	504	--	C
	505	--	C
	506	--	C
	507	--	C
	508	--	C
	509	Fan room	C
	510	--	N
291-Z-1	Bldg.	Ventilation exhaust stack for 232-Z, 234-5Z, and 242-Z Buildings	C
296-Z-3	Bldg.	Ventilation exhaust stack for 241-Z vault and tanks	N
296-Z-5	Bldg.	Ventilation exhaust stack for 2736-Z Building	N
296-Z-6	Bldg.	Ventilation exhaust stack for 2736-Z Building	N
2503-Z	Bldg.	Electrical distribution system for PFP (switch yard)	N
2701-Z	Bldg.	Wooden building (no longer used)	N
2701-ZA	Bldg.	Central station alarm facility	N
2701-ZB	Bldg.	Security badge house	N
2701-ZD	Bldg.	Security check point station	--
2702-Z	Bldg.	Microwave tower	N
2704-Z	Bldg.	PFP Support facility (office building)	N
2705-Z	Bldg.	Badge house	--
2712-Z	Bldg.	291-Z-1 Stack sampler power generators (diesel driven)	C
2715-Z	Bldg.	Paint and solvent storage	N
2715-ZL	Bldg.	Drum storage	N

Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
2721-Z	Bldg.	Emergency electric power generators (diesel driven)	N
2722-Z	Bldg.	Concrete pad for truck load-out station	N
2725-Z	Bldg.	Laundry storage	N
2727-Z	Bldg.	Storage of miscellaneous operations and laboratory equipment	N
2729-Z	Bldg.	Storage of miscellaneous maintenance materials	N
2731-Z	Bldg.	Storage of empty flushed plutonium drums	N
2731-ZA	Bldg.	Laundry storage	C
2734-Z	Bldg.	Gas bottle storage	N
2734-ZA	Bldg.	Liquid argon storage	N
2734-ZB	Bldg.	Flammable gas storage (out of service)	N
2734-ZC	Bldg.	Gas bottle storage (out of service)	N
2734-ZD	Bldg.	Argon and oxygen bottle supply (out of service)	N
2734-ZF	Bldg.	Standby gas bottle supply (out of service)	N
2734-ZG	Bldg.	Standby gas bottle supply (out of service)	N
2734-ZH	Bldg.	Argon bottle supply (out of service)	N
2734-ZJ	Bldg.	Liquid nitrogen storage tank	N
2734-ZK	Bldg.	Gas bottle storage, acetylene, argon, oxygen	N
2734-ZL	Bldg.	HF gas bottles and supply piping	C
2735-Z	Bldg.	Chemical storage of HNO^{3}, and ANN	N
2736-Z	Bldg.	SNM storage	H
	1	Storage of product/recoverable SNM	H
	2	Lard can/cubicle SNM storage	H
	3	Storage of product/recoverable SNM	H
	4	Storage of product/recoverable SNM	H
2736-ZA	Bldg.	2736-Z exhaust fans and 65 kW diesel generator	H
2736-ZB	Bldg.	Shipping and receiving SNM	H
	600	Mech room	H
	602	Mech room	N
	603	--	N
	604	Security computer room	N
	605	Office	N
	606	Office	N
	607	Office	N
	608	Vestibule	N
	610	Receptionist office	N
	611	Office	N
	612	Office	N
	613	--	N
	614	Women's change room	N

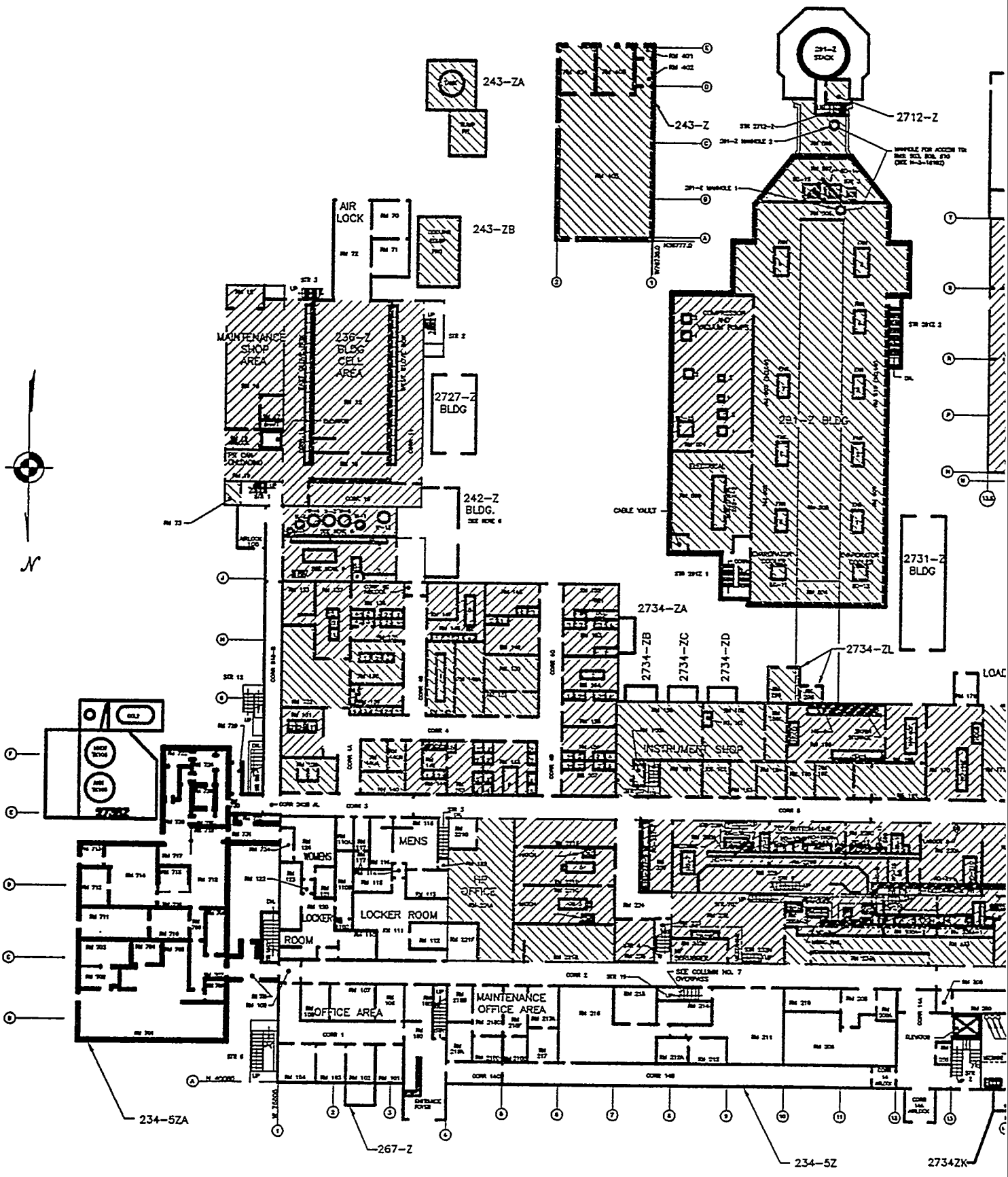
Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
2736-ZB (cont.)	615	Women's change room	N
	616	Women's change room	N
	618	Men's change room	N
	619	Men's change room	N
	620	Lunchroom	N
	621	Men's change room	N
	622	Men's change room	N
	623	UPS room	N
	624	Corridor	N
	625	Corridor	C
	626	Janitor closet	C
	627	Women's rest room	C
	628	Men's rest room	C
	629	Mardix	C
	630	Decontamination room	C
	631	Health Physics office	C
	632	Applied technology chemist's office	C
	633	Corridor	C
	634	Shift manager	C
	635	Operator ready room	C
	636	Repackaging room	H
	637	NDA laboratory	H
	638	Packaging room	H
	638A	--	H
	639	Safety shower room	H
	640	Supply storage	H
	641	Receiving room	H
	641A	--	H
	642	Shipping room	H
	643	Personnel entry	C
	644	Material passageway	C
	645	--	N
	646	--	N

Table 4-2. Room Descriptions and Classification. (14 sheets)

Building number	Room number	Description	Contamination classification
2736-ZC	Bldg.	Loading dock	N
2902-Z	Bldg.	Elevated sanitary water tank and valve pit	N
2904-ZA	Bldg.	Sheet metal structure housing 216-Z-20 crib stream effluent sampling, flow measurement, pH and alpha monitoring equipment	N
2904-ZB	Bldg.	Sheet metal structure housing 216-Z-20 crib stream effluent sampling, flow measurement, pH and alpha monitoring equipment	N

ANN = Aluminum nitrate nonhydrate.
C = "Cold" process support area.
H = "Hot" process area.
HF = Hydrofluoric acid.
IRM = Information Resource Management (Department).
N = Not contaminated.
NDA = Nondestructive assay.
PR = Product removal.
PFP = Plutonium Finishing Plant.
PRF = Plutonium Reclamation Facility.
RADTU = Radioactive Acid Digestion Test Unit.
RCA = Radiological controlled area.
RMA = Remote mechanical "A" line.
RMC = Remote mechanical "C" line.
RWP = Radiological work permit.
SNM = Special nuclear material.
SSDM = Structured system development methodology (data management).
SWP = Special work permit (protective clothing).
UPS = Uninterruptible power supply.
WIPP = Waste Isolation Pilot Plant.
WRAM = Westinghouse Hanford Company radiation area management.


243-ZA
243-Z
2712-Z
AIR LOCK
243-ZB
MAINTENANCE SHOP AREA
236-Z BLDG CELL AREA
2727-Z BLDG
291-Z BLDG
242-Z BLDG.
2731-Z BLDG
2734-ZA
2734-ZB
2734-ZC
2734-ZD
2734-ZL
INSTRUMENT SHOP
MENS
WOMENS
OFFICE
LOCKER ROOM
LOCKER ROOM
OFFICE AREA
MAINTENANCE OFFICE AREA
234-5ZA
267-Z
234-5Z
27342K
N

FIRST FLOOR

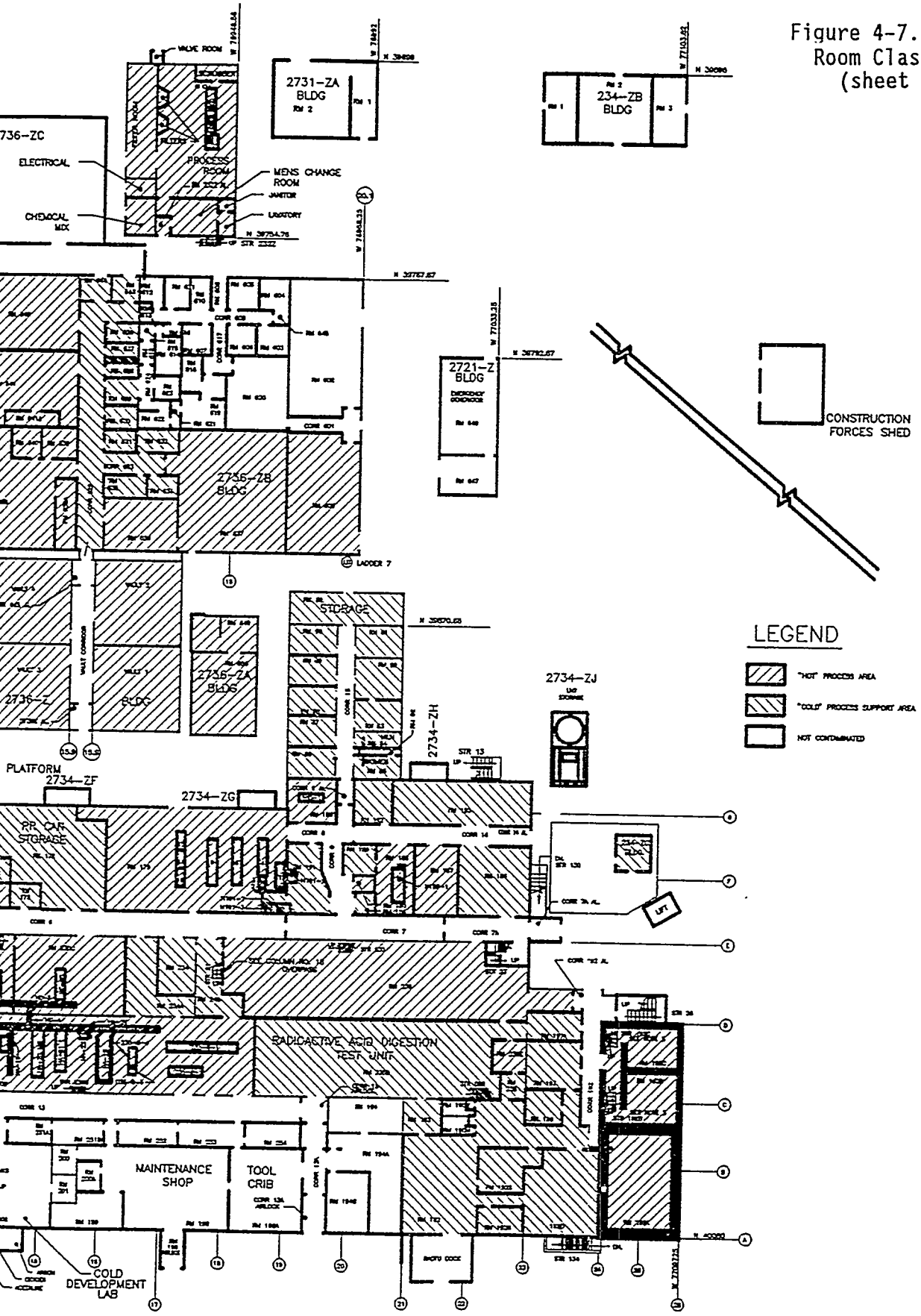
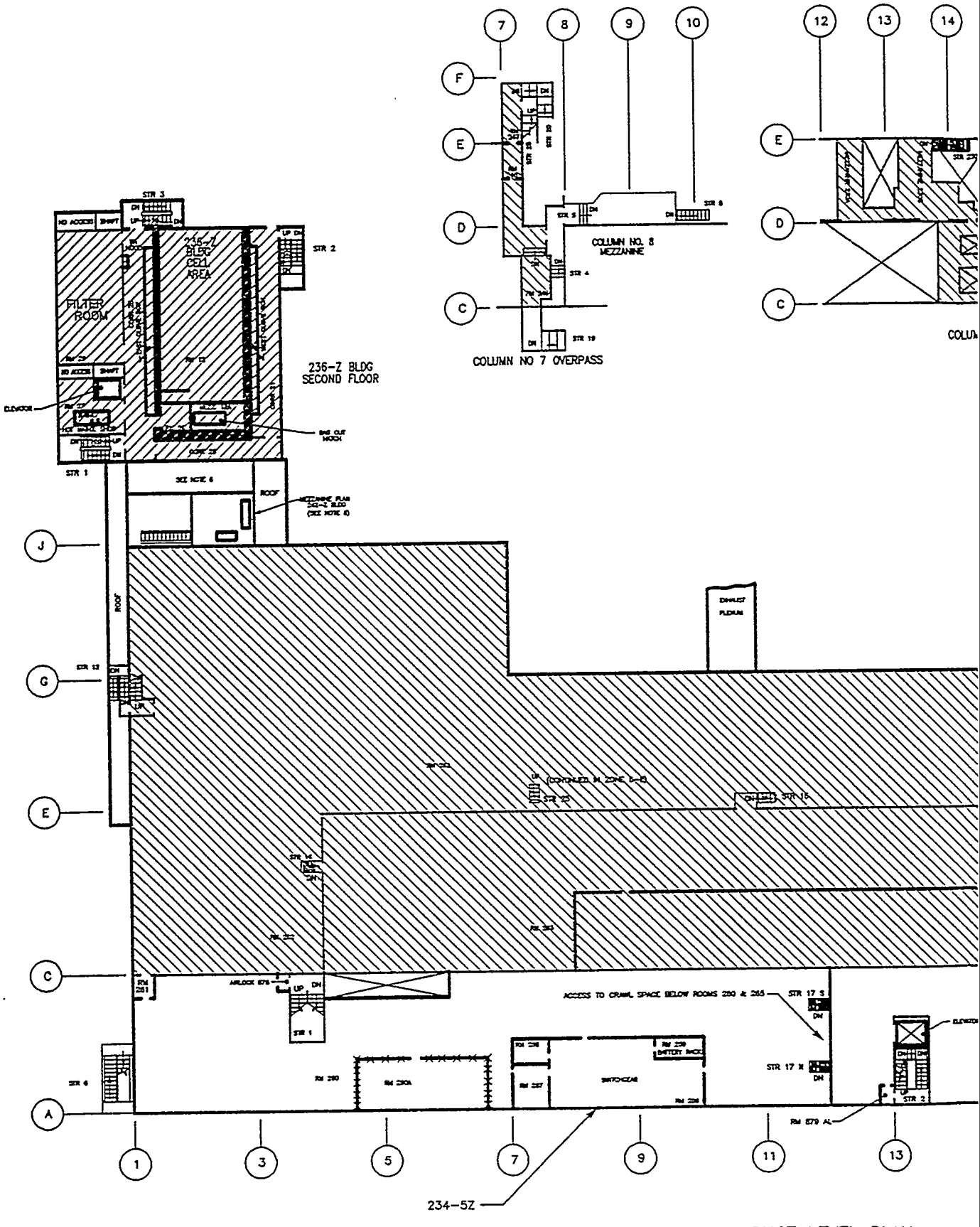
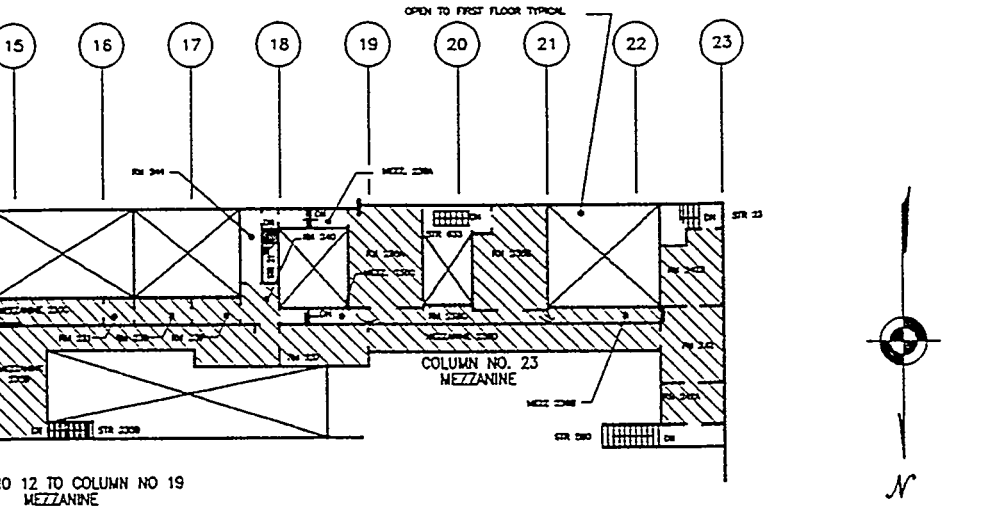


Figure 4-7. Building and Room Classification. (sheet 1 of 4)



DUCT LEVEL PLAN



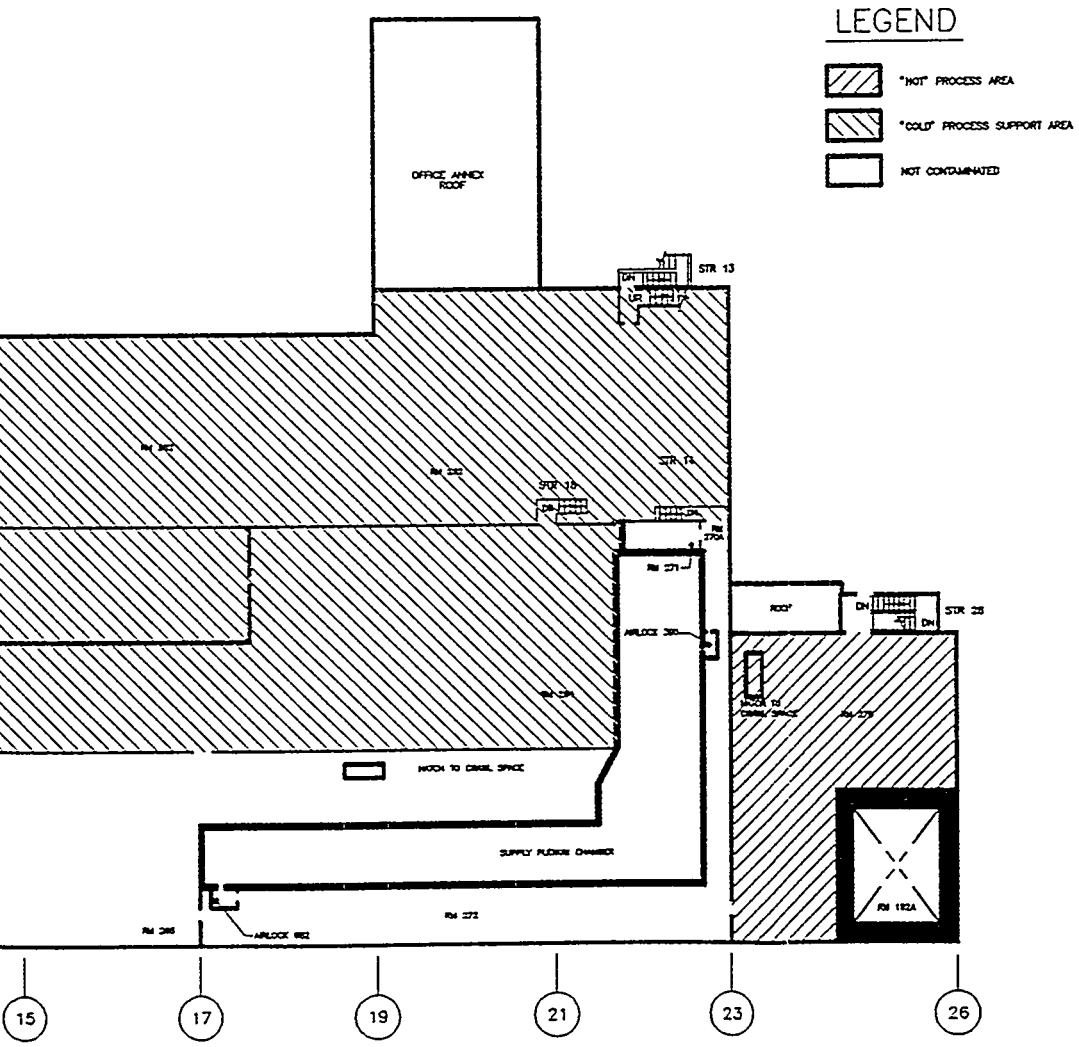


Figure 4-7. Building and Room Classification. (sheet 2 of 4)

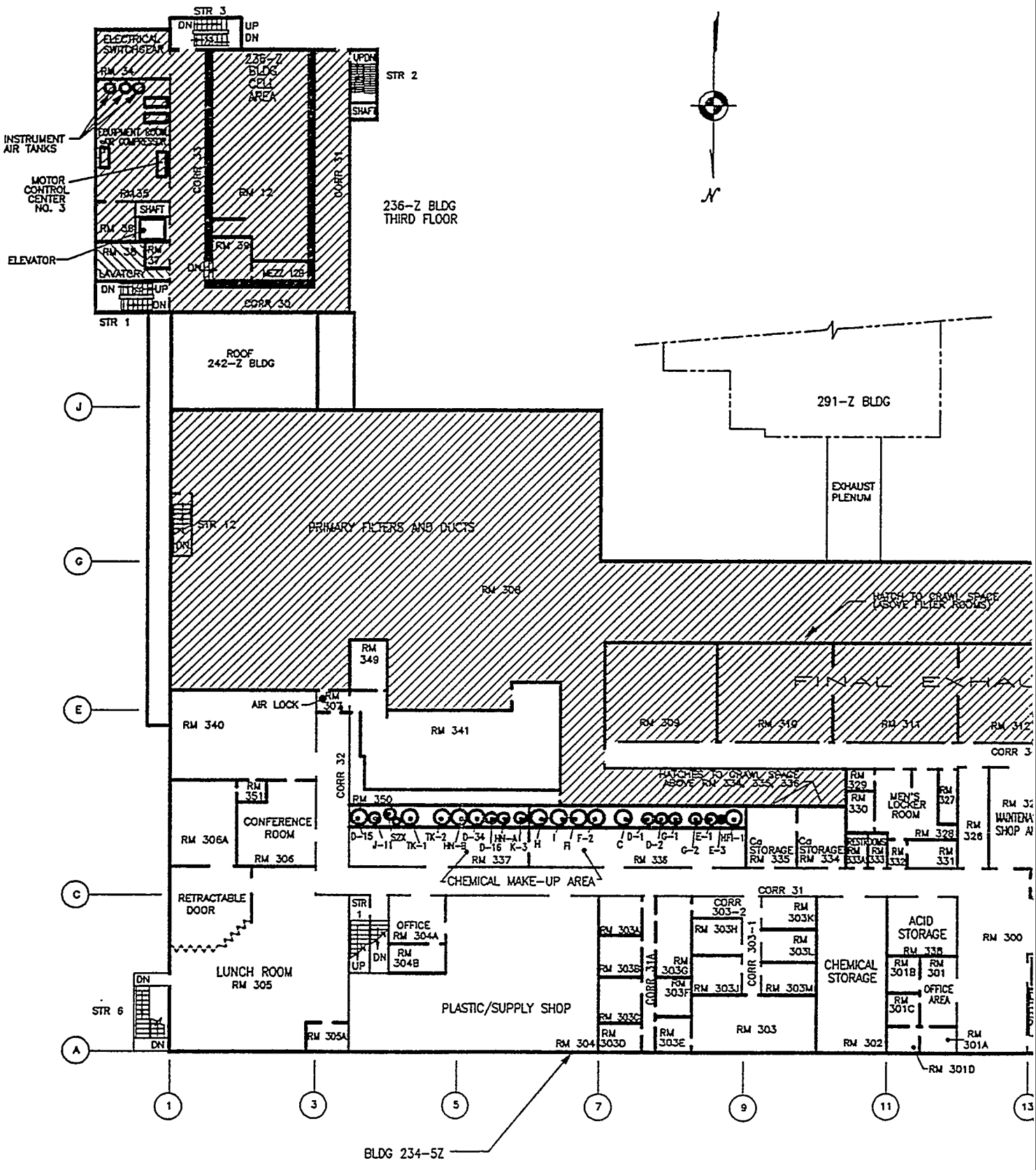
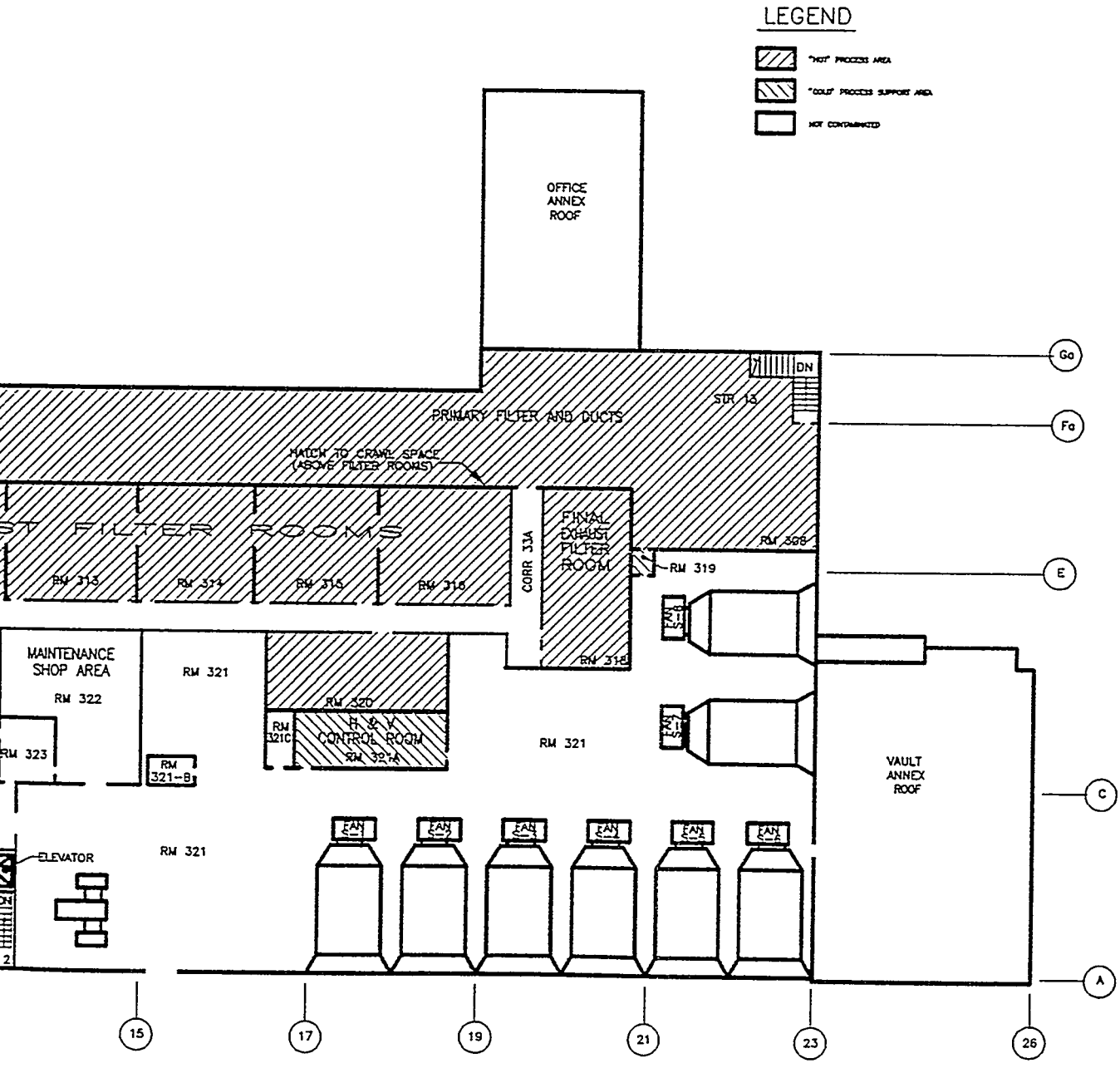
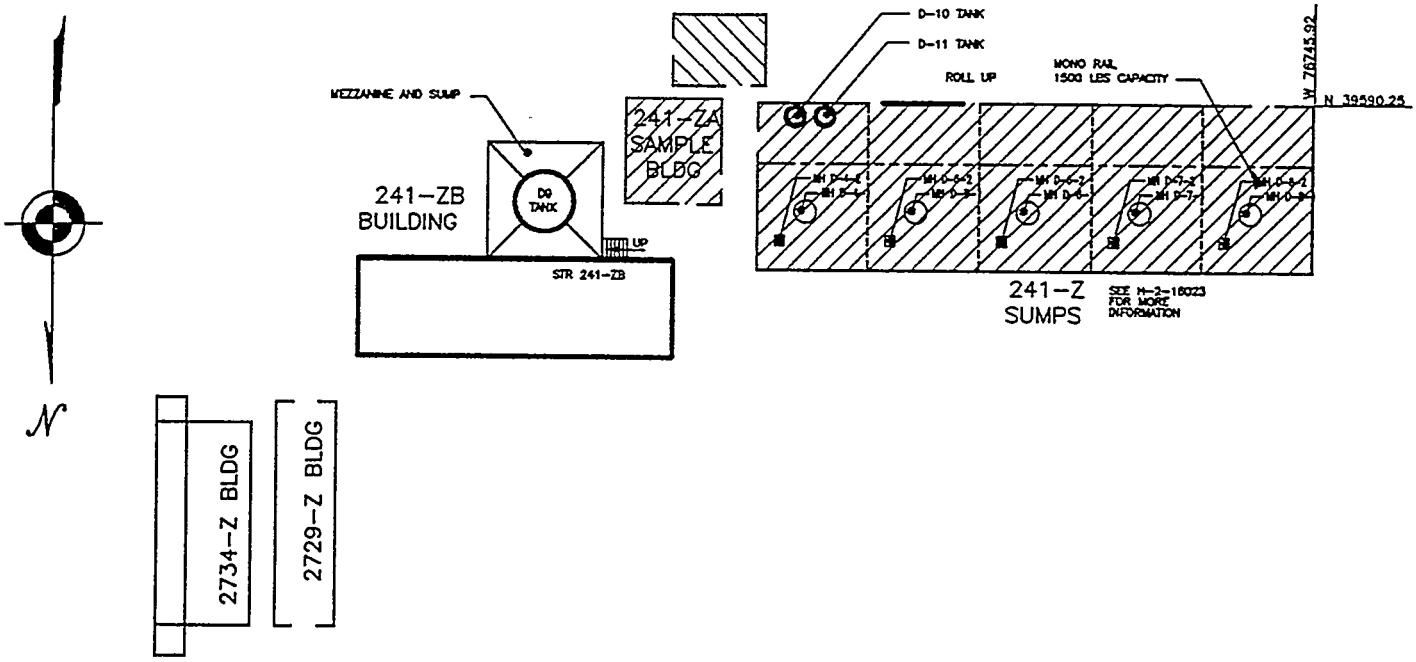
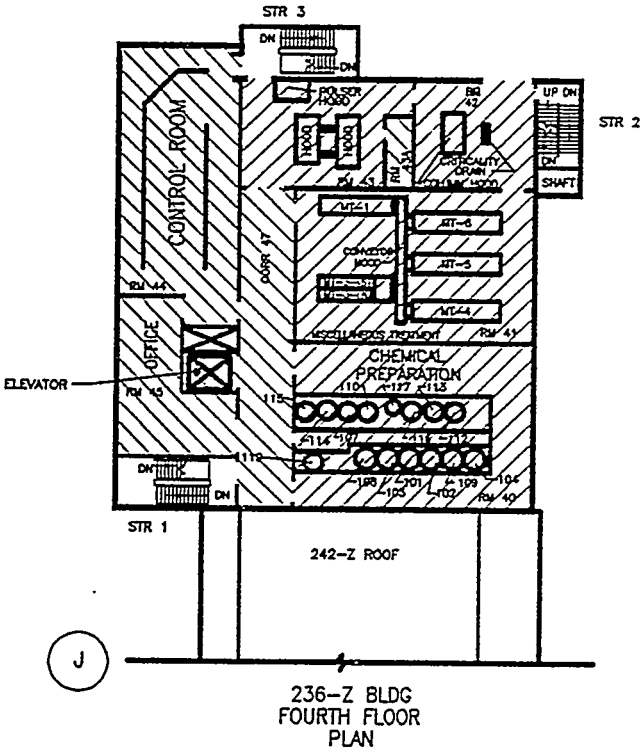

STR 3
DN
UP
DN
ELECTRICAL SWITCHGEAR
RM 34
236-Z BLDG CELL AREA
UP
DN
STR 2
SHAFT
INSTRUMENT AIR TANKS
EQUIPMENT ROOM AIR COMPRESSOR
MOTOR CONTROL CENTER NO. 3
RM 35
CORR 33
RM 12
CORR 31
236-Z BLDG THIRD FLOOR
SHAFT
RM 38
ELEVATOR
RM 36
RM 37
RM 39
LAVATORY
DN
MEZZ 128
DN
UP
DN
CORR 30
STR 1
ROOF 242-Z BLDG
291-Z BLDG
EXHAUST PLENUM
J
G
E
C
A
STR 12
DN
PRIMARY FILTERS AND DUCTS
RM 308
HATCH TO CRAWL SPACE (ABOVE FILTER ROOMS)
RM 349
AIR LOCK
RM 307
RM 340
RM 341
RM 309
RM 310
RM 311
RM 312
CORR 32
RM 350
HATCHES TO CRAWL SPACE ABOVE RM 334, 335, 336
RM 329
RM 330
MEN'S LOCKER ROOM
RM 327
RM 328
RM 326
RM 351
CONFERENCE ROOM
RM 306A
RM 306
D-15
SZX
TK-2
D-34
HN-A
H
F-2
C
D-1
G-1
E-1
HFI-1
J-11
TK-1
HN-B
D-16
K-3
RM 337
RM 336
Cg STORAGE RM 335
Cg STORAGE RM 334
RESTROOMS
RM 333A
RM 333
RM 332
RM 331
CHEMICAL MAKE-UP AREA
CORR 31
RETRACTABLE DOOR
STR 1
OFFICE RM 304A
RM 304B
RM 303A
CORR 303-2
RM 303K
ACID STORAGE
RM 300
RM 303H
RM 303L
RM 303G
RM 303F
RM 303J
RM 303M
CORR 303-1
CORR 31A
RM 303B
CHEMICAL STORAGE
RM 301B
RM 301
LUNCH ROOM RM 305
PLASTIC/SUPPLY SHOP
RM 303C
RM 303D
RM 303E
RM 303
RM 302
OFFICE AREA
RM 301C
RM 301A
STR 6
RM 305A
RM 304
RM 301D
1
3
5
7
9
11
13
BLDG 234-5Z
SECOND FL

Figure 4-7. Building and Room Classification. (sheet 3 of 4)

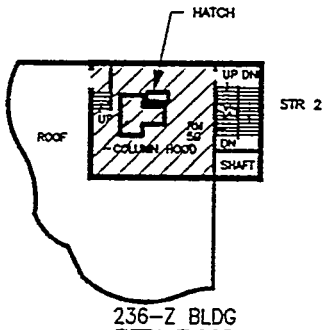


OR PLAN

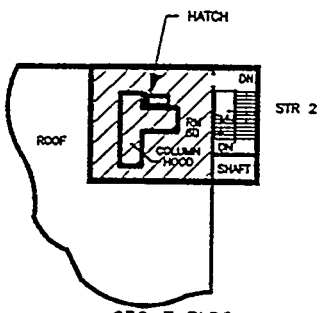




236-Z BLDG FOURTH FLOOR PLAN



236-Z BLDG FIFTH FLOOR PLAN



236-Z BLDG SIXTH FLOOR PLAN

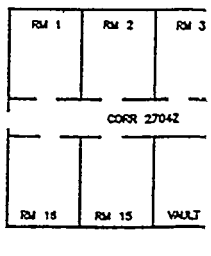
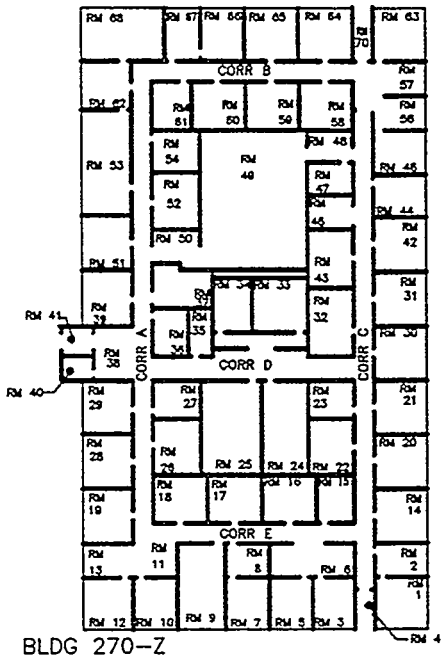
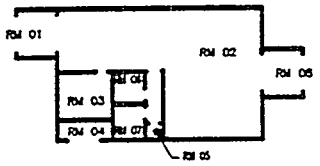


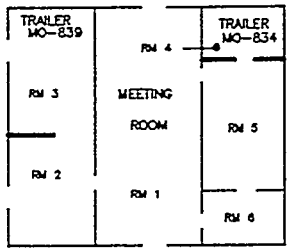
Figure 4-7. Building and Room Classification. (sheet 4 of 4)

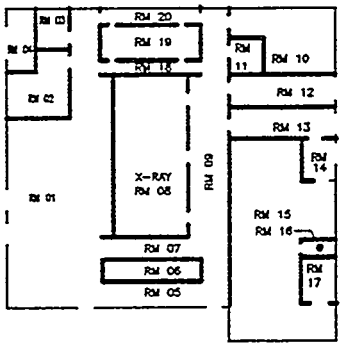


BLDG 270-Z
(NOT TO SCALE)

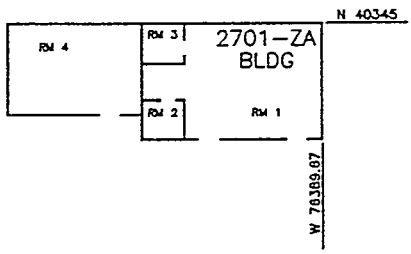
BLDG 2705-Z
(NOT TO SCALE)

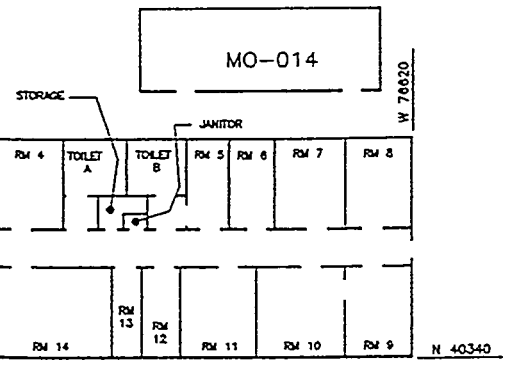






BLDG 2701-ZD
(NOT TO SCALE)





2704-Z BLDG

LEGEND

"HOT" PROCESS AREA

"COLD" PROCESS SUPPORT AREA

NOT CONTAMINATED

- Piping not in gloveboxes (i.e., waste drainage piping, service piping, and vacuum system piping).
- Ventilation system (i.e., filterboxes and filters, supply and exhaust duct work).
- Miscellaneous equipment that is not expected to be removed prior to D&D (i.e., the mass spectrometer in the analytical lab).

Contaminated equipment encountered on drawings and during the walkdown which does not fit into any of the other categories is noted.

The piping and ventilation systems were considered on a building by building basis. Separate spreadsheets were developed to total volumes from drawings. All information not available from the documentation was gathered during the walkdown. The spreadsheets were then updated to reflect the walkdown data (see Appendices B and C).

Interviews with PFP personnel revealed other relevant drawings. These were used to update, verify and correct our data. The existence of gloveboxes and hoods was verified from drawings H-2-23400 and H-2-29674, which represent the status of 234-5Z and 236-Z, respectively, as of November 1993.

Specific assumptions, methods, and results are given in Section 5.0 by physical category. Totals for the PFP by waste type are provided in the Summary, Section 6.0.

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5.0 RESULTS

This section presents, by natural physical category, the solid waste volume estimates that are expected from the D&D of the PFP. The uncertainties, global assumptions, and general approach for this project are stated in Section 4.0. The specific assumptions and methodology used to determine these volumes are detailed for each category of waste. Total D&D waste estimates are given by waste type (DSW, LLW, LLMW, TRU, TRU MW) in Section 6.0.

5.1 GLOVEBOXES AND HOODS

Gloveboxes are used when handling of bare material is required. An operator can access material inside the glovebox through gloves installed in gloveports. The gloveports are strategically located to permit servicing of glovebox equipment. Operation and control of certain process equipment, valving, and material transfers are remote from the glovebox's interior, thereby minimizing extremity and whole-body exposures. Utilities provided to gloveboxes include electrical power, ventilation, fire protection, chemical lines, protected process water, nitrogen, and vacuum lines.

The metal shell of a typical glovebox is made of 4.8-mm (0.19-in.) 304-L stainless steel; the windows can be made of laminated glass, leaded glass, or polycarbonate. Lead shielding is used for gloveboxes in many of the process areas to provide shielding from gamma radiation. Water wall barriers for neutron attenuation are used between RMC Line process areas and the control room and also around gloveboxes where neutron exposures may be high.

The normal ventilation system is designed to ensure control of airborne contaminants even if normal airflow patterns are disrupted, such as by an open glovebox access port. To ensure minimal escape of radioactive materials, the system also maintains airflows from lowest to highest contamination potential and filters all radioactive material work areas and confinement device exhausts. Supply airflow in radiation zones within process areas moves from ceiling diffusers to floor exhaust grills to maintain clean air in the breathing zone.

Gloveboxes may be equipped with internal fire protection equipment depending on need, which is determined by the nature of the glovebox operations and the associated fire loading. The internal automatic sprinkler system consists of sprinkler heads connected to pressurized water canisters. An electric switch monitors the system pressure and alarms at a facility fire panel and at the fire station when pressures drop below a set point. There are several alternatives to the internal sprinkler system. A fixed heat detector alarms at the plant as well as at the fire station. Magnesium oxide sand, available inside the glovebox, is used to extinguish small spot fires should they occur. A fire extinguisher and bayonet are kept outside the glovebox. In the event of a fire, the bayonet is punched through the glove and the contents of the extinguisher discharged. Metal gloveport covers are available to seal the damaged gloveport.

The functions of a glovebox can require a supply of chemicals. Some are pumped in from chemical preparation tanks. Others are sealed into the glovebox's small plastic containers, or the containers are pushed through the glovebox sphincter.

Nitrogen gas is pumped into the gloveboxes from the building's supply system. Pressure inside the glovebox and the supply line pressure outside the glovebox are monitored. The supply valve automatically closes at a set differential pressure.

The vacuum source is either supplied by a self-contained vacuum pump or an external system. The vacuum is used to remove residual powders.

A standard laboratory hood is a stainless steel, open-faced fume hood that exhausts out the top. A pull-down front (sash) is provided. The front is constructed of glass, reinforced glass, or Plexiglas[2] to protect the worker. The front of a fixed-faced hood is fixed in place, with open ports to provide access.

Many of the tanks used in glovebox processes are contained within the gloveboxes themselves. These interior tanks will be considered separately from those that are exterior to the gloveboxes (such as the chemical preparation tanks). Waste types are based on regulated chemicals expected to be left in the tanks as heels after flushing. The chemical contaminants possibly residing in tanks within gloveboxes are estimated based on the type of process occurring in the glovebox and the data available in the literature. Some tanks are partially enclosed by gloveboxes (such as the PRF pencil tanks). It is assumed that these must be removed from the glovebox during D&D; therefore, these tanks will be considered external.

Most of the process piping and manifolding that services gloveboxes is contained within the gloveboxes themselves. For example, the PRF gloveboxes known as 1st East, 1st West, 2nd East, and 2nd West contain piping and manifolds for the pencil tanks and columns located in the canyon. This interior piping comprises a large portion of the volume of the glovebox and thus will be considered part of the glovebox rather than receiving separate consideration as piping. Piping that is exterior to the glovebox (such as that for flushed chemicals, process water, and vacuum systems) will be considered separately as piping in Section 5.3.

Table 5-1 provides a list of PFP gloveboxes and hoods, their locations by building and room number, dimensions (including volumes), and, in cases in which it was known, the type of shielding used. The best known plutonium holdup estimate is also included by glovebox. For cases without data, a dash ("-") has been used. The total volume of solid waste expected from gloveboxes and hoods is 856 m^3 (30,230 ft^3), all of which is expected to be TRU waste. A total of 34.9 kg (77 lb) of plutonium is estimated to be enclosed in the

[2] Plexiglas is a trademark of Rohm & Haas.

Table 5-1. Gloveboxes and Hoods. (7 sheets)

Building number	Room number	Gloveboxes and hoods	Type of shielding	Plutonium holdup (g)	Dimensions (m)			Volume (m^3)	Information origin
					Length	Depth	Height		
234-5Z	131	GB-1-131	--	--	3.05	0.91	1.22	3.40	Walkdown
		GB-2-131	--	--	3.05	0.91	1.22	3.40	Walkdown
		GB-3-131	--	--	3.05	0.91	1.22	3.40	Walkdown
234-5Z	134	H-1-134	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-2-134	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-3-134	--	--	0.91	0.91	2.44	2.04	Walkdown
		H-4-134	--	--	0.91	0.91	2.44	2.04	Walkdown
234-5Z	135	H-1-135	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-2-135	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-3-135	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-4-135	--	--	1.22	0.91	2.13	2.38	Walkdown
234-5Z	136	GB-1-136 (3 gloveboxes together)	Water walls	--	3.05	0.91	0.91	2.55	Walkdown
234-5Z	137	Emissions spectroscopy	--	--	2.44	1.22	0.91	2.72	Walkdown
234-5Z	139	GB-1-139	--	--	0.91	0.91	3.05	2.55	Walkdown
		GB-2-139	--	--	0.91	0.91	3.05	2.55	Walkdown
		GB-3-139	--	--	0.91	0.91	3.05	2.55	Walkdown
		GB-4-139	--	--	0.91	0.91	3.05	2.55	Walkdown
		GB-5-139	--	--	0.91	0.91	3.05	2.55	Walkdown
		GB-6-139 (3 gloveboxes together)	--	--	1.83	0.91	0.91	1.53	Walkdown
234-5Z	143	H-1-143	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-2-143	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-3-143	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-4-143	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-5-143	--	--	1.22	0.91	2.13	2.38	Walkdown
234-5Z	144	Hoods (8)	--	--	1.22	0.91	2.13	19.03	Walkdown
		Ported hood	--	--	2.44	1.22	0.91	2.72	Walkdown
234-5Z	145	GB-1-145	--	--	5.49	1.22	2.44	16.31	Walkdown

Table 5-1. Gloveboxes and Hoods. (7 sheets)

Building number	Room number	Gloveboxes and hoods	Type of shielding	Plutonium holdup (g)	Dimensions (m)			Volume (m^3)	Information origin
					Length	Depth	Height		
234-5Z	146	Hoods (2)	--	--	1.22	0.91	2.13	4.76	Walkdown
		GB-5-146	--	--	2.44	1.22	1.22	3.62	Walkdown
234-5Z	148	H-1-148	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-1-148	--	--	1.22	0.91	2.13	2.38	Walkdown
234-5Z	149	GB-2-149	--	--	1.52	1.22	0.91	1.70	Walkdown
		H-1-149	--	--	1.22	0.91	2.13	2.38	Walkdown
234-5Z	152	GB-1-152	--	--	3.05	0.91	2.13	5.95	Walkdown
		H-1-152	--	--	1.22	0.91	2.13	2.38	Walkdown
234-5Z	153	H-1-153	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-2-153	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-3-153	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-4-153	--	--	1.22	0.91	2.13	2.38	Walkdown
234-5Z	154	GB-1-154	--	--	3.66	0.91	0.91	3.06	Walkdown
		ALK-1-154	--	--	0.61	0.46	0.46	0.13	Walkdown
234-5Z	155	H-1-155	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-2-155	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-3-155	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-4-155	--	--	1.22	0.91	2.13	2.38	Walkdown
234-5Z	156	H-1-156	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-2-156	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-3-156	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-4-156	--	--	1.22	0.91	2.13	2.38	Walkdown
234-5Z	157	GB-3-157	--	--	1.22	0.91	2.13	2.38	Walkdown
		GB-4-157	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-1-157	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-2-157	--	--	1.22	0.91	2.13	2.38	Walkdown
234-5Z	159	H-1-159	--	--	1.22	0.61	1.83	1.36	Walkdown
		H-2-159	--	--	1.22	0.61	1.83	1.36	Walkdown

Table 5-1. Gloveboxes and Hoods. (7 sheets)

Building number	Room number	Gloveboxes and hoods	Type of shielding	Plutonium holdup (g)	Dimensions (m)			Volume (m^3)	Information origin
					Length	Depth	Height		
234-5Z	166	HC-4	0.635-cm (0.25-in.) lead glass	539	4.57	0.58	1.99	5.33	Document
		HC-6	2.54-cm (1-in.) lead glass; 15.24-cm (6-in.) lead/masonite wall in front of tanks	189	1.79	0.76	1.59	2.17	Document
		H-1-166	--	--	1.22	0.61	1.52	1.13	Walkdown
		H-2-166	--	--	1.22	0.61	1.52	1.13	Walkdown
234-5Z	169	HA-40f	--	190	3.96	1.52	1.22	7.36	Walkdown
234-5Z	170	HC-46f	1.27-cm (0.5-in.) lead, 0.635-cm (0.25-in.) lead glass	6	4.01	1.22	1.22	5.97	Walkdown Drawings
		H-1-170	Lead glass	--	1.83	1.07	2.13	4.16	Walkdown
234-5Z	179	GB-179-1	--	--	1.52	1.22	2.44	4.53	Walkdown
		GB-179-4	--	109	2.44	1.22	2.44	7.25	Walkdown
		GB-179-6	--	13	3.05	1.22	2.44	9.06	Walkdown
		GB-179-9	--	34	3.05	1.22	2.44	9.06	Walkdown
		GB-179-10	--	19	1.22	1.22	2.44	3.62	Walkdown
		GB-179-12	--	33	1.22	1.22	2.44	3.62	Walkdown
		H-179-2	--	--	0.61	1.22	2.44	1.81	Walkdown
		H-179-3	--	--	0.61	1.22	2.44	1.81	Walkdown
		H-179-11	--	--	0.61	1.22	2.44	1.81	Walkdown
234-5Z	180	H-1-180	--	--	1.22	0.91	0.91	1.02	Walkdown
234-5Z	183	GB-179-5	--	4	2.44	0.61	2.13	3.17	Walkdown
234-5Z	187	Hoods, 3 together	--	17	3.05	0.91	1.22	3.40	Walkdown
		Hoods, 2 together	--	16	3.05	0.91	1.22	3.40	Walkdown
234-5Z	188	GB-188-1	--	26	4.57	1.22	1.83	10.19	Walkdown
234-5Z	221-C	GB-3-221C	--	--	2.64	1.02	0.81	2.18	H-2-80208
		H-1-221C	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-2-221C	--	--	1.22	0.91	2.13	2.38	Walkdown
234-5Z	221-D	GB-5-221D	--	--	2.64	1.02	0.81	2.18	H-2-80208
		H-1-221D	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-2-221D	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-3-221D	--	--	1.22	0.91	2.13	2.38	Walkdown

Table 5-1. Gloveboxes and Hoods. (7 sheets)

Building number	Room number	Gloveboxes and hoods	Type of shielding	Plutonium holdup (g)	Dimensions (m)			Volume (m^3)	Information origin
					Length	Depth	Height		
234-5Z	221-D	H-4-221D	--	--	1.22	0.91	2.13	2.38	Walkdown
234-5Z	221-E	H-1-221E	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-2-221E	--	--	1.22	0.91	2.13	2.38	Walkdown
		H-3-221E	--	--	1.22	0.91	2.13	2.38	Walkdown
234-5Z	227	HC-227-t	2.54-cm (1-in.) lead	2	3.66	0.61	4.57	10.19	Document
		HC-227-s	1.27-cm (0.5 in.) lead; 0.635-cm (0.25-in.) lead	529	3.66	0.61	3.51	7.82	Document
234-5Z	228-A	HC-10B	2.54-cm (1-in.) lead glass	37	0.70	0.48	0.69	0.23	Document
		HC-7	2.54-cm (1-in.) lead glass	2,616	2.44	1.22	3.05	9.06	Document
		HC-1	2.54-cm (1-in.) lead glass	27	23.93	0.38	0.86	7.87	Document
		HC-9b	2.54-cm (1-in.) lead glass and water shield at mid-level	5,595	2.29	0.86	4.34	8.57	Drawings Document
		HC-11	2.54-cm (1-in.) water walls	202	2.15	0.70	0.69	1.03	Document
234-5Z	228-B	HC-1	2.54-cm (1-in.) lead glass	--	23.93	0.41	0.86	8.40	Document
		HC-12s	2.54-cm (1-in.) lead glass	73	0.81	0.71	1.09	0.63	Document
		HC-13MD	2.54-cm (1-in.) lead glass	69	0.99	0.94	1.52	1.42	Document
		HC-16CC	2.54-cm (1-in.) lead glass	60	0.71	0.74	1.24	0.65	Document
		HC-15A, B, C	2.54-cm (1-in.) lead glass	26	2.44	0.76	1.83	3.40	Document
234-5Z	228-C	HC-17DC	2.54-cm (1-in.) lead glass	48	1.19	0.76	1.40	1.27	Document
		HC-17P	2.54-cm (1-in.) lead glass	50	0.91	0.76	1.22	0.85	Document
		HC-18BS	2.54-cm (1-in.) lead glass	96	2.48	2.08	0.77	3.96	Document
		HC-5	--	324	1.04	0.61	0.96	0.61	Walkdown
		HC-2	--	155	15.54	0.40	0.96	5.93	Walkdown
234-5Z	230-A	HC-21C	1.27-cm (0.5-in.) lead; 0.635-cm (0.25-in.) lead glass	28	3.25	1.07	0.91	3.17	Document
234-5Z	230-B	HC-21A	1.27-cm (0.5-in.) lead; 0.635-cm (0.25-in.) lead glass	147	3.25	1.07	0.91	3.17	Document
234-5Z	230-C	HC-60	--	51	3.05	0.91	1.98	5.52	Walkdown
		HC-3	--	49	4.57	0.35	0.96	1.56	Walkdown
		HC-4	--	--	2.74	0.76	2.13	4.46	Walkdown
234-5Z	232	HA-46	--	--	5.33	0.53	4.19	11.92	Walkdown
234-5Z	235-A1	H-14CC	--	124	0.46	1.22	1.07	0.59	Walkdown

Table 5-1. Gloveboxes and Hoods. (7 sheets)

Building number	Room number	Gloveboxes and hoods	Type of shielding	Plutonium holdup (g)	Dimensions (m)			Volume (m^3)	Information origin
					Length	Depth	Height		
234-5Z	235-A1	H-14DC	--	--	1.22	0.91	1.22	1.36	Walkdown
		H-14S	--	--	0.61	0.61	0.61	0.23	Walkdown
		H-14P	--	--	1.22	1.22	1.83	2.72	Walkdown
		H-15	--	175	0.91	0.30	3.66	1.02	Walkdown
		H-16CS	--	--	1.52	1.52	0.76	1.77	Walkdown
		H-16BS	--	38	1.52	1.52	0.76	1.77	Walkdown
		H-16L	--	--	0.91	0.76	0.61	0.42	Walkdown
234-5Z	235-A2	H-12S	--	19	0.61	1.22	0.61	0.45	Walkdown
		H-13MD	--	38	0.61	1.22	1.22	0.91	Walkdown
		H-13G	--	23	0.61	1.22	1.22	0.91	Walkdown
		H-13A	--	78	0.76	1.22	2.44	2.27	Walkdown
		H-13B	--	--	0.76	1.22	2.44	2.27	Walkdown
		H-13C	--	--	0.76	1.22	2.44	2.27	Walkdown
		HA-13	--	--	1.22	1.22	1.83	2.72	Walkdown
234-5Z	235-A3	H-10	--	541	3.66	0.91	0.61	2.04	Walkdown
		H-8A	--	--	4.27	1.07	0.91	4.16	Walkdown
		H-11	--	36	0.61	1.22	0.61	0.45	Walkdown
		H-7A	1.27-cm (0.5-in.) lead glass	565	2.44	1.22	3.00	8.91	Document
		H-9A	1.27-cm (0.5-in.) lead glass	2,821	2.29	0.86	3.76	7.42	Document
		H-9B	--	--	0.91	0.61	0.30	0.17	Walkdown
		H-9C	--	--	1.12	0.84	0.91	0.86	Document
		H-9E	1.27-cm (0.5-in.) lead; 1.27-cm (0.5-in.) lead glass	11	1.63	0.91	0.71	1.06	Document
		H-9D	--	33	0.91	0.91	0.91	0.76	Walkdown
234-5Z	235-B	HA-19B1	--	45	0.46	0.40	0.99	0.18	Drawings
		HA-19B2	--	--	1.52	0.76	0.76	0.88	Walkdown
		HA-19	--	--	4.57	0.46	1.22	2.55	Walkdown
		HC-235-B-1	--	--	5.49	0.91	2.74	13.76	Walkdown
		HC-235-B-2	--	1	3.05	0.76	1.52	3.54	Walkdown
		HA-22B	--	29	1.07	0.76	2.44	1.98	Walkdown

Table 5-1. Gloveboxes and Hoods. (7 sheets)

Building number	Room number	Gloveboxes and hoods	Type of shielding	Plutonium holdup (g)	Dimensions (m)			Volume (m^3)	Information origin
					Length	Depth	Height		
234-5Z (cont.)	235-B (cont.)	HA-21 I	1.27-cm (0.5-in.) lead; 0.635-cm (0.25-in.) lead glass	460	3.66	1.07	1.22	4.76	Walkdown
		HA-20MB	1.27-cm (0.5-in.) lead; 0.635-cm (0.25-in.) lead glass	275	4.57	1.07	1.22	5.95	Walkdown
		HA-28	--	89	18.29	0.91	0.46	7.65	Walkdown
		HA-23S	1.27-cm (0.5-in.) lead, 0.635-cm (0.25-in.) lead glass, water walls	59	9.75	3.05	3.66	108.74	Walkdown
234-5Z	235-D	Hood 100B	--	--	3.66	5.49	0.91	18.35	Walkdown
		Hood 200	--	--	3.96	2.44	1.52	14.72	Walkdown
		Hood 300B	--	--	4.57	1.22	1.22	6.80	Walkdown
		Hood 400	--	--	2.13	0.91	1.52	2.97	Walkdown
236-Z	11	Corridor glovebox (1st West)	--	3,787	17.68	0.61	2.44	26.28	Walkdown
		Corridor glovebox	--	--	1.83	0.61	0.91	1.02	Walkdown
236-Z	14	Corridor glovebox (1st East)	--	4,970	17.68	0.61	2.44	26.28	Walkdown
		Corridor glovebox	--	--	1.83	0.61	0.91	1.02	Walkdown
236-Z	21	Corridor glovebox (2nd West)	--	2,912	19.51	0.61	2.44	29.00	Walkdown
236-Z	25	pH glovebox, corridor (2nd East)	--	2,998	19.51	0.61	2.44	29.00	Walkdown
236-Z	27	Maintenance glovebox	No lead	73	3.05	1.22	0.91	3.40	Walkdown
236-Z	41	MT-6	--	653	4.88	0.76	2.39	8.87	Drawings
		MT-5	--	394	5.33	0.99	1.68	8.86	Drawings
		MT-4	--	357	5.49	0.91	2.44	12.23	H-2-29674
		MT-3	--	656	3.35	1.07	2.44	8.72	H-2-29674
		MT-1	--	221	3.05	0.76	1.52	3.54	H-2-29674
		Transfer glovebox	--	369	6.40	0.46	0.91	2.68	Walkdown
236-Z	42	Column glovebox	--	280	1.83	1.83	2.44	8.16	Walkdown
236-Z	43	Dissolver canning facility	--	--	1.65	0.56	0.91	0.84	Drawings
		Dissolver loading glovebox	--	--	1.65	0.56	0.79	0.73	Drawings
		Pulser glovebox	--	--	0.91	0.61	0.91	0.51	Walkdown
		Charging glovebox	Lead windows	--	1.52	0.61	0.91	0.85	Walkdown

Table 5-1. Gloveboxes and Hoods. (7 sheets)

Building number	Room number	Gloveboxes and hoods	Type of shielding	Plutonium holdup (g)	Dimensions (m)			Volume (m^3)	Information origin
					Length	Depth	Height		
236-Z (cont.)	43 (cont.)	Canning loading	--	6	3.05	0.61	0.76	1.42	Walkdown
236-Z	50	Column glovebox	--	172	1.83	1.83	2.44	8.16	Walkdown
236-Z	60	Column glovebox	--	219	3.05	2.13	2.44	15.86	Walkdown
241-ZA	Bldg.	GB-2-241-ZA	--	--	0.61	0.30	0.46	0.08	Walkdown
		GB-1-241-ZA	--	--	1.22	0.61	0.91	0.68	Walkdown
242-Z	Bldg.	WT-1	--	--	9.07	0.84	2.29	17.38	Drawings
		WT-2	--	--	1.98	0.61	2.44	2.94	Drawings
		WT-3	--	--	3.81	0.53	4.39	8.93	Drawings
		WT-4	--	--	0.66	0.53	0.94	0.33	Drawings
		WT-5	--	--	0.61	1.63	1.52	1.51	Drawings
2736-ZB	636	Load-in hood	--	--	0.71	0.76	0.46	0.25	Drawings
		Load-out hood	--	1	0.91	0.76	0.46	0.32	Drawings
			Total plutonium holdup:	34,907		Total volume:		856.17 m^3	

gloveboxes and hoods. Dimensions are from documents, drawings, and walkdown estimates (determined visually to the nearest three decimeters [foot]), as noted. This table was verified and corrected during the walkdown. The existence of gloveboxes and hoods was verified from drawings H-2-23400 and H-2-29674, which represent the status of 234-5Z as of November 1993 and 236-Z as of February 1994, respectively.

The Division of Military Application Line was used from 1945 to 1965 for the fabrication, inspection, and packaging of plutonium weapon components. Most of the Division of Military Application equipment was removed during the decommissioning activities that occurred between May 28, 1974, and May 25, 1976. The equipment removed included most of the gloveboxes, but some remained to perform additional functions. The estimates presented in this study do not include the waste removed by prior activities. It is interesting to note, however, that the Division of Military Application equipment that was removed is stored in 61 boxes located in burial ground 218-W-3A, trench 17. These boxes have a volume of 2,231 m^3 (78,781 ft^3), a net weight of 149,209 kg (328,950 lb), and contain 5,591 g (12.33 lb) of plutonium (Demiter 1991).

Knowledge of the type of shielding is useful because lead, a common shielding material, is a hazardous material regulated by WAC 173-303-040. In some cases, water-filled walls are used as shielding, which may pose unique challenges for D&D and disposal.

Table 5-2 is a list of tanks that are internal to gloveboxes. The list includes the building, location within the building, size, volume, contents, and classification for each tank identified in the available literature. It should be noted that this list includes previously documented data and is most likely not inclusive of all tanks within gloveboxes.

Tank dimensions and contents listed in Table 5-2 have been accumulated from available literature, operating processes, and walkdown data. Information that was not found is indicated as unknown in the table and unknown volumes were assumed to be zero. Both the classification and volume of the tanks assume that residuals of chemicals once contained in the tanks are still present. This assumption results in a conservative estimate; however, most process gloveboxes will be considered TRU waste, in which case the internal tanks would also most likely be equally contaminated. Therefore, virtually 100 percent of the solid waste expected from the D&D of tanks internal to gloveboxes is classified as TRU or TRU MW.

Based on the information available, it is estimated that the total volume of solid waste expected from internal glovebox tanks is 1.73 m^3. This total volume is composed of approximately 1.717 m^3 of TRU MW and 0.017 of TRU waste. Thus, TRU MW represents approximately 99 percent of the solid waste expected to be generated by tanks internal to gloveboxes.

Table 5-2. Tanks Internal to Gloveboxes. (4 sheets)

Building number	Room number	Gloveboxes and hoods	Tanks	Dimensions (m)		Total volume (m^3)	Chemical	Regulated
				Diameter	Height			
234-5Z	166	HC-4	A, B, C, D, E, F	0.15	1.22	0.02	$Pu(NO_3)_4$	TRU MW
			Vacuum trap	0.15	0.30	0.005	$Pu(NO_3)_4$	TRU MW
			Chemical addition tank	0.10	0.40	0.003	HNO_3	TRU MW
234-5Z	166	HC-6	TK-1	0.15	6.40	0.11	$Pu(NO_3)_4$	TRU MW
			TK-2	0.15	6.40	0.11	$Pu(NO_3)_4$	TRU MW
			Vacuum trap	0.15	0.30	0.005	$Pu(NO_3)_4$	TRU MW
			Safety overflow-sump tank	0.13	5.03	0.07	$Pu(NO_3)_4$	TRU MW
			Safety overflow-sump tank	0.13	5.03	0.07	$Pu(NO_3)_4$	TRU MW
234-5Z	227	HC-227-S	BT-1	0.15	2.44	0.04	$Pu(NO_3)_4$	TRU MW
			BT-2	0.15	2.44	0.04	$Pu(NO_3)_4$	TRU MW
			BT-3	0.15	2.44	0.04	$Pu(NO_3)_4$	TRU MW
			RT-1	0.15	0.76	0.01	$Pu(NO_3)_4$	TRU MW
			RT-2	0.15	0.76	0.01	$Pu(NO_3)_4$	TRU MW
			RT-3	0.15	0.76	0.01	$Pu(NO_3)_4$	TRU MW
			Load-out tank	0.15	0.61	0.01	$Pu(NO_3)_4$	TRU MW
			Vent catch tank	0.15	0.30	0.005	$Pu(NO_3)_4$	TRU MW
			Vacuum trap tank	--	--	0.008	$Pu(NO_3)_4$	TRU MW
			Chemical addition tank	0.10	0.40	0.003	$Pu(NO_3)_4$	TRU MW
234-5Z	228	HC-7	Aqueous catch tank	0.15	1.22	0.02	$Pu(NO_3)_4$	TRU MW
			Vacuum trap	0.15	0.30	0.005	$Pu(NO_3)_4$	TRU MW
			E-4 vent trap	0.15	0.30	0.005	$Pu(NO_3)_4$*	TRU MW
234-5Z	232A	H-7A	Prereduction tank	0.15	0.91	0.02	$Pu(NO_3)_4$	TRU MW
			Measuring tank	--	--	0.002	Hydrogen peroxide	TRU
			Transfer head tank	0.15	0.91	0.02	$Pu(NO_3)_4$	TRU MW
			Aqueous catch tank	0.15	1.22	0.02	$Pu(NO_3)_4$	TRU MW
			Filtrate shipping tank	0.15	1.83	0.03	$Pu(NO_3)_4$*	TRU MW
234-5Z	232A	H-9A	Overflow tank	0.15	0.30	0.005	$Pu(NO_3)_4$*	TRU MW
			Vacuum receiver tank	0.15	0.61	0.01	$Pu(NO_3)_4$*	TRU MW
			Condensate receiver tank	0.15	0.30	0.005	$Pu(NO_3)_4$*	TRU MW

Table 5-2. Tanks Internal to Gloveboxes. (4 sheets)

Building number	Room number	Gloveboxes and hoods	Tanks	Dimensions (m)		Total volume (m^3)	Chemical	Regulated
				Diameter	Height			
234-5Z	232A	HA-46	Tanks (8)	0.15	3.4	0.48	11.5M KOH	TRU MW
236-Z	41	HD 2	TK-59	0.15	0.76	0.01	$Pu(NO_3)_4$*	TRU MW
			TK-60	0.15	0.76	0.01	$Pu(NO_3)_4$*	TRU MW
			TK-61	0.13	1.02	0.01	$Pu(NO_3)_4$*	TRU MW
			TK-62	0.13	1.02	0.01	$Pu(NO_3)_4$*	TRU MW
			TK-63	0.13	1.02	0.01	$Pu(NO_3)_4$*	TRU MW
236-Z	41	HD 3	TK-64	0.13	1.02	0.01	$Pu(NO_3)_4$*	TRU MW
			TK-71	0.10	0.46	0.004	$Pu(NO_3)_4$*	TRU MW
			TK-72	--	--	--	Unknown	--
			TK-73	0.10	0.30	0.002	$Pu(NO_3)_4$*	TRU MW
			TK-74	0.06	0.30	0.001	$Pu(NO_3)_4$*	TRU MW
			TK-75	0.15	1.22	0.02	$Pu(NO_3)_4$*	TRU MW
			TK-76	0.15	1.22	0.02	$Pu(NO_3)_4$*	TRU MW
			TK-77	0.15	0.30	0.01	$Pu(NO_3)_4$*	TRU MW
			TK-78	0.15	0.76	0.01	$Pu(NO_3)_4$*	TRU MW
			TK-79	--	--	0.01	$Pu(NO_3)_4$*	TRU MW
			TK-80-87	--	--	--	Unknown	--
			TK-88	0.10	0.61	0.005	$Pu(NO_3)_4$*	TRU MW
			TK-90	0.15	0.46	0.008	$Pu(NO_3)_4$*	TRU MW
			TK-91	0.15	0.30	0.005	$Pu(NO_3)_4$*	TRU MW
			TK-136	0.15	0.15	0.003	$Pu(NO_3)_4$*	TRU MW
			TK-137	0.15	0.91	0.02	72% HNO_3	TRU MW
			TK-138	0.15	0.46	0.01	$Pu(NO_3)_4$*	TRU MW
			TK-139	0.15	0.15	0.003	$Pu(NO_3)_4$*	TRU MW
			TK-140	0.15	0.91	0.02	72% HNO_3	TRU MW
			Tk-141	0.15	0.46	0.01	$Pu(NO_3)_4$1	TRU MW
			TK-142	0.15	1.52	0.03	$Pu(NO_3)_4$*	TRU MW
			TK-143	0.15	0.30	0.005	Cooling water	TRU
			TK-144	0.08	0.22	0.001	$Pu(NO_3)_4$*	TRU MW

Table 5-2. Tanks Internal to Gloveboxes. (4 sheets)

Building number	Room number	Gloveboxes and hoods	Tanks	Dimensions (m)		Total volume (m^3)	Chemical	Regulated
				Diameter	Height			
236-Z	41	HD 4	TK-93	0.10	0.25	0.002	$Pu(NO_3)_4$*	TRU MW
			TK-94	0.15	0.30	0.005	$Pu(NO_3)_4$*	TRU MW
236-Z	41	HD 5 (MT-5)	TK-131	0.15	0.63	0.01	ANN	TRU MW
			TK-132	0.15	0.48	0.008	B-Acid	TRU MW
			TK-133	0.15	0.76	0.01	$Pu(NO_3)_4$*	TRU MW
			TK-134	0.1	0.25	0.002	$Pu(NO_3)_4$*	TRU MW
			TK-135	0.1	0.46	0.004	$Pu(NO_3)_4$*	TRU MW
236-Z	41	HD 6 (MT-6)	TK-C1	0.10	0.30	0.003	$Pu(NO_3)_4$	TRU MW
			TK-C2	0.15	0.76	0.01	$Pu(NO_3)_4$	TRU MW
			TK-C3	0.15	0.76	0.01	$Pu(NO_3)_4$	TRU MW
			TK-C4	--	--	0.01	Water reservoir	TRU
236-Z	50	Room 50 glovebox	TK-58	0.10	0.76	0.01	Am, NaOH, ANN	TRU MW
	60	Room 60 glovebox	TK-32A	0.15	1.07	0.02	Am, NaOH, ANN	TRU MW
	Process Cell	West glovebox	OA column (TK-48)	0.13	1.40	0.02	$Pu(NO_3)_4$	TRU MW
			TK-51	0.10	0.46	0.004	$Pu(NO_3)_4$	TRU MW
		East glovebox	TK-10A	0.15	0.61	0.01	$Pu(NO_3)_4$*	TRU MW
			TK-11	0.05	0.66	0.001	$Pu(NO_3)_4$*	TRU MW
			TK-13	0.05	0.66	0.001	$Pu(NO_3)_4$*	TRU MW
		East glovebox	TK-16.1	0.10	0.30	0.002	$Pu(NO_3)_4$, Pu^{+4}-2TBP-$4NO_3$	TRU MW
			TK-16.2	0.10	0.30	0.002	$Pu(NO_3)_4$, Pu+4-2TBP-4NO3	TRU MW
			TK-52.1	0.15	0.76	0.01	$Pu(NO_3)_4$	TRU MW
			TK-52.2	0.15	0.76	0.01	$Pu(NO_3)_4$	TRU MW
		West glovebox	TK-52.3	0.15	0.76	0.01	$Pu(NO_3)_4$, Pu^{+4}-2TBP-$4NO_3$	TRU MW
			TK-52.4	0.15	0.76	0.01	$Pu(NO_3)_4$, Pu^{+4}-2TBP-$4NO_3$	TRU MW
		East glovebox	TK-54	0.15	0.53	0.01	$Pu(NO_3)_4$	TRU MW

Table 5-2. Tanks Internal to Gloveboxes. (4 sheets)

Building number	Room number	Gloveboxes and hoods	Tanks	Dimensions (m)		Total volume (m^3)	Chemical	Regulated
				Diameter	Height			
242-Z	Unknown	WT-1	TK-DW-5	0.10	0.66	0.01	Pu, Am, HNO3, DBBP-CCl4	TRU MW
			TK-DW-51	0.10	0.79	0.01	Pu, Am, HNO_3, DBBP-CCl_4	TRU MW
242-Z	Unknown	WT-2	TK-W-14	0.17	0.67	0.02	Am, HNO_3, DBBP-CCl_4	TRU MW
			TK-W-23	0.15	0.61	0.01	Am, HNO_3, DBBP-CCl_4	TRU MW
			TK-DW-13	0.10	0.66	0.01	Pu, Am, HNO_3, DBBP-CCl_4	TRU MW
				Total volume:		1.73 m^3		
				TRU volume:		0.017 m^3		
				TRU MW volume:		1.717 m^3		

*Estimate based on process information.

Am = Americium.
ANN = Aluminum nitrate nanohydrate.
B acid = 12M HNO_3 + 0.35M HF.
CCl_4 = Carbon tetrachloride.
DBBP = Dibutylbiphenyl.
HF = Hydrofluoric acid.
HN = Hydroxylamine nitrate.
HNO_3 = Nitric acid.
H_2O_2 = Hydrogen peroxide.
HS = Hydroxylamine sulfate.
$KMnO_4$ = Potassium permanganate.
KOH = Potassium hydroxide.
Na_2CO_3 = Sodium carbonate.
$NaNO_2$ = Sodium nitrate.
NaOH = Sodium hydroxide.
Pu = Plutonium.
$Pu(NO_3)_4$ = Plutonium nitrate.
TBP = Tributyl phosphate.
TRU = Transuranic (waste).
TRU MW = Transuranic mixed waste.
U = Uranium.

5.2 TANKS CONSIDERED EXTERNAL TO GLOVEBOXES OR HOODS

During plutonium processing, several tanks were required to supply process chemicals, receive process chemicals, mix chemicals, and catch overflow. Typical storage tanks have inlet and outlet control valves, a pump-operated recirculation line used to keep the tanks mixed and to prevent solids from settling out, a pump bypass line, a sampling valve, a drain valve, and a transfer control valve. The PFP process tanks are typically constructed of stainless steel; however, there are glass, polyvinyl chloride, and titanium tanks. Some tanks are lined with Teflon[3], and column tanks usually contain mixing media, chemical exchange media, or filter media.

The functions of the tanks include extracting plutonium from aqueous feed, stripping plutonium from organic feed, plutonium scrubbing, uranium scrubbing, dibutyl phosphate scrubbing, and organic reacidification.

The PRF canyon pencil tanks, TK-32, TK-33, TK-WS-1, TK-123, TK-69, and TK-48 are also known as columns CA, CC, CO, CU, CX, and OA, respectively. They range in height from 1.2 to 15.5 m (4 to 51 ft) and extend through as many as six floors of the 236-Z Building. Each has a bottom disengaging section and a top disengaging section of either Pyrex[4] glass or stainless steel. The remaining length of the column is made of 304-L stainless steel tubing, or Teflon-lined stainless steel pipe. Some also include a packed section containing Teflon Raschig rings, Kynar[5] Raschig rings, or Kynar saddles. Three of the columns are pulsed by air pulsers in which air pressure is alternately applied and vented on a 25.4-mm (1-in.) pulse leg connected to the bottom of the column and extending up into a higher floor's glovebox. As stated in the previous section, these columns will be considered external because they are only partially enclosed by gloveboxes and will most likely be removed and separated from the gloveboxes.

Facilities in rooms 336 and 337, Building 234-5Z, are used to prepare and supply chemicals to the RMC Line. Tanks are arranged along the south wall of the rooms in a low-walled sump. Room 336, containing tanks C, D-1, D-2, G-1, G-2, and E-1, is hooded and ventilated through roof exhausts. The room is equipped with safety showers, floor drains, and fire sprinklers. The walls and ceiling are constructed of 19-mm (0.75-in.) plaster on metal lath. Motor controls for outside chemical pumps are located in room 337.

Chemical-makeup vessels are also located in room 40 of Building 236-Z. This room contains the tanks, scales, and associated equipment used in preparing the organic solvent and other chemicals that were used in the solvent extraction and other processing activities in 236-Z. All makeup vessels are located within a dike area for spill control and empty to a catch tank for collection. The dike area accommodates the contents of the largest vessel and is alarmed for spill detection. The area outside of the dike is manned during the makeup operation.

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[3] Teflon is a trademark of E. I. du Pont de Nemours & Company.

[4] Pyrex is a trademark of Corning Glass Works.

[5] Kynar is a trademark of the Pennwalt Corporation.

Building 241-Z covers a below grade liquid waste collection system containing five tanks in five, separate, covered cells. Each tank is made of stainless steel, and each has an approximate volume of 18 m^3 (628 ft^3). Nuclear criticality safety for these tanks is provided administratively by limiting plutonium concentrations and quantities. This radioactive liquid waste facility is used for intermediate storage and neutralization of PFP aqueous wastes and is active. After neutralization, the wastes are pumped to the 244-TX Tank Farm.

Table 5-3 provides a list of potentially contaminated tanks that are considered external to gloveboxes or hoods, their locations by building and room number, dimensions (including volume), and expected solid waste classifications. The total volume of solid waste expected from the D&D of external tanks listed in the table is 173 m^3. The table was generated based on data from available literature. Any additional dimensions resulting from the walkdown were estimated visually to the nearest three decimeters (foot). Walkdown information is indicated in the table with an asterisk. Of the total expected solid waste volume, 133 m^3 is estimated to be TRU MW and 40.3 m^3 DSW.

The classification of external tanks results from process information contained in available documents. Information that was not found is indicated as unknown in the table and unknown volumes were assumed to be zero. If the chemical contents for a particular tank were not documented, process information was used to estimate the possible classification of the expected solid waste. It should be noted that the external tanks listed in Table 5-3 are not inclusive of all tanks in the PFP; the table only included tanks listed in the literature and tanks identified during the walkdown.

5.3 PIPING NOT IN GLOVEBOXES OR HOODS

Before January 1994, liquid waste streams, including condenser cooling water from gloveboxes, were collected from PFP facilities via an extensive drainage system and then routed to the vitreous clay pipe, Z-20 crib stream system. These waste streams were normally free of radioactive contamination, but they had the potential of becoming contaminated. Each of the waste streams from various PFP facilities was routed to a specific drain header and discharged into the Z-20 crib stream at a specific manhole. The waste collection lines were sloped to provide gravity-flow to the Z-20 crib stream. An exception is the waste collection line in the 291-Z waste sump; this line was pumped. Surface water runoff, resulting from rain and snow melt, was collected by four storm sewer drains located south of the 234-5Z Building. This water was also routed to the Z-20 crib stream.

The various manholes in the Z-20 crib stream system provided access for flushing and/or cleanout of the Z-20 crib stream. The manholes also provided access for grab sampling, when required, to determine the origin of abnormal chemical or radioactive contamination.

The Z-20 crib sewer stream effluent was disposed to the ground via the Z-20 crib, located southeast of the PFP facilities. The Z-20 crib consists of three parallel, perforated, polyvinyl chloride pipes, 460 m (1,500 ft) long.

Table 5-3. Tanks Considered External to Gloveboxes or Hoods. (7 sheets)

Building number	Room number	Tanks	Tank type	Dimensions (m)		Number of tanks	Total volume (m^3)	Chemical	Classification
				Diameter	Height				
234-5Z	166	Storage[a]	--	0.15	6.10	2	0.22	HS	DSW
234-5Z	337	HN-A	304-L stainless steel	--	--	1	0.30	HS	DSW
		HN-B	Fiberglass and reinforced plastic	--	--	1	2.00	1.8 - 2.2M, HNO_3	DSW
		HN-C	Schedule 10S 304-L stainless steel	0.41	2.74	1	0.36	HS, HN, HNO_3	DSW
		HN-D	Schedule 10S 304-L stainless steel	0.41	2.74	1	0.36	HS, HN, HNO_3	DSW
		HN-E	304-L stainless steel	--	--	1	0.90	HN	DSW
234-5Z	336	H	Unknown	--	--	1	0.60	HNO_3, Oxalic acid	DSW
		I	Unknown	--	--	1	0.60	HNO_3, Oxalic acid	DSW
		F-1	Unknown	--	--	1	0.60	Oxalic acid	DSW
		F-2	Unknown	--	--	1	0.60	Oxalic acid	DSW
		C	Unknown	--	--	1	0.60	HNO_3	DSW
		D-1	Unknown	--	--	1	0.18	Unknown	DSW[b]
		D-2	Unknown	--	--	1	0.18	Unknown	DSW[b]
		G-1	Unknown	--	--	1	0.18	Unknown	DSW[b]
		G-2	Unknown	--	--	1	0.18	Demineralized water	SW
		E-1	Unknown	--	--	1	0.18	Unknown	DSW[b]
		E-3	Unknown	--	--	1	0.10	H_2O_2	DSW
		HF1-1	Unknown	--	--	1	0.90	Unknown	DSW[b]
234-5Z	337	D-15	Unknown	--	--	1	0.90	$KMnO_4$	DSW
		D-16	Stainless steel	0.7	0.86	1	0.33	DBBP-CCl_4	DSW
		K-3	Stainless steel	0.7	0.86	1	0.33	CCl_4	DSW
		G-11	Stainless steel	1.06	1.24	1	1.09	HNO_3, KOH	DSW
		TK-2	Polyvinyl chloride	0.61	0.91	1	0.27	HNO_3-HF	DSW
		D-34	Stainless steel	1.06	1.24	1	1.09	NaOH	DSW
		F2X	Unknown	--	--	--	--	Unknown	--
		J-11	Unknown	--	--	1	0.10	$KMnO_4$	DSW

Table 5-3. Tanks Considered External to Gloveboxes or Hoods. (7 sheets)

Building number	Room number	Tanks	Tank type	Dimensions (m)		Number of tanks	Total volume (m^3)	Chemical	Classification
				Diameter	Height				
236-Z	12	TK-01	304-L stainless steel	0.05	1.22	1	0.002	HNO_3, $Pu(NO_3)_4$	TRU MW
		TK-02	304-L stainless steel	0.05	1.22	1	0.002	HNO_3, $Pu(NO_3)_4$	TRU MW
		TK-03-07	Unknown	--	--	--	--	Unknown	--
		TK-08	Unknown	--	--	1	0.09	HNO_3, $Pu(NO_3)_4$	TRU MW
		TK-8.1	304-L stainless steel	0.06	0.30	1	0.001	HNO_3, $Pu(NO_3)_4$	TRU MW
		TK-09	304-L stainless steel	0.10	5.18	1	0.04	HNO_3, $Pu(NO_3)_4$	TRU MW
		TK-10	304-L stainless steel	0.15	5.18	1	0.09	HNO_3, $Pu(NO_3)_4$	TRU MW
		TK-12	304-L stainless steel	0.15	5.18	1	0.09	HNO_3, $Pu(NO_3)_4$	TRU MW
		TK-14	Unknown	--	--	--	--	Unknown	--
		TK-15	304-L stainless steel	0.13	1.14	1	0.02	$Pu(NO_3)_4$, ANN	TRU MW
		TK-16	304-L stainless steel	0.13	4.67	1	0.06	$Pu(NO_3)_4$, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-17	304-L stainless steel	0.13	4.67	4	0.25	$Pu(NO_3)_4$	TRU MW
		TK-18	304-L stainless steel	0.13	4.67	4	0.25	$Pu(NO_3)_4$	TRU MW
		TK-19	304-L stainless steel	0.13	4.67	4	0.25	$Pu(NO_3)_4$	TRU MW
		TK-20	304-L stainless steel	0.13	1.12	1	0.01	$Pu(NO_3)_4$	TRU MW
		TK-21	304-L stainless steel	0.15	1.83	1	0.03	$Pu(NO_3)_4$	TRU MW
		TK-22	304-L stainless steel	0.15	1.12	1	0.02	$Pu(NO_3)_4$	TRU MW
		TK-23	304-L stainless steel	0.13	1.12	1	0.01	$Pu(NO_3)_4$	TRU MW
		TK-23.1	304-L stainless steel	0.08	0.33	1	0.002	$Pu(NO_3)_4$	TRU MW
		TK-24	304-L stainless steel	0.13	1.12	1	0.01	$Pu(NO_3)_4$	TRU MW
		TK-25	304-L stainless steel	0.13	1.12	4	0.06	$Pu(NO_3)_4$	TRU MW
		TK-25.1	304-L stainless steel	0.08	0.33	1	0.002	$Pu(NO_3)_4$	TRU MW
		TK-26	304-L stainless steel	0.13	1.12	4	0.06	$Pu(NO_3)_4$	TRU MW
		TK-26.1	304-L stainless steel	0.08	0.33	1	0.002	$Pu(NO_3)_4$	TRU MW
		TK-27	304-L stainless steel	0.13	1.12	4	0.06	$Pu(NO_3)_4$	TRU MW
		TK-28	304-L stainless steel	0.13	1.14	4	0.06	$Pu(NO_3)_4$	TRU MW
		TK-29	304-L stainless steel	0.13	1.14	4	0.06	$Pu(NO_3)_4$	TRU MW

Table 5-3. Tanks Considered External to Gloveboxes or Hoods. (7 sheets)

Building number	Room number	Tanks	Tank type	Dimensions (m)		Number of tanks	Total volume (m^3)	Chemical	Classification
				Diameter	Height				
236-Z (cont.)	12 (cont.)	TK-30	304-L stainless steel	0.15	1.07	4	0.08	HNO_3, $Pu(NO_3)_4$	TRU MW
		TK-31	304-L stainless steel	0.15	3.84	1	0.07	$Pu(NO_3)_4$	TRU MW
		TK-32	304-L stainless steel with Pyrex[1]	0.10	15.24	1	0.12	$Pu(NO_3)_4$, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-32A	Glass	0.15	1.07	1	0.02	Am, NaOH, ANN	TRU MW
		TK-33	304-L stainless steel with Pyrex	0.10	15.24	1	0.12	$Pu(NO_3)_4$, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-34	Teflon[2]-lined stainless steel	0.15	6.05	1	0.11	$Pu(NO_3)_4$, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-34A	Glass	0.15	0.30	1	0.005	$Pu(NO_3)_4$, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-34.1	304-L stainless steel	0.06	0.30	1	0.001	$Pu(NO_3)_4$, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-35	Unknown	--	--	--	--	Unknown	--
		TK-36	304-L stainless steel	0.13	1.14	4	0.06	$Pu(NO_3)_4$	TRU MW
		TK-37	304-L stainless steel	0.13	4.17	4	0.22	TBP, CCl_4	DSW
		TK-37.1	304-L stainless steel	0.08	0.33	1	0.002	TBP, CCl_4	DSW
		TK-38	304-L stainless steel	0.13	4.17	4	0.22	TBP, CCl_4	DSW
		TK-38.1	304-L stainless steel	0.08	0.33	1	0.002	TBP, CCl_4	DSW
		TK-39	304-L stainless steel	0.13	4.17	4	0.22	$Pu(NO_3)_4$	TRU MW
		TK-39.1	304-L stainless steel	0.10	0.30	1	0.002	$Pu(NO_3)_4$	TRU MW
		TK-39.2	304-L stainless steel	0.10	0.30	1	0.002	$Pu(NO_3)_4$	TRU MW
		TK-40	304-L stainless steel	0.13	4.17	4	0.22	$Pu(NO_3)_4$	TRU MW
		TK-41	304-L stainless steel	0.13	1.14	4	0.06	$Pu(NO_3)_4$	TRU MW
		TK-41.1	304-L stainless steel	0.10	0.30	1	0.002	$Pu(NO_3)_4$	TRU MW
		TK-41.2	304-L stainless steel	0.10	0.30	1	0.002	$Pu(NO_3)_4$	TRU MW
		TK-42	304-L stainless steel	0.13	1.14	4	0.06	$Pu(NO_3)_4$	TRU MW
		TK-43	Titanium	0.10	3.28	1	0.03	$Pu(NO_3)_4$	TRU MW
		TK-44	304-L stainless steel	0.15	1.12	1	0.02	$Pu(NO_3)_4$, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-45	304-L stainless steel	0.13	1.14	4	0.06	$Pu(NO_3)_4$	TRU MW
		TK-46	304-L stainless steel	0.13	1.14	4	0.06	$Pu(NO_3)_4$	TRU MW
		TK-49	304-L stainless steel	0.13	1.14	4	0.06	$Pu(NO_3)_4$	TRU MW

Table 5-3. Tanks Considered External to Gloveboxes or Hoods. (7 sheets)

Building number	Room number	Tanks	Tank type	Dimensions (m)		Number of tanks	Total volume (m^3)	Chemical	Classification
				Diameter	Height				
236-Z (cont.)	12 (cont.)	TK-50	304-L stainless steel	0.15	1.52	1	0.03	$Pu(NO_3)_4$	TRU MW
		TK-51	304-L stainless steel	0.10	0.46	1	0.004	$Pu(NO_3)_4$	TRU MW
		TK-51-A	304-L stainless steel	0.10	0.46	1	0.004	$Pu(NO_3)_4$	TRU MW
		TK-53	Glass	0.05	0.61	1	0.001	$Pu(NO_3)_4$	TRU MW
		TK-53.1	304-L stainless steel	0.06	0.30	1	0.001	$Pu(NO_3)_4$	TRU MW
		TK-54	Glass	0.15	0.53	1	0.01	$Pu(NO_3)_4$	TRU MW
		TK-55	304-L stainless steel	0.15	0.46	1	0.01	$Pu(NO_3)_4$, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-56	304-L stainless steel	0.15	0.46	1	0.01	$Pu(NO_3)_4$, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-57	Glass	0.15	0.61	1	0.01	$Pu(NO_3)_4$, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-66	Glass	0.15	0.46	1	0.01	$Pu(NO_3)_4$, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-67	Polyvinyl chloride	0.15	0.46	1	0.01	$Pu(NO_3)_4$, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-68	304-L stainless steel	0.06	0.30	1	0.001	$Pu(NO_3)_4$, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-69	Teflon-lined, 304-L stainless steel	0.15	3.84	1	0.07	Pu, Pu^{+4}-2TBP-4NO_3	TRU MW
		TK-70	304-L stainless steel	0.13	1.14	4	0.06	$Pu(NO_3)_4$	TRU MW
		TK-70.A	304-L stainless steel	0.10	0.46	1	0.004	NaOH	DSW
236-Z	40	A-101	Stainless steel	1.23	1.52	1	1.81	Pu, ANN, HNO_3	TRU MW
		A-102	Stainless steel	1.23	1.52	1	1.81	Pu, ANN, HNO_3	TRU MW
		A-103	Stainless steel	0.75	0.81	1	0.36	NaOH	DSW
		A-104	Stainless steel	1.23	1.52	1	1.81	Na_2CO_3, HNO_3, HNO_3-HF, ANN	DSW
		A-105	Stainless steel	1.07	2.13	1	1.91	HNO_3 57%	DSW
		A-106	Stainless steel	1.07	2.13	1	1.91	ANN 50%	DSW
		A-107	Polyvinyl chloride	0.75	0.81	1	0.36	Na_2CO_3	SW
		A-108	Stainless steel	0.75	0.81	1	0.36	HNO_3	DSW
		A-109	Polyvinyl chloride	1.23	1.52	1	1.81	HN+HNO_3	DSW
		A-109-A	Glass	0.15	0.76	1	0.01	NH_2NH_2	DSW

Table 5-3. Tanks Considered External to Gloveboxes or Hoods. (7 sheets)

Building number	Room number	Tanks	Tank type	Dimensions (m)		Number of tanks	Total volume (m^3)	Chemical	Classification
				Diameter	Height				
236-Z (cont.)	40 (cont.)	A-110	Polyvinyl chloride	0.75	0.75	1	0.33	HNO_3, HF, ANN	DSW
		A-111	Stainless steel	0.75	0.81	1	0.36	Mistron, $NaNO_2$	DSW
		A-112	Stainless steel	0.75	0.81	1	0.36	Mistron, HNO_3, ANN	DSW
		A-113	Stainless steel	0.75	0.81	1	0.36	HNO_3-$NaNO_3$	DSW
		A-114	Stainless steel	0.75	0.81	1	0.36	TBP	DSW
		A-115	Stainless steel	0.75	0.81	1	0.36	CCl_4	DSW
		A-116	Stainless steel	0.75	0.81	1	0.36	Antifoam, HNO_3	DSW
		A-117	Stainless steel	0.75	0.91	1	0.40	B-acid	DSW
		A-118	Stainless steel	0.20	0.63	1	0.02	$NaNO_2$	DSW
		A-119	Stainless steel	0.46	0.61	1	0.10	HNO_3 72%	DSW
		TK-120	304-L stainless steel	1.35	2.26	1	3.23	Pu^{+4}-2TBP-$4NO_3$	TRU MW
		TK-121	304-L stainless steel	1.35	2.26	1	3.23	Pu, U, HNO_3, HN	TRU MW
		TK-122	304-L stainless steel Intalox[3] saddles	0.10	7.01	1	0.06	Pu, U, HNO_3, HN	TRU MW
		TK-122-A	Carbon steel	0.15	3.66	1	0.06	Air surge tank	TRU MW[b]
		TK-123	304-L stainless steel Intalox saddles	0.10	7.01	1	0.06	$Pu(NO_3)_4$	TRU MW
		TK-123-A	Carbon steel	0.15	3.66	1	0.06	Air surge tank	TRU MW[b]
		TK-124	Kynar[4]-lined stainless steel	0.10	5.18	2	0.08	HNO_3	DSW
		TK-124.1	304-L stainless steel	0.06	0.30	1	0.001	HNO_3	DSW
		TK-125	304-L stainless steel	0.15	0.81	1	0.01	Condenser surge tank	TRU MW[b]
		TK-126	304-L stainless steel	0.13	4.67	4	0.25	$Pu(NO_3)_4$, Pu^{+4}-2TBP-$4NO_3$	TRU MW
		TK-127	304-L stainless steel	0.13	4.67	4	0.25	$Pu(NO_3)_4$	TRU MW
		TK-128	304-L stainless steel	0.13	1.14	4	0.06	$Pu(NO_3)_4$	TRU MW
		TK-WM-1	304-L stainless steel	0.16	4.37	3	0.26	HNO_3, $Pu(NO_3)_4$, HF	TRU MW
236-Z	Canyon	TK-WE-1	304-L stainless steel	0.16	7.92	1	0.16	Pu, Am, DBBP-CCl_4	TRU MW
		TK-WS-1	Kynar-lined stainless steel	0.10	6.56	1	0.05	Pu, Am, DBBP-CCl_4, HNO_3	TRU MW
		TK-WS-2	Kynar-lined stainless steel	0.10	4.88	1	0.04	Pu, HNO_3, HF	TRU MW

Table 5-3. Tanks Considered External to Gloveboxes or Hoods. (7 sheets)

Building number	Room number	Tanks	Tank type	Dimensions (m)		Number of tanks	Total volume (m^3)	Chemical	Classification
				Diameter	Height				
236-Z (cont.)	Canyon (cont.)	TK-DWE-1	Glass and stainless steel	0.10	0.66	1	0.005	Pu, Am, DBBP-CCl_4, HNO_3, $NaNO_3$	TRU MW
		TK-W-49	Glass and stainless steel	0.15	0.63	1	0.01	HNO_3, $Pu(NO_3)_4$, HF	TRU MW
		TK-W-103	304-L stainless steel	0.15	0.46	1	0.008	NaOH	DSW
241-Z	Unknown	TK-D-4	304-L stainless steel	3.03	2.97	1	21.40	Pu, Am, DBBP-CCl_4, HNO_3, $NaNO_3$	TRU MW
		TK-D-5	304-L stainless steel	3.03	2.97	1	21.40	Pu, Am, DBBP-CCl_4, HNO_3, $NaNO_3$	TRU MW
		TK-D-7	304-L stainless steel	3.03	2.97	1	21.40	Pu, Am, DBBP-CCl_4, HNO_3, $NaNO_3$	TRU MW
		TK-D-8	304-L stainless steel	3.03	2.97	1	21.40	Pu, Am, DBBP-CCl_4, HNO_3, $NaNO_3$	TRU MW
		Tank[a]	--	3.03	2.97	1	21.40	Pu, Am, DBBP-CCl_4, HNO_3, $NaNO_3$	TRU MW
241-ZB	Unknown	Tank[a]	--	2.44	3.05	1	14.25	NaOH	DSW
242-Z	Unknown	TK-A-1	Stainless steel	0.67	0.91	1	0.32	NaOH	DSW
		TK-A-2	Stainless steel	0.67	0.91	1	0.32	HNO_3, ANN, $NaNO_2$	DSW
		TK-A-3	Stainless steel	0.67	0.91	1	0.32	ANN	DSW
		TK-A-4	Stainless steel	0.67	0.91	1	0.32	HNO_3, resin	DSW
		TK-A-7	Polyvinyl chloride	0.30	0.61	1	0.04	HNO_3, resin	DSW
		TK-A-10	Glass	0.10	0.15	1	0.001	HNO_3, distilled water	DSW
242-Z	Process Cell	TK-W-1	Stainless steel, Dowex[5]	--	--	1	0.16	Pu, Am, DBBP-CCl_4, HNO_3	TRU MW
		TK-W-2	Stainless steel	--	--	1	0.50	Pu, Am, DBBP-CCl_4, HNO_3	TRU MW
		TK-W-3	Stainless steel	1.22	1.51	1	1.76	Pu, Am, DBBP-CCl_4, HNO_3	TRU MW
		TK-W-4	Stainless steel	1.22	1.51	1	1.76	Pu, Am, DBBP-CCl_4, HNO_3	TRU MW
		TK-W-5	Stainless steel	--	--	1	0.42	Pu, Am, DBBP-CCl_4, HNO_3	TRU MW
		TK-W-6	Stainless steel	--	--	1	0.10	Pu, Am, DBBP-CCl_4, HNO_3	TRU MW
		TK-W-7	Glass, stainless steel	--	--	1	0.006	Pu, Am, DBBP-CCl_4, HNO_3	TRU MW[b]

Table 5-3. Tanks Considered External to Gloveboxes or Hoods. (7 sheets)

Building number	Room number	Tanks	Tank type	Dimensions (m)		Number of tanks	Total volume (m^3)	Chemical	Classification
				Diameter	Height				
242-Z (cont.)	Process Cell (cont.)	TK-W-8-3	Stainless steel	0.09	0.60	1	0.004	Pu, Am, DBBP-CCl_4, HNO_3	TRU MW
		TK-W-8-4	Stainless steel	0.09	0.60	1	0.004	Pu, Am, DBBP-CCl_4, HNO_3	TRU MW
		TK-W-10	Glass, stainless steel	--	--	1	0.009	Pu, Am, DBBP-CCl_4, HNO_3	TRU MW[b]
		TK-W-11	Stainless steel	0.09	0.60	1	0.004	Pu, Am, DBBP-CCl_4, HNO_3	TRU MW
		TK-W-12	Stainless steel	1.82	1.51	1	3.93	Pu, Am, HF, HNO_3	TRU MW
		TK-W-13	Stainless steel	1.51	1.51	1	2.70	Pu, Am, HF, HNO_3	TRU MW
				Total volume:			173.20[c]		
				DSW volume:			40.26		
				TRU MW volume:			132.94		

[a] Walkdown estimate.
[b] Estimate based on process information.
[c] Does not include sanitary waste volumes.

[1] Pyrex is a trademark of Corning Glass Works.
[2] Teflon is a trademark of E. I. Du Pont de Nemours & Company.
[3] Intalox is a trademark of Norton Chemical Process Products.
[4] Kynar is a trademark of Pennwalt Corporation.
[5] Dowex is a trademark of Dow Chemical Company.

Am = Americium.
ANN = Aluminum nitrate nanohydrate.
B acid = 12M HNO_3 + 0.35M HF.
CCl_4 = Carbon tetrachloride.
DBBP = Dibutylbiphenyl.
DSW = Dangerous solid waste.
HF = Hydrofluoric acid.
HN = Hydroxylamine nitrate.
HNO_3 = Nitric acid.
H_2O_2 = Hydrogen peroxide.
HS = Hydroxylamine sulfate.
$KMnO_4$ = Potassium permanganate.
KOH = Potassium hydroxide.
Na_2CO_3 = Sodium carbonate.
$NaNO_2$ = Sodium nitrate.
NaOH = Sodium hydroxide.
Pu = Plutonium.
$Pu(NO_3)_4$ = Plutonium nitrate.
SW = Sanitary waste.
TBP = Tributyl phosphate.
TRU MW = Transuranic mixed waste.
U = Uranium.

The central pipe is 25.4 cm (10 in.) in diameter with a 15.2-cm- (6-in.-) diameter pipe located to each side. After five to six years of operation, percolation rates in the Z-20 crib had decreased to the point that Z-20 crib stream flow exceeded Z-20 crib disposal capacity on occasion. Increased disposal capacity was provided by the installation of 11 drain wells.

To reduce the volume of waste water being discharged into the Z-20 crib, the B-680 and C-040 Projects were approved. These projects segregated the process-equipment cooling water by installing a closed loop cooling system (CLCS), consisting of a primary closed cooling (PCW) loop and a secondary closed cooling (SCW) loop. The flow of process cooling water to the Z-20 crib was halted in January 1994 when the CLCS began operating. The PCW and SCW include eight intermediate flat-plate heat exchangers, redundant recirculation pumps, and two evaporative-type fluid coolers. The SCW acts as a heat sink to the PCW through the intermediate heat exchangers. The PCW, which cools the process equipment, operates at a lower pressure than the SCW to ensure that a breach between the systems would cause a flow towards the PCW (and, hence, the process equipment) (Navarro 1994).

The B-680 Project provided a CLCS for equipment and processes in Buildings 236-Z and 234-5Z that represented a potential for contaminating once-through cooling water. The B-680 CLCS installed two PCW loops and an SCW loop. One PCW loop provides cooling to the east and west gallery gloveboxes and gloveboxes 5 and 6 in room 41. The second PCW loop provides sealing/cooling water to two air sample vacuum pumps located in room 35. Provisions for a third loop have been included to service equipment (yet to be identified) in Building 234-5Z (Navarro 1994).

The C-040 Project consisted of four PCW loops for cooling and an extension of the SCW loop for transferring heat from these primary loops located in Building 291-Z. The PCW provides sealing/cooling water to two 43-cm Hg (17-in. Hg) air sample vacuum pumps and two process air compressors in room 501, Building 291-Z. The process air compressors were installed under Project C-171. The C-040 SCW loop is an extension of and ties to the B-680 SCW loop at valves V-CLC-9 and V-CLC-10 (Navarro 1994).

The Z-20 crib is the only crib currently used (active) by the PFP. However, many cribs, ditches, and trenches have been utilized by the PFP in the past. Table 5-4 is a list of these and their service (from H-2-32528).

The amount of solid waste expected to result from the D&D of the crib system is difficult to predict because it is not known at this point whether the cribs will be remediated in place or processed elsewhere. For this reason, the cribs were considered outside the scope of this project. Drain lines to the cribs, ditches, and trenches were included.

Building 241-Z covers a below grade, liquid-waste collection system containing five tanks in five separate covered cells. This Radioactive Liquid Waste Facility is used for intermediate storage and neutralization of PFP aqueous wastes and is still active. After neutralization, wastes are pumped to the 244-TX Tank Farm. A steam jet also is provided for transfer of the pump heel. Ventilation is provided for the cells and the tanks but not for

Table 5-4. Cribs, Ditches, and Trenches Used by PFP in the Past.

Number	Description	Service
Z-1 (ditch)	Ditch (backfilled)	Cooling water, steam condensate
Z-1 (crib)	3.7 x 3.7 x 4.3 m (12 x 12 x 14 ft) timbered cavern	D-6 wastes
Z-1A	20.3-cm (8-in.) clay pipe tile field	Reclamation salt waste (pipe trench) specific retention
Z-2	3.7 x 3.7 x 4.3 m (12 x 12 x 14 ft) timbered cavern	D-6 wastes
Z-3	1.2-m- (4-ft-) diameter perforated culvert pipe, 20.1 m (66 ft) long	D-6 wastes
Z-4	Unknown	231-Z lab wastes
Z-5	Timbered cribs (two)	231-Z process wastes
Z-6	Temporary trench	231-Z process wastes
Z-7	Pipe trench	231-Z lab wastes
Z-8	56,781-L (15,000-gal) tank and French drain	Silica waste form recuplex dissolvers
Z-9	9.1 x 18.3 (at the bottom) x 6.1 m deep (30 ft x 60 ft (at the bottom) x 20 ft deep trench with a 0.3-m (12-in.) concrete top	Recuplex salt waste
Z-10	Reverse well	231-Z wastes
Z-11	Open ditch to swamp (backfilled)	Cooling water, steam condensate, vacuum pump sealing water
Z-12	0.3-m (12-in.) perforated clay pipe in gravel 9.1 m deep (30 ft) x 183 m long (600 ft)	D-6 wastes
Z-13	French drain	234-5 tunnel drain
Z-14	French drain	Evaporator condensate water
Z-15	French drain	Evaporator condensate water
Z-16	Pipe trench	231-Z lab wastes
Z-17	Temporary trench	Unknown
Z-18	Five 61-m (200-ft) long pipe trenches with two 10.2-cm (4-in.) perforated clay pipes in each trench	Reclamation salt waste (pipe trench) specific retention
Z-19	Open ditch to swamp	Cooling water, steam condensate, vacuum pump sealing water

the building. The tanks receive aqueous wastes from processes and laboratories in the PFP complex. Such wastes include steam condensates from the 236-Z plutonium product and filtrate concentrators, filtrate evaporator overheads, and 234-5Z vacuum pump seal water. Wastes are batch transferred to tanks for sampling and analysis to determine their composition. Various pipe sizes and compositions are used throughout this system.

The 241-Z-361 settling tank was placed in service in 1949 and remained in continuous service until May 15, 1973. The tank is an underground, steel-lined, reinforced-concrete structure with a sloping bottom. Its approximate inside dimensions are 4.0 m by 8.0 m by 5.5 m (depth) (13 ft x 26 ft x 18 ft). The tank was filled by jetting from the sump tanks (known as D-4, D-5, D-7, and D-8). Baffles over the inlet and overflow pipes reduced turbulent flow in the tank, permitting particulates in the neutralized waste stream to settle out before the liquid was discharged to the receiving crib. Overflow from the tank flowed to the cribs in Table 5-5, during the given time periods, by gravity feed (Kasper 1981).

Table 5-5. Cribs Fed by Overflow from the 241-Z-361 Settling Tank.

Crib	Period of use
Z-1 and Z-2	June 1949 to June 1952
Z-3	July 1952 to March 11, 1959
Z-12	March 12, 1959, to May 15, 1973

The 241-Z-361 settling tank received neutralized, low-salt, aqueous waste streams from the PFP. The sources of these waste streams were

- The hydro-fluorinator offgas water jet (button line)
- Certain cooling waters and condensates
- Lab wastes and hood floor drains.

In addition, from 1961 to 1973, the sump tanks received expended scrubber and wash solutions from the offgas scrubber of the PFP incinerator, which contained dry fly ash (Harlow 1975). On May 15, 1973, use of the 241-Z-361 settling tank was discontinued and all lines to it were blanked (Harlow 1975). The tank was left full of supernate and sludge; the sludge is reportedly 2.4 m deep (Burns 1978). The plutonium accounted for out of sump tanks D-4, D-5, D-7, and D-8 to the 241-Z-361 settling tank and the cribs is shown in Table 5-6 (Harlow 1975).

Chemical makeup areas are located in Building 234-5Z, rooms 336 and 337, and Building 236-Z, room 40. Chemical makeup involves mixing chemicals with other chemicals and/or water to provide solutions or organic mixtures necessary to run various processes supporting plutonium operation at the PFP. After the chemicals are prepared, they are either stored or transferred via chemical addition pipe lines to the facilities in which they will be used.

Table 5-6. Plutonium from Sump Tanks to 241-Z-361 Settling Tank and Cribs.

Crib	Plutonium (g)
Z-1 and Z-2	199
Z-3	5,698
Z-12	25,300
Total to 241-Z-361	31,200

Blowers supply dry air to various process gloveboxes to maintain low moisture content in plutonium products, which corrode in moist air or are hygroscopic. Two dry-air generating systems, one electric, one steam, are designed to operate separately, so one unit is operating while the other is on standby. Room air is passed through a roughing filter and refrigerated to remove most of the moisture. It is then passed through a silica gel drying tower and refrigerated again, then through a second silica gel drying tower, and finally passed out to the dry-air header that services the gloveboxes in Building 234-5Z. Flow is regulated by control valves at each glovebox serviced by the header.

Dry air to the repackaging glovebox in room 636, 2736-ZB, is supplied by two air compressors, driven by electric motors, and a drying tower.

Instrument air is distributed throughout the 234-5Z Building for general use in controlling instruments for the ventilation systems, the process systems, and the dry-air systems.

The 66-cm Hg (26-in. Hg) process vacuum system provides high-capacity vacuum service to the PFP facilities for vacuum transfers of liquids and other high-vacuum requirements. It is a contaminated system with a Safety Class 2 designation. A 10.2-cm- (4-in.-) diameter stainless steel pipe header is routed throughout the duct level of the 234-5Z Building with branches serving process areas and the 242-Z and 236-Z Buildings.

The air pulled into this system, in many cases, comes from contaminated enclosures and is usually moist from use as the source of a vacuum transfer of contaminated liquid. Thus, each major branch is equipped with demisters. Liquid effluents from the seal-water loop, which may contain trace amounts of contamination, are routed to the 241-Z Building waste tanks for disposal.

Vacuum is provided by two vacuum pumps. The inlet stream to the pumps contains two sets of two-stage HEPA filters. The vacuum pumps discharge water to a trap-silencer tank to separate the seal water from the discharged gas. The gas is routed out of the water trap-silencer tank up through a demister and into the E-4 ventilation system ahead of the final E-4 filter bank (see Section 4.0). A seal-water pump recirculates the seal water from the bottom of the water trap-silencer tank through a water-cooled heat exchanger, supplied by the seal-water cooling loop, then back to the vacuum pumps.

The seal-water cooling system consists of two water-to-water heat exchangers and a closed-loop, glycol-cooling subsystem. The closed-loop, water-cooling subsystem is located outside and south of the 234-5Z Building. It consists of two evaporative coolers and two pumps and is powered by a 5-hp electric motor. Filtered water from the process water supply system is evaporated in the evaporative coolers to remove heat from the glycol cooling loop.

The 43-cm Hg (17-in. Hg) air-sampling vacuum system provides the motive force for continuous air monitor units and fixed-filter air samplers. Pipe headers are run throughout the 234-5Z Building, with branches serving the 291-Z, 242-Z, 2736-Z, and 232-Z Buildings, to provide the vacuum source. The equipment consists of two vacuum pumps, a moisture separator, and inlet and outlet HEPA filters. The air is collected and filtered by one stage of HEPA filters before entering the vacuum pumps. It is then discharged via the moisture separator and two outlet HEPA filters to the 291-Z Building's exhaust fan inlet plenum.

The PRF has its own complete air monitoring system. Two vacuum pumps, powered by a 25-hp electric motor, are installed in room 35, 236-Z Building. The inlet air to each of the vacuum pumps is passed through a HEPA filter; the outlet air is discharged to the E-3 exhaust system.

5.3.1 Waste Drainage Piping

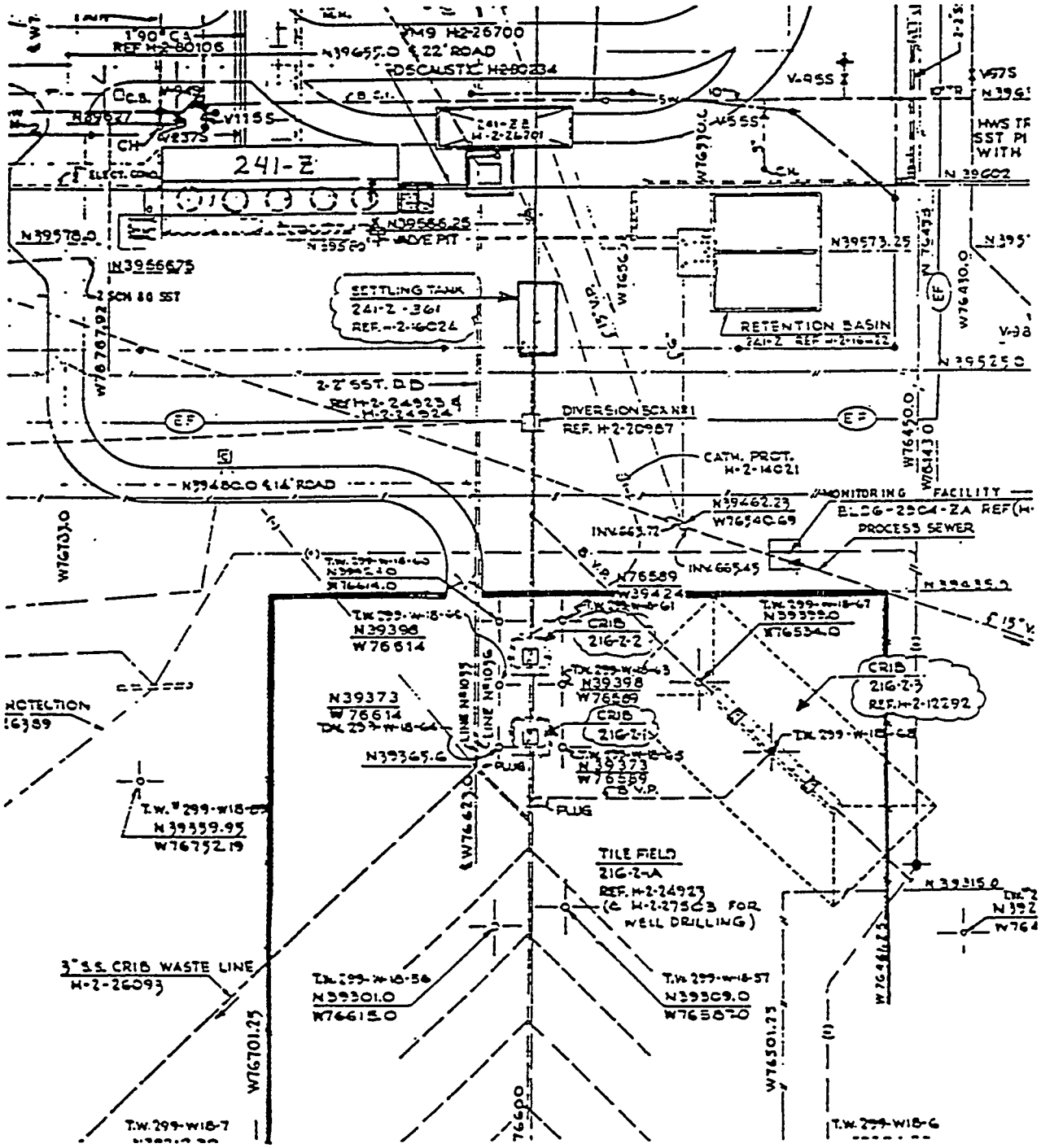
There are three important sections of waste drainage pipe: (1) piping in the tunnels of 234-5Z, (2) piping in the trenches outside of 234-5Z, and (3) piping in Building 241-Z. The drawings used to determine the total volume of waste drainage pipe are listed in Table 5-7. The horizontal drainage system was traced on the appropriate drawing. Each drawing has lines representing the drainage piping labeled D-1 through D-8. The given drawing scale was used to determine the length of pipe; the diameters are given on the drawings. The diameter of the main line was used when a pipe branched into a pipe of unknown diameter. When the pipe diameter changed but the exact location of the change was not known, the largest diameter was used to the point at which either the new diameter was given or a tee in the pipe was located.

From the drawings it was determined that the acid drain lines (D-1) exit the 234-5Z Building in two locations and join the clear-water drain (D-2) outside of the 234-5Z Building. The combined waste emptied into a drainage ditch southeast of the main building. The process-cooling drain line (D-3) drained into a retention pond approximately 122 m (400 ft) from the 234-5Z Building. Drains D-4 through D-8 drained into storage tanks located in Building 241-Z. The distance to the storage tanks was assumed to be 91 m (300 ft). Approximately 23 m (75 ft) of 15-cm (6-in.) drainage line connects the tanks contained in Building 241-Z with settling tank 241-Z-361 located southeast of the building. A pipe, 46 m (150 ft) long by 20 cm (8 in.) in diameter, exits the settling tank and drains into three cribs, 216-Z-1, 216-Z-2, and 216-Z-3. A plan view of the pipe system detailing drainage from the five tanks in 241-Z to the cribs is shown in Figure 5-1.

Table 5-7. Drawing List for Pipe Locations.

Location	Drawing number	Drawing type
234-5Z	H-2-16473 through H-2-16480, H-2-29646	Duct level plan view
	H-2-93504	Engineering flow diagram, RMC Line
	H-2-16414, H-2-16415	Below first floor plan view
	H-2-19325, H-2-16425	First floor plan view
	H-2-23400	Flowcharts
Underground services	H-2-44511, H-2-24923, H-2-16421, H-2-23872, H-2-43517, H-2-16420	Outside services plan view
241-Z	H-2-16419	Waste drains in 241-Z
236-Z	H-2-28014	Process flowcharts
	H-2-29657	First and second floor plan view
	H-2-29658	Third floor plan view
	H-2-29658	Fourth floor plan view
	H-2-29659	Sectional view
	H-2-29661	Chemical preparation room, plan view
	H-2-29663	Equipment room, plan view

Figure 5-1. Pipe Plan View Detailing Drainage from 241-Z to the Cribs.



A small trench is located in the front of the 241-Z Building. The trench piping enters the small trench near the mid-section of the building. The pipe then tees off to the appropriate tank. It is assumed that when the lines enter 241-Z, the D-4 line feeds the D-4 tank, the D-5 line feeds the D-5 tank, and so on.

All drainage lines (D-1 through D-8) are considered TRU MW and have a total estimated volume of 88.5 m^3. The volume of drain piping, detailed by line, is listed in Table 5-8. Appendix B, Table B-1, contains dimensional details used to obtain the drain pipe volumes.

5.3.2 234-5Z Service Piping

The service piping examined in Building 234-5Z consisted of those lines listed in Table 5-9. The drawings used to determine the total volume of service piping in 234-5Z are listed in Table 5-7. Each system was traced on the appropriate drawing. The length of each system was measured using the given scale. For short branch lines where the diameter was not legible, the diameter was assumed to be the same as the main line. Only the sections of water lines and pressurized air lines, including instrument air, that dropped down into a room were considered TRU. All other sections of water and pressurized air lines were considered uncontaminated. All liquid chemical lines were considered hazardous unless they dropped down into a room. The pipe in the room was considered TRU MW. All of the 66-cm Hg (26-in. Hg) vacuum lines and air sampling lines were considered TRU. All gaseous chemical lines were considered uncontaminated unless they dropped down into a room. The pipe in the room was considered TRU.

The total estimated volume of service piping for 234-5Z is 7.85 m^3 TRU, 0.34 m^3 DSW, and 0.02 m^3 TRU MW. Details by service are given in Table 5-9. Appendix B, Table B-2, contains dimensional details used to obtain service pipe volumes.

5.3.3 Plutonium Reclamation Facility Waste Drain and Service Piping

The waste drain service piping examined in Building 236-Z consisted of those lines listed in Table 5-10. The drawings used to determine the total volume of service piping in 236-Z are listed in Table 5-7. All assumptions used for measuring and classifying the TRU, DSW, and TRU MW piping are the same as those used for measuring and classifying the piping in 234-5Z. In addition, all column extractants and column scrubs are considered TRU MW.

The total estimated volume of service piping for 236-Z is 0.50 m^3 TRU, 1.28 m^3 TRU MW, and 0.06 m^3 DSW. Details by service are given in Table 5-10. Appendix B, Table B-3, contains dimensional details used to obtain pipe volumes.

Table 5-8. Drain Pipe Volumes.

Drain number	Tunnel piping volume (m^3)	Trench piping volume (m^3)	241-Z piping volume (m^3)
D-1	0.15	29.22	N/A
D-2	2.03	0.07	N/A
D-1/D-2	N/A	28.33	N/A
D-3	1.41	3.93	N/A
D-4	1.67	0.79	0.02
D-5	0.60	0.84	0.02
D-6	4.72	5.99	0.10
D-7/D-8	0.22	0.91	0.03
Miscellaneous	0.65	N/A	6.77
Total	11.45	70.08	6.94

Table 5-9. 234-5Z Service Pipe Volumes.

Service piping	Transuranic waste (m^3)	Dangerous solid waste (m^3)	Transuranic mixed waste (m^3)
Hot water	0.025	N/A	N/A
Cold water	0.063	N/A	N/A
Distilled water	0.027	N/A	N/A
Chilled water	0.008	N/A	N/A
Glycol	N/A	0.04	0.001
Nitric acid (60%)	N/A	0.16	0.008
Nitric acid (*M*)	N/A	0.03	0.003
Oxalic acid (0.67*M*)	N/A	0.04	0.003
Oxalic acid (0.1*M*)	N/A	0.04	0.003
NaOH (30%)	N/A	0.03	0.002
103-kPa (15-lb/in^2) air	0.026	N/A	N/A
276-kPa (40-lb/in^2) air	0.053	N/A	N/A
621-kPa (90-lb/in^2) air	0.020	N/A	N/A
66-cm Hg (26-in. Hg) vacuum	7.44	N/A	N/A
Instrument air (207 kPa [30 lb/in^2])	0.016	N/A	N/A
Air sampling	0.097	N/A	N/A
Argon	0.011	N/A	N/A
Helium	0.016	N/A	N/A
Propane	0.024	N/A	N/A
Hydrogen	0.003	N/A	N/A
Methane	0.001	N/A	N/A
Methane exhaust	0.001	N/A	N/A
Nitrogen	0.009	N/A	N/A
Oxygen	0.008	N/A	N/A
Hydrofluoric acid	0.004	N/A	N/A
SO_2	0.003	N/A	N/A
Total	7.85	0.34	0.02

Table 5-10. 236-Z Service Pipe Volumes.

Service pipe	Transuranic waste (m^3)	Dangerous solid waste (m^3)	Transuranic mixed waste (m^3)
Compressed air (621 kPa [90 lb/in^2])	0.013	N/A	N/A
Nitrogen	0.005	N/A	N/A
Chemical preparation water	N/A	N/A	N/A
Instrument air	0.014	N/A	N/A
Process water	0.010	N/A	N/A
Protected process water	0.014	N/A	N/A
Vacuum air sampling	0.366	N/A	N/A
Dry air	0.075	N/A	N/A
Aluminum nitrate	N/A	0.005	0.015
Tributyl phosphate	N/A	0.001	0.003
Carbon tetrachloride	N/A	0.002	0.003
Sodium hydroxide	N/A	0.002	0.006
Chemical addition (miscellaneous)	N/A	0.017	0.003
Dissolver feed	N/A	0.003	0.002
Hydrofluoric acid	N/A	0.001	0.003
Nitric acid	N/A	0.023	0.014
Sodium nitrite	N/A	0.002	0.002
CA column scrub	N/A	N/A	0.008
CC column extractant	N/A	N/A	0.004
CO column extractant	N/A	N/A	0.004
CA column extractant	N/A	N/A	0.003
Chemical and clear process waste drain	N/A	N/A	0.616
Potentially contaminated waste	N/A	N/A	0.124
Contaminated waste	N/A	N/A	0.398
Miscellaneous	N/A	N/A	0.075
Total	0.50	0.06	1.28

5.4 VENTILATION SYSTEM

All buildings served by the PFP ventilation systems are zoned to ensure confinement of radioactive materials. Zone 1 is designated as those areas where plutonium contamination would not normally be present. Zone 3 consists of areas in which radioactive material is stored or handled in a contained form. Zone 4 consists of the inside of the hoods, gloveboxes, and process cells that may be grossly contaminated because of direct exposure to plutonium. Airflow is from lowest to medium to highest potentially contaminated areas. The ventilation exhaust involved in the E-3 and E-4 ventilation systems comes from Zone 3 and Zone 4 areas, respectively.

In all buildings, exhaust gases from contaminated and potentially contaminated ventilation zones are filtered via HEPA filters before discharge to the atmosphere. The HEPA filters, as received onsite, are tested by Hanford Environmental Health Foundation personnel to ensure that 99.97 percent of all 0.3-μm-diameter particulates are retained. The HEPA filters are retested before installation to ensure particulate retention and integrity and periodically thereafter in their service locations. Installed differential-pressure instrumentation measures the pressure drop across the filters to ensure that the filter is not plugged or breached. Filters are replaced that do not retain 99.95 percent of the less than 3.0-μm-diameter test particles during field testing.

The HEPA filter inlet air is treated as necessary to prevent moisture accumulation within the filters. Vent exhaust is heated as necessary to preclude HEPA filter wetting.

Air from known-contamination ventilation exhaust zones (Zone 4) is filtered by at least two stages of testable HEPA filtration before discharge to the atmosphere via a stack (E-4 ventilation exhaust system). The E-4 exhaust systems normally contain HEPA filters on glovebox or cell exhausts (see Section 5.1, Table 5-1), with the first testable HEPA filter located in a filterbox (see Tables 5-11 and 5-12). Exhaust flows from these filters are manifolded to a room containing a bank of testable HEPA filters (second stage) before discharge to the atmosphere via a stack.

Table 5-11 provides a list of PFP HEPA filters, both glovebox HEPA filters and testable HEPA filters, and includes their locations by building and room number, dimensions, volumes, and the best estimates of plutonium holdup. The number and volume of HEPA filters (assumed to be removed from filterboxes before D&D activities) are important because, at this time, the Waste Isolation Pilot Plant will not accept them. There are 1,760 HEPA filters (353 glovebox filters and 1407 testable filters) with a total volume of 154 m^3. All glovebox filters are assumed to be standard size (20 x 20 x 15 cm [8 x 8 x 6 in.]). The filters in filter rooms 309 and 310 are contaminated by nitric crystals (various nitrogen salts) that originated from the use in the process of nitric acid, which vaporized and passed through the ventilation system. Of the total waste expected from HEPA filters, 90 percent is expected to be TRU MW because of the presence of dioctyl phthalate, a state-regulated compound used during filter efficiency testing; the remaining 10 percent is expected to be TRU.

Table 5-11. Volume of High-Efficiency Particulate Air Filters. (3 sheets)

Building number	Room number	Number of glovebox HEPA filters	Number of testable filters	Plutonium holdup (g)	Dimensions (m)			Volume (m^3)	Information origin
					Length	Depth	Diameter		
216-Z-9B	Bldg.	--	2	--	0.61	0.29	--	0.22	Drawings
232-Z	Bldg.	--	6	--	0.61	0.29	--	0.65	Drawings
		--	6	--	0.61	0.51	--	1.13	Drawings
234-5Z	131	9	--	--	0.20	0.20	--	0.06	23400
234-5Z	134	--	2	--	0.30	0.29	--	0.05	Drawings
		4	--	--	0.20	0.20	--	0.03	23400
234-5Z	136	8	--	--	0.20	0.20	--	0.05	23400
234-5Z	137	12	--	--	0.20	0.20	--	0.08	23400
234-5Z	139	3	--	--	0.20	0.20	--	0.02	23400
234-5Z	145	2	--	--	0.20	0.20	--	0.01	23400
234-5Z	146	--	4	--	0.30	0.29	--	0.11	Drawings
		9	--	--	0.20	0.20	--	0.06	23400
234-5Z	149	--	1	--	0.61	0.29	--	0.11	Drawings
		--	1	--	0.30	0.29	--	0.05	Drawings
		4	--	--	0.20	0.20	--	0.03	23400
234-5Z	152	6	--	--	0.20	0.20	--	0.04	--
234-5Z	153	4	--	--	0.20	0.20	--	0.03	23400
234-5Z	154	11	--	--	0.20	0.20	--	0.07	23400
234-5Z	156	--	1	--	0.30	0.15	--	0.01	Drawings
		3	--	--	0.20	0.20	--	0.02	23400
234-5Z	157	--	2	--	0.30	0.15	--	0.03	Drawings
		6	--	--	0.20	0.20	--	0.04	23400
234-5Z	166	7	--	--	0.20	0.20	--	0.04	23400
234-5Z	169	2	--	--	0.20	0.20	--	0.01	23400
234-5Z	170	3	--	--	0.20	0.20	--	0.02	23400
234-5Z	179	48	--	--	0.20	0.20	--	0.30	23400
234-5Z	180	--	2	--	0.30	0.29	--	0.05	Drawings
		2	--	--	0.20	0.20	--	0.01	23400
234-5Z	185	4	--	--	0.20	0.20	--	0.03	23400
234-5Z	188	7	--	--	0.20	0.20	--	0.04	23400
234-5Z	221-C	--	4	--	0.30	0.29	--	0.11	Drawings
		--	2	--	0.61	0.29	--	0.22	Drawings
		--	1	--	0.20	0.15	--	0.01	Drawings
		11	--	--	0.20	0.20	--	0.07	23400
234-5Z	221-D	--	4	--	0.61	0.29	--	0.43	Drawings
		--	3	--	0.30	0.29	--	0.16	Drawings
		--	1	--	0.20	0.15	--	0.01	Drawings
		13	--	--	0.20	0.20	--	0.08	23400
234-5Z	221-E	--	3	--	0.61	0.29	--	0.33	Drawings
		7	--	--	0.20	0.20	--	0.04	23400
234-5Z	227	4	--	--	0.20	0.20	--	0.03	23400

Table 5-11. Volume of High-Efficiency Particulate Air Filters. (3 sheets)

Building number	Room number	Number of glovebox HEPA filters	Number of testable filters	Plutonium holdup (g)	Dimensions (m)			Volume (m^3)	Information origin
					Length	Depth	Diameter		
234-5Z	228-A	--	2	--	--	--	0.19	0.01	Drawings
		15	--	--	0.20	0.20	--	0.09	23400
234-5Z	228-B	4	--	--	0.20	0.20	--	0.03	23400
234-5Z	228-C	10	--	--	0.20	0.20	--	0.06	23400
234-5Z	230-A	1	--	--	0.20	0.20	--	0.01	23400
234-5Z	230-B	3	--	--	0.20	0.20	--	0.02	23400
234-5Z	230-C	3	--	---	0.20	0.20	--	0.02	23400
234-5Z	232	7	--	--	0.20	0.20	--	0.04	23400
234-5Z	234	--	1	--	0.61	0.29	--	0.11	Drawings
		1	--	--	0.20	0.20	--	0.01	23400
234-5Z	235-A1	2	--	--	0.20	0.20	--	0.01	23400
234-5Z	235-A2	7	--	--	0.20	0.20	--	0.04	23400
234-5Z	235-A3	10	--	--	0.20	0.20	--	0.06	23400
234-5Z	235-B	16	--	--	0.20	0.20	--	0.10	23400
234-5Z	235-D	--	3	--	0.61	0.51	--	0.57	Drawings
		--	1	--	0.61	0.29	--	0.11	Drawings
		--	3	--	0.30	0.15	--	0.04	Drawings
		--	2	--	0.61	0.36	--	0.26	Drawings
		15	--	--	0.20	0.20	--	0.09	23400
234-5Z	235-E	2	--	--	0.20	0.20	--	0.01	23400
234-5Z	262	--	16	--	0.61	0.29	--	1.74	Drawings
		--	2	--	0.61	0.29	--	0.22	Drawings
		2	--	--	0.20	0.20	--	0.01	23400
234-5Z	263	3	--	--	0.20	0.20	--	0.02	23400
		--	14	36	0.61	0.29	--	1.52	Drawings
234-5Z	264	--	4	46	0.61	0.29	--	0.43	Drawings
		--	3	20	0.61	0.15	--	0.17	Drawings
		2	--	--	0.20	0.20	--	0.01	23400
234-5Z	270	--	2	--	0.61	0.29	--	0.22	Drawings
234-5Z	308	--	107	--	0.61	0.29	--	11.61	Drawings
234-5Z	309 (filter rm)	--	128	--	0.61	0.29	--	13.89	Drawings
234-5Z	310 (filter rm)	--	128	--	0.61	0.29	--	13.89	Drawings
234-5Z	311 (filter rm)	--	112	--	0.61	0.29	--	12.16	Drawings
234-5Z	312 (filter rm)	--	112	--	0.61	0.29	--	12.16	Drawings
234-5Z	313 (filter rm)	--	112	--	0.61	0.29	--	12.16	Drawings
234-5Z	314 (filter rm)	--	112	--	0.61	0.29	--	12.16	Drawings
234-5Z	315 (filter rm)	--	112	--	0.61	0.29	--	12.16	Drawings
234-5Z	316 (filter rm)	--	112	--	0.61	0.29	--	12.16	Drawings
234-5Z	318 (filter rm)	--	102	--	0.61	0.29	--	11.07	Drawings
234-5Z	320	--	12	--	0.61	0.29	--	1.30	Drawings

Table 5-11. Volume of High-Efficiency Particulate Air Filters. (3 sheets)

Building number	Room number	Number of glovebox HEPA filters	Number of testable filters	Plutonium holdup (g)	Dimensions (m)			Volume (m^3)	Information origin
					Length	Depth	Diameter		
236-Z	19	--	1	--	0.61	0.29	--	0.11	Drawings
		1	--	--	0.20	0.20	--	0.01	29674
236-Z	20	--	7	--	0.61	0.29	--	0.76	Drawings
		3	--	--	0.20	0.20	--	0.02	29674
236-Z	25	1	--	--	0.20	0.20	--	0.01	29674
236-Z	26	--	48	9	0.61	0.29	--	5.21	Drawings
236-Z	27	2	--	--	0.20	0.20	--	0.01	29674
236-Z	30	--	4	--	0.61	0.29	--	0.43	Drawings
		4	--	--	0.20	0.20	--	0.03	29674
236-Z	35	--	2	--	0.61	0.29	--	0.22	Drawings
236-Z	36	--	1	--	0.61	0.29	--	0.11	Drawings
236-Z	41	39	--	85	0.20	0.20	--	0.25	28674
236-Z	43	7	--	--	0.20	0.20	--	0.04	29674
236-Z	50	--	2	--	0.61	0.29	--	0.22	Drawings
236-Z	60	4	--	--	0.20	0.20	--	0.03	29674
241-Z	Bldg.	--	4	3	0.61	0.29	--	0.43	Drawings
291-Z	502	--	16	--	0.61	0.51	--	3.02	Drawings
2736-ZA	Bldg.	--	26	--	0.61	0.29	--	2.82	Drawings
2736-ZB	600	--	33	--	0.61	0.29	--	3.58	Drawings
2736-ZB	630	--	1	--	0.61	0.29	--	0.11	Drawings
2736-ZB	636	--	2	--	0.30	0.15	--	0.03	Drawings
2736-ZB	637	--	8	--	0.61	0.29	--	0.87	Drawings
2736-ZB	638	--	2	--	0.61	0.29	--	0.22	Drawings
2736-ZB	639	--	1	--	0.61	0.29	--	0.11	Drawings
2736-ZB	641	--	2	--	0.61	0.29	--	0.22	Drawings
2736-ZB	642	--	2	--	0.61	0.29	--	0.22	Drawings
Totals		353	1,407	199	Total volume			154.47	--

The filterboxes that house the testable HEPA filters, with the exception of those in filter rooms, are listed by location in Table 5-12. Their volumes were calculated from their overall dimensions. These filterboxes account for 100 m^3 of TRU waste. Dimensions are from various facility drawings (H-2-131559 in particular). Both Tables 5-11 and 5-12 were verified during the walkdown.

For Building 234-5Z, ventilation supply air is provided to meet the criteria of limiting release of radioactive contaminants to the environment and of minimizing the spread of contamination. Five supply fans are normally used to provide proper balancing of the individual air zones. Three fans provide backup for normal fan maintenance activities. The supply fans draw air from outside the building through roughing filters to remove airborne dust and dirt. The air then passes through preheaters, air washers, and reheaters before it goes to the supply plenum. The year-round temperature of the air is approximately 20 °C (70 °F). Ducts lead from the supply plenum chamber to the various building zones ventilated by the system.

In Building 234-5Z, exhaust air from Zone 3 areas is filtered through a single stage of testable HEPA filters located in seven filter rooms. Exhaust air from Zone 4 areas, which are potentially contaminated or known to be contaminated, is routed to a single stage of testable HEPA filtration with individual filters or to several filters operated in parallel. Exhaust from these filters is manifolded and routed to the E-4 filter rooms, which provide a second stage of testable HEPA filtration via filter banks. The E-4 ventilation exhaust is then combined with the E-3 exhaust downstream of the filters and discharged to the atmosphere via the 291-Z-1 stack. The E-4 system exhaust flow is maintained at -12.7 to -50.8 mm w.g. (-0.5 to -2.0 in. w.g.) to minimize the potential for backflow into Zone 3 areas; similarly, the E-3 system exhaust flow is maintained at -3.8 to -12.7 mm w.g. (-0.15 to -0.5 in. w.g.) to prevent backflow into Zone 1 areas.

For Building 241-Z, one exhaust ventilation system with two branches serves both the 241-Z tanks and cells. Exhaust ventilation from the tanks is routed via the vessel vent system, which consists of a 10.2-cm- (4-in.-) diameter header with tie-ins to each tank, and a demister. A valve in the header, upstream of the demister, controls the vessel vent exhaust flow to 2.83 m^3/min (100 m^3/min). The vessel vent system exhaust joins the cell ventilation exhaust downstream of the demister. The 241-Z tank sampler glovebox and D-9 caustic supply tank are also exhausted via the vessel vent system. Exhaust ventilation from the 241-Z cells is routed via a 38.1-cm- (15-in.-) diameter vitreous clay duct. Exhaust air from the two systems is heated to protect the HEPA filters from moisture buildup and routed through two stages of HEPA filtration, in series, before discharge to the atmosphere via the stainless steel stack.

The 2736-ZA Building consists of two rooms. Room 1 houses a diesel generator that provides emergency power for operation of the EF-1-1 and EF-1-2 exhaust fans and associated instrumentation and controls, which are housed in room 2. Room 2 is exhausted to the atmosphere via two stages of HEPA filtration and exhaust fans. Exhaust ventilation for room 1 is provided by wall louvers and a through-the-wall motorized exhaust fan.

Table 5-12. Volume of Filterboxes. (3 sheets)

Building number	Room number	Filterboxes	Type of filterbox	Dimensions (m)				Volume (m^3)	Information origin
				Length	Depth	Height	Diameter		
216-Z-9B	Bldg.	2	Hanford design	0.61	0.29	0.61	--	0.22	Drawings
232-Z	Bldg. (Process)	6	Hanford design	0.61	0.29	0.61	--	0.65	Drawings
		6	Self-contained	--	--	--	--	N/A	Drawings
234-5Z	134	2	Flanders G1	--	--	0.46	0.41	0.12	Drawings
234-5Z	146	4	Flanders G1	--	--	0.46	0.41	0.24	Drawings
234-5Z	149	1	Flanders E2	0.76	0.76	0.76	--	0.44	Drawings
		1	Flanders G1	--	--	0.46	0.41	0.06	Drawings
234-5Z	156	1	Flanders G1	--	--	0.46	0.41	0.06	Drawings
234-5Z	157	2	Flanders G1	--	--	0.46	0.41	0.12	Drawings
234-5Z	180	2	Flanders G1	--	--	0.46	0.41	0.12	Drawings
234-5Z	221-C	4	Flanders G1	--	--	0.46	0.41	0.24	Drawings
		2	Flanders E4	0.76	0.76	0.76	--	0.88	Drawings
		1	Hanford design	0.30	0.29	0.30	--	0.03	Drawings
234-5Z	221-D	4	Flanders E4	0.76	0.76	0.76	--	1.77	Drawings
		3	Flanders G1	--	--	0.46	0.41	0.18	Drawings
		1	Hanford design	0.20	0.15	0.20	--	0.01	Drawings
234-5Z	221-E	3	Flanders E4	0.76	0.76	0.76	--	1.33	Drawings
234-5Z	228-A	2	Hanford design	--	--	0.15	0.19	0.01	Drawings
234-5Z	234	1	Self-contained	--	--	--	--	N/A	Drawings
234-5Z	235-D	3	Self-contained	--	--	--	--	N/A	Drawings
		1	Self-contained	--	--	--	--	N/A	Drawings
		3	Self-contained	--	--	--	--	N/A	Drawings
		2	Self-contained	--	--	--	--	N/A	Drawings
234-5Z	262	16	Self-contained	--	--	--	--	N/A	Drawings
		1	Hanford design	2.13	0.61	0.91	--	1.19	--
234-5Z	263	1	Flanders E4	0.76	0.76	0.76	--	0.44	Drawings
		13	Flanders E4	0.76	0.76	0.76	--	5.75	--
234-5Z	264	4	Hanford design	0.61	0.29	0.61	--	0.43	Drawings
		FB-7A	Hanford design	0.61	0.15	0.61	--	0.06	--
		FB-9A	Hanford design	0.61	0.29	0.61	--	0.11	Drawings

Table 5-12. Volume of Filterboxes. (3 sheets)

Building number	Room number	Filterboxes	Type of filterbox	Dimensions (m)				Volume (m^3)	Information origin
				Length	Depth	Height	Diameter		
234-5Z	270	2	Hanford design	0.61	0.29	0.61	--	0.22	Drawings
234-5Z	308	12	Hanford design	0.61	0.29	0.61	--	1.30	Drawings
		FB-16E, FB-16W, FB-17, FB-8, FB-9, FB-10, FB-7, FB-1-N, FB-1-S	Hanford design	0.91	1.07	1.07	--	17.34	Walkdown
		FB-242-Z	Hanford design	0.91	1.83	0.61	--	1.02	Walkdown
		FB-6, FB-11, FB-12, FB-15, FB-26	Hanford design	1.83	1.83	1.07	--	3.57	Walkdown
		FB-3, FB-4, FB-5, FB-18	Hanford design	3.66	1.83	1.07	--	7.14	Walkdown
		FB-2	Hanford design	1.52	1.83	0.91	--	2.55	Walkdown
		FB-23, FB-24, FB-25	Hanford design	--	--	0.91	0.91	0.600	Walkdown
		FB-13	Hanford design	1.83	1.22	1.52	--	3.40	Walkdown
234-5Z	320	FB-20, FB-22	Hanford design	1.83	1.22	1.52	--	6.80	Walkdown
		FB-14	Hanford design	1.52	1.07	1.07	--	3.49	Walkdown
236-Z	10	FB-10E	Hanford design	1.52	0.91	0.61	--	1.70	Walkdown
236-Z	19	1	Self-contained	--	--	--	--	N/A	Drawings
236-Z	20	3	Self-contained	--	--	--	--	N/A	Drawings
		FB-20-W	Hanford design	1.22	0.91	0.61	--	0.68	Walkdown
		FB-20-E	Hanford design	1.22	0.91	0.61	--	0.68	Walkdown
236-Z	26	48	Self-contained	--	--	--	--	N/A	Drawings
236-Z	30	4	Self-contained	--	--	--	--	N/A	Drawings
236-Z	35	2	Hanford design	0.61	0.29	0.61	--	0.22	Drawings
236-Z	36	1	Self-contained	--	--	--	--	N/A	Drawings
236-Z	50	FB-50	Hanford design	1.52	0.91	0.61	--	0.85	Drawings
241-Z	Bldg.	4	Flanders E2	0.76	0.76	0.76	--	1.77	Drawings
291-Z	502	16	Self-contained	--	--	--	--	N/A	Drawings
2736-ZA	Bldg.	26	Flanders E2	0.76	0.76	0.76	--	11.50	Drawings
2736-ZB	600	32	Flanders E4	0.76	0.76	0.76	--	14.16	Drawings
		1	Flanders G1	--	--	0.46	0.41	0.06	Drawings
2736-ZB	630	1	Flanders E4	0.76	0.76	0.76	--	0.44	Drawings
2736-ZB	636	2	Flanders G1	--	--	0.46	0.41	0.12	Drawings

Table 5-12. Volume of Filterboxes. (3 sheets)

Building number	Room number	Filterboxes	Type of filterbox	Dimensions (m)				Volume (m^3)	Information origin
				Length	Depth	Height	Diameter		
2736-ZB	637	8	Flanders E4	0.76	0.76	0.76	--	3.54	Drawings
2736-ZB	638	2	Flanders E4	0.76	0.76	0.76	--	0.88	Drawings
2736-ZB	639	1	Flanders E4	0.76	0.76	0.76	--	0.44	Drawings
2736-ZB	641	2	Flanders E4	0.76	0.76	0.76	--	0.88	Drawings
2736-ZB	642	2	Flanders E4	0.76	0.76	0.76	--	0.88	Drawings
						Total volume		100.46	

Ventilation air for the 2736-ZB Building is supplied by two systems. One system provides conditioned air via two supply fans to all areas of the building except that portion housing the NDA laboratory. Exhaust air from Zone 4 is filtered via a single-stage HEPA filter, combined with Zone 3 exhaust air and filtered through two additional stages of HEPA filtration, then discharged to the atmosphere via the 296-Z-5 stack. The second ventilation supply system provides filtered, conditioned air to the NDA laboratory portion of the building. The supply air is maintained at the required temperature by steam heating during the winter and refrigeration cooling during the warmer seasons. Exhaust air is collected by three exhaust ducts, each provided with a single stage of HEPA filtration. These exhaust flows are combined, filtered via two additional stages of HEPA filtration, and recycled to the NDA supply system by fans. Recycled air is diverted to provide supply air for the mechanical equipment and is continuously monitored and sampled for radioactive content.

5.4.1 234-5Z Supply Systems

The drawings used to determine the total volume of the air supply system in 234-5Z are listed in Table 5-13. The air supply system was broken down into five sections, S-1, S-2, S-3, S-3A, and S-5. The S-1 air supply system was considered uncontaminated; therefore the volume was not determined. The volumes of the S-2, S-3, and S-3A air supply systems were determined using the cross-sectional areas and the lengths of the duct work. The cross-sectional areas were determined using the isometric drawings, and the lengths were measured from the plan drawings. From the isometric drawings of the S-5 air supply systems, it was determined that the system occupies only a small area near room 192. It was estimated that the total volume of the S-5 air supply system is approximately 1 percent of the total volume for all air supply systems in 234-5Z.

A precise measurement, consisting of all elevation changes and bends in duct work, was made for a portion of the S-2 air supply system. The precise measurement was compared to the estimated value. The precise measurement was approximately 10 percent greater then the estimated value. From this information, it could be stated that the volume of the combined air supply systems could be underestimated by 10 percent. The total volume of air supply system duct work in 234-5Z is 1632 m^3 (see Table 5-14). The S-2, S-3, S-3A, and S-5 air supply systems are considered LLW. It is feasible to assume that contamination of the air supply systems could have occurred because of backflow of air during system shutdown.

5.4.2 234-5Z E-3 and E-4 Exhaust

The drawings used to determine the total volume of E-3 and E-4 exhaust ducting in Building 234-5Z are listed in Table 5-13. The E-3 exhaust ducts occupying the first floor and duct level of the PFP Building were highlighted on the plan drawings then compared to the isometric drawings of the ventilation layout to determine the cross-sectional area of the ducts. The length of the ducts was measured from the plan view of the ventilation system. The volume was then calculated for the horizontal duct work. The volume of vertical duct work was determined using the cross-sectional area and an

Table 5-13. Reference Drawing List.

Building	Drawing number	Drawing type
234-5Z	H-2-16429 through H-2-16432, H-2-80203	Plan views
	H-2-16435 through H-2-16447	Sectional views
	H-2-24606	Isometric (S-2)
	H-2-24607	Isometric (S-3)
	H-2-24608	Isometric (S-3A)
	H-2-24609	Isometric (S-5)
	H-2-26060 through H-2-26062	Isometric (E-3)
	H-2-26063 through H-2-26066	Isometric (E-4)
236-Z	H-2-29675, H-2-29676, H-2-29677	
241-Z	H-2-28851	
2736-ZA	H-2-27969	
2736-ZB	H-2-80168, H-2-80169	

Table 5-14. Ventilation System Volume.

Building	Building volume (m^3)	Supply system volume (m^3)	Exhaust volume (m^3)	
		Low-level waste	Low-level waste	Transuranic waste
234-5Z	92,511	1,632	2,081	23
236-Z	7,624	99	28	3
241-Z	625	Not significant*	Not significant*	Not significant*
2736-ZA	600	Not significant*	Not significant*	Not significant*
2736-ZB	4,037	43	30	0
Total	105,397	1,774	2,139	26

*Less then 1 percent of the total volume.

assumed length of 3 m (10 ft). The assumed length was determined by averaging the lengths of the vertical ducts for room ventilation on the sectional drawings. The cross-sectional areas of all vertical duct work were given on the isometric drawings. A total volume of horizontal duct work and vertical duct work was calculated.

To determine the volume of the E-4 exhaust system, the length of the duct work had to be estimated using room locations. The isometric drawings listed the diameters of the duct work and the room numbers where the ducts originated. A plan view of the E-4 exhaust system could not be found; therefore, the length of the duct work was estimated from the location of the rooms in the PFP. To estimate the overall volume, a nominal duct size was selected after examining the given diameters. The diameter was assumed to be 30.5 cm (12 in.).

Table 5-14 lists the estimated volume of E-3 and E-4 exhaust. Using the same theory described for the supply air system, it is assumed that the final values of E-3 and E-4 exhaust are underestimated by 10 percent. After calculating the volumes of duct work for the E3 and E4 systems, it was discovered that the E3 system contributes around 48 percent of the total volume of duct work in 234-5Z, and the E4 system contributes around 8 percent of the total volume. The differences in percentages may be attributed to the relatively small diameter of a large portion of the E4 duct work. The E3 system contains several sections of enormous ducting (e.g., 40 m [135 ft] of 3.7 x 3.0 m [144 x 120 in.] duct work).

The E-3 exhaust system is considered LLW because it directly exhausted rooms that had a potential for contamination. It is assumed that only the E-4 duct work from the gloveboxes and hoods to the first filterbox will be TRU waste. By examining the isometric drawings of the E-4 exhaust system it was determined that the majority of duct work from the gloveboxes to the first filterbox was vertical duct work. Therefore the vertical E-4 duct work is TRU waste. The other duct work in the E-4 exhaust system will be considered LLW. The total amount of LLW from the exhaust ventilation system in 234-5Z is 2081 m^3. The total amount of TRU waste is 23 m^3 (see Table 5-14).

5.4.3 Plutonium Reclamation Facility Supply and Exhaust

The drawings used to determine the total volume of supply and exhaust duct work in 236-Z are listed in Table 5-13. Drawing H-2-29675 shows the general layout of duct work in the PRF, and Drawing H-2-29602 gives the dimensions of the overall PRF Building and the internal rooms. Using both drawings, an estimate was made of all the duct work. The air supply system duct work was separated from the exhaust duct work. A distinction between E-3 and E-4 exhaust was not necessary in determining TRU and LLW. Examining the total supply and exhaust systems, it was estimated that 28 percent of all duct work in 236-Z was exhaust duct work. This appears to be a low percentage when compared to the percentage of exhaust duct work in 234-5Z. However, the majority of the gloveboxes and hoods in PRF are exhausted into the inner chamber. This process uses far less duct work than exhausting the gloveboxes and hoods to 291-Z, as is done in other buildings. In addition, the amount of TRU waste is very low. The duct work connecting the gloveboxes to the first filterbox was considered to be TRU. The volume of supply and exhaust duct work in PRF is listed in Table 5-14. The table also contains the amount of TRU waste in PRF.

5.4.4 241-Z Exhaust

An estimate of the total volume of Building 241-Z was made using the dimensions provided in the plant description. It was determined that the volume of 241-Z was only 0.7 percent of the volume of 234-5Z (see Table 5-14). Therefore, it was assumed that the duct work in the building would not contribute significantly to the overall total volume of duct work in the PFP complex. This theory is also supported by examining the plan drawing of duct work in 241-Z (see Table 5-13).

5.4.5 2736-ZA Exhaust

Building 2736-ZA is approximately the same size as 241-Z. Therefore it was determined that the duct work in this building would not contribute significantly to the overall total volume of duct work in the PFP complex. The drawings that support the hypothesis are listed in Table 5-13.

5.4.6 2736-ZB Supply and Exhaust

The drawings used to determine the total volume of supply and exhaust duct work in 2736-ZB are listed in Table 5-13. The drawings contained all dimensions needed to determine the volume of the duct work. A distinction between E3 and E4 exhaust was not determined. The air supply and exhaust systems were considered LLW. This was assumed because the system is fairly new and there has been very little chance of backflow through the system. The total volume of LLW is listed in Table 5-14.

5.4.7 Volume of Ventilation System

Table 5-14 details the volumetric results for the PFP ventilation systems. The supply system has a volume of 1,774 m^3, all of which is LLW. The exhaust system has a volume of 2,165 m^3, of which 99 percent is LLW and 1 precent is TRU.

5.5 MISCELLANEOUS EQUIPMENT

Table 5-15 provides a list of miscellaneous D&D solid waste that includes location by building and room number, dimensions, and volume. The volume of waste does not include equipment that is expected to be removed prior to D&D. Contaminated items encountered on drawings or during the walkdown that are not included in the other physical categories are included in Table 5-15. The total volume of solid waste expected from miscellaneous equipment is 165 m^3. This entire volume has been classified as TRU waste because the contamination levels of the items are unknown. In many cases, these items are listed in Table 5-15 based on statements made by PFP personnel. This table was verified and corrected during the walkdown. Dimensions are from various facility drawings unless specified as a walkdown estimate. In the latter case, dimensions were estimated visually to the nearest three decimeters (foot).

Table 5-15. Miscellaneous Equipment. (2 sheets)

Building number	Room number	Miscellaneous equipment	Dimensions (m)				Volume (m^3)	Information origin
			Length	Depth	Height	Diameter		
234-5Z	132	Mass spectrometer with 10.2-cm- (4-in.-) diameter exhaust	1.83	0.91	2.44	--	4.08	Walkdown
	227	Pressure gauges	--	--	2.44	0.28	0.15	Drawings
	228-A	Agitators on top of glovebox (2)	--	--	0.61	0.30	0.04	Drawings
		Ratiomotor	0.15	0.23	0.36	--	0.01	Drawings
		Sand hopper	--	--	0.51	0.20	0.02	Drawings
		Vacuum assembly	--	--	0.38	0.05	0.001	Drawings
		Sphincter seal assembly	--	--	0.25	0.23	0.01	Drawings
		Turntable drive assembly	--	--	0.13	0.13	0.002	Drawings
	228-B	Cutter assembly	--	--	0.30	0.08	0.001	Drawings
		Sweep assembly	--	--	0.30	0.28	0.02	Drawings
	228-C	Drive shaft	--	--	0.20	0.10	0.002	Drawings
		Motor	--	--	0.53	0.15	0.01	Drawings
		Sweep actuator assemblies (2)	--	--	1.17	0.08	0.01	Drawings
	235-B	Drive assembly	--	--	0.69	0.30	0.05	Drawings
		Seal out platform	0.46	0.41	0.03	--	0.005	Drawings
	235-E	Hydraulic ram, pump	1.22	1.22	1.22	--	1.81	Walkdown
		Digester vessels (2)	--	--	0.91	1.52	3.33	Walkdown
	320	Recirculating air-conditioning units (3)	1.22	1.52	0.91	--	5.10	Walkdown
		Acme chiller	1.52	0.61	0.91	--	0.85	Walkdown
		Vacuum filters, 66 cm (26 in.) (4)	--	--	0.61	0.91	1.60	Walkdown
236-Z	35	Vacuum pumps numbers 1 and 2	0.61	0.61	0.61	--	0.23	Walkdown
		Compressor tanks VF-1 and VF-2	--	--	0.91	0.91	0.60	Walkdown
	43	Lead chases (2)	1.07	0.15	0.15	--	0.02	Walkdown

Table 5-15. Miscellaneous Equipment. (2 sheets)

Building number	Room number	Miscellaneous equipment	Dimensions (m)				Volume (m^3)	Information origin
			Length	Depth	Height	Diameter		
241-Z	Building	Exhaust fan EF-22-25D	--	--	0.30	0.91	0.20	Walkdown
		Exhaust fan EF-21-25D	--	--	0.20	0.61	0.06	Walkdown
291-Z	501	Air compressors (2 new)	1.22	1.52	1.83	--	3.40	Walkdown
		Air compressors (2 old)	1.83	0.61	0.91	--	1.02	Walkdown
		Air compressors (621 kPa [90 lb/in^2])	1.22	2.44	1.52	--	4.53	Walkdown
		Vacuum pumps, 43 cm (17 in.) (2)	--	--	0.91	0.6096	0.27	Walkdown
	502	Fans EF5-EF7, and EF8	3.05	2.74	1.83	--	61.16	Walkdown
	509	Fans EF1-EF4 and EF9	3.05	2.74	1.83	--	76.46	Walkdown
					Total volume		165.04	

6.0 SUMMARY

In this section, the results presented in Section 5.0 by natural physical category are summarized by solid waste category. These results were derived from a document search, including PFP engineering drawings, and a walkdown. Research included interviews with key PFP personnel (see Acknowledgements).

Because of the uncertainties presented in Section 4.1, several global assumptions were made (see Section 4.2). The reader must understand these assumptions when applying or interpreting the results. Additional assumptions made during the project are noted where they apply.

The accuracy of this report is limited to that of the available documentation. While the walkdown provided verification of the existence of the items included in this report, there are certainly items which were not included.

Table 6-1 and Figures 6-1 and 6-2 present the results of this project. Volumes are given in cubic meters. A total volume of 5,489 m^3 is expected in solid waste. This total is expected to be 1 percent DSW, 71 percent LLW, 21 percent TRU, and 7 percent TRU MW. Assuming that tanks containing regulated chemicals, or heels, will be removed from the gloveboxes, all of the gloveboxes and hoods have been classified as TRU waste. Mixed wastes are mainly from tanks and piping. The large amount of LLW is mainly due to the ventilation systems (3,913 m^3), which are assumed to be uncompacted. All miscellaneous equipment that was known to be contaminated was conservatively assumed to be TRU, since the extent of the contamination was unknown.

Table 6-1. Decontamination and Decommissioning Solid Waste Volume Summary.

Physical category	Waste type (m^3)				
	DSW	LLW	TRU	TRU MW	Total volume
Gloveboxes and hoods	0	0	856.17	0	856.17
Internal tanks	0.54	0	0	1.18	1.73
External tanks	40.26	0	0	132.94	173.20
Piping	0.40	0	8.35	89.80	98.55
Ventilation Filterboxes HEPA filters	0 0 0	3,913.00 0 0	26.00 100.46 15.45	0 0 139.02	3,939.00 100.46 154.47
Miscellaneous equipment	0	0	165.04	0	165.04
Totals	41.2	3,913.00	1,171.47	362.94	5,488.62

DSW = Dangerous solid waste.
HEPA = High-efficiency particulate air (filter).
LLW = Low-level waste.
TRU = Transuranic.
TRU MW = Transuranic mixed waste.

Figure 6-1. Decontamination and Decommissioning Solid Waste Classification by Percentage.

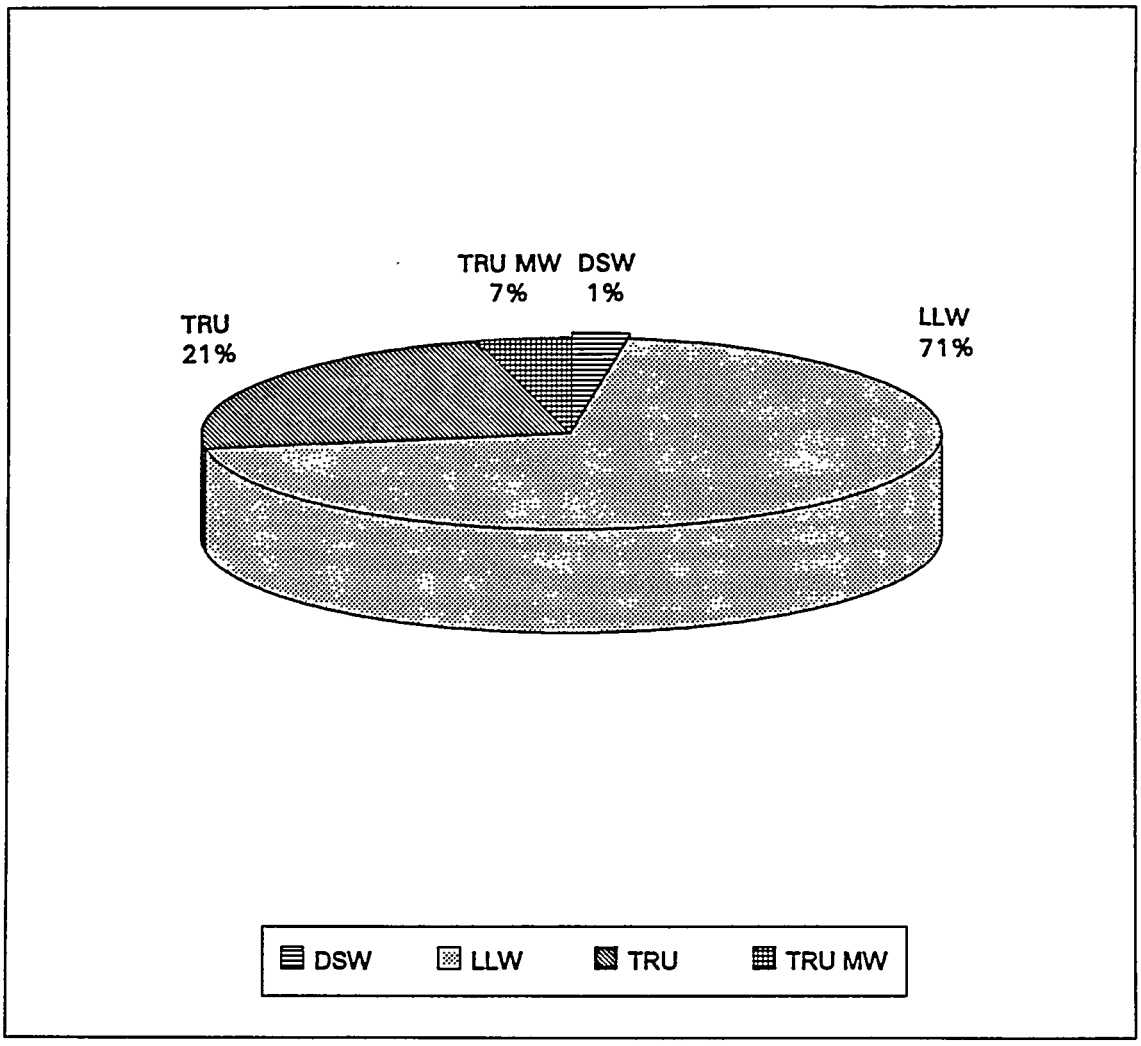
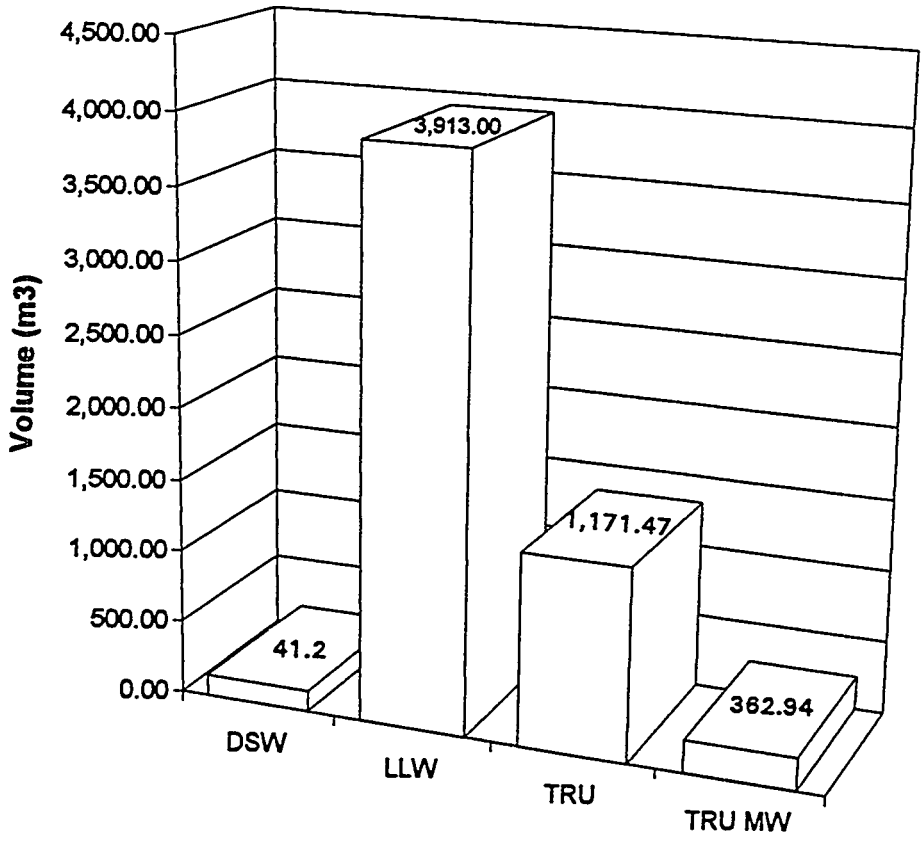


Figure 6-2. Decontamination and Decommissioning Solid Waste Classification by Volume.



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APPENDIX A

PLUTONIUM FINISHING PLANT — POTENTIAL CONTAMINATION LEVELS

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PLUTONIUM FINISHING PLANT — POTENTIAL CONTAMINATION LEVELS

This appendix contains the spreadsheet (generated in Excel 5.0) that was used to classify the Plutonium Finishing Plant's buildings and rooms by potential contamination levels. This classification was then used to focus the project on the contaminated areas of the facility.

LEGEND

Ventilation Area

1 = Zone 1 = Cold clean area.
2 = Zone 2 = Radiation area.
4 = Zone 4 = Area of potential airborne radioactivity.

Normal Dose Levels (mrem/h)

Note: The mrem/h values are gamma (QF = 1) plus neutron exposure rates.
* Dose rate is associated with the principal work station in the area indicated. General area readings are usually 10% or less of this value.

Radiation Sources

Note: The 234-5Z foundation and tunnel plan shows radiation sources in all five tunnels and the 241-Z foundation.

Glovebox Location

N/A = Figure does not apply to these buildings/rooms.
YES = One or more gloveboxes are located in this building/room.
NONE = No gloveboxes are located in this building/room.

Radiation Control Access Areas

N/Cont. = Not controlled.
CCA = Contamination control areas.
CAA = Controlled access areas.
*Glovebox is CCA, but room is NOT CAA.

Radiological Posting as of January 1994

ARA = Airborne radioactivity area.
SCA = Surface contamination area.
RCA = Radiological control area.
CLEAR = Not posted, assumed to be free of contamination.

Contamination Classification

H = "Hot" process area.
C = "Cold" process support area.
N = Not contaminated.

In general, a "-" means that the data were not available using this figure or table.

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
232-Z	Bldg.	Incinerator (layaway status)	4	<2.0	YES	N/A	N/Cont.	SCA/RCA	H	X	80175	H-9-1002
	-	Storage, laundry (SWPs), used filters	-	-	-	-	-	-	-	-	-	-
234-5ZX	Bldg.	Plutonium conversion facility	4	N/A	YES	YES	YES	N/A	H	-	80250 80012	No drwgs listed
	-	Air supply plenum chamber	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	80	Storage	1	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	81	Office	1	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	82	Office	1	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	83	Office	1	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	84	Men's rest room	1	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	85	Women's rest room	1	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	86	Office	1	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	87	Office	1	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	88	Office	1	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	89	Office	1	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	90	Office	1	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	92	Pipe chase	1	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	100-108	Office area	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	109	Air lock	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	110	Women's locker room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	110-A	Women's laundry hampers	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	110-B	Women's locker room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	111	Men's locker room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	112	Men's rest room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	113	Men's rest room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	114	-	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
234-5Z (cont.)	115	-	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	116	Men's change room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	117	Men's laundry hampers	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	117A	-	-	-	-	-	-	-	-	-	-	-
	120	Women's locker room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	121	Women's rest room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	122	-	1	<0.5	NO	N/A	N/Cont.	RCA	N	-	-	-
	123	Women's shower room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	124	Women's change room	1	<0.5	NO	N/A	N/Cont.	RCA	N	-	-	-
	126	Personnel decontamination facility	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	131	Plutonium assay	4	<2.0	YES	N/A	N/Cont.	RCA	H	-	-	-
	132	Mass spectrometry	3	<0.5	NO	N/A	N/Cont.	RCA	C	X	-	-
	133	Dark room	3	<0.5	NO	N/A	N/Cont.	SCA	H	-	-	-
	134	Mass spectrometry	4	<0.5	YES	N/A	N/Cont.	SCA	H	X	-	-
	135	Mass spectrometry	4	<0.5	YES	N/A	N/Cont.	SCA	H	X	-	-
	136	Emission spectrometry	3	<0.5	NO	N/A	N/Cont.	RCA	C	X	-	-
	137	Emission spectrometry	4	<0.5	YES	N/A	CCA*	SCA	H	X	-	-
	139	PuO_2 sample storage	4	<30.0*	YES	N/A	N/Cont.	RCA	H	X	-	-
	140-A	Analytical support services	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	140-B	Laboratory manager	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	140-C	Laboratory staff chemist	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	141	Nonradioactive solution preparation	4	<0.5	NO	N/A	N/Cont.	RCA	H	-	-	-
	142	Miscellaneous storage	4	<2.0	YES	N/A	N/Cont.	SCA	H	-	-	-
	143	Waste process	4	<3.0	YES	N/A	N/Cont.	SCA	H	X	-	-
	144	Process support	4	<0.5	YES	N/A	N/Cont.	SCA	H	X	-	-

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
234-5Z (cont.)	145	Physical test	3	<2.0	YES	N/A	N/Cont.	RCA	C	X	-	-
	145-A	Stock room	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	146	WIPP repackaging and sample analysis	4	<0.5	YES	N/A	N/Cont.	SCA	H	X	-	-
	147	Waste packaging and analysis manager	3	<0.5	NO	N/A	N/Cont.	SCA	H	-	-	-
	148	Sample analysis	4	<0.5	YES	N/A	N/Cont.	SCA	H	X	-	-
	149	Sample dissolution	4	<0.5	YES	N/A	N/Cont.	SCA	H	X	-	-
	150	Laboratory shift manager	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	151	Miscellaneous counting room	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	152	Waste concentrator	4	<2.0	YES	N/A	N/Cont.	SCA	H	X	-	-
	153	Product specification analysis	4	<1.5	YES	N/A	N/Cont.	SCA	H	-	-	-
	154	Product specification analysis	3	<0.5	NO	N/A	N/Cont.	SCA	H	X	-	-
	155	Infrared spectrophotometer	4	<0.5	YES	N/A	N/Cont.	SCA	H	X	-	-
	156	Slag and crucible analysis	4	<0.5	YES	N/A	N/Cont.	SCA	H	X	-	-
	157	Product specification analysis	4	<0.5	YES	N/A	N/Cont.	SCA	H	X	-	-
	158	Instrument shop	3	<0.5	NO	NONE	N/Cont.	RCA	C	-	-	-
	158-A	Instrument shop	3	<0.5	NO	NONE	N/Cont.	RCA	C	-	-	-
	159	Instrument shop	3	<0.5	NO	NONE	N/Cont.	RCA	C	X	-	-
	159-A	Instrument shop	3	<0.5	NO	NONE	N/Cont.	RCA	C	-	-	-
	161	RMC shift manager	3	<0.5	NO	NONE	N/Cont.	RCA	C	-	-	-
	162	RMC shift manager	3	<0.5	NO	NONE	N/Cont.	RCA	C	-	-	-
	163	Instruments manager	3	<0.5	NO	NONE	N/Cont.	RCA	C	-	-	-
	164	RMC shift office	3	<0.5	NO	NONE	N/Cont.	RCA	C	-	-	-
	165	Calcium storage	3	<0.5	NO	NONE	N/Cont.	RCA	C	-	-	-
	166	RMC batch tanks	4	<30.0*	YES	YES	CAA	RCA	H	X	80604	25810

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

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234-5Z (cont.)	167	RMC operations storage	3	<0.5	NO	NONE	N/Cont.	RCA	C	-	-	-
	168	RMC ready room/storage	3	<0.5	NO	NONE	N/Cont.	RCA	C	-	-	-
	169	Ash stabilization	4	<2.0	YES	YES	N/Cont.	SCA	H	X	80310	93480
	170	Ash dissolution	4	<0.5	YES	YES	N/Cont.	SCA	H	X	80320	93476
	171	Corridor	3	<0.5	NO	NONE	N/Cont.	RCA	C	-	-	-
	172	Maintenance shop (RMC)	3	<2.0	NO	NONE	N/Cont.	RCA	C	-	-	-
	173	Maintenance shop	3	<2.0	NO	NONE	N/Cont.	RCA	C	-	-	-
	174	SNM storage vault	3	<30.0	YES	NONE	CAA	RCA	H	-	-	-
	175	SNM storage vault	3	<2.0	YES	NONE	CAA	RCA	C	-	-	-
	176	Loading platform	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	179	Process support laboratory	4	<0.5	YES	N/A	CAA	SCA	H	X	-	-
	180	Isotopic research	3	<0.5	NO	N/A	N/Cont.	SCA	H	X	-	-
	182	Process support (microscope)	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	183	Specialized processing	3	<0.5	NO	N/A	N/Cont.	RCA	C	X	-	-
	185	Miscellaneous storage	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	186	Storage	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	187	Open-faced hoods	3	<0.5	NO	N/A	N/Cont.	SCA	H	X	-	-
	188	Glovebox/chemical storage	4	<0.5	YES	N/A	N/Cont.	RCA	H	X	-	-
	189	Equipment storage	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	190	Radioactive material storage	3	<30.0*	YES	N/A	N/Cont.	RCA	H	-	-	-
	191	Product support cold laboratory	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	192	Drum staging area	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	192-A	SNM storage vault	3	<30.0*	YES	N/A	CAA	RCA	H	-	-	-
	192-B	SNM storage vault	3	>30.0*	YES	N/A	CAA	SCA	H	-	80340	No drwgs listed
	192-C	SNM storage vault	3	>30.0*	YES	N/A	CAA	SCA	H	-	-	-

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
234-5Z (cont.)	192-D	PR can storage	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	192-S	Storage	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	192-N	NDA storage	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	193	Air lock	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	194	Storage vault	3	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	194-A	Material coordinators	3	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	194-B	-	-	-	-	N/A	-	-	N	-	-	-
	195-M	-	-	-	-	N/A	-	-	N	-	-	-
	195-W	-	-	-	-	N/A	-	-	N	-	-	-
	196	Waste drum storage	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	196-A	Tool crib	-	-	-	N/A	-	-	N	-	-	-
	197	Waste drum storage	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	197-A	Mixed-waste drum storage	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	198A	Tool crib	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	198AL	Air lock	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	199	Welding shop	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	198	Maintenance shop	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	200	Maintenance lockers	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	200-A	Maintenance manager	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	201	Pu process vault	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	202	Pu process support lab	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	205	-	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	208	Work authorization system	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	208-A	Planner/scheduler	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	208-B	Planner/scheduler	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
234-5Z (cont.)	209	Planner/scheduler	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	209-A	Planner/scheduler	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	209-B	Planner/scheduler	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	210	Men's change room hampers	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	211	Men's change room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	212	Men's rest room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	212A	-	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	213	Air locks	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	214	Men's showers	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	215	Men's rest room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	216	Men's change room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	217	Analytical lab manager	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	217-A	Maintenance office	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	218-A	Maintenance office	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	218-B	Maintenance office	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	218-C	Maintenance office	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	218-D	Maintenance office	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	218-E	Maintenance office	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	218-F	Maintenance office	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	221-A	Health Physics office	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	221-B	Sealer repair shop	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	221-C	Radiochemical standards laboratory	4	<2.0	YES	N/A	CAA	SCA	H	-	-	-
	221-D	Radiochemical standards laboratory	4	<2.0	YES	N/A	CAA	SCA	H	X	-	-
	221-E	Radiochemical standards laboratory	3	<2.0	NO	N/A	CAA	SCA	H	X	-	-
	221-F	Health Physics office	-	-	-	N/A	-	-	N	-	-	-

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
234-5Z (cont.)	221-G	Health Physics office	-	-	-	N/A	-	-	N	-	-	-
	224	Corridor	3	<0.5	NO	NONE	N/Cont.	CLEAR	N	-	-	-
	225	Product handling vault	3	>30.0*	YES	NONE	CAA	RCA	H	-	-	-
	227	Product load-in/load-out	4	<2.0	YES	YES	CAA	SCA	H	X	-	-
	228-A	RMC production line	4	<30.0*	YES	YES	CAA	SCA	H	X	80610	19233
	228-A	RMC production line	-	-	-	-	-	-	-	-	-	20997
	228-B	RMC production line	4	<30.0*	YES	YES	CAA	SCA	H	X	80608	19241
	228-C	RMC production line	4	<30.0*	YES	YES	CAA	SCA	H	X	80608	19241
	229	RMC control room	1	<0.5	NO	NONE	CAA	CLEAR	N	-	-	-
	230-A	RMC seal-out glovebox	4	<30.0*	YES	YES	N/Cont.	SCA	H	X	80618	19002
	230-B	RMC recoverable powder glovebox	4	<30.0*	YES	YES	N/Cont.	SCA	H	X	80621	19669
	230-C	Glovebox HC-60 hydrolysis	4	<2.0	YES	YES	N/Cont.	SCA	H	X	83060	26268
	231	-	3	<0.5	NO	N/A	-	CLEAR	C	-	-	-
	232	HF scrubber cell	4	<2.0	YES	YES	CCA/CAA	RCA	H	X	80603	24448
	232A	HF scrubber	4	<0.5	NO	N/A	CCA/CAA	ARA	H	X	-	-
	233	RMA control room	3	<2.0	NO	NONE	N/Cont.	RCA	C	-	-	-
	233A	Electrical room	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	234	Trash compactor	3	<2.0	NO	NONE	N/Cont.	RCA	C	X	-	-
	234-A	NDA measurement of drums	3	<2.0	NO	NONE	N/Cont.	RCA	C	-	-	-
	235	Air lock	3	<0.5	NO	NONE	N/Cont.	RCA	C	-	-	-
	235-A1	RMA oxide line (inactive)	4	>30.0*	YES	YES	N/Cont.	SCA	H	X	-	-
	235-A2	RMA oxide line (inactive)	4	<30.0*	YES	YES	N/Cont.	SCA	H	X	-	-
	235-A3	RMA oxide line (inactive)	4	<30.0*	YES	YES	CAA	SCA	H	X	80105	-
	235-B	Recoverable material stabilization	4	<30.0*	YES	YES	N/Cont.	SCA	H	X	80030	No drwgs listed

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Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
234-5Z (cont.)	235-C	Waste repackaging	4	<1.0	YES	YES	N/Cont.	SCA	H	-	80290	No drwgs listed
	235-D	Waste drum storage/RADTU	3	<2.0	NO	N/A	N/Cont.	RCA	H	X	-	-
	235-E	RADTU filter room	3	<2.0	-	N/A	-	-	H	X	-	-
	236	PR can storage vault	3	<30.0*	YES	N/A	CAA	RCA	H	-	-	-
	236A	-	3	<0.5	NO	N/A	-	CLEAR	C	-	-	-
	236B	-	3	<0.5	NO	N/A	-	CLEAR	C	-	-	-
	236C	-	3	<0.5	NO	N/A	-	CLEAR	C	-	-	-
	237	-	3	<0.5	NO	N/A	-	CLEAR	C	-	-	-
	238	-	3	<0.5	NO	N/A	-	CLEAR	C	-	-	-
	239	-	3	<0.5	NO	N/A	-	CLEAR	C	-	-	-
	240	-	3	<0.5	NO	N/A	-	CLEAR	C	-	-	-
	241	-	3	<0.5	NO	N/A	-	CLEAR	C	-	-	-
	242	Ready room shipping/receiving	3	<0.5	NO	N/A	-	RCA	C	-	-	-
	242A	Shift manager product handling	3	<0.5	NO	N/A	-	RCA	C	-	-	-
	242B	Shift supervisor product handling	3	<0.5	NO	N/A	-	RCA	C	-	-	-
	245	Corridor	3	<0.5	NO	NONE	N/Cont.	RCA	C	-	-	-
	247	-	1	<0.5	NO	N/A	-	SCA	C	-	-	-
	248	-	1	<0.5	NO	N/A	-	RCA	C	-	-	-
	249	-	1	<0.5	NO	N/A	-	RCA	C	-	-	-
	Mezz	Mezzanine columns 12-22	3	<0.5	NO	N/A	-	CLEAR	C	-	-	-
	250	Office/storage	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	251A	Office/storage	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	251B	Office/storage	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	252	Office/storage	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	253	Office/storage	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-

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Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
234-5Z (cont.)	254	Office/storage	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	255	Janitors' room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	260	Duct level	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	260A	Air lock	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	261	Storage	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	262	Duct level	3	<2.0	YES	N/A	N/Cont.	SCA	H	X	-	-
	263	Duct level	3	<2.0	YES	N/A	N/Cont.	SCA	H	X	80080	No drwgs listed
	264	Duct level	3	<2.0	YES	N/A	N/Cont.	SCA	H	X	-	-
	265	Duct level	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	266	Electrical room	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	267	Telephone swtg room	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	268	Storage room	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	269	Battery storage	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	270	Duct level	1	<0.5	NO	N/A	-	CLEAR	C	X	-	-
	270A	Air lock	3	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	271	-	3	<0.5	NO	N/A	-	CLEAR	C	-	-	-
	272	Duct level	1	<0.5	NO	N/A	-	CLEAR	C	-	-	-
	300	Foyer	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	301	Maintenance engineers	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	301-A	Process engineers	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	301-B	Staff assistant	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	301-C	Process engineer	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	301-D	-	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	302	Chemical storage	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	303	Process engineer	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-

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Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
234-5Z (cont.)	303-A	Process engineer	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	303-B	Process engineer	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	303-C	Process engineer	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	303-D	Repository	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	303-E	Process engineer	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	303-F	Envir. and effluents engr. manager	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	303-G	Process engineers	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	303-H	Process engineers	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	303-J	Process engineers	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	303-K	Secretary (engineering)	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	303-L	Process support manager	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	303-M	Process control manager	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	304	Plastic shop	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	304-A	Store room office	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	304-B	Property specialist	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	305	Lunch room	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	305A	-	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	306	Conference room	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	306-A	Computer room	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	307	Air lock	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	308	Duct level	4	<0.5	YES	N/A	N/Cont.	SCA	H	X	80800	No drwgs listed
	309	E-4 filter room	4	<0.5	NO	N/A	N/A	SCA	H	X	80250	No drwgs listed
	310	E-4 filter room	4	<0.5	NO	N/A	N/A	SCA	H	X	80250	No drwgs listed
	311	E-3 filter room	4	<0.5	NO	N/A	N/A	SCA	H	X	80250	No drwgs listed

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Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
234-5Z (cont.)	312	E-3 filter room	4	<0.5	NO	N/A	N/A	SCA	H	X	80250	No drwgs listed
	313	E-3 filter room	4	<0.5	NO	N/A	N/A	SCA	H	X	80250	No drwgs listed
	314	E-3 filter room	4	<0.5	NO	N/A	N/A	SCA	H	X	80250	No drwgs listed
	315	E-3 filter room	4	<0.5	NO	N/A	N/A	SCA	H	X	80250	No drwgs listed
	316	E-3 filter room	4	<0.5	NO	N/A	N/A	SCA	H	X	80250	No drwgs listed
	318	E-3 filter room	4	<0.5	NO	N/A	N/A	SCA	H	X	80250	No drwgs listed
	319	Supply fans	1	<0.5	NO	N/A	N/A	CLEAR	C	-	-	-
	320	Filterboxes	4	<2.0	YES	N/A	N/A	SCA	H	X	80250	No drwgs listed
	321	Steam supply	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	321-A	Power control room	3	<0.5	NO	N/A	N/A	CLEAR	C	-	-	-
	321-B	Power manager	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	321-C	Change room	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	322	Electrical shop	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	323	Electrical manager	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	324	Janitors' closet	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	325	Process engineer	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	326	Air lock passageway	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	327	Hamper room	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	328	Men's change room	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	329	Men's toilet	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	330	Men's shower	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	331	Men's locker room	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	332	Men's locker room entry	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-

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234-5Z (cont.)	333	Men's toilet	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	333-A	Women's toilet	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	334	Calcium storage	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	335	Calcium storage	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	336	Chemical makeup	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	337	Chemical makeup	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	338	Wet chemical storage	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	339	Men's shower	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	340	Instrument shop	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	341	IRM/SSDM manager	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	342	Maintenance engineer	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	343	Maintenance engineer	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	344	Hallway	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	344-A	Radiation engineer	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	345	Activity engineer	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	346	Administrative specialist	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	347	IRM/SSDM engineer	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	348	IRM/SSDM engineer	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	349	-	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	350	-	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	351	Entrance to computer room	1	<0.5	NO	N/A	N/A	CLEAR	N	-	-	-
	390	Air lock	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	682	Air lock	-	-	-	-	-	RCA	C	-	-	-
	878AL	Air lock	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-
	879AL	Air lock	1	<0.5	NO	N/A	-	CLEAR	N	-	-	-

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Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
234-5ZA (cont.)	701	Men's change room	-	-	-	-	-	-	N	-	-	-
	702	-	-	-	-	-	-	-	N	-	-	-
	703	-	-	-	-	-	-	-	N	-	-	-
	704	-	-	-	-	-	-	-	N	-	-	-
	705	-	-	-	-	-	-	-	N	-	-	-
	706	-	-	-	-	-	-	-	N	-	-	-
	707	-	-	-	-	-	-	-	N	-	-	-
	708	Storage	-	-	-	-	-	-	N	-	-	-
	709	Corridor	-	-	-	-	-	-	N	-	-	-
	710	Storage	-	-	-	-	-	-	N	-	-	-
	711	Storage	-	-	-	-	-	-	N	-	-	-
	712	-	-	-	-	-	-	-	N	-	-	-
	713	Fire sprinkler riser room	-	-	-	-	-	-	N	-	-	-
	714	Computer room	-	-	-	-	-	-	N	-	-	-
	715	HPT WRAM station	-	-	-	-	-	-	N	-	-	-
	716	RWP posting area	-	-	-	-	-	-	N	-	-	-
	717	Self survey station	-	-	-	-	-	-	N	-	-	-
	718	Locker room/lobby	-	-	-	-	-	-	N	-	-	-
	719	Lobby	-	-	-	-	-	-	N	-	-	-
	720	RCA entrance/exit thoroughfare	-	-	-	-	-	-	N	-	-	-
	722	RCA exit security portal	-	-	-	-	-	-	N	-	-	-
	724	RCA exit security	-	-	-	-	-	-	N	-	-	-
	726	RCA entry portal	-	-	-	-	-	-	N	-	-	-
	728	Security check station	-	-	-	-	-	-	N	-	-	-
	730	Corridor	-	-	-	-	-	-	N	-	-	-

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234-5ZA (cont.)	731	Corridor	-	-	-	-	-	-	N	-	-	-
	732	-	-	-	-	-	-	-	N	-	-	-
	733	Corridor	-	-	-	-	-	-	N	-	-	-
	734	-	-	-	-	-	-	-	N	-	-	-
236-Z	10	Corridor	3	<2.0	YES	N/A	N/Cont.	SCA	H	-	-	-
	11	Corridor	3	<30.0*	YES	N/A	N/Cont.	SCA	H	-	80708	27974
	12	Process cell	4	>30.0*	YES	N/A	CCA/CAA	ARA	H	-	-	-
	12A	Mezzanine	4	<3.0	YES	NO	-	ARA	H	-	-	-
	13	Corridor	3	<30.0*	NO	N/A	N/Cont.	SCA	H	-	-	-
	14	Corridor	3	<30.0*	YES	N/A	N/Cont.	SCA	H	-	80707	27974
	15	Welding shop	3	<0.5	NO	N/A	N/Cont.	SCA	H	-	-	-
	16	Maintenance shop (PRF)	3	<0.5	NO	N/A	N/Cont.	SCA	H	-	-	-
	17	Maintenance manager's office	3	<0.5	NO	N/A	N/Cont.	SCA	H	-	-	-
	18	Elevator access/storage	3	<0.5	NO	N/A	N/Cont.	SCA	H	-	-	-
	19	NDA counting room	3	<0.5	NO	N/A	N/Cont.	SCA	H	X	-	-
	20	Corridor/filterboxes	3	<2.0	YES	N/A	N/Cont.	SCA	H	X	-	-
	21	West corridor	3	<2.0	YES	N/A	N/Cont.	SCA	H	-	80710	27974
	25	East corridor	3	<2.0	YES	N/A	N/Cont.	SCA	H	-	80709	27974
	26	Filter room	3	<0.5	NO	N/A	N/Cont.	SCA	H	X	80250	No drwgs listed
	27	Maintenance glovebox	3	<30.0*	YES	N/A	N/Cont.	SCA	H	X	80727	29957
	28	Glovebox room	3	<2.0	NO	NO	-	ARA	H	-	-	-
	30	Corridor	3	<2.0	NO	N/A	N/Cont.	SCA	H	X	-	-
	31	West corridor	3	<2.0	NO	N/A	N/Cont.	SCA	H	-	-	-
	33	East corridor	3	<0.5	NO	N/A	N/Cont.	SCA	H	-	-	-
	34	Instrument shop	3	<0.5	NO	N/A	N/Cont.	SCA	H	-	-	-

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
236-Z (cont.)	35	Electrical room	3	<0.5	NO	N/A	N/Cont.	SCA	H	X	-	-
	36	Compressor room	3	<0.5	NO	N/A	N/Cont.	SCA	H	X	-	-
	37	Storage room	3	<0.5	NO	N/A	N/Cont.	SCA	H	-	-	-
	38	Rest room	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	40	Chemical preparation	-	<0.5	NO	N/A	N/Cont.	SCA	H	X	-	-
	41	Miscellaneous treatment	-	<30.0*	YES	N/A	N/Cont.	SCA	H	X	80711	29872
	42	Column room	-	<30.0*	YES	N/A	N/Cont.	SCA	H	-	80704	29885
	43	Slag and crucible gloveboxes	-	<2.0	YES	N/A	N/Cont.	RCA	H	X	80731	29605
	43A	-	3	<0.5	NO	NO	-	SCA	C	-	-	-
	44	Column room	-	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	45	Shift manager's office	-	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	46	Shift engineer's office	-	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	47	Corridor	-	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	50	Column glovebox	-	<2.0	YES	N/A	N/Cont.	SCA	H	X	80705	29885
	60	Column glovebox	-	<30.0	YES	N/A	N/Cont.	SCA	H	X	80705	29885
	73	Mechanical room	-	-	-	-	-	RCA	C	-	-	-
234-ZB	Bldg.	Miscellaneous storage for construction forces	1	N/A	NO	N/A	N/Cont.	CLEAR	N	-	-	-
234-ZC	Bldg.	Loading dock for waste drums and SNM containers	-	N/A	NO	N/A	N/Cont.	SCA/RCA	C	-	-	-
241-Z	Bldg.	Liquid waste collection tanks in an underground concrete vault	4	<0.5	YES	N/A	CCA/CAA	RCA	H	X	80741	No drwgs listed
241-Z-RB	Bldg.	Waste water retention basin (no longer used)	-	N/A	-	N/A	-	-	N	-	-	-
241-ZA	Bldg.	241-Z tank sampling	4	<2.0	YES	N/A	-	RCA	H	X	-	-
241-ZB	Bldg.	Curbed concrete pad housing the D-9 caustic tank	-	N/A	-	N/A	-	RCA	N	X	-	-
241-ZG	-	Change room	-	-	-	-	-	RCA	C	-	-	-

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
241-Z-361	Bldg.	Underground liquid waste settling tank (no longer used)	-	N/A	-	N/A	-	-	N	-	-	-
242-Z	Bldg.	Waste Treatment Facility (layaway status)	4	N/A	YES	N/A	CCA/CAA	SCA	H	X	corr 242	43521
	108	Air lock	1	<0.5	NO	-	N/Cont.	CLEAR	N	-	-	-
243-ZA	-	Tank and sump pit	-	-	-	-	-	-	C	-	-	-
243-Z	401	-	-	-	-	-	-	-	C	-	-	-
	402	-	-	-	-	-	-	-	C	-	-	-
	403	-	-	-	-	-	-	-	C	-	-	-
	404	Drum washer	-	-	-	-	-	-	C	-	-	-
	405	Drum storage	-	-	-	-	-	-	C	-	-	-
243-ZB	-	Cooling equipment pad	-	-	-	-	-	-	C	-	-	-
252-Z-1	Bldg.	Electrical transformers	-	N/A	-	N/A	-	-	N	-	-	-
252-Z-2	Bldg.	Electrical transformers	3	N/A	-	N/A	-	CLEAR	C	-	-	-
267-Z	Bldg.	Valve house for water supply to a 234-5Z sprinkler system	-	N/A	NO	N/A	-	CLEAR	N	-	-	-
270-Z	Bldg.	PRF support facility (office building)	-	N/A	N/A	N/A	-	-	N	-	-	-
291-Z	Bldg.	Ventilation exhaust fan house	3	N/A	NO	N/A	N/Cont.	RCA	C	-	-	-
	-	Cable vault	3	<0.5	NO	N/A	N/Cont.	CLEAR	C	-	-	-
	500	Electrical room	3	<0.5	NO	N/A	N/Cont.	CLEAR	C	-	-	-
	501	Compressor room	3	<0.5	NO	N/A	N/Cont.	RCA & SCA	C	X	-	-
	502	Exhaust plenum	3	<0.5	NO	N/A	N/Cont.	RCA	C	X	-	-
	503	-	-	-	-	-	-	-	N	-	-	-
	504	-	3	<0.5	NO	N/A	N/Cont.	-	C	-	-	-
	505	-	3	<0.5	NO	N/A	N/Cont.	CLEAR	C	-	-	-
	506	-	3	<0.5	NO	N/A	N/Cont.	CLEAR	C	-	-	-
	507	-	3	<0.5	NO	N/A	N/Cont.	CLEAR	C	-	-	-
	508	-	3	<0.5	NO	N/A	N/Cont.	CLEAR	C	-	-	-

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
291-Z (cont.)	509	Fan room	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	510	-	-	-	-	-	-	-	N	-	-	-
291-Z-1	Bldg.	Ventilation exhaust stack for 232-Z, 234-5Z, and 242-Z Buildings	3	N/A	NO	N/A	-	CLEAR	C	-	-	-
296-Z-3	Bldg.	Ventilation exhaust stack for 241-Z vault and tanks	-	N/A	-	N/A	-	-	N	-	-	-
296-Z-5	Bldg.	Ventilation exhaust stack for 2736-Z Building	-	N/A	-	N/A	-	-	N	-	-	-
296-Z-6	Bldg.	Ventilation exhaust stack for 2736-Z Building	-	N/A	-	N/A	-	-	N	-	-	-
2503-Z	Bldg.	Electrical distribution system for PFP (switch yard)	-	N/A	N/A	N/A	-	-	N	-	-	-
2701-Z	Bldg.	Wooden building (no longer used)	-	N/A	N/A	N/A	-	-	N	-	-	-
2701-ZA	Bldg.	Central station alarm facility	-	N/A	N/A	N/A	-	CLEAR	N	-	-	-
2701-ZB	Bldg.	Security badge house	-	N/A	N/A	N/A	-	-	N	-	-	-
2701-ZD	Bldg.	Security checkpoint station	-	-	-	-	-	-	-	-	-	-
2702-Z	Bldg.	Microwave tower	-	N/A	N/A	N/A	-	-	N	-	-	-
2704-Z	Bldg.	PFP support facility (office building)	-	N/A	-	N/A	-	CLEAR	N	-	-	-
2705-Z	Bldg.	Badge house	-	-	-	-	-	-	-	-	-	-
2712-Z	Bldg.	291-Z-1 stack sampler power generators (diesel driven)	3	N/A	NO	N/A	-	-	C	-	-	-
2715-Z	Bldg.	Paint and solvent storage	-	N/A	N/A	N/A	-	CLEAR	N	-	-	-
2715-ZL	Bldg.	Drum storage	-	N/A	N/A	N/A	-	-	N	-	-	-
2721-Z	Bldg.	Emergency electric power generators (diesel driven)	1	N/A	NO	N/A	N/Cont.	CLEAR	N	-	-	-
2722-Z	Bldg.	Concrete pad for truck load-out station	1	N/A	NO	N/A	-	-	N	-	-	-
2725-Z	Bldg.	Laundry storage	1	N/A	NO	N/A	N/Cont.	CLEAR	N	-	-	-
2727-Z	Bldg.	Storage of miscellaneous operations and laboratory equipment	1	N/A	-	N/A	-	CLEAR	N	-	-	-
2729-Z	Bldg.	Storage of miscellaneous maintenance materials	-	N/A	N/A	N/A	-	CLEAR	N	-	-	-

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
2731-Z	Bldg.	Storage of empty flushed plutonium drums	1	N/A	NO	N/A	N/Cont.	CLEAR	N	-	-	-
2731-ZA	Bldg.	Laundry storage	1	N/A	NO	N/A	N/Cont.	RCA	C	-	-	-
2734-Z	Bldg.	Gas bottle storage	-	N/A	-	N/A	-	-	N	-	-	-
2734-ZA	Bldg.	Liquid argon storage	1	N/A	NO	N/A	-	CLEAR	N	-	-	-
2734-ZB	Bldg.	Flammable gas storage (out of service)	1	N/A	NO	N/A	-	CLEAR	N	-	-	-
2734-ZC	Bldg.	Gas bottle storage (out of service)	1	N/A	NO	N/A	-	RCA	N	-	-	-
2734-ZD	Bldg.	Argon and oxygen bottle supply (out of service)	1	N/A	NO	N/A	-	CLEAR	N	-	-	-
2734-ZF	Bldg.	Standby gas bottle supply (out of service)	1	N/A	NO	N/A	-	CLEAR	N	-	-	-
2734-ZG	Bldg.	Standby gas bottle supply (out of service)	1	N/A	NO	N/A	-	CLEAR	N	-	-	-
2734-ZH	Bldg.	Argon bottle supply (out of service)	1	N/A	NO	N/A	-	CLEAR	N	-	-	-
2734-ZJ	Bldg.	Liquid nitrogen storage tank	1	N/A	NO	N/A	-	CLEAR	N	-	-	-
2734-ZK	Bldg.	Gas bottle storage, acetylene, argon, oxygen	1	N/A	NO	N/A	-	CLEAR	N	-	-	-
2734-ZL	Bldg.	HF gas bottles and supply piping	1	N/A	NO	N/A	CAA	CLEAR	C	-	-	-
2735-Z	Bldg.	Chemical storage of HNO_3, and ANN	1	N/A	NO	N/A	N/Cont.	CLEAR	N	-	-	-
2736-Z	Bldg.	SNM storage	3	N/A	YES	N/A	YES	RCA	H	-	-	-
	1	Storage of product/recoverable SNM	3	<30.0	YES	N/A	CAA	RCA	H	-	80102	-
	2	Lard can/cubicle SNM storage	3	>30.0	YES	N/A	CAA	RCA	H	-	-	-
	3	Storage of product/recoverable SNM	3	>30.0	YES	N/A	CAA	RCA	H	-	-	-
	4	Storage of product/recoverable SNM	3	>30.0	YES	N/A	CAA	RCA	H	-	-	-
2736-ZA	Bldg.	2736-Z exhaust fans and 65-kW diesel generator	1	N/A	NO	N/A	N/Cont.	CLEAR	H	X	-	-
2736-ZB	Bldg.	Shipping and receiving SNM	3	N/A	YES	N/A	YES	N/A	H	-	-	-
	600	Mechanical room	1	<0.5	NO	N/A	N/Cont.	CLEAR	H	X	-	-
	602	Mechanical room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	603	-	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
2736-ZB (cont.)	604	Security computer room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	605	Office	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	606	Office	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	607	Office	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	608	Vestibule	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	610	Receptionist's office	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	611	Office	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	612	Office	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	613	-	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	614	Women's change room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	615	Women's change room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	616	Women's change room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	618	Men's change room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	619	Men's change room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	620	Lunchroom	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	621	Men's change room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	622	Men's change room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	623	UPS room	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	624	Corridor	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	625	Corridor	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	626	Janitors' closet	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	627	Women's rest room	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	628	Men's rest room	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	629	Mardix	3	<0.5	NO	N/A	N/Cont.	CLEAR	C	-	-	-
	630	Decontamination room	3	<0.5	NO	N/A	N/Cont.	RCA	C	X	-	-

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
2736-ZB (cont.)	631	Health Physics office	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	632	Applied technology chemist's office	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	633	Corridor	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	634	Shift manager	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	635	Operator ready room	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	636	Repackaging room	4	<30.0*	YES	N/A	N/Cont.	RCA	H	X	80171	80174
	637	NDA laboratory	3	<30.0*	YES	N/A	N/Cont.	RCA	H	X	80121	No drwgs listed
	638	Packaging room	3	<30.0*	YES	N/A	CAA	RCA	H	X	80360	No drwgs listed
	638A	-	3	<30.0*	YES	N/A	CAA	RCA	H	-	-	-
	639	Safety shower room	3	<30.0*	NO	N/A	CAA	RCA	H	X	-	-
	640	Supply storage	3	<30.0*	NO	N/A	CAA	RCA	H	-	-	-
	641	Receiving room	3	<30.0*	NO	N/A	CAA	RCA	H	X	-	-
	641A	-	3	<30.0*	YES	N/A	CAA	RCA	H	-	-	-
	642	Shipping room	3	<30.0*	YES	N/A	CAA	RCA	H	X	-	-
	643	Personnel entry	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	644	Material passageway	3	<0.5	NO	N/A	N/Cont.	RCA	C	-	-	-
	645	-	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
	646	-	1	<0.5	NO	N/A	N/Cont.	CLEAR	N	-	-	-
2736-ZC	Bldg.	Loading dock	1	N/A	NO	N/A	N/Cont.	CLEAR	N	-	-	-
2902-Z	Bldg.	Elevated sanitary water tank and valve pit	-	N/A	N/A	N/A	-	N/A	N	-	-	-
2904-ZA	Bldg.	Sheet metal structure housing 216-Z-20 crib stream effluent sampling, flow measurement, pH, and alpha monitoring equipment	-	N/A	N/A	N/A	-	N/A	N	-	-	-

Table A-1. Data From WHC-SD-CP-SAR-021, Rev. 0. (21 sheets)

Building number	Room number	Description	Vent. area	Normal dose levels (mrem/h)	Radiation sources	Glovebox location	Radiation control access areas	Radiological posting as of January 1994	Cont. class.	"Hot" items present	Reference CPS-Z-165 -XXXXX	Reference drawings H-2-XXXXX
2904-ZB	Bldg.	Sheet metal structure housing 216-Z-20 crib stream effluent sampling, flow measurement, pH, and alpha monitoring equipment	-	N/A	N/A	N/A	-	N/A	N	-	-	-

References: Plutonium Finishing Plant Final Safety Analysis Report, WHC-SD-CP-SAR-021, Rev. 0, Westinghouse Hanford Company, Richland, Washington (1991).
Criticality Prevention Specifications [for PFP], CPS-Z-165, Westinghouse Hanford Company, Richland, Washington (1994).

ANN = Aluminum nitrate nonhydrate.
HF = Hydrofluoric acid.
IRM = Information Resource Management (Department).
NDA = Nondestructive assay.
PR = Product removal.
PFP = Plutonium Finishing Plant.
PRF = Plutonium Reclamation Facility.
RADTU = Radioactive Acid Digestion Test Unit.
RCA = Radiological controlled area.
RMA = Remote mechanical "A" line.
RMC = Remote mechanical "C" line.
RWP = Radiological work permit.
SNM = Special nuclear material.
SSDM = Structured system development methodology (data management).
SWP = Special work permit (protective clothing).
UPS = Uninterruptible power supply.
WIPP = Waste Isolation Pilot Plant.
WRAM = Westinghouse Hanford Company radiation area management.

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APPENDIX B

ESTIMATION OF PIPING REMOVAL DURING DECONTAMINATION AND DECOMMISSIONING AT THE PLUTONIUM FINISHING PLANT

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ESTIMATION OF PIPING REMOVAL DURING DECONTAMINATION AND DECOMMISSIONING AT THE PLUTONIUM FINISHING PLANT

This appendix contains the spreadsheet (generated in Excel 5.0) that was used to estimate the volume of piping external to gloveboxes and hoods that is likely to be removed during the decontamination and decommissioning of the Plutonium Finishing Plant.

Table B-1. Drain Pipe Dimensions for the 234-5Z Building. (2 sheets)

Line	Length		Diameter		Volume		Total	
	ft	m	in.	cm	in^3	m^3	(in^3)	(m^3)
D-1 acid drain in 234-5Z	2	0.61	4	10.16	301.44	0.005		
	82	24.99	3	7.62	6,951.96	0.114		
	52	15.85	2	5.08	1,959.36	0.032		
	12	3.66	1.5	3.81	254.34	0.004	9,467.10	0.155
D-1 line in trench	30	9.14	3	7.62	2,543.40	0.042		
	100	30.48	10	25.40	94,200.00	1.544		
	800	243.84	15	38.10	1,695,600.00	27.786	1,792,343.40	29.371
D-2 clear water drain in 234-5Z	513	156.36	4	10.16	77,319.36	1.267		
	449	136.86	3	7.62	38,066.22	0.624		
	167	50.90	2	5.08	6,292.56	0.103		
	136	41.45	1.5	3.81	2,882.52	0.047	124,560.66	2.041
D-2 line in trench	30	9.14	4	10.16	4,521.60	0.074	4,521.60	0.074
D-1 and D-2 combined line	820	249.94	15	38.1	1,737,990.00	28.480	1,737,990.00	28.480
D-3 process cooling drain in 234-5Z	60	18.29	6	15.24	20,347.20	0.333		
	163	49.68	4	10.16	24,567.36	0.403		
	290	88.39	3	7.62	24,586.20	0.403		
	237	72.24	2	5.08	8,930.16	0.146		
	395	120.40	1.5	3.81	8,372.03	0.137	86,802.95	1.422
D-3 line to retention pond	400	121.92	8	20.32	241,152.00	3.952	241,152.00	3.952
D-4 Development Laboratory drain in 234-5Z	417	127.10	4	10.16	62,850.24	1.030		
	463	141.12	3	7.62	39,253.14	0.643		
	5	1.52	2	5.08	188.40	0.003	102,291.78	1.676
D-4 in trench to 241-Z	320	97.54	4	10.16	48,230.40	0.790	48,230.40	0.790
D-4 in 241-Z	10	3.05	4	10.16	1,507.20	0.025	1,507.20	0.025

Table B-1. Drain Pipe Dimensions for the 234-5Z Building. (2 sheets)

Line	Length		Diameter		Volume		Total	
	ft	m	in.	cm	in^3	m^3	(in^3)	(m^3)
D-5 Analytical Laboratory drain in 234-5Z	80	24.38	4	10.16	12,057.60	0.198		
	183	55.78	3	7.62	15,514.74	0.254		
	98	29.87	2	5.08	3,692.64	0.061		
	263	80.16	1.5	3.81	5,574.29	0.091	36,839.27	0.604
D-5 in trench to 241-Z	340	103.63	4	10.16	51,244.80	0.840	51,244.80	0.840
D-5 in 241-Z	10	3.05	4	10.16	1,507.20	0.025	1,507.20	0.025
D-6 process drain in 234-5Z	185	56.39	8	20.32	111,532.80	1.828		
	180	54.86	6	15.24	61,041.60	1.000		
	220	67.06	4	10.16	33,158.40	0.543		
	862	262.74	3	7.62	73,080.36	1.198		
	213	64.92	2	5.08	8,025.84	0.132		
	123	37.49	1.5	3.81	2,606.99	0.043	289,445.99	4.743
D-6 in trench to 241-Z	610	185.93	8	20.32	367,756.80	6.026	367,756.80	6.026
D-6 in 241-Z	10	3.05	8	20.32	6,028.80	0.099	6,028.80	0.099
D-7 and D-8 process drains	160	48.76	3	7.62	13,564.80	0.222	13,564.80	0.222
D-7 and D-8 in trench to 241-Z	660	201.17	3	7.62	55,954.80	0.917	55,954.80	0.917
D-7 and D-8 in 241-Z	20	6.10	3	7.62	1,695.60	0.028	1,695.60	0.028
Miscellaneous pipe	88	26.82	1.5	3.81	1,865.16	0.031		
Sanitary sewer	100	30.48	3	7.62	8,478.00	0.139		
To waste storage tank	328	99.97	1.5	3.81	6,951.96	0.114		
	100	30.48	4	10.16	15,072.00	0.247		
	65	19.81	3	7.62	5,510.70	0.090		
	80	24.38	1.5	3.81	1,695.60	0.028	39,573.42	0.649
					Total		5,012,478.56	82.140

Table B-2. Service Pipe Dimensions for the 234-5Z Building.

Diameter (cm)	Length (m)											Drops to room (3.05 m)			
	1.27	1.91	2.54	3.18	3.81	5.08	6.35	7.62	10.16	12.24	20.32		TRU	DSW	TRU MW
Hot water	--	10.36	56.39	2.44	--	--	28.19	251.46	--	--	--	29	0.025	--	--
Cold water	9.75	44.20	102.11	6.71	76.20	139.60	28.19	298.09	--	--	--	72	0.063	--	--
Distilled water	8.23	46.02	56.39	4.57	--	--	28.19	251.46	--	--	--	31	0.027	--	--
Chilled water	--	30.48	56.39	--	--	--	28.19	251.46	--	--	--	9	0.008	--	--
Glycol	--	--	77.11	--	--	--	--	--	--	--	--	1	--	0.04	0.001
Nitric acid (60%)	--	71.63	24.38	60.96	68.58	--	--	--	--	--	--	9	--	0.16	0.008
Nitric acid (M)	--	--	--	36.58	--	--	--	--	--	--	--	3	--	0.03	0.003
Oxalic acid (.67M)	--	3.05	77.11	--	--	--	--	--	--	--	--	3	--	0.04	0.003
Oxalic (.1M)	--	3.05	77.11	--	--	--	--	--	--	--	--	4	--	0.04	0.003
NaOH (30%)	--	--	--	--	30.48	--	--	--	--	--	--	2	--	0.03	0.002
Air, 103 kPa	1.52	31.09	10.67	60.96	10.67	90.83	--	--	--	--	--	30	0.026	--	--
Air, 276 kPa	--	--	--	--	--	--	--	--	--	--	--	61	0.053	--	--
Air, 621 kPa	--	27.13	57.91	51.82	59.44	33.53	--	--	--	--	--	23	0.020	--	--
Vacuum, 66 cm Hg	--	89.31	65.23	23.47	33.53	15.24	--	71.63	18.29	260.60	62.48	46	7.440	--	--
Instrument air, 207 kPa	56.39	16.76	39.62	1.52	35.05	301.14	--	--	--	--	--	18	0.016	--	--
Air sampling	--	--	139.90	3.05	176.78	56.08	107.59	58.52	--	315.47	--	112	0.097	--	--
Argon	--	--	27.43	--	67.97	--	--	--	--	--	--	13	0.011	--	--
Helium	2.44	6.10	48.77	--	62.48	59.44	--	--	--	--	--	18	0.016	--	--
Propane	--	36.58	153.92	--	--	--	--	--	304.80	--	--	28	0.024	--	--
Hydrogen	--	--	--	27.43	48.77	--	--	--	--	--	--	3	0.003	--	--
Methane	--	--	--	13.72	--	--	--	--	--	--	--	1	0.001	--	--
Methane exhaust	--	--	--	--	48.77	--	0.91	--	--	--	--	1	0.001	--	--
Nitrogen	--	--	--	--	100.58	--	--	--	--	--	--	10	0.009	--	--
Oxygen	--	--	--	--	122.83	--	--	--	--	--	--	9	0.008	--	--
Hydroflouric acid	--	--	--	--	67.97	54.86	--	--	--	--	--	5	0.004	--	--
SO_2	--	--	54.86	--	48.77	--	--	--	--	--	--	4	0.003	--	--
Total	78.33	415.75	1,125.32	293.22	1,058.88	750.72	221.28	1,182.62	323.09	576.07	62.48	545	7.85	0.34	0.02

DSW = Dangerous solid waste.
TRU = Transuranic (waste).
TRU MW = Transuranic mixed waste.

Table B-3. Service Pipe Dimensions for the 236-Z Building.

	Length (m)									Drops to room				
Diameter (cm)	0.64	1.27	1.91	2.54	3.81	5.08	7.62	10.16	15.24	3.66 m	3.05 m	TRU	DSW	TRU MW
Aluminum nitrate	--	223.52	20.32	20.32	--	--	--	--	--	--	10	--	0.005	0.015
Compressed air (621 kPa)	--	185.42	--	454.66	--	187.96	--	--	--	2	6	0.013	--	--
CA column scrub	--	203.20	--	--	--	--	--	--	--	--	3	--	--	0.008
Carbon tetrachloride	--	119.38	--	--	--	--	--	--	--	--	2	--	0.002	0.003
CC column extractant	--	175.26	--	--	--	--	--	--	--	--	1	--	--	0.004
Nitrogen	--	12.70	515.62	--	--	--	--	--	--	--	3	0.005	--	--
CO column extractant	--	185.42	--	--	--	--	--	--	--	--	1	--	--	0.004
Dissolver feed	--	165.1	--	--	--	--	--	--	--	--	1	--	0.003	0.002
Chemical preparation water	--	--	20.32	--	--	--	--	--	--	--	--	--	--	--
Hydrofluoric acid	--	76.20	--	--	--	--	--	--	--	--	2	--	0.001	0.003
Nitric acid	--	652.78	--	210.82	--	--	--	--	--	--	9	--	0.023	0.014
Instrument air	30.48	127.00	899.16	--	--	--	--	--	--	1	8	0.014	--	--
Sodium nitrite	--	106.68	--	--	--	--	--	--	--	--	1	--	0.002	0.002
Process water	--	314.96	162.56	594.36	--	63.50	--	--	--	2	4	0.010	--	--
Protected process water	--	304.80	378.46	--	--	--	--	--	--	--	9	0.014	--	--
Tributyl phosphate	--	76.20	--	--	--	--	--	--	--	--	2	--	0.001	0.003
Vacuum air sampling	--	--	--	716.28	411.48	708.66	33.02	--	--	9	38	0.366	--	--
Sodium hydroxide	--	20.32	--	20.32	--	--	--	--	--	--	4	--	0.002	0.006
Dry air	25.40	--	--	208.28	337.82	--	--	--	--	3	7	0.075	--	--
CA column extractant	--	83.82	--	--	--	--	--	--	--	--	1	--	--	0.003
Chemical addition	--	482.60	15.24	--	--	38.10	--	--	--	--	2	--	0.017	0.003
Chemical and clear process waste drain	--	--	--	--	12.70	632.46	223.52	--	152.40	--	3	--	--	0.616
Potentially contaminated waste	--	--	--	--	--	165.1	88.90	--	--	4	18	--	--	0.124
Contaminated waste	--	--	--	--	--	429.26	502.92	17.78	--	--	1	--	--	0.398
Miscellaneous	--	203.20	15.24	--	111.76	175.26	--	--	--	--	9	--	--	0.075
											Total	0.496	0.055	1.284

DSW = Dangerous solid waste.
TRU = Transuranic (waste).
TRU MW = Transuranic mixed waste.

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APPENDIX C

ESTIMATION OF VENTILATION REMOVAL DURING DECONTAMINATION AND DECOMMISSIONING AT THE PLUTONIUM FINISHING PLANT

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ESTIMATION OF VENTILATION REMOVAL DURING DECONTAMINATION AND DECOMMISSIONING AT THE PLUTONIUM FINISHING PLANT

This appendix contains the spreadsheet (generated in Excel 5.0) that was used to estimate the volume of duct work (and other ventilation items) that is likely to be removed during the decontamination and decommissioning of the Plutonium Finishing Plant.

Table C-1. Air Supply System for Building 2736-ZB.

Total length		Dimensions of duct		Volume	
ft	m	in	cm	in^3	m^3
22	6.71	6 x 6	15.24 x 15.24	9,504	0.1557
6	1.83	7 x 7	17.78 x 17.78	3,528	0.0578
87	26.52	8 x 4	20.32 x 10.16	33,408	0.5475
20	6.10	8 x 6	20.32 x 15.24	11,520	0.1888
15	4.57	10 x 6	25.40 x 15.24	10,800	0.1770
67	20.42	12 x 10	30.48 x 25.40	96,480	1.5810
85	25.91	12 x 8	30.48 x 20.32	97,920	1.6046
104	31.70	12 x 6	30.48 x 15.24	89,856	1.4725
39	11.89	12 x 12	30.48 x 30.48	67,392	1.1044
57	17.37	16 x 16	40.64 x 40.64	175,104	2.8694
12	3.66	16 x 12	40.64 x 30.48	27,648	0.4531
6	1.83	18 x 8	45.72 x 20.32	10,368	0.1699
12	3.66	20 x 12	50.80 x 30.48	34,560	0.5663
17	5.18	22 x 12	55.88 x 30.48	53,856	0.8825
34	10.36	24 x 12	60.96 x 30.48	117,504	1.9255
48	14.63	28 x 12	71.12 x 30.48	193,536	3.1715
104	31.70	30 x 16	76.20 x 40.64	599,040	9.8165
85	25.91	30 x 12	76.20 x 30.48	367,200	6.0173
77	23.47	36 x 14	91.44 x 35.56	465,696	7.6314
36	10.97	18 x 12	45.72 x 30.48	93,312	1.5291
38	11.58	18 x 8	45.72 x 20.32	65,664	1.0760
18	5.49	18 x 8	45.72 x 20.32	31,104	0.5097
Total volume for air supply systems				2,655,000	43.5075

Table C-2. Exhaust System for Building 2736-ZB.

Length		Duct diameter/dimensions		Volume	
ft	m	in.	cm	in^3	m^3
46	14.02	28	71.12	339,723	5.5670
50	15.24	10	25.40	47,100	0.7718
33	10.06	28 x 24	71.12 x 60.96	266,112	4.3608
36	10.97	28 x 24	71.12 x 60.96	290,304	4.7572
27	8.23	28	71.12	199,403	3.2676
27	8.23	16	40.64	65,111	1.0670
23	7.01	16	40.64	55,465	0.9089
21	6.40	16	40.64	50,642	0.8299
44	13.41	12 x 7	30.48 x 17.78	44,352	0.7268
62	18.90	12 x 8	30.48 x 20.32	71,424	1.1704
21	6.40	16 x 18	40.64 x 45.72	72,576	1.1893
33	10.06	10 x 8	25.40 x 20.32	31,680	0.5191
24	7.32	26	66.04	152,830	2.5044
12	3.66	16	40.64	28,938	0.4742
24	7.32	16	40.64	57,876	0.9484
16	4.88	8	20.32	9,646	0.1581
7	2.13	6	15.24	2,374	0.0389
18	5.49	10	25.40	16,956	0.2779
14	4.27	6	15.24	4,748	0.0778
15	4.57	12	30.48	20,347	0.3334
Total volume for air supply systems				1,827,607	29.9489

Table C-3. E-4 Ventilation System for Building 234-5Z.

Horizontal duct work					
Total length		Diameter/dimensions		Volume	
ft	m	in.	cm	in^3	m^3
15	4.57	6	15.24	5,086.8	0.0834
132	40.23	12	30.48	179,055.36	2.9342
33	10.06	14	35.56	60,928.56	0.9984
62	18.90	16	40.64	149,514.24	2.4501
10	3.05	17	43.18	27,223.8	0.4461
7	2.13	18	45.72	21,364.56	0.3501
144	43.89	20	50.80	542,592	8.8915
27	8.23	24	60.96	146,499.84	2.4007
35	10.67	25	63.50	206,062.5	3.3767
42	12.80	30	76.20	356,076	5.8350
30	9.14	32	81.28	289,382.4	4.7421
40	12.19	38	96.52	544,099.2	8.9162
270	82.30	42	106.68	4,486,557.6	73.5212
25	7.62	68	172.72	1,088,952	17.8447
600	182.88	12	30.48	813,888	13.3372
50	15.24	78 x 78	198.12 x 198.12	3,650,400	59.8191
44	13.41	78 x 81	198.12 x 205.74	3,335,904	54.6655
Total volume of horizontal duct work				15,903,586.86	260.6122

Vertical duct work					
Total length		Diameter		Volume	
ft	m	in.	cm	in^3	m^3
1,002	305.41	10	25.40	943,884	15.4674
210	64.01	15	38.10	445,095	7.2938
Total volume of vertical duct work				1,388,979	22.7612

Table C-4. Air Zone Systems for Building 234-5Z. (3 sheets)

System S-2					
Length		Duct dimensions		Volume	
ft	m	in.	cm	in^3	m^3
25	7.62	24 x 10	60.96 x 25.40	72,000	1.1799
10	3.05	15 x 26	38.10 x 66.04	46,800	0.7669
20	6.10	15 x 26	38.10 x 66.04	93,600	1.5338
75	22.86	18 x 16	45.72 x 40.64	259,200	4.2475
25	7.62	16 x 14	40.64 x 35.56	67,200	1.1012
40	12.19	16 x 22	40.64 x 55.88	168,960	2.7687
220	67.06	60 x 30	152.40 x 76.20	4,752,000	77.8710
30	9.14	18 x 16	45.72 x 40.64	103,680	1.6990
20	6.10	24 x 12	60.96 x 30.48	69,120	1.1327
100	30.48	20 x 12	50.80 x 30.48	288,000	4.7195
20	6.10	18 x 12	45.72 x 30.48	51,840	0.8495
23	7.01	18 x 16	45.72 x 40.64	79,488	1.3026
10	3.05	24 x 9	60.96 x 22.86	25,920	0.4248
140	42.67	24 x 24	60.96 x 60.96	967,680	15.8574
73	22.25	48 x 28	121.92 x 71.12	1,177,344	19.2931
120	36.58	48 x 28	121.92 x 71.12	1,935,360	31.7147
100	30.48	84 x 48	213.36 x 121.92	4,838,400	79.2869
95	28.96	84 x 60	213.36 x 152.40	5,745,600	94.1531
67	20.42	38 x 20	96.52 x 50.80	611,040	10.0131
17	5.18	20 x 16	50.80 x 40.64	65,280	1.0697
140	42.67	30 x 24	76.20 x 60.96	1,209,600	19.8217
Total volume				22,628,112	370.8068

Table C-4. Air Zone Systems for Building 234-5Z. (3 sheets)

System S-3A					
Length		Duct dimensions		Volume	
ft	m	in.	cm	in^3	m^3
52	15.85	18 x 32	45.72 x 81.28	359,424	5.8899
105	32.00	18 x 16	45.72 x 40.64	362,880	5.9465
60	18.29	18 x 16	45.72 x 40.64	207,360	3.3980
35	10.67	20 x 24	50.80 x 60.96	201,600	3.3036
80	24.38	24 x 24	60.96 x 60.96	552,960	9.0614
103	31.39	30 x 24	76.20 x 60.96	889,920	14.5831
55	16.76	30 x 66	76.20 x 167.64	1,306,800	21.4145
67	20.42	30 x 48	76.20 x 121.92	1,157,760	18.9722
40	12.19	33 x 28	83.82 x 71.12	443,520	7.2680
70	21.34	36 x 42	91.44 x 106.68	1,270,080	20.8128
75	22.86	42 x 24	106.68 x 60.96	907,200	14.8663
190	57.91	48 x 24	121.92 x 60.96	2,626,560	43.0414
45	13.72	48 x 42	121.92 x 106.68	1,088,640	17.8395
30	9.14	48 x 20	121.92 x 50.80	345,600	5.6633
50	15.24	48 x 44	121.92 x 111.76	1,267,200	20.7656
20	6.10	50 x 54	127.00 x 137.16	648,000	10.6188
15	4.57	72 x 120	182.88 x 304.80	1,555,200	25.4851
140	42.67	96 x 66	243.84 x 167.64	10,644,480	174.4311
20	6.10	66 x 28	167.64 x 71.12	443,520	7.2680
140	42.67	66 x 24	167.64 x 60.96	2,661,120	43.6078
160	48.77	66 x 96	167.64 x 243.84	12,165,120	199.3498
Total volume				41,104,944	673.5867

Table C-4. Air Zone Systems for Building 234-5Z. (3 sheets)

System S-3					
Length		Duct dimensions		Volume	
ft	m	in.	cm	in^3	m^3
22	6.71	26 x 16	66.04 x 40.64	109,824	1.7997
68	20.73	72 x 30	182.88 x 76.20	1,762,560	28.8831
67	20.42	72 x 48	182.88 x 121.92	2,778,624	45.5333
57	17.37	36 x 24	91.44 x 60.96	590,976	9.6843
190	57.91	60 x 30	152.40 x 76.20	4,104,000	67.2522
79	24.08	54 x 20	137.16 x 50.80	1,023,840	16.7777
137	41.76	36 x 20	91.44 x 50.80	1,183,680	19.3970
132	40.23	24 x 20	60.96 x 50.80	760,320	12.4594
115	35.05	20 x 20	50.80 x 50.80	552,000	9.0456
117	35.66	36 x 18	91.44 x 45.72	909,792	14.9088
113	34.44	60 x 18	152.40 x 45.72	1,464,480	23.9984
89	27.13	60 x 40	152.40 x 101.60	2,563,200	42.0032
37	11.28	24 x 24	60.96 x 60.96	255,744	4.1909
185	56.39	90 x 30	228.60 x 76.20	5,994,000	98.2237
185	56.39	90 x 48	228.60 x 121.92	9,590,400	157.1579
85	25.91	36 x 24	91.44 x 60.96	881,280	14.4415
12	3.66	72 x 30	182.88 x 76.20	311,040	5.0970
Total volume				34,835,760	570.8537

Total volume for air supply systems S-2, S-3A, S-3	98,568,816	1,615.2472
Total volume with 1% for S-5	99,554,504	1,631.3996

Table C-5. E-3 Ventilation System for Building 234-5Z. (3 sheets)

Horizontal ducting					
Length		Dimensions		Volume	
ft	m	in.	cm	in^3	m^3
40	12.19	10 x 10	25.40 x 25.40	48,000	0.7866
20	6.10	12 x 30	30.48 x 76.20	86,400	1.4158
13	3.96	15 x 11	38.10 x 27.94	25,740	0.4218
30	9.14	18 x 74	45.72 x 187.96	479,520	7.8579
60	18.29	22 x 22	55.88 x 55.88	348,480	5.7105
60	18.29	24 x 34	60.96 x 86.36	587,520	9.6277
90	27.43	24 x 57	60.96 x 144.78	1,477,440	24.2108
195	59.44	24 x 36	60.96 x 91.44	2,021,760	33.1306
67	20.42	26 x 10	66.04 x 25.40	209,040	3.4255
25	7.62	26 x 24	66.04 x 60.96	187,200	3.0676
20	6.10	30 x 28	76.20 x 71.12	201,600	3.3036
111	33.83	30 x 20	76.20 x 50.80	799,200	13.0965
47	14.33	30 x 16	76.20 x 40.64	270,720	4.4363
17	5.18	32 x 12	81.28 x 30.48	78,336	1.2837
45	13.72	32 x 20	81.28 x 50.80	345,600	5.6633
37	11.28	36 x 34	91.44 x 86.36	543,456	8.9056
70	21.34	38 x 24	96.52 x 60.96	766,080	12.5538
24	7.32	46 x 24	116.84 x 60.96	317,952	5.2103
35	10.67	48 x 30	121.92 x 76.20	604,800	9.9109
25	7.62	48 x 80	121.92 x 203.20	1,152,000	18.8778
77	23.47	54 x 72	137.16 x 182.88	3,592,512	58.8705
130	39.62	56 x 24	142.24 x 60.96	2,096,640	34.3576
102	31.09	66 x 30	167.64 x 76.20	2,423,520	39.7142
37	11.28	66 x 54	167.64 x 137.16	1,582,416	25.9311
59	17.98	66 x 24	167.64 x 60.96	1,121,472	18.3776
10	3.05	72 x 24	182.88 x 60.96	207,360	3.3980
40	12.19	78 x 54	198.12 x 137.16	2,021,760	33.1306
25	7.62	84 x 84	213.36 x 213.36	2,116,800	34.6880
40	12.19	84 x 96	213.36 x 243.84	3,870,720	63.4295
110	33.53	96 x 60	243.84 x 152.40	7,603,200	123.5936
85	25.91	100 x 24	254.00 x 60.96	2,448,000	40.1154
20	6.10	120 x 132	304.80 x 335.28	3,801,600	62.2968
30	9.14	120 x 96	304.80 x 243.84	4,147,200	67.9602
92	28.04	132 x 132	335.28 x 335.28	19,236,096	315.2219
135	41.15	144 x 120	365.76 x 304.80	27,993,600	458.7311
65	19.81	144 x 96	365.76 x 243.84	10,782,720	176.6964
Total volume horizontal ducting				105,596,460	1,729.4091

Table C-5. E-3 Ventilation System for Building 234-5Z. (3 sheets)

Vertical ducting				
Number of ducts	Dimensions		Volume	
3.05 m (10 ft)	in.	cm	in^3	m^3
2	5 x 8	12.70 x 20.32	9,600	0.1573
2	6 x 12	15.24 x 30.48	17,280	0.2832
4	6 x 6	15.24 x 15.24	17,280	0.2832
1	7 x 6	17.78 x 15.24	5,040	0.0826
2	7 x 7	17.78 x 17.78	11,760	0.1927
1	8 x 6	20.32 x 15.24	5,760	0.0944
1	9 x 9	22.86 x 22.86	9,720	0.1593
1	8 x 8	20.32 x 20.32	7,680	0.1259
4	10 x 8	25.40 x 20.32	38,400	0.6293
5	10 x 10	25.40 x 25.40	60,000	0.9832
4	11 x 11	27.94 x 27.94	58,080	0.9518
2	12 x 6	30.48 x 15.24	17,280	0.2832
3	12 x 10	30.48 x 25.40	43,200	0.7079
1	12 x 8	30.48 x 20.32	11,520	0.1888
2	12 x 12	30.48 x 30.48	34,560	0.5663
2	13 x 13	33.02 x 33.02	40,560	0.6647
1	14 x 7	35.56 x 17.78	11,760	0.1927
2	14 x 14	35.56 x 35.56	47,040	0.7708
1	15 x 11	38.10 x 27.94	19,800	0.3245
1	15 x 15	38.10 x 38.10	27,000	0.4424
1	15 x 20	38.10 x 50.80	36,000	0.5899
2	16 x 10	40.64 x 25.40	38,400	0.6293
3	16 x 8	40.64 x 20.32	46,080	0.7551
1	16 x 16	40.64 x 40.64	30,720	0.5034
2	16 x 12	40.64 x 30.48	46,080	0.7551
1	17 x 17	43.18 x 43.18	34,680	0.5683
1	18 x 8	45.72 x 20.32	17,280	0.2832
1	18 x 10	45.72 x 25.40	21,600	0.3540
1	20 x 9	50.80 x 22.86	21,600	0.3540
2	20 x 10	50.80 x 25.40	48,000	0.7866
1	20 x 20	50.80 x 50.80	48,000	0.7866
10	22 x 10	55.88 x 25.40	264,000	4.3262
1	22 x 20	55.88 x 50.80	52,800	0.8652
5	22 x 8	55.88 x 20.32	105,600	1.7305
2	24 x 14	60.96 x 35.56	80,640	1.3214

Table C-5. E-3 Ventilation System for Building 234-5Z. (3 sheets)

Vertical ducting				
Number of ducts	Dimensions		Volume	
3.05 m (10 ft)	in.	cm	in^3	m^3
1	24 x 8	60.96 x 20.32	23,040	0.3776
1	24 x 12	60.96 x 30.48	34,560	0.5663
1	24 x 24	60.96 x 60.96	69,120	1.1327
1	24 x 15	60.96 x 38.10	43,200	0.7079
3	26 x 6	66.04 x 15.24	56,160	0.9203
58	26 x 10	66.04 x 25.40	1,809,600	29.6539
1	27 x 10	68.58 x 25.40	32,400	0.5309
1	30 x 5	76.20 x 12.70	18,000	0.2950
3	30 x 8	76.20 x 20.32	86,400	1.4158
2	30 x 10	76.20 x 25.40	72,000	1.1799
4	30 x 12	76.20 x 30.58	172,800	2.8317
1	32 x 7	81.28 x 17.78	26,880	0.4405
5	36 x 10	91.44 x 25.40	216,000	3.5396
1	44 x 10	111.76 x 25.40	52,800	0.8652
Total volume vertical ducting			4,097,760	67.1503

Total volume ducting	109,694,220	1,796.5594

Table C-6. Air Support System for Building 236-Z. (2 sheets)

Floor	Total length		Duct dimensions		Volume	
	ft	m	in.	cm	in^3	m^3
1	15	4.57	6 x 6	15.24 x 15.24	6,480	0.1062
	30	9.14	10 x 8	25.40 x 20.32	28,800	0.4719
	6	1.83	10 x 16	25.40 x 40.64	11,520	0.1888
	24	7.32	14 x 12	35.56 x 30.48	48,384	0.7929
	13	3.96	18 x 12	45.72 x 30.48	33,696	0.5522
	15	4.57	18 x 18	45.72 x 45.72	58,320	0.9557
	164	49.99	24 x 16	60.96 x 40.64	755,712	12.3839
	19	5.79	26 x 18	66.04 x 45.72	106,704	1.7486
	13	3.96	30 x 18	76.20 x 45.72	84,240	1.3804
2	12	3.66	13 x 13	33.02 x 33.02	24,336	0.3988
	9	2.74	14 x 12	35.56 x 30.48	18,144	0.2973
	131	39.93	24 x 16	60.96 x 40.64	603,648	9.8920
	38	11.58	24 x 12	60.96 x 30.48	131,328	2.1521
3	10	3.05	8 x 8	20.32 x 20.32	7,680	0.1259
	24	7.32	10 x 24	25.40 x 60.96	69,120	1.1327
	4	1.22	10 x 8	25.40 x 20.32	3,840	0.0629
	37	11.28	14 x 12	35.56 x 30.48	74,592	1.2223
	7	2.13	14 x 10	35.56 x 25.40	11,760	0.1927
	21	6.40	16 x 18	40.64 x 45.72	72,576	1.1893
	40	12.19	18 x 30	45.72 x 76.20	259,200	4.2475
	130	39.62	20 x 16	50.80 x 40.64	499,200	8.1804
	12	3.66	30 x 26	76.20 x 66.04	112,320	1.8406
4	9	2.74	13 x 13	33.02 x 33.02	18,252	0.2991
	44	13.41	14 x 22	35.56 x 55.88	162,624	2.6649
	22	6.71	14 x 32	35.56 x 81.28	118,272	1.9381
	70	21.34	16 x 10	40.64 x 25.40	134,400	2.2023
	9	2.74	18 x 12	45.72 x 30.48	23,328	0.3823
	49	14.94	20 x 16	50.80 x 40.64	188,160	3.0834
	11	3.35	20 x 12	50.80 x 30.48	31,680	0.5191

Table C-6. Air Support System for Building 236-Z. (2 sheets)

	Total length		Duct dimensions		Volume	
Floor	ft	m	in.	cm	in^3	m^3
4 (cont.)	40	12.19	20 x 18	50.80 x 45.72	172,800	2.8317
	19	5.79	24 x 12	60.96 x 30.48	65,664	1.0760
	24	7.32	24 x 6	60.96 x 15.24	41,472	0.6796
	32	9.75	30 x 18	76.20 x 45.72	207,360	3.3980
	4	1.22	36 x 12	91.44 x 30.48	20,736	0.3398
	11	3.35	36 x 18	91.44 x 45.72	85,536	1.4017
	37	11.28	40 x 28	101.60 x 71.12	497,280	8.1489
	10	3.05	42 x 24	106.68 x 60.96	120,960	1.9822
	6	1.83	42 x 12	106.68 x 30.48	36,288	0.5947
	37	11.28	42 x 42	106.68 x 106.68	783,216	12.8346
5	34	10.36	14 x 22	35.56 x 55.88	125,664	2.0593
6	28	8.53	14 x 22	35.56 x 55.88	103,488	1.6959
	16	4.88	28 x 14	71.12 x 35.56	75,264	1.2334
	9	2.74	18 x 14	45.72 x 35.56	27,216	0.4460
Total volume					6,061,260	99.3261

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