DOE/RL-2000-23
Revision 0

Radioactive Air Emissions Notice of Construction for Plutonium Finishing Plant Project W-460, "Plutonium Stabilization and Handling

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

**United States
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Radioactive Air Emissions Notice of Construction for Plutonium Finishing Plant Project W-460, "Plutonium Stabilization and Handling

Date Published
March 2000

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

United States Department of Energy
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Printed in the United States of America

DOE/RL-2000-23
Revision 0

UC-630

Radioactive Air Emissions Notice of Construction for Plutonium Finishing Plant Project W-460, "Plutonium Stabilization and Handling"

Date Published
February 2000

United States
Department of Energy
Richland, Washington

Approved for Public Release

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FIGURES

RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION FOR PLUTONIUM FINISHING PLANT PROJECT W-460, "PLUTONIUM STABILIZATION AND HANDLING"

1.0 INTRODUCTION

The following description and any attachments and references are provided to the Washington State Department of Health (WDOH), Division of Radiation Protection, Air Emissions & Defense Waste Section as a notice of construction (NOC) in accordance with Washington Administrative Code (WAC) 246-247, Radiation Protection – Air Emissions. The WAC 246-247-060, "Applications, registration, and licensing", states "This section describes the information requirements for approval to construct, modify, and operate an emission unit. Any NOC requires the submittal of information listed in Appendix A." Appendix A (WAC 246-247-110) lists the requirements that must be addressed.

Additionally, the following description, attachments, and references are provided to the U.S. Environmental Protection Agency (EPA) as an NOC, in accordance with Title 40 Code of Federal Regulations (CFR), Part 61, "National Emission Standards for Hazardous Air Pollutants." The information required for submittal to the EPA is specified in 40 CFR 61.07. The potential emissions from this activity are estimated to provide greater than 0.1 millirem year total effective dose equivalent (TEDE) to the hypothetical offsite maximally exposed individual (MEI) and commencement is needed within a short time. Therefore, this application also is intended to provide notification of the anticipated date of initial startup in accordance with the requirement listed in 40 CFR 61.09(a)(1), and it is requested that approval of this application also constitutes EPA acceptance of this initial startup notification. Written notification of the actual date of initial startup, in accordance with the requirement listed in 40 CFR 61.09(a)(2), will be provided later.

This NOC covers the activities associated with the construction and operation activities involving stabilization and/or repackaging of plutonium in the 2736-ZB Building. An operations support trailer will be installed in the proximity of the 2736-ZB Building. A new exhaust stack will be built and operated at the 2736-ZB Building to handle the effluents associated with the operation of the stabilization and repackaging process. Figures provided are based on preliminary design.

For the activities covered under this NOC, the unabated and abated TEDE to the hypothetical MEI is 1.10 E+03 and 5.49 E-01 millirem per year, respectively.

2.0 FACILITY LOCATION (REQUIREMENT 1)

U. S. Department of Energy, Richland Operations Office
825 Jadwin Avenue
P.O. Box 550
Richland, Washington 99352-3562

The coordinates for the proposed new stack are as follows:

2736-ZB Building, 200 West Area
Latitude: 46° 33′ 00″
Longitude: 119° 37′ 60″

3.0 RESPONSIBLE MANAGER (REQUIREMENT 2)

The responsible manager for the activities described under this NOC is as follows:

Mr. L. D. Romine, Director
Transition Program Division
U.S. Department of Energy,
P.O. Box 550
Richland, Washington 99352
(509) 376-4747

4.0 TYPE OF PROPOSED ACTION (REQUIREMENT 3)

The proposed action results in the construction of a new major emission unit.

5.0 STATE ENVIRONMENTAL POLICY ACT (REQUIREMENT 4)

The proposed action is categorically exempt from the requirements of the *State Environmental Policy Act* under WAC 197-11-845.

6.0 PROCESS DESCRIPTION (REQUIREMENT 5)

Project W-460 will provide the equipment and modifications necessary for the Plutonium Finishing Plant to stabilize and/or repackage plutonium and uranium, oxide and metals, for long-term storage. Additional office space, lunchrooms, and change rooms will be provided by the addition of an operations support trailer. The trailer will be located within the Plutonium Finishing Plant Security Fence near the 2736-ZB Building. The proposed construction site is a radiologically controlled area; the area is previously disturbed with no record of surface or subsurface radiological contamination.

Within the 2736-Z Building, existing vault storage cubicles will be modified to accommodate larger, long-term storage canisters.

Activities that will take place at the 2736-ZB Building to accomplish the stabilization and repackaging of plutonium and uranium are as follows:

- Modification of several rooms to accommodate the stabilization and packaging equipment and International Atomic Energy Agency (IAEA) personnel, equipment, and supplies
- Install and connect a process exhaust filtration system to a new exhaust stack
- Install airlocks to alleviate existing problems with the 2736-ZB Building heating, ventilation, and air-conditioning system
- Reconfigure existing offices to provide space for a radiological decontamination shower
- Construct additional security walls
- Install dry air, nitrogen, or inert gas system.

Additional details regarding Project W-460 can be found in HNF-SD-W460-CDR-001, Rev. 1, *Conceptual Design Report – Plutonium Stabilization and Handling, Project W-460*, and HNF-SD-W460-FDC-001, Rev. 1, *Functional Design Criteria - Plutonium Stabilization and Handling (PuSH) Project W-460.*

Plutonium and uranium that will be processed in the stabilization and repackaging process under Project W-460 will be in the form of oxides and pure metal (Figure 1). Americium, plutonium, and uranium oxides will be stabilized by heating the material in an oven to a temperature of approximately 1,000°C ± 50°C for a minimum of 2 hours. In-line monitoring equipment will be provided for determining the moisture/volatile content of the material processed. An alternative method exists to use thermogravimetric mass spectrometer analysis. The material will be considered thermally stabilized when there is less than 0.5 percent loss on ignition. All stabilized plutonium-bearing materials will be containerized in an inner-welded and outer-welded container and placed in secure vault storage pending final disposition.

7.0 ANNUAL POSSESSION QUANTITY AND PHYSICAL FORM
(REQUIREMENTS 8, 10, AND 11)

The annual possession quantity for installation of the operations trailer is not calculated. As noted previously, the proposed location is within a radiological control area. The area has been disturbed previously, most recently associated with intrusive construction activities for an effluent collection system. No surface or subsurface radiological contamination was detected during installation of the system. If radiological contamination were encountered during construction activities for the proposed Project W-460, work would cease until the source/extent of the contamination could be assessed. Work control procedures would be modified and implemented to ensure worker and public safety before continuation of activities.

The annual possession quantity for construction activities modifying the existing 2736-ZB Building ventilation system specifically was not calculated. For conservatism, it is assumed that the annual possession quantity for this activity will not exceed the annual emission quantity for the existing

2736-ZB Building 296-Z-5 exhaust stack for calendar year 1998, as documented in DOE/RL-99-41, *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1998.* That is, total alpha was not detected and total beta was 1.2×10^{-7} curies. The existing ventilation and monitoring systems for the 2736-ZB Building will remain operational during modification/construction activities. Alarms will be activated in the event of off-normal emissions. Work would cease until the source/extent of the contamination could be assessed. Work control procedures will be modified and implemented to ensure worker and public safety before continuation of activities.

The annual possession quantity for stabilization and packaging activities is based on a conservative estimate for the maximum amount of material that could be stabilized and repackaged in a year. The annual possession quantity for Project W-460 assumed an annual throughput of 1.6 metric tonnes plutonium (100 percent plutonium-239); 1.1 metric tonnes uranium (100 percent uranium-233); and 0.01 metric tonnes americium (100 percent americium-241).

The physical form of all radionuclides encountered during construction, stabilization, and packaging activities would be expected to be dry particulates. The physical form of all radionuclides emitted is expected to be particulate.

Potential radionuclides that are expected to be encountered during construction, stabilization, and packaging activities include: uranium-235, uranium-238, plutonium-238, plutonium-239, plutonium-240, plutonium-241, plutonium-242, americium-241, and americium-243.

8.0 ABATEMENT TECHNOLOGY AND CONCEPTUAL DRAWING(S) (REQUIREMENTS 6 AND 7)

Figures 2-6 contain schematics the proposed ventilation system modifications for the 2736-ZB Building. Emissions resulting from work performed within 2736-ZB Building will be exhausted out the existing 296-Z-5 stack, which contains two stages of HEPA filtration with a minimum efficiency of 99.95 percent for particles with a median diameter of 0.3 micron. The average flow rate in 1998 was reported to be 4.9 cubic meters per second (10,000 cubic feet per minute).

The Project W-460 stabilization and packaging activities would be conducted predominantly in Rooms 642 and 641. The resulting emissions would be exhausted through the new stack, which will contain two stages of HEPA filtration (credit taken for only one stage) with a minimum efficiency of 99.95 percent for particles with a median diameter of 0.3 micron. The maximum flowrate from the new stack is projected to be 0.8 cubic meters per second (1,800 cubic feet per minute).

9.0 MONITORING SYSTEM (REQUIREMENT 9)

The existing 296-Z-5 stack exhausts filtered air from the 2736-ZB Building. Emission sampling consists of a record sampler for particulate radionuclides. This stack is registered with WDOH, with emissions estimated or verified using methods approved by the EPA and WDOH. Most recent data are reported in DOE/RL-99-41.

The new stack will exhaust filtered air from stabilization and packaging activities conducted in the 2736-ZB Building. The stack/emission sampling will consist of a continuous air monitor record sampler for particulate radionuclides and flow monitor.

10.0 RELEASE RATES (REQUIREMENTS 12 AND 13)

As discussed earlier in Section 7.0, the annual possession quantity for construction activities modifying the 2736-ZB Building resulting in continued emissions from the existing ventilation system was not specifically calculated. For conservatism, it is assumed that the annual possession quantity for this activity will not exceed the annual emission quantity for the existing 2736-ZB 296-Z-5 exhaust stack, as documented in DOE/RL-99-41. That is, total alpha was not detected, and total beta was 1.2×10^{-7} curies. The 296-Z-5 stack exhaust will continue to be operated in a continuous mode.

The annual possession quantity for stabilization and packaging was multiplied by the conservative 40 CFR 61, Appendix D, release factor of 1.0 E-03 for particulates and solutions. Although the furnace(s) will operate at temperatures near 1000°C, the boiling point temperature of plutonium, americium, and uranium oxides and metals is well above 1000°C. At high temperatures, the oxides will undergo transformation to a pure metal state. For americium, plutonium, and uranium oxide, the transformation begins to occur at a temperature of approximately 1,150°C, 1,500°C, and 2,800°C, respectively. The boiling point of metallic americium, plutonium and uranium occurs at 2,607°C, 3,232°C, and 3,818°C, respectively. The release rate conservatively assumes that all material is stabilized and repackaged. Pure metals will only be repackaged. The new stack will be operated in a continuous mode.

11.0 OFFSITE IMPACT (REQUIREMENTS 14 AND 15)

A summary of the abated and unabated TEDE to the MEI is provided in Attachment A. The TEDE to the MEI was calculated using CAP88-PC (HNF-3602). The modeling was done based on an effective stack height of less than 40 meters and the MEI being located 22,000 meters southeast of the REDOX Facility in the 200 West Area on the Hanford Site.

12.0 COST FACTORS AND FACILITY LIFETIME (REQUIREMENTS 16 AND 17)

Requirement 16 is not applicable because a best available radionuclide control technology (BARCT) demonstration is provided (Attachment B).

The maximum design life of the project is approximately 11 years (completion on or before October 1, 2010).

13.0 TECHNOLOGY STANDARDS (REQUIREMENT 18)

The 296-Z-5 stack is a registered emissions unit with WDOH. The stack design and operation will not be modified to support Project W-460.

The new stack will be a registered emissions unit with WDOH. The new stack will meet control technology standards listed in WAC 246-247-110(18).

14.0 REFERENCES

AIR 92-107, letter, A.W. Conklin, Washington State Department of Health, to J.D. Bauer, U.S. Department of Energy, Richland Operations Office, no subject, October 5, 1992.

DOE/RL-99-41, *Radionuclide Air Emissions Report for the Hanford Site Calendar Year 1998*, June 1999, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

HNF-3602, *Volume 1: Calculating Potential to Emit Releases and Doses for FEMPS and NOCs*, July 1999, Fluor Daniel Hanford, Inc., Richland, Washington.

HNF-SD-CP-SAR-021, Rev 1, *Plutonium Finishing Plant Final Safety Analysis Report.*

HNF-SD-W460-CDR-001, Rev. 1, *Conceptual Design Report – Plutonium Stabilization and Handling, Project W-460.*

HNF-SD-W460-FDC-001, Rev. 1, *Functional Design Criteria - Plutonium Stabilization and Handling (PuSH) Project W-460.*

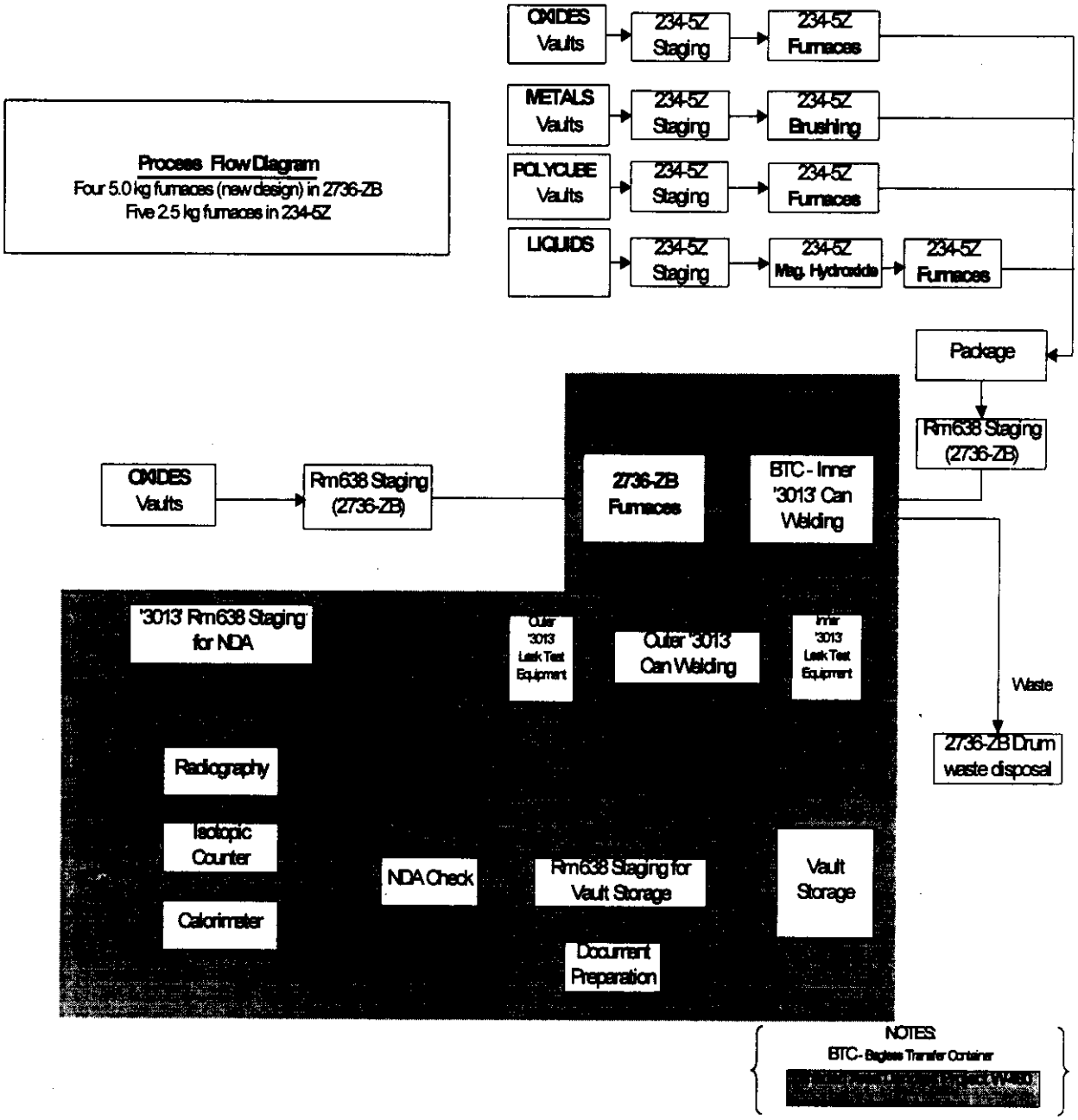

Figure 1. Process Flow Diagram

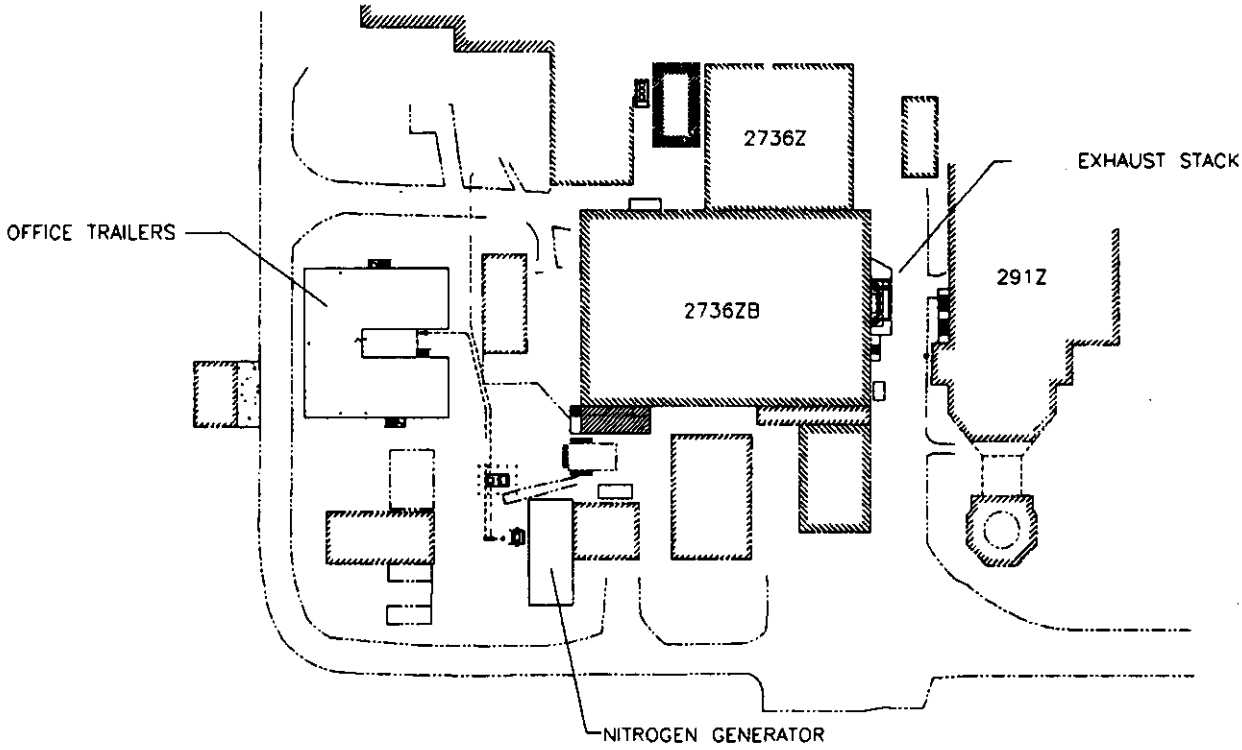

Figure 2. Site Plan

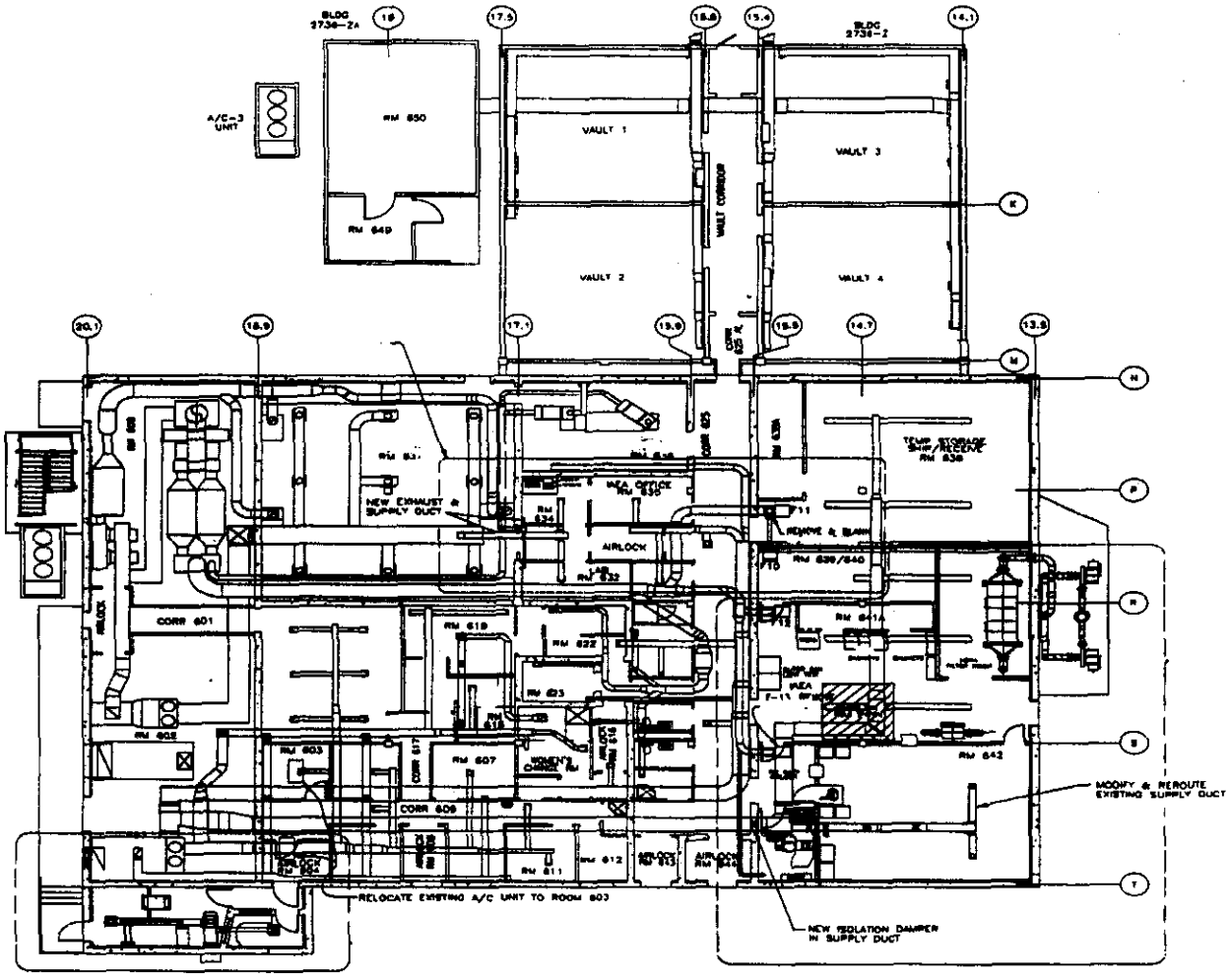

Figure 3. 2736-ZB Floor Plan.

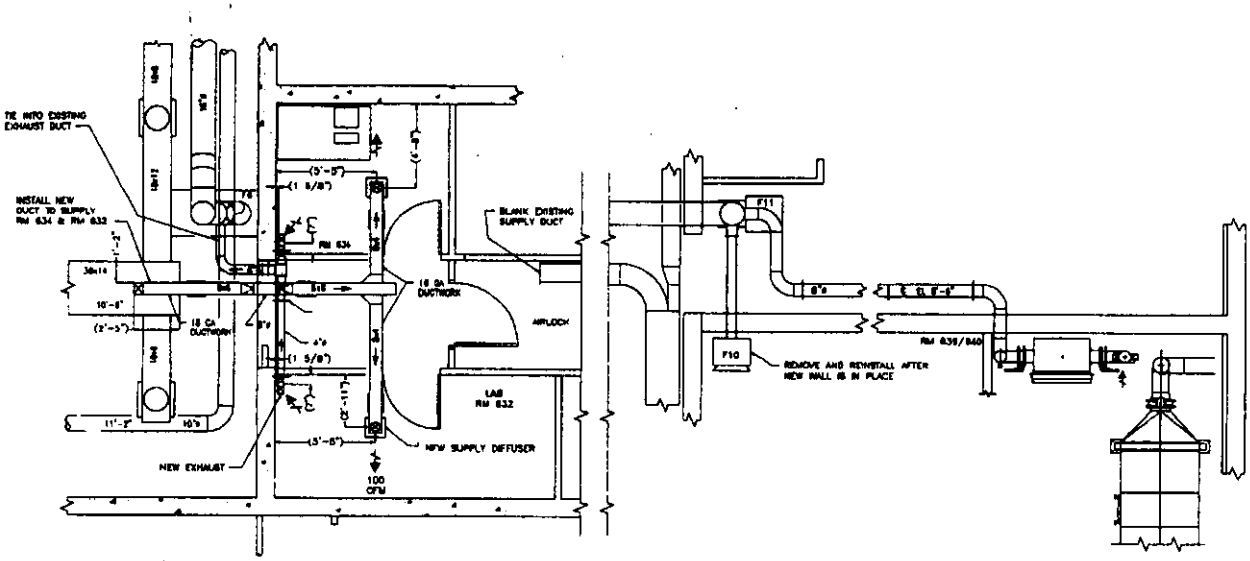

Figure 4. 2736-ZB Building Existing Ventilation System Modifications.

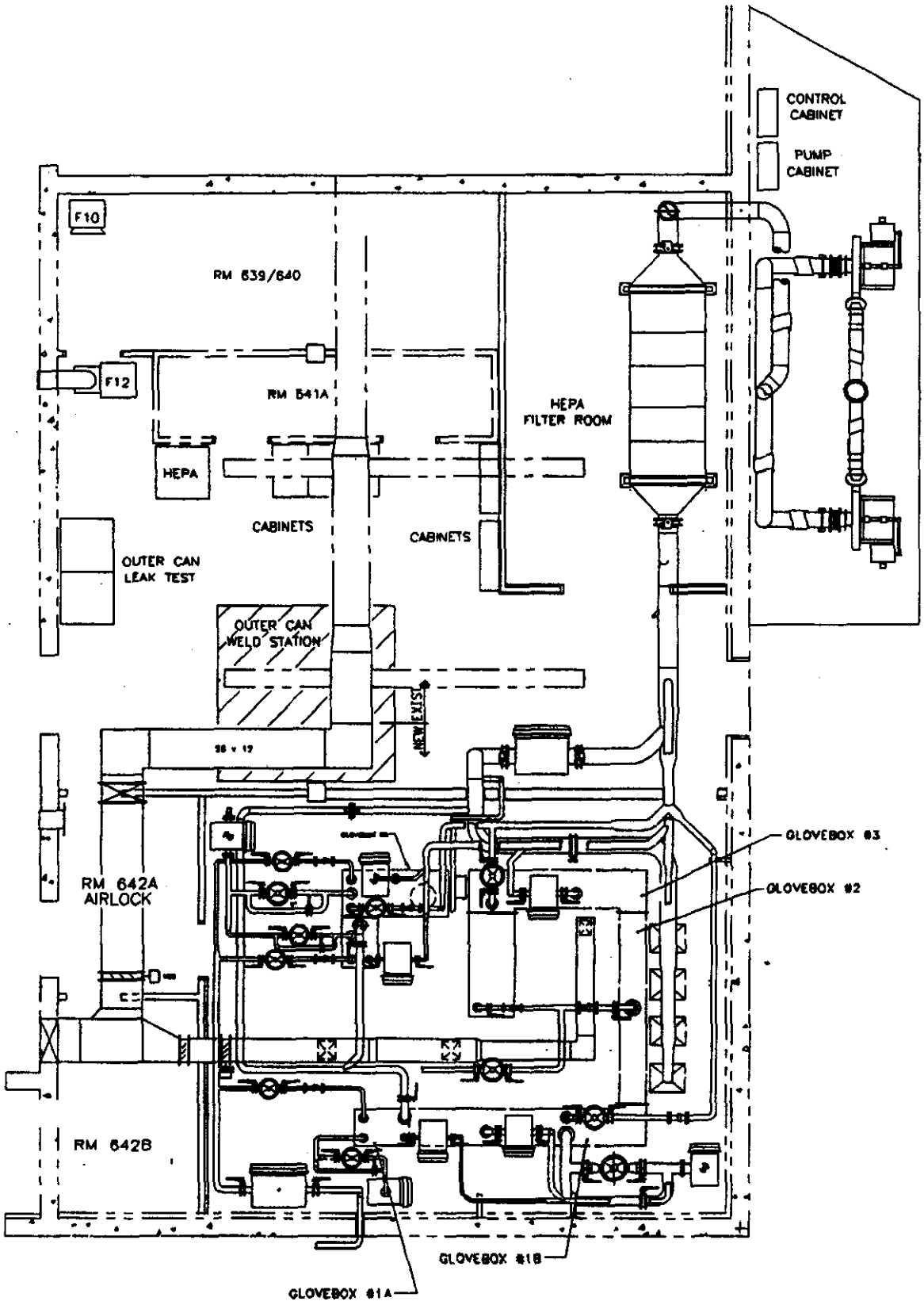

Figure 5. 2736-ZB Building New Process Ventilation System.

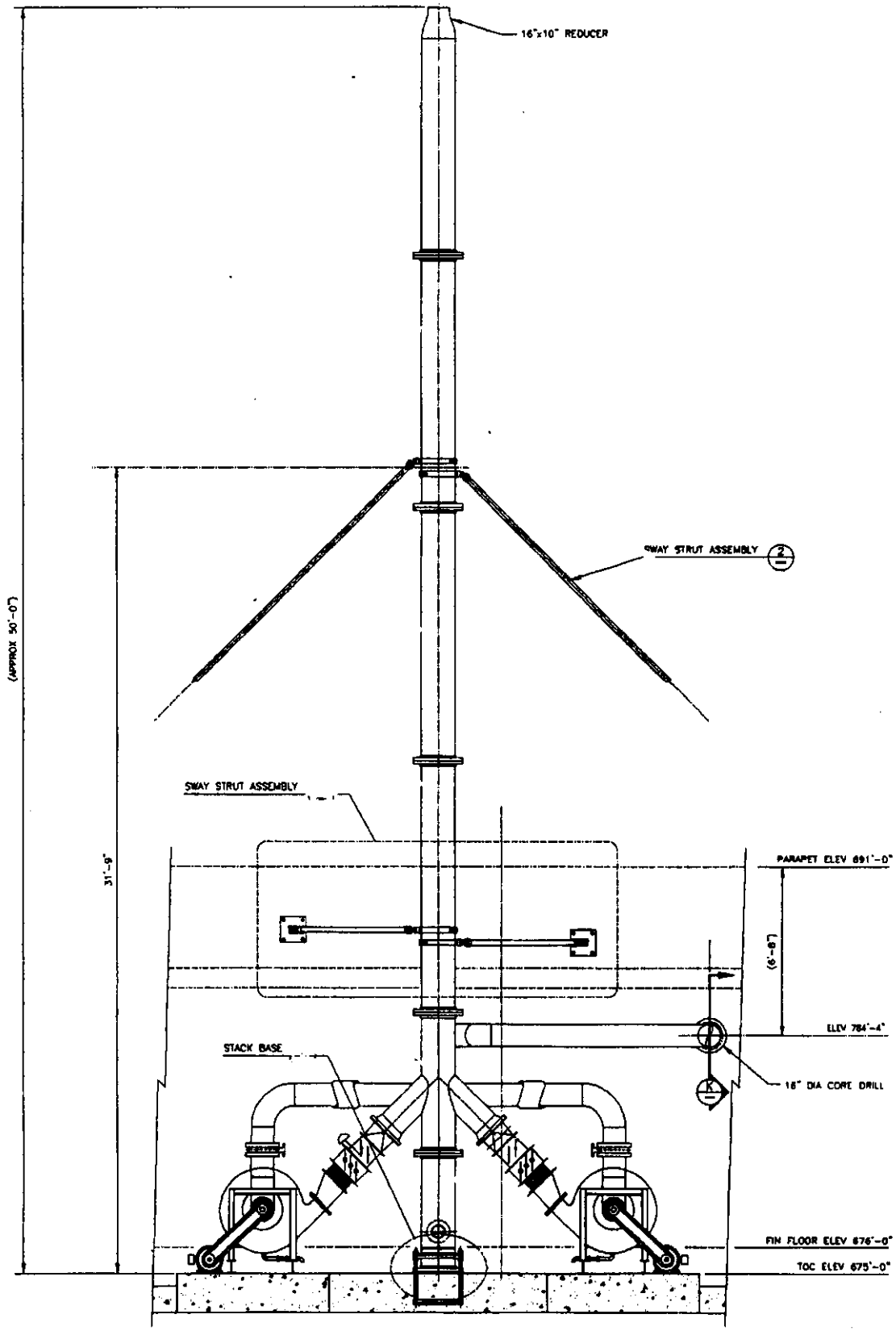

Figure 6. 2736-ZB Building New Process Exhaust System Stack.

ATTACHMENT A

TOTAL ESTIMATED INVENTORY (ANNUAL POSSESSION QUANTITY) AND EMISSIONS

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RELEASE FRACTION	1.00E-03	(TEMPERATURE BELOW BOILING POINT OF AMERICIUM AND PLUTONIUM)						
NUMBER OF HEPA FILTERS	1							
HEPA FILTER EFFICIENCY	99.95%							
ISOTOPE	ANNUAL MASS (GRAM/YEAR)	SPECIFIC ACTIVITY (CURIE/GRAM)	ANNUAL POSSESSION QUANTITY (CURIE/YEAR)	UNABATED ANNUAL RELEASE (CURIES/YEAR)	ABATED ANNUAL RELEASE (CURIES/YEAR)	CAP88 OFFSITE DOSE FACTOR (MILLIREM/CURIE)	UNABATED ANNUAL DOSE (MILLIREM/YEAR)	ABATED ANNUAL DOSE (MILLIREM/YEAR)
Pu (assume 100% Pu-239)	1.60E+06	6.21E-02	9.94E+04	9.94E+01	4.97E-02	6.40E+00	6.36E+02	3.18E-01
U (assume 100% U-233)	1.10E+06	9.64E-03	1.06E+04	1.06E+01	5.30E-03	2.40E+00	2.54E+01	1.27E-02
Am (assume 100% Am-241)	1.30E+04	3.43E+00	4.46E+04	4.46E+01	2.23E-02	9.80E+00	4.37E+02	2.18E-01
TOTAL	2.71E+06		1.55E+05	1.55E+02	7.73E-02		1.10E+03	5.49E-01

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ATTACHMENT B

DISCUSSION OF BEST AVAILABLE RADIONUCLIDE CONTROL TECHNOLOGY

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DISCUSSION OF BEST AVAILABLE RADIONUCLIDE CONTROL TECHNOLOGY
(REQUIREMENT 16)

Pursuant to WAC 246-247-110(16), providing cost factors for construction, operation, and maintenance of the proposed control technology components is not required because the following best available radionuclide control technology (BARCT) discussion is provided. The BARCT is defined by WAC 246-247-030 as follows:

> "Technology that will result in a radionuclide emission limitation based on the maximum degree of reduction for radionuclides from any proposed newly constructed or significantly modified emission units that the licensing authority determines is achievable on a case-by-case basis. A BARCT compliance demonstration must consider energy, environmental, and economic impacts, and other costs through examination of production processes, and available methods, systems and techniques for control of radionuclide emissions. A BARCT compliance demonstration is the conclusion of an evaluative process that results in the selection of the most effective control technology from all know feasible alternatives. In no event shall application of BARCT result in emissions of radionuclides that could exceed the applicable standards of WAC 246-247-040. Control technology that meets BARCT requirements also meets ALARCT requirements."

As stated in WAC 246-247-120, only those radionuclides comprising more than 10 percent of the unabated dose need to be evaluated. All of the dose is due to particulate radionuclides. The Washington State Department of Health has provided guidance that HEPA filters generally are considered BARCT for particulate emissions (AIR 92-107).

It is proposed, pursuant to the quoted citation and the cited WDOH guidance that the ventilation system described in Section 8.0 and the controls (engineering and administrative) described in Section 9.0 be approved as BARCT for the proposed activities.

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