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DOE/RL-2000-42
Revision 2

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

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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**
**Department of Energy**
**P.O. Box 550**
**Richland, Washington 99352**

**Approved for public release; further dissemination unlimited**

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Chris Willingham 4-25-01
Release Approval Date

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# CONTENTS

GLOSSARY ..... v

1.0 INTRODUCTION ..... 1

2.0 FACILITY LOCATION (REQUIREMENT 1) ..... 2

3.0 RESPONSIBLE MANAGER (REQUIREMENT 2) ..... 2

4.0 TYPE OF PROPOSED ACTION (REQUIREMENT 3) ..... 2

5.0 STATE ENVIRONMENTAL POLICY ACT (REQUIREMENT 4) ..... 2

6.0 PROCESS DESCRIPTION (REQUIREMENT 5) ..... 2

7.0 ANNUAL POSSESSION QUANTITY AND PHYSICAL FORM (REQUIREMENTS 8, 10, and 11) ..... 5

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

9.0 MONITORING SYSTEM (REQUIREMENT 9) ..... 8

10.0 RELEASE RATES (REQUIREMENTS 12 AND 13) ..... 9

11.0 OFFSITE IMPACT (REQUIREMENTS 14 AND 15) ..... 9

12.0 COST FACTORS AND FACILITY LIFETIME (REQUIREMENTS 16 AND 17) ..... 10

13.0 TECHNOLOGY STANDARDS (REQUIREMENT 18) ..... 10
13.1 296-Z-5 AND 296-Z-6 STACKS ..... 10
13.2 296-Z-7 STACK ..... 12

14.0 REFERENCES ..... 18

# ATTACHMENTS

A ENGINEERING DRAWINGS ..... ATT A-i

B SUMMARY AND SYNOPSIS OF CAP88-PC ..... ATT B-i

C DISCUSSION OF BEST AVAILABLE RADIONUCLIDE CONTROL TECHNOLOGY ..... ATT C- i

D ASME N509 REQUIREMENTS FOR 296-Z-7 ..... ATT D- i

# FIGURES

Figure 1. Process Flow Diagram. ..... F-1
Figure 2. Ventilation Schematic for Project W-460. ..... F-2
Figure 3. Site Plan. ..... F-3
Figure 4. 2736-ZB Floor Plan. ..... F-4
Figure 5. 2736-ZB Building Existing Ventilation System Modifications. ..... F-5
Figure 6. 2736-ZB Building New Process Ventilation System. ..... F-6
Figure 7. 2736-ZB Building New Process Exhaust System Stack. ..... F-7
Figure 8. 2736-ZB Building, Rooms 641/642 Layout. ..... F-8
Figure 9. 2736-ZB Building, Room 642 Glovebox Layout. ..... F-9

# TABLES

Table 13-1. Status of Conformance to Technology Standards for Minor Stacks 296-Z-5 and 296-Z-6. ..... 16
Table 13-2. Status of Conformance to Technology Standards for New Major Stack 296-Z-7 ..... 17

# GLOSSARY

| | |
|---|---|
| APQ | annual possession quantity |
| BARCT | best available radionuclide control technology |
| BTC | bagless transfer container |
| BTS | bagless transfer system |
| CFR | Code of Federal Regulations |
| DOE | U.S. Department of Energy |
| DOE-RL | U.S. Department of Energy, Richland Operations Office |
| EPA | U.S. Environmental Protection Agency |
| HEPA | high-efficiency particulate air |
| HVAC | heating, ventilation, and air conditioning |
| LOI | loss on ignition |
| MEI | maximally exposed individual |
| NDA | nondestructive analysis |
| NOC | notice of construction |
| PFP | Plutonium Finishing Plant |
| PTE | potential-to-emit |
| scfm | standard cubic feet per minute |
| SFE | supercritical fluid extraction |
| TEDE | total effective dose equivalent |
| WAC | Washington Administrative Code |
| WDOH | Washington State Department of Health |

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

## 1.0 INTRODUCTION

Revision 0 of this notice of construction (NOC) was submitted June 5, 2000, to the U.S. Environmental Protection Agency and Washington State Department of Health[1] (WDOH). WDOH approved the NOC with conditions and limitations on July 20, 2000[2]. Under separate correspondence, the EPA also approved the NOC on July 20, 2000[3]. On September 27, 2000, Revision 1 of the subject NOC was submitted to the EPA and WDOH for approval[4]. Revision 1 was not approved. Information regarding technology standards associated with Project W-460 was requested. This revision (Revision 2) supercedes Revision 1 and incorporates requested details associated with technology standards as these standards apply to Project W-460 radioactive air emissions.

The following description and any attachments and references are provided to WDOH, Division of Radiation Protection, Air Emissions & Defense Waste Section as a 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".

Additionally, the following description, attachments, and references are provided to the EPA as a 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 per 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 Plutonium Finishing Plant (PFP) 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.

For the activities covered under this NOC, the unabated and abated TEDE to the hypothetical MEI is 1.67 E+03 and 8.34 E-01 millirem per year, respectively.

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[1] DOE-RL 00-OSS-366 DOE-RL to J.M. Leitch, EPA, and A.W. Conklin, WDOH, from S.H. Wisness, dated June 5, 2000.
[2] WDOH AIR 00-709, WDOH letter to S.H. Wisness, DOE-RL, from A.W. Conklin, dated July 20, 2000.
[3] EPA OAQ-107, EPA letter to S.H. Wisness, DOE-RL, from B. McAllister, dated July 20, 2000.
[4] DOE-RL 00-RCA-002, DOE-RL letter to J.M. Leitch, EPA, and A.W. Conklin, WDOH, from S.H. Wisness, dated September 27, 2000.

## 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 (296-Z-7) 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
Materials Disposition Division
U.S. Department of Energy, Richland Operations Office
P.O. Box 550
Richland, Washington 99352-3562
(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 categorically is 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 PFP to stabilize and/or repackage plutonium, uranium, oxide, and metal for long-term storage. Within the 2736-Z Building, existing vault storage cubicles will be modified to accommodate larger, long-term storage canisters.

Project W-460 consists of distinct modules. Figure 1 provides a process flow diagram. A brief description of the Project W-460 modules and processes are as follows.

- #1-Stabilization Module. The Stabilization Module consists of the material preparation area, furnace area, and the product fill area. In the material preparation area, canned items containing plutonium-bearing materials are received, measured for accountability, and placed into a furnace tray (or boat) for insertion into a furnace in the furnace area. The module also provides a waste pathway to dispose of the waste cans and plastic. In the furnaces, the material in the boats is heated to greater than 950°Centigrade (C) for at least 2 hours, as specified in U.S. Department of Energy Standard 3013 (DOE-STD-3013, *Criteria for Safe Storage of Plutonium Metals and Oxides*). The material is cooled, placed in a convenience can, sampled to verify dryness, and inserted into the Bagless Transfer System (BTS) Module.

- #2-BTS Module. In the BTS Module, the filled convenience cans are received from the Stabilization Module and placed into an inner can. The inner can head space is backfilled with helium. A plug is welded to the inner wall of the container, and the middle of the weld would be cut (maintaining glovebox confinement at all times).

- #3-Inner Can Leak Test Module. The Inner Can Leak Test Module receives an inner welded container [bagless transfer container (BTC)]. Operations in this module verify the BTC meets or exceeds the leak tightness requirements of DOE Standard 3013.

- #4-Outer Can Weld Module. The Outer Can Weld Module receives a leak-checked BTC. The BTC is placed in an outer container. The outer can head space is backfilled with helium, and an outer container lid is welded onto the container in accordance with the requirements of DOE Standard 3013.

- #5-Outer Can Leak Test Module. The Outer Can Leak Test Module receives an outer welded container (3013 package) and operations in this module verify the package meets or exceeds the leak tightness requirements of 3013.

- #6-NDA Laboratory Modification Module. The Nondestructive Analysis (NDA) Laboratory receives the 3013 package and analyzes the 3013 package for isotopic distribution, heat load, and container baseline.

- #7-Vault Modification Module. The secure vault storage locations in the 2736-Z Building will be modified to accommodate the 3013 packages. These packages will be sealed, offering no additional potential-to-emit (PTE). No modifications to the existing 2736-Z Building ventilation system, exhausting through minor stack 296-Z-6, will be made. A new chiller will be installed on the 2736-Z Building roof to assist in cooling the current supply air temperature. The cooling coil will be placed in the current (exterior) air supply ductwork with no change in the supply air flow rate or route, or in the 296-Z-6 radioactive airborne emissions. Additionally, a vault heating, ventilation, and air conditioning (HVAC) supply isolation damper will be installed on the supply air to minimize unfiltered release of effluent from the building via back flow out the HVAC supply system (Figure 2).

- #8-Infrastructure Modification Module. Project W-460 will modify existing infrastructure support systems. Capacities of ventilation systems will be verified and enhanced if necessary. Configuration of the systems will be modified, if necessary, to provide appropriate separation of PFP and process enclosure ventilation. New systems will be installed if no system currently exists. Addition is planned of a new major exhaust stack and associated compliant monitoring equipment. Equipment pads for a nitrogen system and a gas bottle storage area will be installed.

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 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 greater than 950°C for a minimum of 2 hours.

The gloveboxes have two exhaust systems, normal and emergency. The normal exhaust exit points have a roughing filter and fire screen inside the glovebox. Immediately outside each normal exhaust connection is a high-efficiency particulate air (HEPA)-type process filter. The nominal operating temperature inside the glovebox is approximately 40°C. The emergency exhaust exits do not have any filters or screens inside the glovebox or immediately outside the glovebox. The normal and emergency exhaust lines are combined and routed to the process exhaust HEPA filter system.

The offgas temperature from the furnaces will be a maximum 4 standard cubic feet per minute (scfm) at 1,000°C. Each furnace will have an exhaust outlet line inside the glovebox that will segregate the furnace offgas from the nitrogen atmosphere within the glovebox. The four exhaust lines (one per furnace) will combine inside the glovebox and pass through a ceramic HEPA-grade filter. The temperature of the offgas at that point should be about 150°C. The ceramic filter is designed for 980°C. After the filter, the offgas will leave the glovebox and enter the glovebox exhaust header. In the header, the offgas will mix with the approximately 300 scfm of glovebox exhaust before reaching the two testable stages of HEPA filters. The maximum continuous operating temperature for HEPA filters (Types A, B, and C) is approximately 121°C (Reference "*Code on Nuclear Air and Gas Treatment ASME AG- 1 1997, Article FC-1121*"). Offgas temperatures (associated with the new stack) will be determined during initial startup to ensure the offgas stays below a nominal 80°C during operations before passing through dual stage testable HEPA filters. After exiting the dual stage of HEPA filters, the offgas will exit through the new stack (296-Z-7).

In-line monitoring equipment will be provided for determining the moisture/volatile content of the material processed. An alternative method will exist to use thermogravimetric mass spectrometer analysis. The material will be considered thermally stabilized when there is less than 0.5 percent loss on ignition (LOI). Representative samples of 100 percent of the packages will be subjected to LOI testing (glovebox GB-642D). The LOI process will verify dryness and suitability for packaging. The LOI process will heat a sample taken from each material batch. The sample will be weighed and placed into a muffle furnace where the sample will undergo a heating cycle similar to the stabilization process. After the heating cycle is completed, the sample will be weighed again and the beginning and ending weights compared. If the beginning and ending weights differ by less than 0.5 percent, the material will go to final packaging in the BTS Module. If the difference in weights is greater than 0.5 percent, the material will be sent back through the stabilization process until the LOI result is less than 0.5 percent. The furnaces will be heated electrically. The purge gas in the LOI furnace will be nominally 1 scfm of air. The operating temperature of the offgas will be approximately 1,150°C to 1,200°C. The offgas will be discharged directly to the glovebox where the offgas will mix with approximately 13°C nitrogen atmosphere in the LOI glovebox.

Another alternative method (to LOI) for determining the moisture content of the processed material has been approved by U.S. Department of Energy and could be implemented in the future. The method, supercritical fluid extraction (SFE), involves placing representative samples of stabilized material from a

batch into porous sample cells in a glovebox. Supercritical carbon dioxide ($CO_2$, approximately 100°C and 3,000 pounds per square inch) is passed through the sample, solubilizing water in the sample. The solubilized water is carried in the fluid stream to a spectrometer for water detection and quantification. The measured fluid stream, composed of $CO_2$ and water, is released into the glovebox atmosphere. In normal operation, it is expected the SFE effluent would be only $CO_2$.

All stabilized plutonium-bearing materials will be containerized in an inner-welded and outer-welded container (i.e., the aforementioned 3013 package) and placed in secure vault storage (2736-Z Building) pending final disposition. No modification to the existing 2736-Z Building ventilation system, which exhausts through the 296-Z-6 stack, will be made. A new chiller will be installed on the 2736-Z Building roof to assist in cooling the current supply air temperature. The cooling coil will be placed in the current (exterior) air supply ductwork with no change in the supply air flow rate or route, or in the 296-Z-6 radioactive airborne emissions. Additionally, a vault HVAC supply isolation damper will be installed on the supply air to prevent unfiltered release of plutonium from the building via backflow out the HVAC supply system (Figure 2).

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

The following discusses three annual possession quantities. One quantity is for excavation activities. One quantity is for those activities associated with modifications during construction affecting the existing 2736-ZB Building ventilation system, and subsequent continued emissions through the existing 296-Z-5 Stack exhaust. The other quantity is for those activities that will result in emissions through the proposed new stack (296-Z-7).

The annual possession quantity for Project W-460 excavation activities is based on the "Categorical Notice of Construction for use of the Guzzler Vacuum Excavation System for Radiologically Limited Activities on the Hanford Site," approved by WDOH on December 18, 1998. Detailed records during previous excavation activities [associated with Project L-281 ("200 West Area Regional Drainfield")] indicate that no radiological contamination would be expected to be encountered during Project W-460 excavation activities. However, for conservatism, the following calculated annual possession quantity for Project W-460 excavation activities is developed:

- Assume approximately 75 cubic yards (2,025 cubic feet) of soil would be excavated in support of Project W-460 (e.g., installation of the nitrogen system and gas bottle storage pads and new stack)

- The aforementioned sitewide guzzler NOC provides for removal of 94,500 cubic feet of soil per year, 30 percent of which would take place in the 200 Areas. Therefore 0.3 x 94,500 cubic feet = 28,350 cubic feet of soil would be excavated in the 200 Areas in a year

- For Project W-460, 2,025 cubic feet represents 7.1 percent of the total excavated soil allowed under the sitewide guzzler NOC

- The aforementioned sitewide guzzler NOC provides for the 200 Areas strontium-90 and americium-241 curie releases (guzzler cleaning/excavation and backfilling activities), a total of 0.0466 curie. Thus for Project W-460, 7.1 percent of 0.0466 curie = 0.0033 curie (0.0032 curie strontium-90; 0.0001 curie americium-241[5]).

[5] Consistent with the sitewide guzzler NOC, addressing activities in the 200 Areas, strontium-90 is used for all of the beta-gamma contamination in the soil, while americium-241 is used for the alpha contamination.

The annual possession quantity for modifications during construction activities affecting the existing 2736-ZB Building ventilation system (exhausting through the existing 296-Z-5 Stack exhaust) was estimated based on emissions from calendar year 1998. It was conservatively estimated that during modifications, residual contamination on the ductwork might be knocked loose and be re-introduced to the existing ventilation system. The total measured release from the 296-Z-5 Stack exhaust for calendar year 1998, as documented in DOE/RL-99-41 (*Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1998*), was used as a basis for estimating the annual possession quantity. These data indicate that total alpha was not detected and total beta was $1.2 \times 10^{-7}$ curies. Therefore, for conservatism, 100 times the 1998 emissions from the 296-Z-5 Stack (i.e., $1.2 \times 10^{-5}$ curies) is the maximum annual possession quantity due to beta radiological emissions anticipated during construction activities associated with Project W-460.

Although alpha radiological emissions were not detected, given the operations in the 2736-ZB Building deal with plutonium, the following provides development of a hypothetical maximum plutonium (alpha) annual possession quantity.

- Assume smearable alpha contamination is present as Pu-239 on the exterior of an inner-welded container that is transported to 2736-ZB Building Room 641 for outer welding (note that Room 641 exhausts through the existing 296-Z-5 Stack).

- The smearable alpha is considered some multiplier of a hot speck. A hot speck alpha is defined as a very small amount of contamination reading >50 counts per minute. For conservatism, the multiplier is assumed to be 100. Therefore, the maximum alpha activity is considered to be 5,000 counts per minute per inner-welded container.

- It is assumed that 100 inner containers per year have smearable contamination when transferred to Room 641. Therefore the annual possession quantity alpha is based on 500,000 counts per minute.

- Activity of Pu-239 is $1.4 \times 10^{11}$ disintegrations per minute per gram. Inverting and multiplying yields $3.6 \times 10^{-6}$ grams of Pu-239. Further, given 0.062 curie per gram of Pu-239, the annual possession quantity alpha equals $2.2 \times 10^{-7}$ curies alpha.

- Finally, applying an additional factor of 100 (as with beta calculations), the maximum postulated annual possession quantity alpha would be $2.2 \times 10^{-5}$ curies. This would be in addition to the postulated beta activity emissions of $1.2 \times 10^{-5}$ curies, giving a total annual possession quantity of $3.4 \times 10^{-5}$ 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. If necessary, work control procedures will be modified and implemented to ensure personnel and public safety before continuation of activities.

The annual possession quantity for operations (i.e., stabilization and packaging activities) resulting in emissions through the new stack (296-Z-7) 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)[6], and 0.01 metric tonne 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 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)

Excavation activities, as necessary to support Project W-460 (e.g., installation of the nitrogen system and gas bottle storage pads and new stack), will be conducted in a similar fashion as those activities performed for the 200 West Area Regional Drainfield (Project L-281, September 1998). The guzzler vacuum excavation system ("Categorical Notice of Construction for use of the Guzzler Vacuum Excavation System for Radiologically Limited Activities on the Hanford Site," approved by WDOH, December 18, 1998) will be used. Although historical records from Project L-281 activities indicate no radiological contamination should be encountered, a conservative estimate of emissions is provided in Sections 7.0, 10.0, and 11.0. For example (as discussed in the "Notice of Construction for Guzzler Excavation and Backfilling Activities in Support of the L-281: 200 West Area Regional Drainfield," approved by WDOH, September 8, 1998), during excavation in potentially contaminated areas, the soils will be surveyed over every linear and vertical foot before excavation. Any hot specks detected will be removed and containerized before the excavation is allowed to continue, unless located at the bottom of the excavation (these specks will be covered with clean fill). For the purpose of this NOC, the term hot speck and speck are used interchangeably. A hot speck/speck is defined as a very small amount (i.e., a pebble, metal turning, etc.) of contamination reading up to 500,000 counts per minute beta-gamma and/or >50 counts per minute alpha. The contaminated soil will be (in piles) from the 'clean' soil during excavation. Contaminated soil will be controlled using water, fixatives, or covers.

If the radiological contamination is determined to be more extensive, the spread of contamination will be controlled both during the excavation and during the backfilling of the soil. A minimal amount of water could be applied using a hand-held sprayer to control the generation of dust (and contamination).

After the backfilling of the excavation where radiologically contaminated soil in the excavation has been removed and used as backfill, the area will be surveyed to verify no radiological contamination is present on the soil surface. If contamination is present on the surface, the soil either will be removed and containerized or covered with clean fill material or fixatives to prevent the spread of the contamination. The area will be posted radiologically, both during and after completion of the project.

[6] The actual isotopes of uranium expected to be encountered during construction, stabilization and packaging activities are U-235 and U-238. However, for conservatism, the annual possession quantity (APQ) for uranium was based on U-233. That is, the specific activity of U-233 (0.0096 curie per gram) is greater than the specific activity of either U-235 or U-238 (0.0000022 curie per gram and 0.00000034 curie per gram, respectively). Thus, the most conservative value for curie release was provided in NOC calculations.

Figure 2 shows the overall ventilation schematic emission sources, and identifies safety systems, structures, and components. This figure depicts the general flow patterns for the various offgas systems. Figures 3 through 7 contain general schematics of the proposed ventilation system modifications for the 2736-ZB Building.

For clarity, additional preliminary engineering drawings[7] are provided in Attachment A. These drawings detail the following:

- Location of filters on exhaust systems of gloveboxes and furnaces: Drawing H-2-829445
- Location of high-temperature equipment: Drawings H-2-829969 and H-2-829971; two furnace sketches supporting Drawing H-2-829969
- Direction and path of airflow: Drawing H-2-829442
- Location of sampling lines on new stack (296-Z-7): Drawings H-2-829485 and H-2-829443
- Location of additional controls on ventilation system: Drawing H-2-829443.

Emissions resulting from work performed within the 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 (DOE/RL-99-41).

Project W-460 stabilization and packaging activities will be conducted predominantly in Rooms 642 and 641 (Figures 8 and 9). The resulting emissions will be exhausted through the new stack (296-Z-7) that 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 meter per second.

## 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-2000-37.

The existing 296-Z-6 Stack exhausts filtered air from the 2736-Z 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-2000-37.

The new stack (296-Z-7) 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

[7] All HEPA filters will be installed and tested in place initially (and on replacement). The dual stage HEPA filters upstream from the 296-Z-7 Stack and Room 642 exhaust HEPA filter will be tested annually. All other filters are considered process equipment (HEPA-type), not subject to annual testing.

sampler for particulate radionuclides and flow monitor (Attachment A, Drawings H-2-829485 and H-2-829443).

## 10.0 RELEASE RATES (REQUIREMENTS 12 AND 13)

As discussed in Section 7.0, the annual possession quantity for Project W-460 excavation activities was estimated [0.0033 curie total (0.0032 curie strontium-90; 0.0001 curie americium-241)]. This conservative estimate was developed based on PTE calculations provided in the "Categorical Notice of Construction for use of the Guzzler Vacuum Excavation System for Radiologically Limited Activities on the Hanford Site," approved by WDOH on December 18, 1998. Specifically: "The release form of the soil and contamination from Guzzler cleaning and excavation activities is assumed to be gas (for potential releases in accordance with 40 CFR 61, Appendix D), therefore from 40 CFR 61, Appendix D, a release factor of 1.0 will be used. The release form of the soil and contamination from manual cleaning, excavation, and backfilling activities is assumed to be particulate; therefore, from 40 CFR 61, Appendix D, a release factor of 1.0 E-03 will be used".

As discussed 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 estimated. Activities associated with modifications to the existing 2736-ZB Building ventilation system will not introduce new material. It was estimated conservatively that during modifications, residual contamination on the ductwork might be knocked loose and re-introduced to the existing ventilation system. The total measured release from the 296-Z-5 Stack exhaust for calendar year 1998 was provided as a basis for a conservative estimate of this annual possession quantity, as well as postulated smearable contamination present on inner-welded containers. Therefore, as discussed in Section 7.0, the annual possession quantity is estimated to be $3.4 \times 10^{-5}$ curies. The 296-Z-5 Stack exhaust will be operated in a continuous mode.

The annual possession quantity for stabilization and packaging activities (with potential emissions through the new 296-Z-7 Stack) was multiplied by the conservative release factor of 1.0 E-03 for particulates and solutions (40 CFR 61, Appendix D). Although the furnace(s) will operate at temperatures near 1,000°C, the boiling point temperature of plutonium, americium, and uranium oxides and metals is well above 1,000°C. At high temperatures, the oxides will undergo transformation to a pure metal state. For americium, plutonium, and uranium oxides, 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 only will be repackaged. The new stack will be operated in a continuous mode.

## 11.0 OFFSITE IMPACT (REQUIREMENTS 14 AND 15)

Summary and synopsis outputs from CAP88-PC (DOE 1992) for the postulated emissions from the 296-Z-7 Stack are provided in Attachment B. For the activities covered under this NOC, the unabated and abated TEDE to the hypothetical MEI is 1.67 E+03 and 8.34 E-01 millirem per year, respectively.

For Project W-460 excavation activities, the unabated TEDE to the hypothetical MEI was estimated based on the "Categorical Notice of Construction for use of the Guzzler Vacuum Excavation System for Radiologically Limited Activities on the Hanford Site," approved by WDOH on December 18, 1998. As discussed in Section 7.0, potential W-460 excavation activities would be approximately 7.1 percent of the

allowable annual excavations in the 200 Areas. Therefore, 0.071 x 2.54 E-02 mrem per year (total offsite dose value for the 200 Areas from the sitewide guzzler NOC) = 0.0018 millirem per year.

As discussed 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 estimated. Potential conservative unabated doses (TEDE to the hypothetical MEI) associated with the aforementioned alpha and beta emissions (assuming Pu-239 and Cs-137, respectively) are as follows:

- From HNF-3602, Volume 1, Table 4-10: Pu-239 = 6.4 mrem/Ci ; Cs-137 = 0.021 mrem/Ci

- Thus: Dose due to alpha = 6.4 mrem/Ci x 2.2 x $10^{-5}$ curies = 1.4 x $10^{-4}$ mrem
  Dose due to beta = 0.021 mrem/Ci x 1.2 x $10^{-5}$ curies = 2.5 x $10^{-7}$ mrem
  Total unabated dose = 1.4 x $10^{-4}$ mrem + 2.5 x $10^{-7}$ mrem = 1.4 x $10^{-4}$ mrem.

## 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 C).

The maximum design life of the 2736-ZB stabilization and packaging activities associated with Project W-460 is approximately 20 years (completion on or before October 1, 2021.

## 13.0 TECHNOLOGY STANDARDS (REQUIREMENT 18)

The following sections address technology standards for the minor stacks (296-Z-5 and 296-Z-6) and the new major stack (296-Z-7).

### 13.1 296-Z-5 AND 296-Z-6 STACKS

The 296-Z-5 and 296-Z-6 Stacks are registered emissions units with WDOH. The design and operation of these stacks will not be modified to support Project W-460.

*Indicate which of the following control technology standards have been considered and will be complied with in the design and operation of the emission unit described in this application:*

*ASME/ANSI AG-1, ASME/ANSI N509, ASME/ANSI N510, ANSI/ASME NQA-1, 40 CFR 60, Appendix A Methods 1, 1A, 2, 2A, 2C, 2D, 4, 5, and 17, and ANSI N13.1*

*For each standard not so indicated, give reasons to support adequacy of the design and operation of the emission unit as proposed.*

The abatement control systems for the 296-Z-5 and 296-Z-6 Stacks were installed in the early 1980's and late 1970's (respectively) before this requirement for control technology standards was specified in WAC 246-247 (April 1994). Although the listed technology standards, if available at time of construction, might have been followed as guidance, there was no regulatory requirement for compliance with the listed standards. Operational history, routine maintenance, testing, and inspections (ANSI N509 and N510) demonstrate adequacy of the design and operation of the existing abatement control

technology as proposed. A summary is provided in Table 13-1 of the status of conformance by the ventilation and monitoring systems. Cited documents will be provided to WDOH on request.

- ASME/ANSI AG-1:

The 296-Z-5 and 296-Z-6 Stacks and ventilation systems were built before compliance with the code was required. Regarding the section in AG-1 on HEPA filters, the HEPA filters in the ventilation systems for the 296-Z-5 and 296-Z-6 Stacks meet all but two criteria dealing with filter qualification testing. Justification for these sitewide exceptions was discussed with and approved by WDOH at the December 1998 Routine Technical Assistance Meeting. A WDOH approved temporary deviation currently is in place to satisfy this issue (WDOH AIR 99-507). Other sections in AG-1 either are not applicable (e.g., adsorbers or moisture separators) or are addressed under ANSI N509.

- ASME/ANSI N509:

The HEPA filters conform to ASME N509, Section 5.1. Documentation to show full compliance with the remaining sections of ANSI N509 cannot be provided. Instead, the following information is provided to support adequacy of design.

ANSI N510 was established in 1976. ANSI N509 was established in 1977. Before 1976, testing and maintenance was based on DOE Orders, which included guidance provided in ERDA 76-21, *The Nuclear Air Cleaning Handbook.*

Design adequacy of the fans is demonstrated by operational history and/or passing routine functional tests. Regular visual inspections of the fans and motors in accordance with current maintenance procedures and schedules ensure proper and consistent function. The operating fans and motors are inspected for operational variables such as abnormal noise, excessive vibration, and fan bearing temperatures, and are lubricated as needed.

Adequacy of the HEPA filters and housings has been demonstrated by operational history and successful testing in accordance with guidance provided in ASME/ANSI N510. The existing systems have been successfully tested annually in their current configurations since construction.

- ASME/ANSI N510:

As allowed in ASME/ANSI N510, certain sections of N510 can be used as technical guidance for non-N509 systems. To demonstrate the adequacy of the system design and operation, stages of HEPA filters are aerosol tested individually in-place annually (at a minimum control efficiency of 99.95 percent) to meet the intent of ANSI N510. This annual testing includes a visual inspection of the housing as described in ANSI N510.

- ANSI/ASME NQA-1:

NQA-1 sections addressing abatement technology components design were not applicable during systems construction and so are not addressed. Quality assurance for sampling of emissions and subsequent analysis is addressed in HNF-0528-3, *NESHAP Quality Assurance Project Plan for Radioactive Airborne Emissions* (all of Sections 2.0, 3.0 and 5.0), which was written in accordance with applicable NQA-1 requirements.

- 40 CFR 60, Appendix A

Stack flow is tested using Methods 1 and 2. Methods 1A, 2A, 2C, and 2D are not applicable to the stack dimensions/design. Relative humidity (as allowed in Method 2) is measured with a calibrated hygrometer or with wet and dry bulb readings. Methods 4, 5, and 17, which provide a method for measuring relative humidity for combustion sources, are not applicable to radioactive airborne effluent stacks.

- ANSI N13.1:

The sampling system complies with ANSI N13.1 (1969) criteria. For each stack, emission sampling consists of a record sampler for particulate radionuclides.

- The 296-Z-5 Stack record sampler is operational. Stack discharge air is sampled continuously and monitored. Currently the sample systems are operated to provide periodic confirmatory measurements only.

- The 296-Z-6 Stack record sampler is operational. Filtered exhaust air is near-isokinetically sampled and monitored continuously. Currently, the sample systems are operated to provide only periodic confirmatory measurements.

Adequacy of the sampling systems is demonstrated by inspection, calibration, and maintenance activities as scheduled in current facility procedures.

## 13.2 296-Z-7 STACK

The new stack (296-Z-7) will be a registered emissions unit with WDOH. The new stack will meet control technology standards listed in WAC 246-247-110(18) as follows.

- ASME AG-1, Code on Nuclear Air and Gas Treatment.

The exhaust fans for the Exhaust Ventilation System for Project W460 Plutonium Stabilization and Handling meet the requirements of AG-1, Section BA. Procurement specification W460-P10 titled, "Procurement Specification Centrifugal Exhaust Fan for the SPE Exhaust System for the Plutonium Storage and Handling Facility" states the following, "The fans shall meet ASME N509 sections 5.7 and 5.8, and section BA of ASME AG-1. (If conflicts with other standards listed occur, ASME AG-1 shall take precedence)."

Construction Specification W460-C2 , Section 15500 states, "The nuclear grade HEPA filters shall meet the requirements of ASME AG-1-1997 Code on Nuclear Air and Gas Treatment, section FC-1000- through section FC-9200 and specification HNF-S-0552 Procurement specification of Nuclear Grade High Efficiency Particulate Air (HEPA) Filters".

Other sections in AG-1 either are not applicable (e.g., adsorbers or moisture separators) or are addressed under ANSI N509.

- ASME N509, Nuclear Power Plant Air-Cleaning units and Components.

The HEPA filter housings located at the gloveboxes and Room 642 exhaust are Flanders® G1 type filter housings. The final HEPA exhaust filtration train located in HEPA filter room 641B are Flanders filter housings type BG bag out containment series. Both types of the HEPA filter housings meet the design and construction requirements of ASME N509.

The exhaust piping and fittings from the gloveboxes to the inlet of the final HEPA filtration exhaust trains located in HEPA filter room 641B are schedule 10S stainless steel. The exhaust piping and fittings from the discharge side (outlet) of the filter train to inlet of exhaust fans EF-1 and EF-2, located out of doors, are schedule 20 carbon steel. Both the inlet and outlet pipe and fittings meet the design and construction requirements of ASME N509.

All valves that are used to isolate components, (e.g., HEPA filters, control valves, etc.) are butterfly valves and meet the requirements of ASME N509, paragraph 5.9, and the requirements for class A construction. The valves will be tested in accordance with paragraph 5.9.7.3, which is a bubble test.

A line-by-line evaluation of the requirements identified in ASME N509 is provided in Appendix D.

- ASME N510, Testing of Nuclear Air Treatment Systems

Before leaving the factory, all HEPA filter housings are tested to ASME N510 requirements to demonstrate system design adequacy. After the HEPA filter systems have been installed, the systems are tested to meet the housing leak test requirement of ASME N510, Section 6.

In-place aerosol testing of each filter bank also is performed per Section 10 to ensure the penetration requirements of 99.95% has been accomplished.

Test and inspection frequencies will be performed as minimum per ASME N510, Table 1, to maintain system reliability.

After installation, the ductwork/piping will be leak tested to ASME N510, Section 6 to ensure the system meets the leakage requirements of the test plans.

All isolation valves were factory leak tested to class I requirements of the bubble test method as outlined in ASME N509, paragraph 5.9.7.3.

The fan procurement specification (W460-P-10) states the fan housing will be made airtight. Fan shaft leakage will be limited to 0.01% of the normal air flow per inch of fan operating pressure, or 0.5 scfm, whichever is greater. The fan housing will be pressurized to 1.25 times the fan operating pressure.

- ANSI/ASME NQA-1 Quality Assurance Program Requirements for Nuclear Facilities

The exhaust system from the gloveboxes to the exhaust stack includes structures and components that have different safety classifications assigned to varying segments of the system. The system has been broken into the following three main areas.

- Ductwork, HEPA filter housings and valves from the gloveboxes to the final HEPA filter housing were designated as Safety Significant.

® Flanders/CSC, Bath, North Carolina.

- The final stage HEPA filter housing located before the exit of 2736-ZB and the discharge side ductwork up to, and including the penetration of the exterior building wall, were designated as Safety Class.

- The ductwork exterior to the building, exhaust fans, and stack were classified as General Services.

As a means for complying with the requirements set forth in 10 CFR 830.120, *Quality Assurance*, applicable criteria from ANSI/ASME NQA-1, *Nuclear Quality Assurance*, have been used. Quality programmatic requirements for the Safety Class and Safety Significant structures and components have been imposed based on ANSI/ASME NQA-1 criterion, as determined by the extent of the efforts being applied (e.g., Basic Requirements 1-18; less if there are no design efforts required).

Specifications were prepared for major components for the Safety Class (such as the HEPA filter housing) and safety significant portions. These components are procured from suppliers found on the Fluor Hanford Evaluated Supplier List. Smaller components (such as ductwork piping, fittings, and valves) are procured from vendors on the Evaluated Supplier List or by a Commercial Grade Items method.

All other structures and components that were designated as General Services were procured on material specific procurements as commercial products, not necessarily from vendors on the Evaluated Supplier List. Some of the major components (such as the exhaust fans) were procured based on technical and quality requirements identified in procurement specifications.

- ANSI/HPS N13.1-1999 "Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities"

The stack sampling system for the 296-Z-007 exhaust stack is designed in accordance with ANSI/HPS N13.1-1999. The system will use two identical and independent shrouded probes mounted in a parallel configuration within the stack at an elevation of approximately 25 feet. The sample streams are routed out of the stack and down to an instrument cabinet located at the base of the stack. After sampling and monitoring, air is returned via vacuum pumps to the stack at a location above the sample elevation.

The sample flow for the alpha monitor is controlled to a fixed flow rate. The flow to the record filter is controlled to a flow rate that is proportional to the stack flow. Stack mass flow (compensated for temperature and pressure) is monitored using an annubar flow element located in the stack just above the sampling location. The flow element contains an integral temperature sensor. Signals from the flow/temperature element are routed to a flow indicating transmitter located in the instrument cabinet. The transmitter displays mass flow and provides a proportional signal for sample flow control.

The stack flow measurement will be validated by comparison to manual flow measurements in accordance with section 6.2 of ANSI/HPS N13.1-1999. Methods used will be 40 CFR 60, Appendix A, Method 1 and 2, modified.

The stack and sampling system will be qualified to the criteria in Table 4 of ANSI/HPS N13.1-1999.

A sample system depositional loss calculation using industry accepted computer code(s) will be performed. The results of the calculation will be documented in a report verifying satisfaction of the acceptance criteria given in Section 6.4.1 of ANSI/HPS N13.1-1999.

- 40 CFR 60, Appendix A, Standards of Performance for New Stationary Sources

The stack flow monitoring system will be validated using Appendix A, Methods 1 and 2 as modified per ANSI/HPS N13.1-1999, Section 6.2. The flow monitoring system will be validated annually.

Table 13-1. Status of Conformance to Technology Standards for Minor Stacks 296-Z-5 and 296-Z-6.

| STANDARD | REQUIREMENT | STATUS |
|---|---|---|
| ANSI/ASME AG-1 | Fans | Not applicable (built before standard implemented) |
| | Ductwork | Not applicable (built before standard implemented) |
| | HEPA filters | Applicable to replacement HEPA filters |
| | Dampers | Not applicable (built before standard implemented) |
| | Design requirements | Applicable to replacement HEPA filters |
| | Quality assurance | Not applicable (built before standard implemented) |
| ASME/ANSI N509 | Quality assurance | Not applicable (built before standard implemented) |
| | Filter housing | Pre-filters, two stages of HEPA filters (in four parallel banks), and dampers are certified to meet purchase order specifications regarding fabrication, materials, welds, and final inspections |
| ASME/ANSI N510 | Bypass leak testing | Ultrasonic testing at filter changes |
| | Visual inspection | Performed annually (with no significant findings identified); conforms to requirement |
| | Aerosol test | Performed annually; meets intent of N510 requirements as described in Section 10.0 |
| ANSI/ASME NQA-1 | Quality assurance requirements | Not applicable (built before standard implemented) |
| | Sampling and analysis procedures | Complies with HNF-0528-3; conforms to applicable NQA-1 requirements |
| 40 CFR 60, Appendix A | Methods 1 and 2 | Applicable (annual testing conforms to requirements) |
| | Methods 1A, 2A, 2C, 2D, 4, 5, and 17 | Not applicable |
| ANSI 13.1 (1969) | Equal annular nozzle spacing | Conforms to requirements |
| | Near isokinetic sampling and other requirements | Not fully assessed but appears compliant; sampling system provides periodic confirmatory measurements as described in Sections 9.0 and 18.0 |

Table 13-2. Status of Conformance to Technology Standards for New Major Stack 296-Z-7.

| STANDARD | REQUIREMENT | STATUS |
|---|---|---|
| ANSI/ASME AG-1 | Fans | Procured to Section BA of ASME AG-1 |
| | HEPA filters | Meets the requirements of FC-1000-FC9200 |
| ASME/ANSI N509 (Refer to Appendix D) | HEPA filter housing | Meets the design and construction requirements |
| | Butterfly valves | Meets the design and construction requirements |
| | Piping | Meets the design and construction requirements |
| ASME/ANSI 510 | Pressure decay test | Piping and housings will be leak tested |
| | Visual inspection | HEPA filter housing will be inspected visually |
| | Aerosol test | HEPA filter will be aerosol tested |
| ASME/ANSI NQA-1 | Design requirements | HEPA filter and filter housings meet NQA-1 requirements |
| 40 CFR 60, Appendix A | Methods 1 and 2 | Modified per ANSI N13.1 |
| | Methods 1A,2A,2C,2D,4,5, and 17 | Not applicable |
| ANSI N13.1 (1999) | Representative sampling using shrouded probes | System will be qualified by testing |

## 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.

ANSI/HPS N13.1-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities*, American National Standards Institute, Inc.

ASME, 1997, *Code on Nuclear Air and Gas Treatment*, AG-1, Article FC-1121, American Society of Mechanical Engineers.

DOE, 1992, *CAP88-PC Version 2.0, User's Guide*, U.S. Department of Energy, Germantown, Maryland.

DOE-STD-3013-96 and/or latest revision, *Criteria for Safe Storage of Plutonium Metals and Oxides.*

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.

DOE/RL-2000-37, *Radionuclide Air Emissions Report for the Hanford Site Calendar Year 1999*, June 2000, 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*, Fluor Hanford, Richland, Washington.

HNF 6385, *Fire Hazard Analysis for Plutonium Finishing Plant 2736-Z Complex*, January 2001, Dyncorp Tri-Cities Services, Inc., Richland, Washington.

HNF-S-0552, *Specification for Procurement and Onsite Storage of Nuclear Grade High-Efficiency Particulate Air (HEPA) Filters*, Rev. 2, June 2000, Fluor Hanford, Richland, Washington.

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

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

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

WDOH, 1998, "Categorical Notice of Construction for Use of the Guzzler Vacuum Excavation System for Radiologically Limited Activities on the Hanford Site", approved December 18, 1998, Washington State Department of Health, Olympia, Washington.

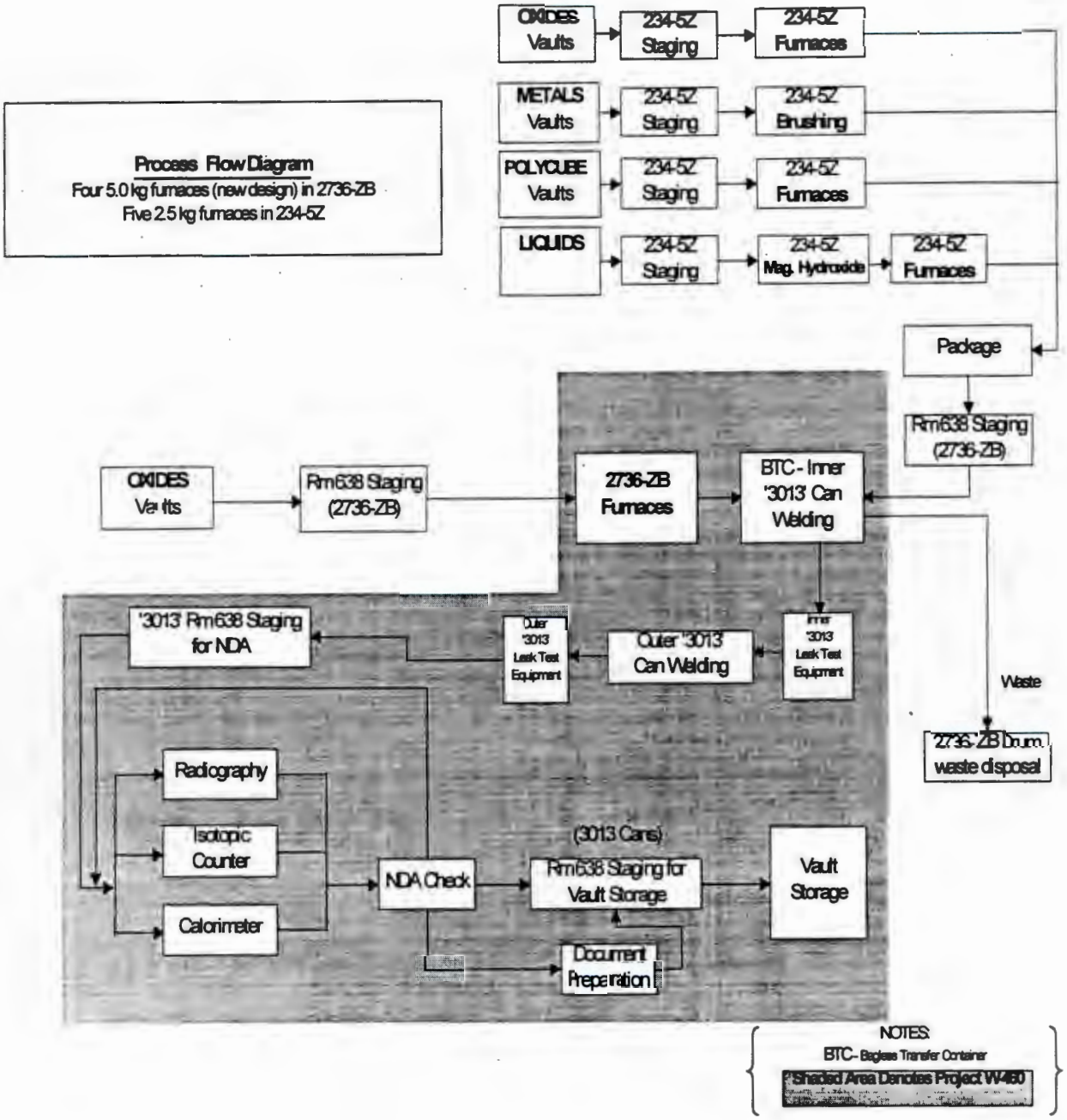


Figure 1. Process Flow Diagram.

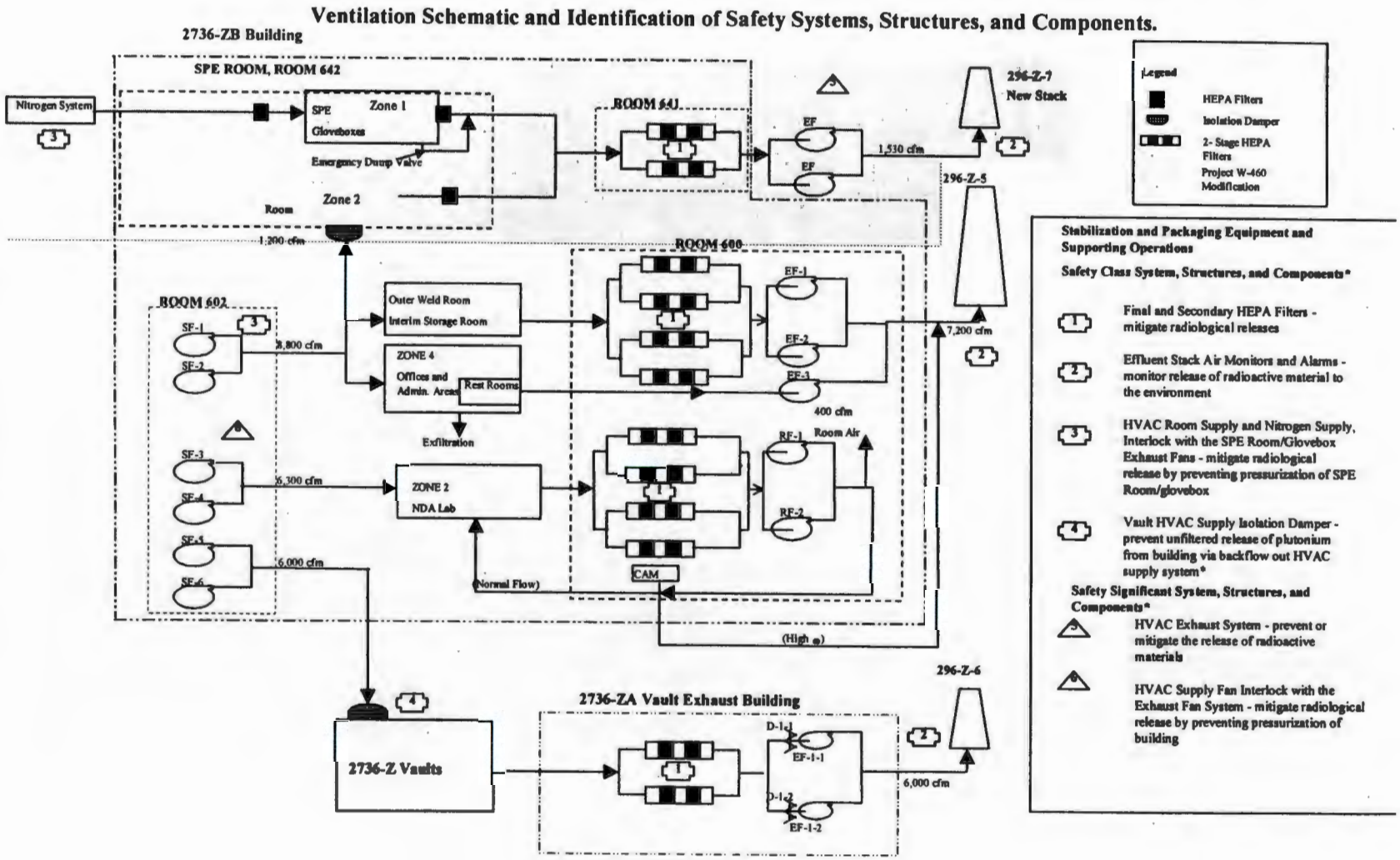


Figure 2. Ventilation Schematic for Project W-460.

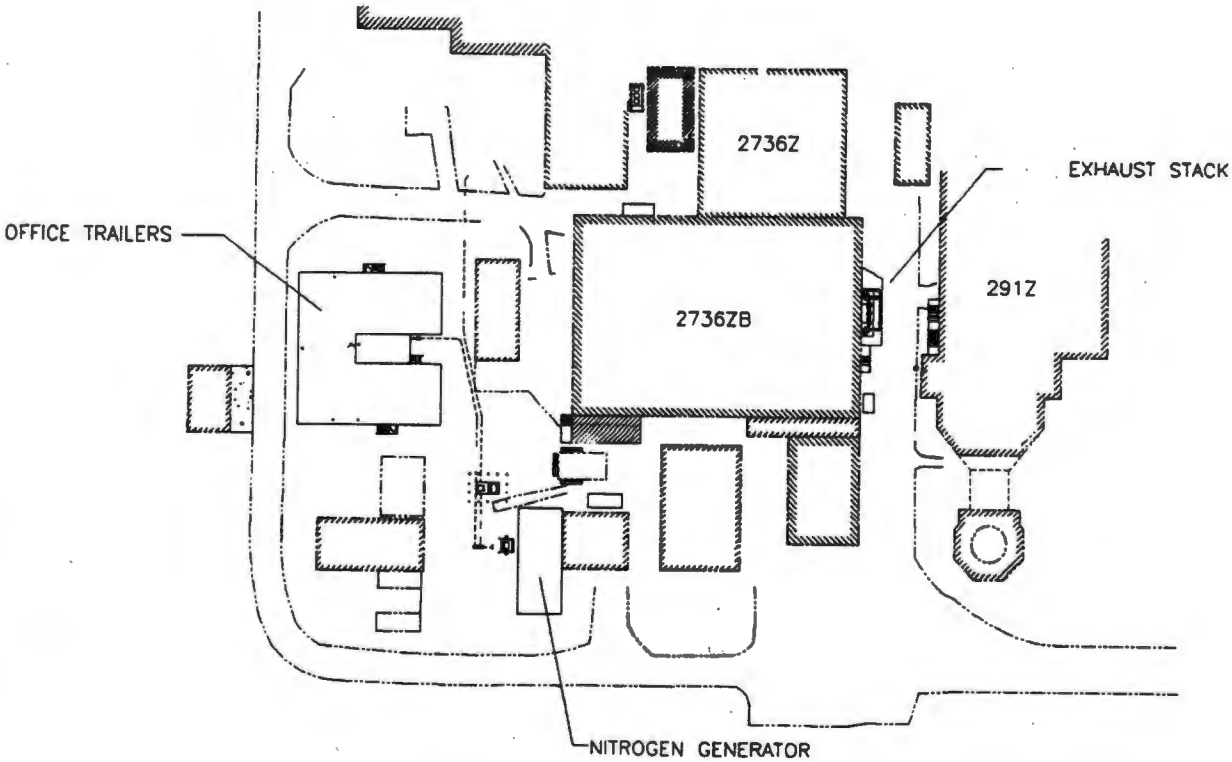


Figure 3. Site Plan.

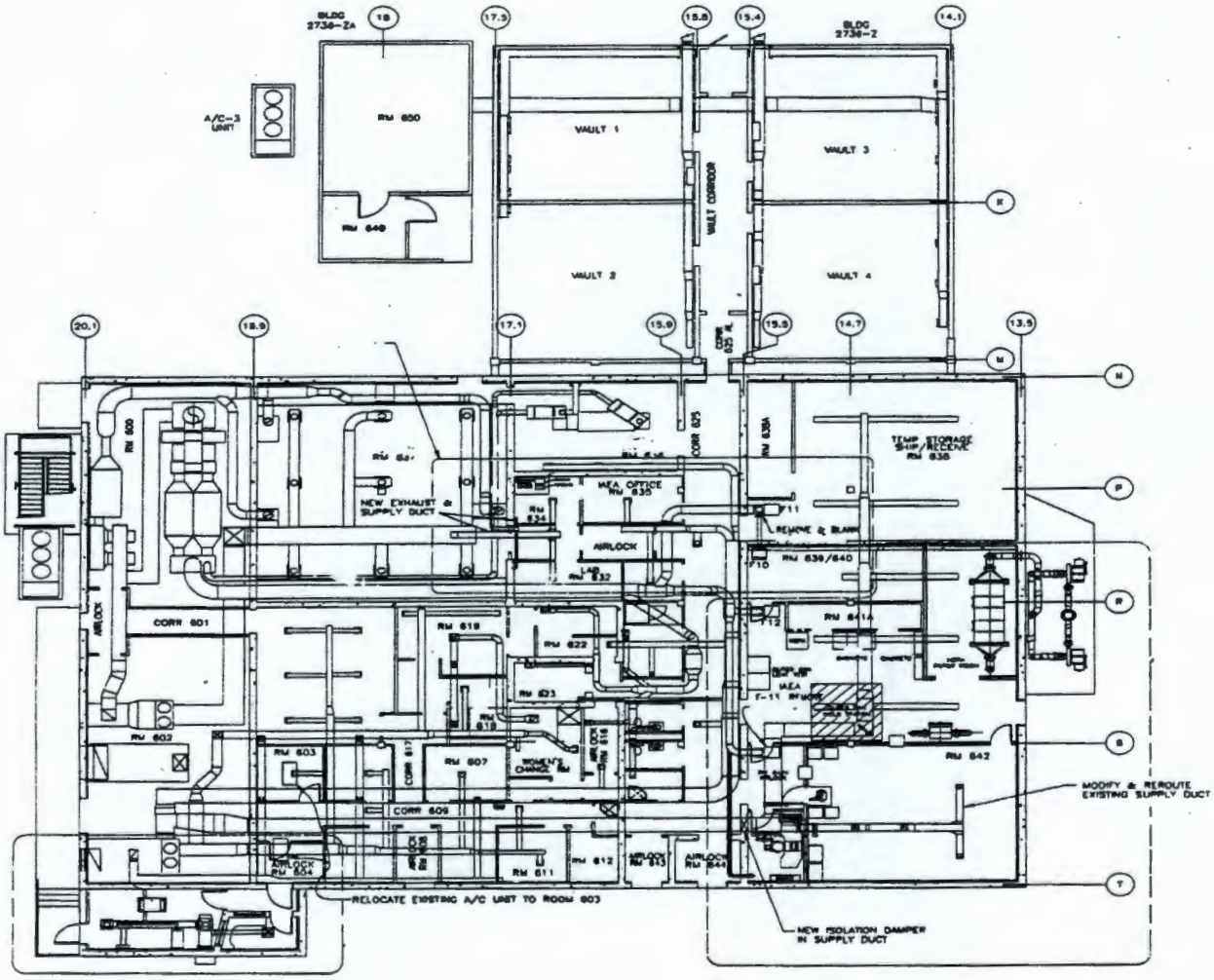


Figure 4. 2736-ZB Floor Plan.

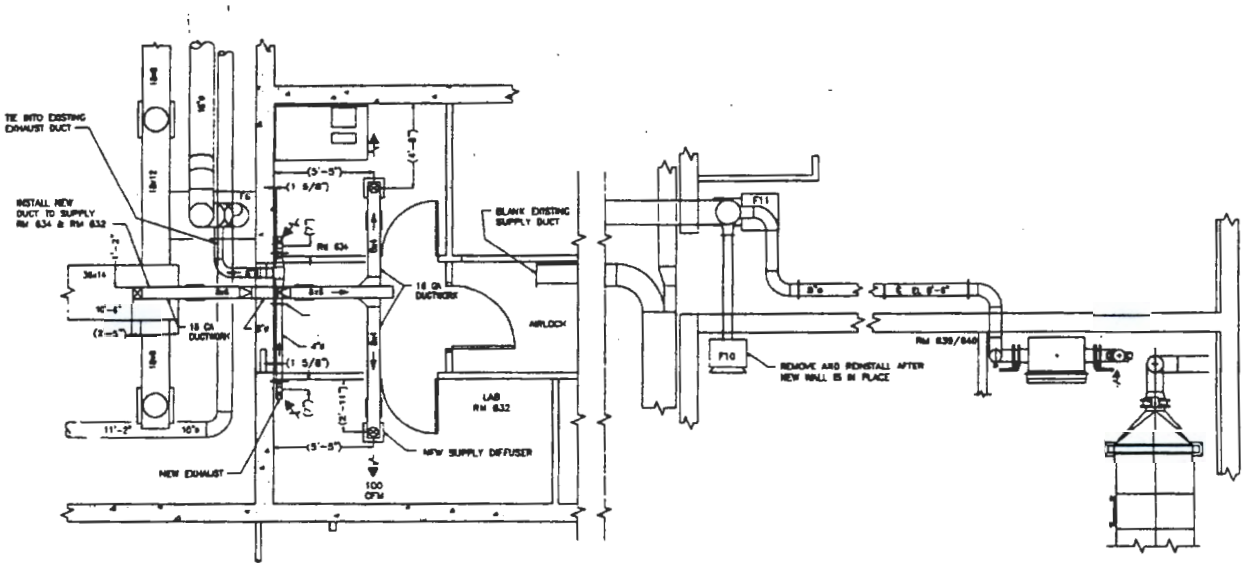


Figure 5. 2736-ZB Building Existing Ventilation System Modifications.

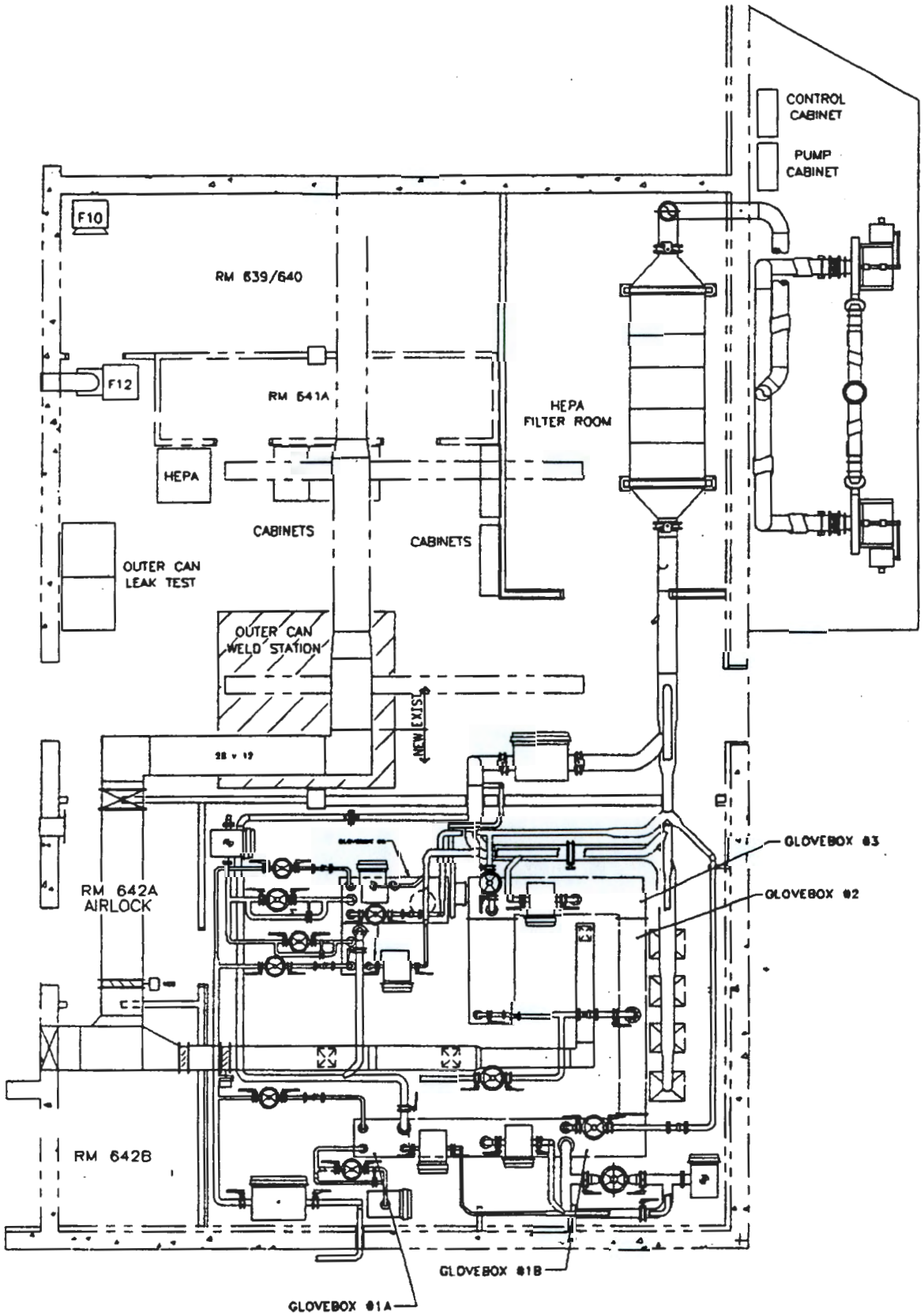


Figure 6. 2736-ZB Building New Process Ventilation System.

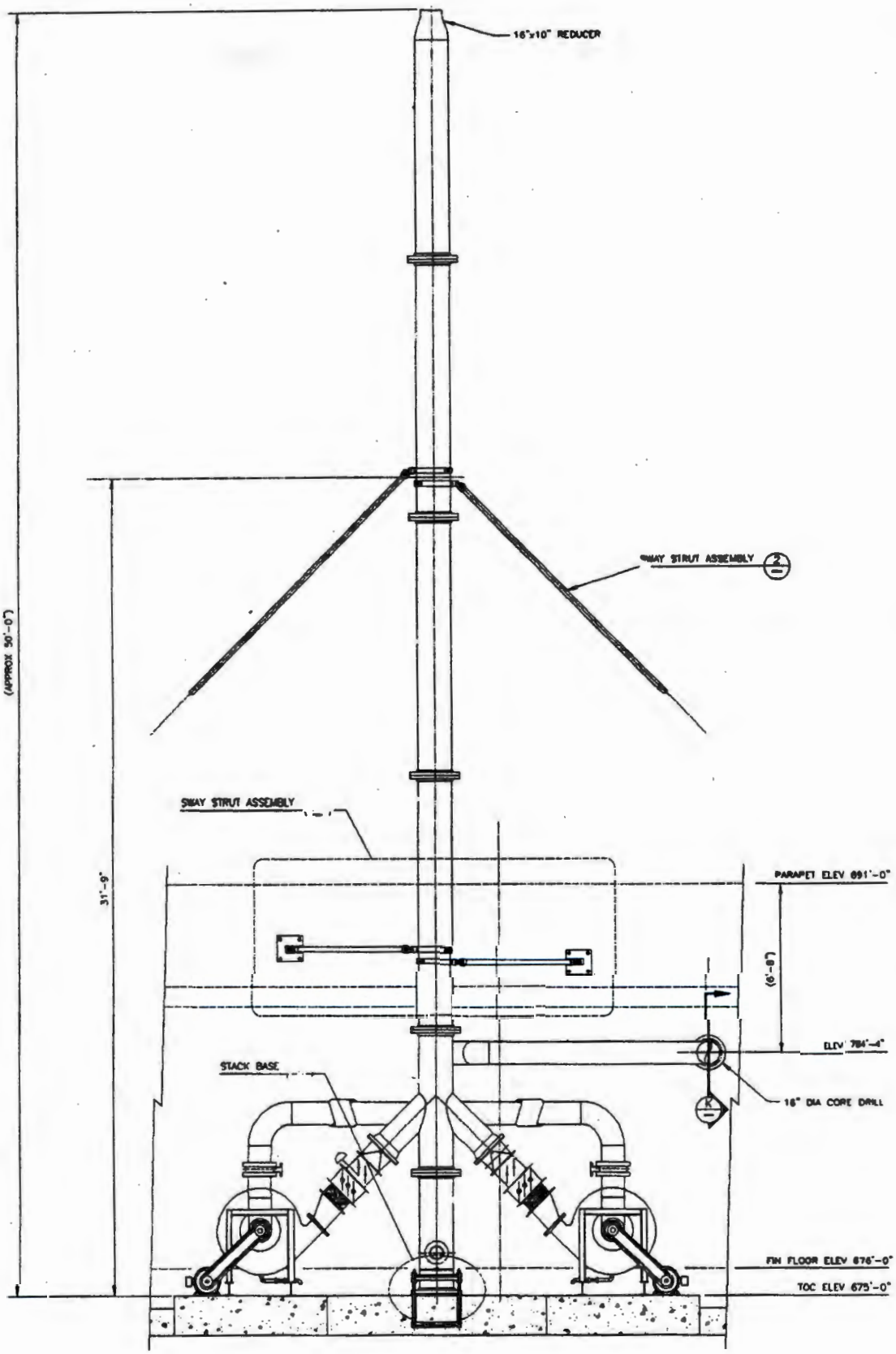


Figure 7. 2736-ZB Building New Process Exhaust System Stack.

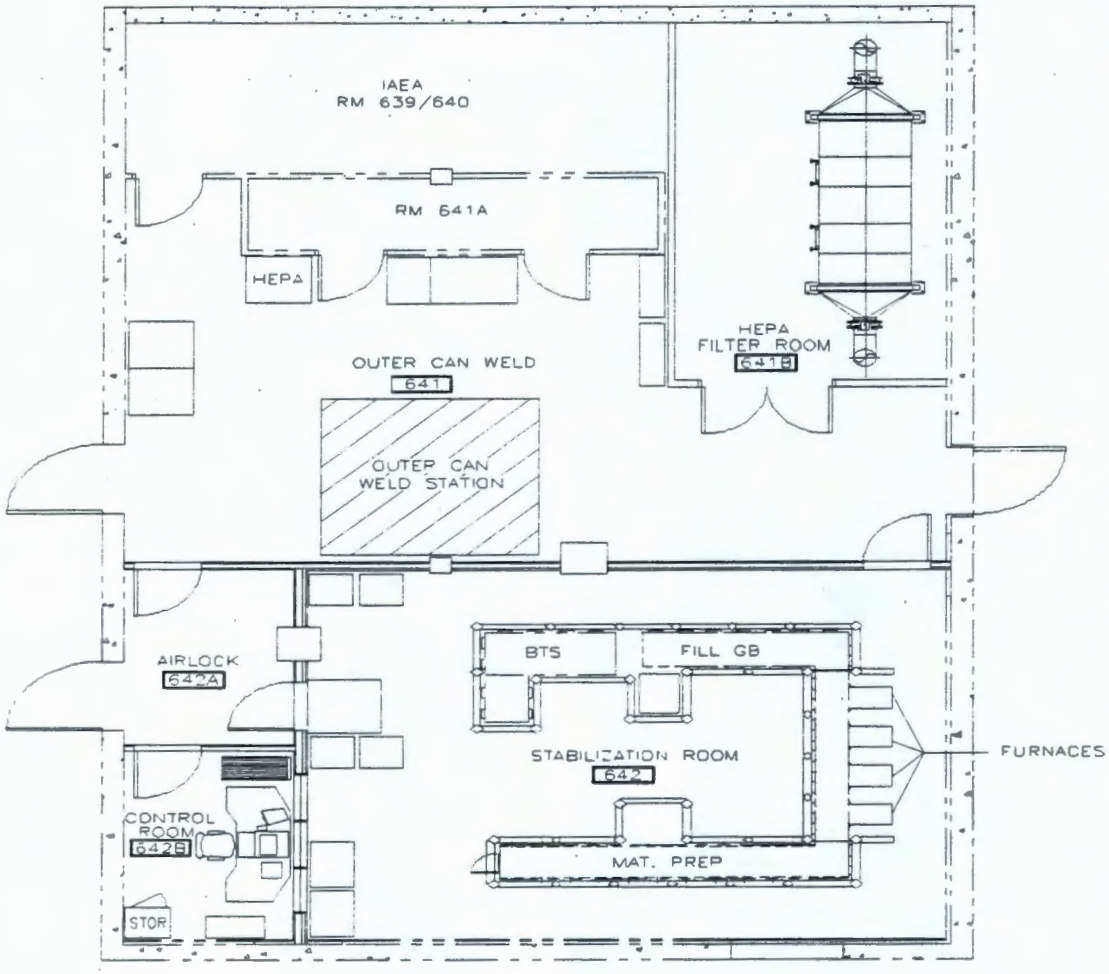


Figure 8. 2736-ZB Building, Rooms 641/642 Layout.

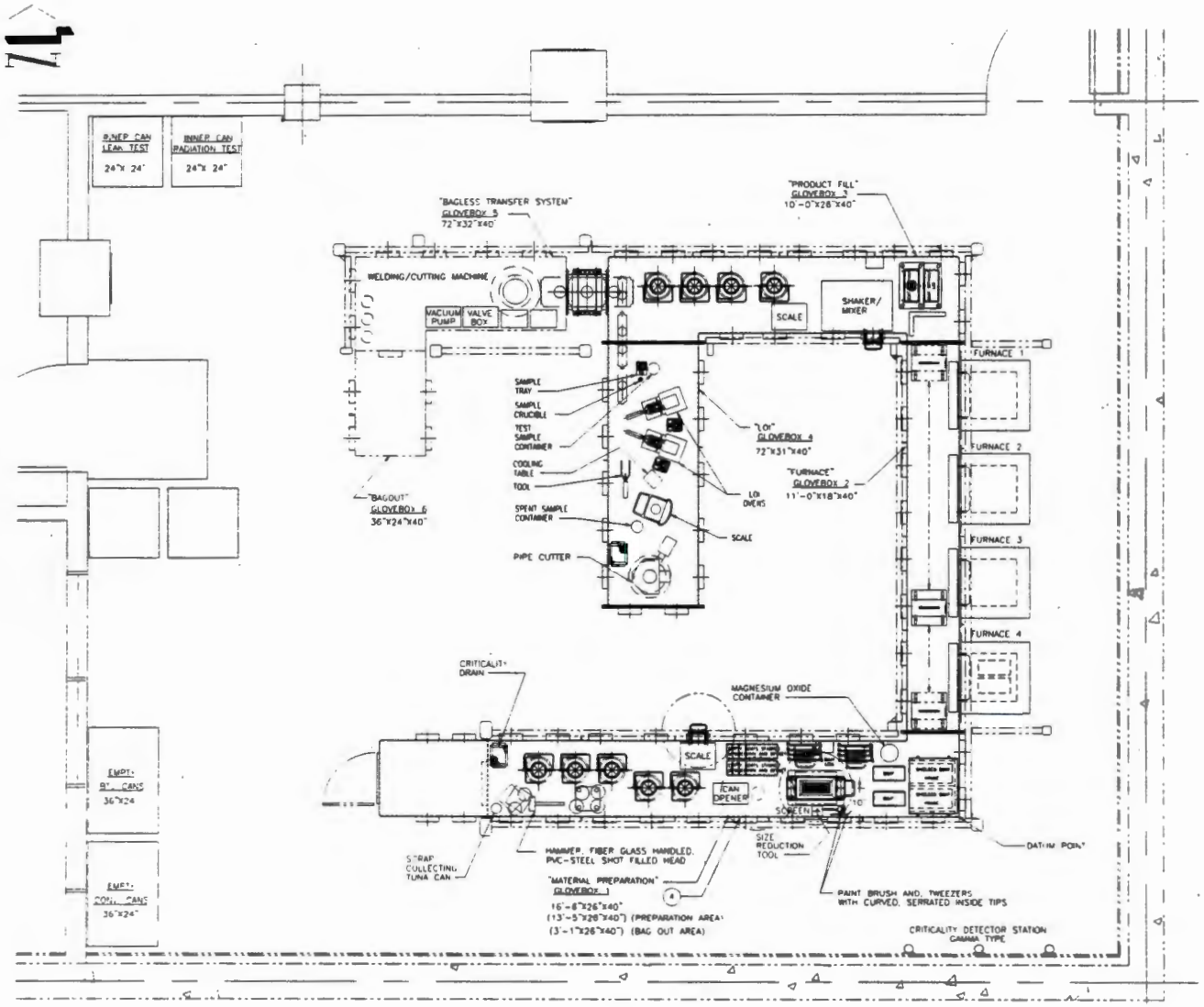


Figure 9. 2736-ZB Building, Room 642 Glovebox Layout.

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# ATTACHMENT A

## PRELIMINARY ENGINEERING DRAWINGS

- Location of filters on exhaust systems of gloveboxes and furnaces: Drawing H-2-829445 (sheet 1 of 5).

- Location of high-temperature equipment: Drawings H-2-829969 (sheet 1 of 1) and H-2-829971 (sheet 1 of 1); two furnace sketches supporting Drawing H-2-829969.

- Direction and path of airflow: Drawing H-2-829442 (sheet 1 of 1).

- Location of sampling lines on new stack (296-Z-7): Drawing H-2-829485 (sheets 1 and 2 of 2) and Drawing H-2-829443 (sheet 10 of 10).

- Location of additional controls on ventilation system: Drawing H-2-829443 (sheets 1 through 9 of 10).

Note : All HEPA filters will be installed and tested in place initially (and on replacement). The dual-stage HEPA filters upstream from the 296-Z-7 Stack and Room 642 exhaust HEPA filter will be tested annually. All other filters are considered process equipment (HEPA-type), not subject to annual testing.

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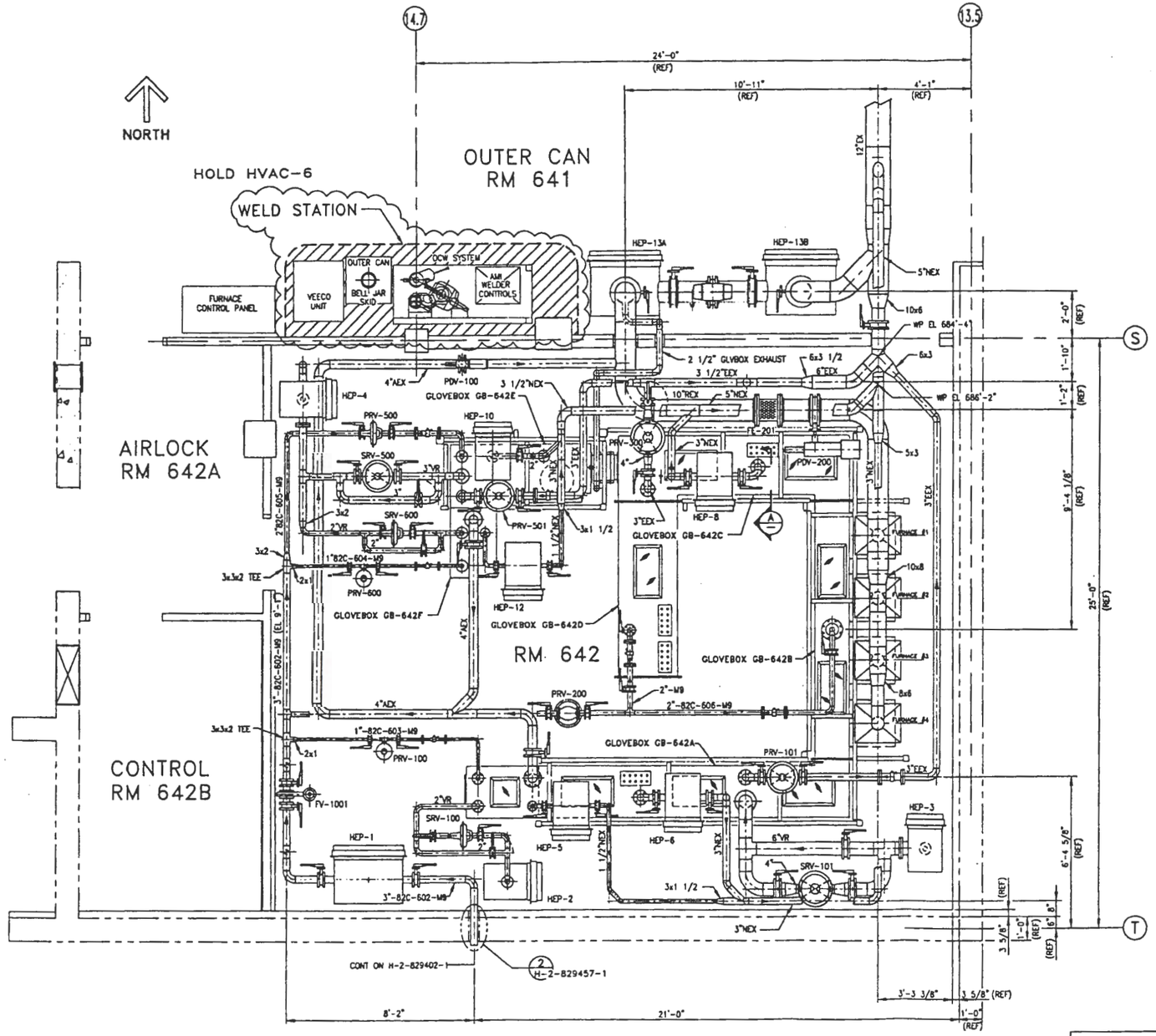
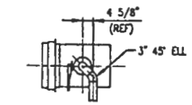



ENLARGED PLAN
REF DWG H-2-829444-1
SCALE: 1/2" = 1'-0"




A SECTION
SCALE: 1/2"=1'-0"

NOTES

1. FOR GENERAL NOTES SEE H-2-829444 SHEET 1.

U DOES NOT CONTAIN CLASSIFIED OR UNCLASSIFIED CONTROLLED NUCLEAR INFORMATION
CLASSIFIER/RO: DATE:
TITLE:

HOLD TABLE

| HOLD NO. | DESCRIPTION | EXPECTED RLSE DATE |
|---|---|---|
| 6 | PENDING WELD STATION INFO | TBD |
| | | |

FLUOR FEDERAL SERVICES

| DWG NO | TITLE | REF NUMBER | TITLE |
|---|---|---|---|
| DRAWING TRACEABILITY LIST | | H-2-829350 | DRAWING LIST WORK PACKAGE #2 |
| | | REFERENCES | NEXT USED ON |

| REV NO | DESCRIPTION | DATE | CHKD |
|---|---|---|---|
| 0 | APPROVED FOR CONSTRUCTION | | |
| REVISIONS | | | |

| NAME | DATE |
|---|---|
| DC WORDEN | |

PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING
U.S. DEPARTMENT OF ENERGY
Richland Operations Office

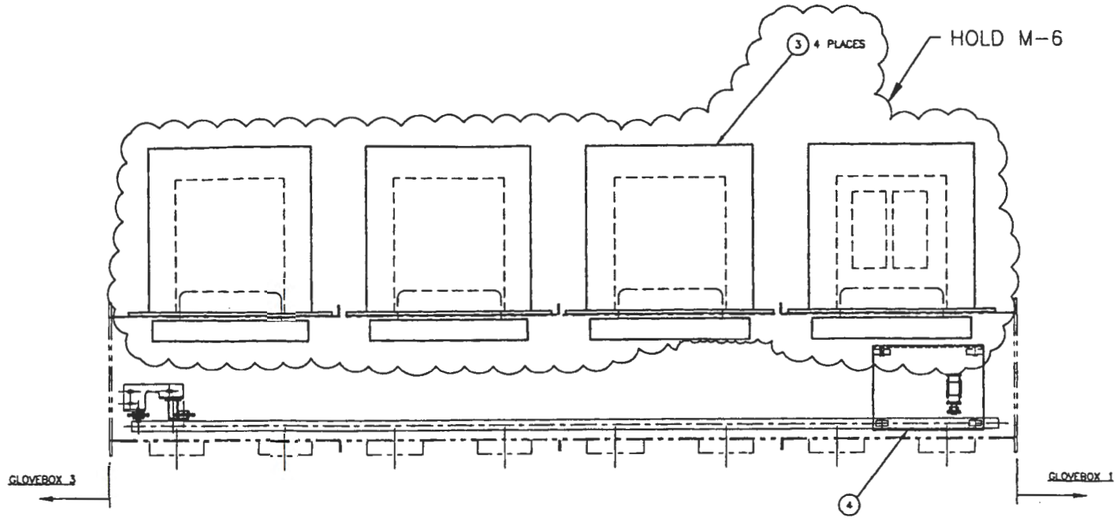
HVAC
ENLARGED FLOOR PLAN

| SIZE | DWG NO | REV |
|---|---|---|
| F | H-2-829445 | 0 |

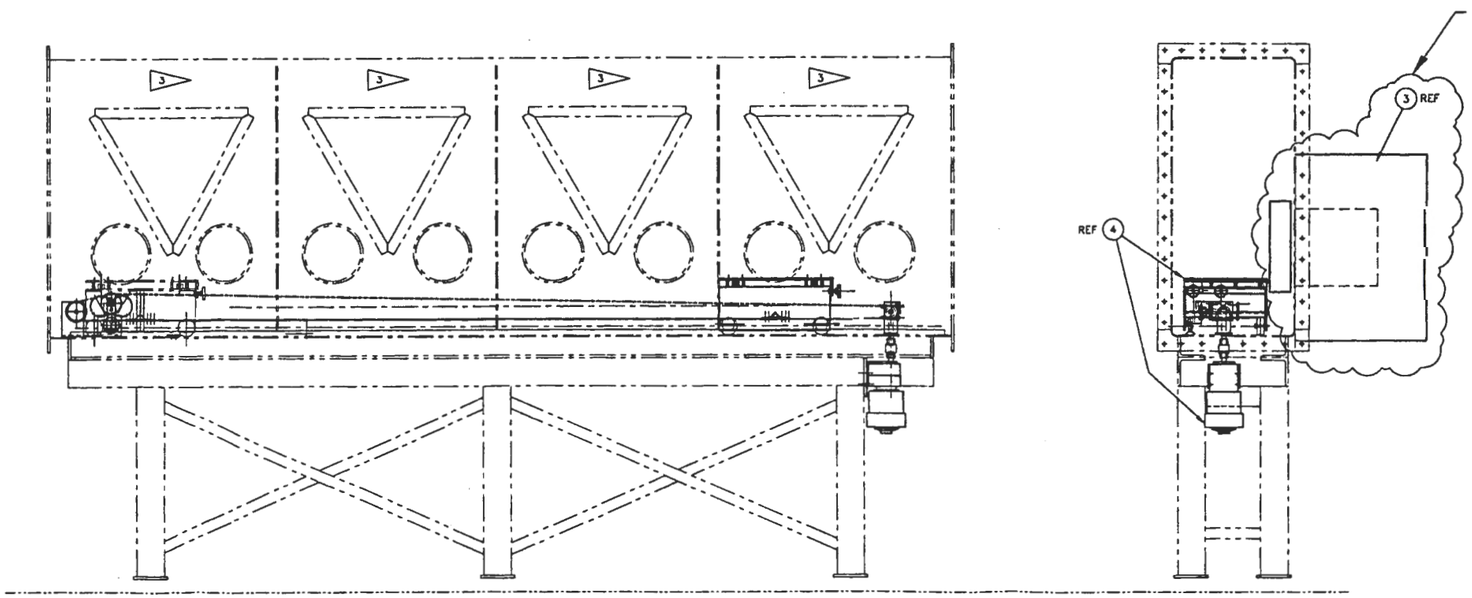
SCALE 1/2"=1'-0" SHEET 1 OF 5

| PARTS/MATERIAL LIST | | | | | | |
|---|---|---|---|---|---|---|
| QTY REQD | SAFETY | PART/DASH NUMBER | NOMENCLATURE/DESCRIPTION | MATERIAL/REFERENCE | SM | ITEM NO |
| | 2 | -010 | ASSEMBLY | | | 1 |
| | | | | | | 2 |
| | 3 SC | 4 H-2-829968 | ASSEMBLY, FURNACE | | | 3 |
| | GS | 1 H-2-829965-010 | ASSEMBLY, TROLLEY | | | 4 |
| | | | | | | 5 |
| | | | | | | 6 |

HOLD M-6




PLAN VIEW
SCALE: 1/8




1 ASSEMBLY
SCALE: 1/8

| HOLD TABLE | | |
|---|---|---|
| HOLD NO. | DESCRIPTION | EXPECTED RLSE DATE |
| M-6 | ITEM 3, FURNACE ASSEMBLY | 6/30/00 |
| | | |

## GENERAL NOTES

1. EQUIPMENT INSTALLATION SHALL BE IN ACCORDANCE WITH CONSTRUCTION SPECIFICATION W-460-C2
2. SAFETY CLASSIFIED ITEMS ARE IDENTIFIED AS FOLLOWS: SAFETY CLASS (SC), SAFETY SIGNIFICANT (SS), OR GENERAL SERVICE (GS).
3. FURNACE TEMPERATURE DISPLAY READOUT IS LOCATED OUTSIDE GLOVEBOX

CHARLES K. SOOTER STATE OF WASHINGTON REGISTERED PROFESSIONAL ENGINEER
01/31/02

FLUOR FEDERAL SERVICES

| DRAWING TRACEABILITY LIST | | |
|---|---|---|
| DWG NO | TITLE | |
| | REFERENCES | |
| REF NUMBER | TITLE | |
| H-2-829350 | DRAWING LIST WORK PACKAGE #2 | |
| NEXT USED ON H-2-829941 | | |

| REVISIONS | | |
|---|---|---|
| REV NO | DESCRIPTION | DATE |
| 0 | ISSUED FOR CONSTRUCTION | |

| NAME | DATE |
|---|---|
| DRAWN BY | |
| CHECKED BY | |
| DESIGN ENGINEER | 7/19/99 |

PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

MECHANICAL
GLOVEBOX GB-642B
EQUIPMENT ARRANGEMENT

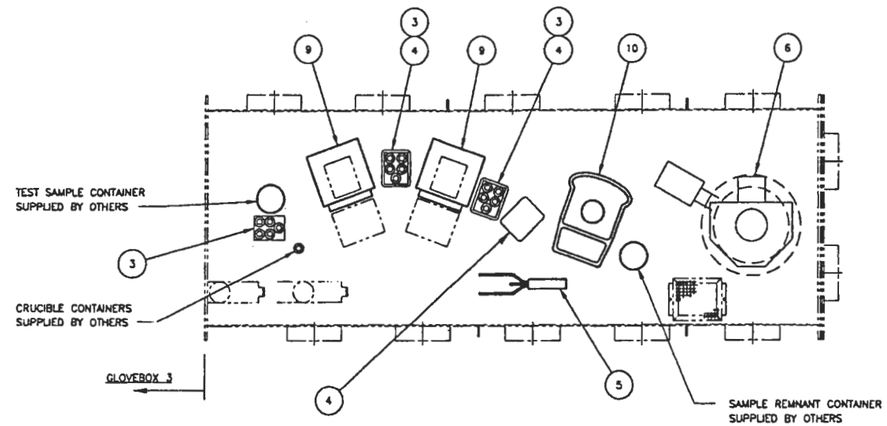
| SIZE | FSCM NO | SHEET NO | DWG NO | REV |
|---|---|---|---|---|
| F | 37368-2B | 4700 | H-2-829969 | 0 |

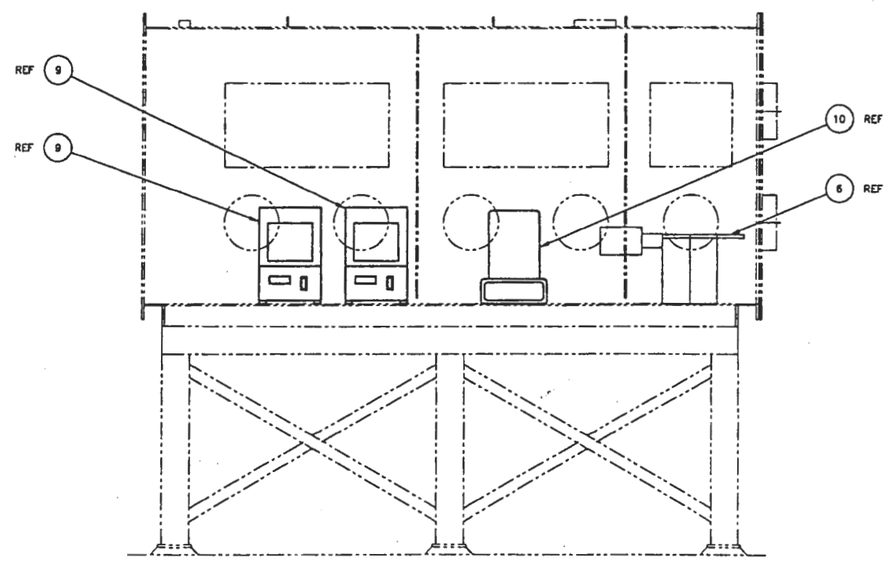
SCALE AS NOTED | SHEET 1 OF 1

H-2-829969

PARTS/MATERIAL LIST

| QTY REQD SAFETY | QTY REQD -010 | PART/DASH NUMBER | NOMENCLATURE/DESCRIPTION | MATERIAL/REFERENCE | SH | ITEM NO |
|---|---|---|---|---|---|---|
| 2 | X | -010 | ARRANGEMENT, GLOVEBOX #6 | | | 1 |
| | | | | | | 2 |
| GS | 3 | H-2-829975-001 | CRUCIBLE TRAY | | | 3 |
| GS | 2 | H-2-829975-010 | COOLING TABLE | | | 4 |
| GS | 1 | H-2-829975-030 | CRUCIBLE FORK | | | 5 |
| GS | 1 | H-2-829980-010 | ASSEMBLY, PIPE CUTTER | | | 6 |
| | | | | | | 7 |
| | | | | | | 8 |
| GS | 2 | FB 1300 | MUFFLE FURNACE | BARNSTEAD THERMOLYNE | | 9 |
| GS | 1 | AB104-S | ANALYTICAL BALANCE | METTLER TOLEDO | | 10 |




1 GLOVEBOX ASSEMBLY
SCALE: 1/8

## GENERAL NOTES

1. EQUIPMENT INSTALLATION SHALL BE IN ACCORDANCE WITH CONSTRUCTION SPECIFICATION W-460-C2, SECTION 13095.
2. SAFETY CLASSIFIED ITEMS ARE IDENTIFIED AS FOLLOWS: SAFETY CLASS (SC), SAFETY SIGNIFICANT (SS), OR GENERAL SERVICE (GS).

STATE OF WASHINGTON — CHARLES W. ZOLLER — REGISTERED PROFESSIONAL ENGINEER
01/31/02

FLUOR FEDERAL SERVICES

PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING
U.S. DEPARTMENT OF ENERGY
Richland Operations Office

MECHANICAL
GLOVEBOX GB-642D
EQUIPMENT ASSEMBLY

| NAME | DATE |
|---|---|
| KD HUNT | 1/30/02 |

| SIZE | BLDG NO | DRWG NO | SHEET NO | REV |
|---|---|---|---|---|
| F | 2736-28 | 4700 | H-2-829971 | 0 |

SCALE AS SHOWN — SHEET 1 OF 1

| DWG NO | TITLE |
|---|---|
| H-2-829350 | DRAWING LIST WORK PACKAGE #2 |

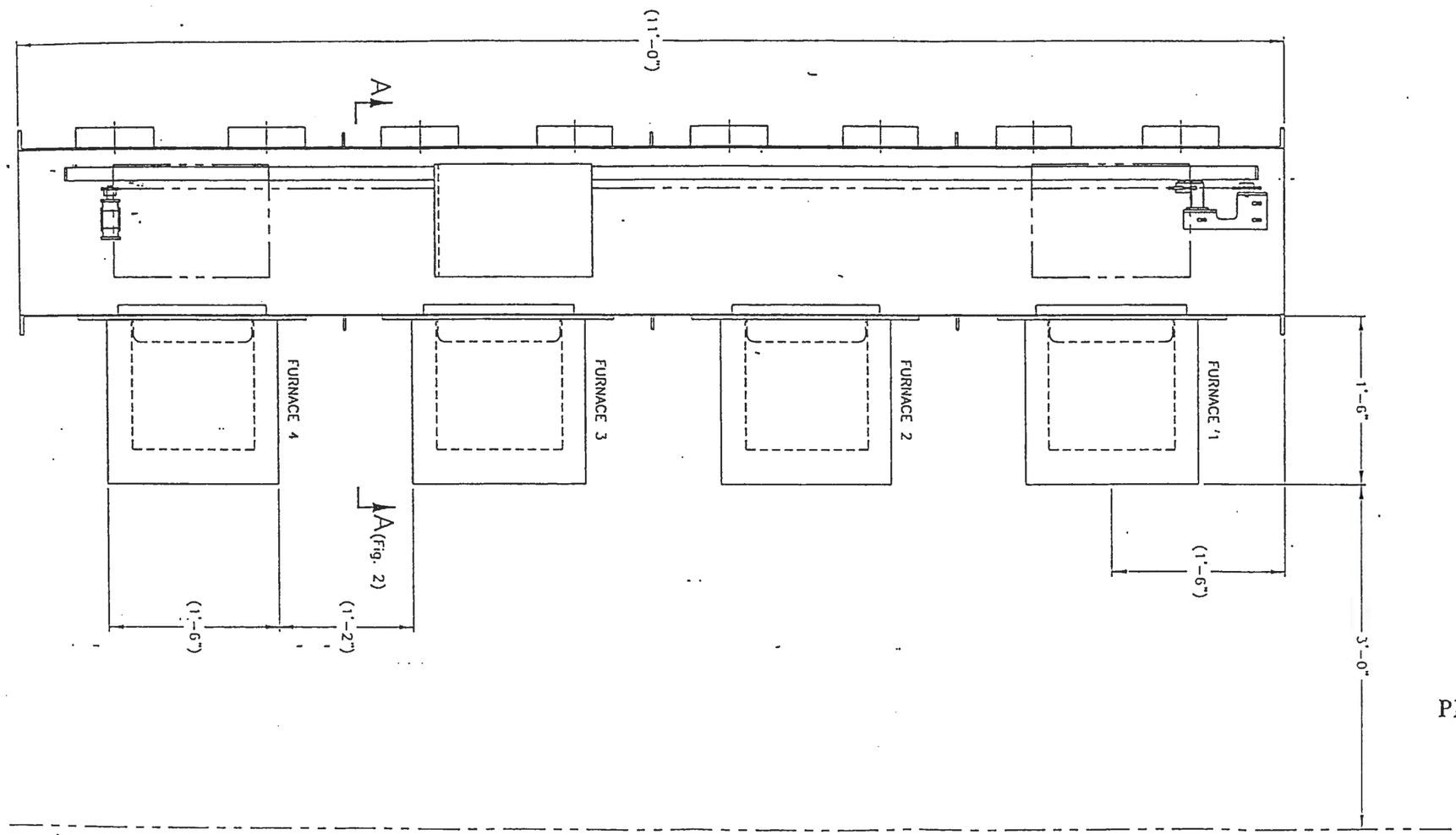
DRAWING TRACEABILITY LIST

| REF NUMBER | TITLE |
|---|---|
| NEXT USED ON H-2-829941 | |

REFERENCES

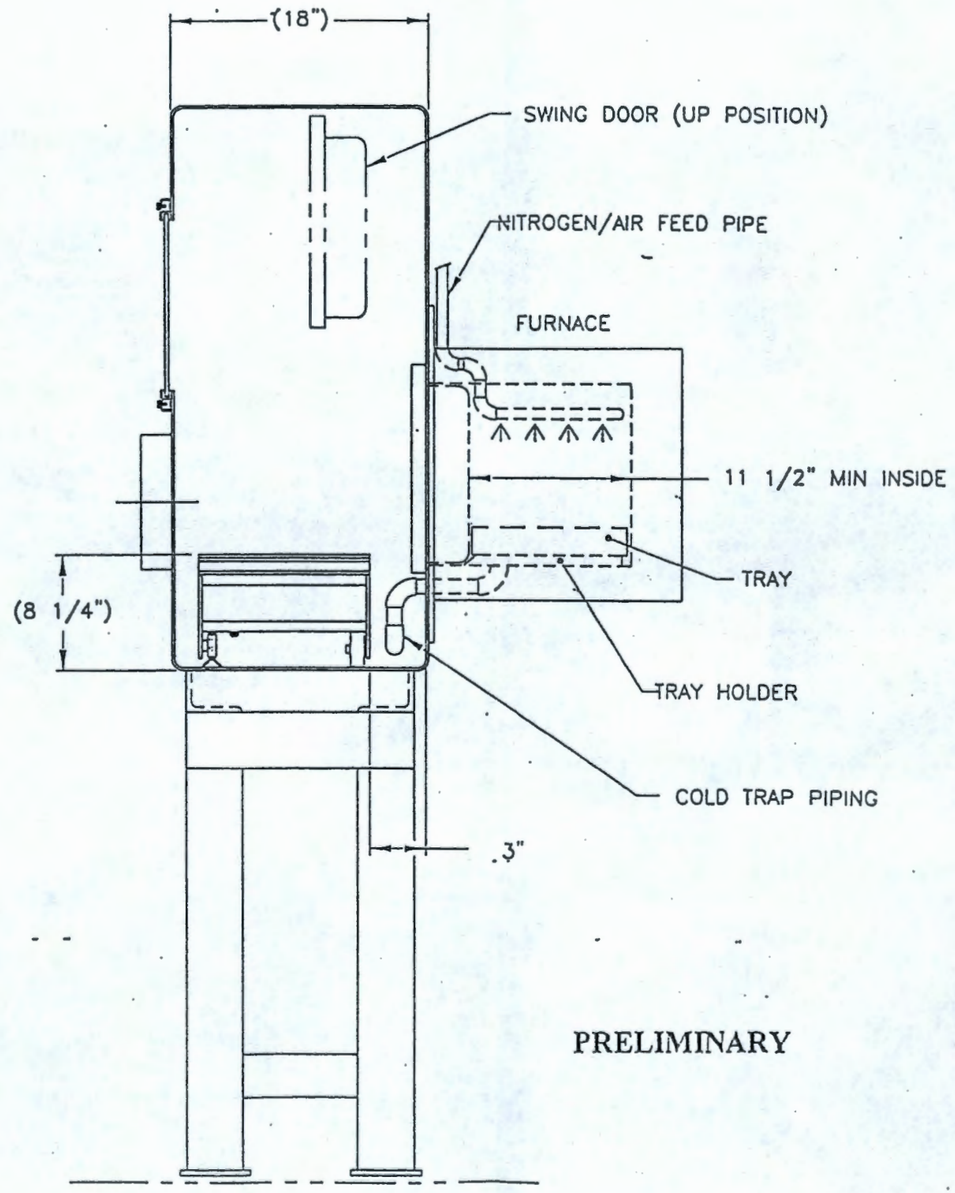
| REV NO | DESCRIPTION |
|---|---|
| 0 | APPROVED FOR CONSTRUCTION |

REVISIONS




PRELIMINARY

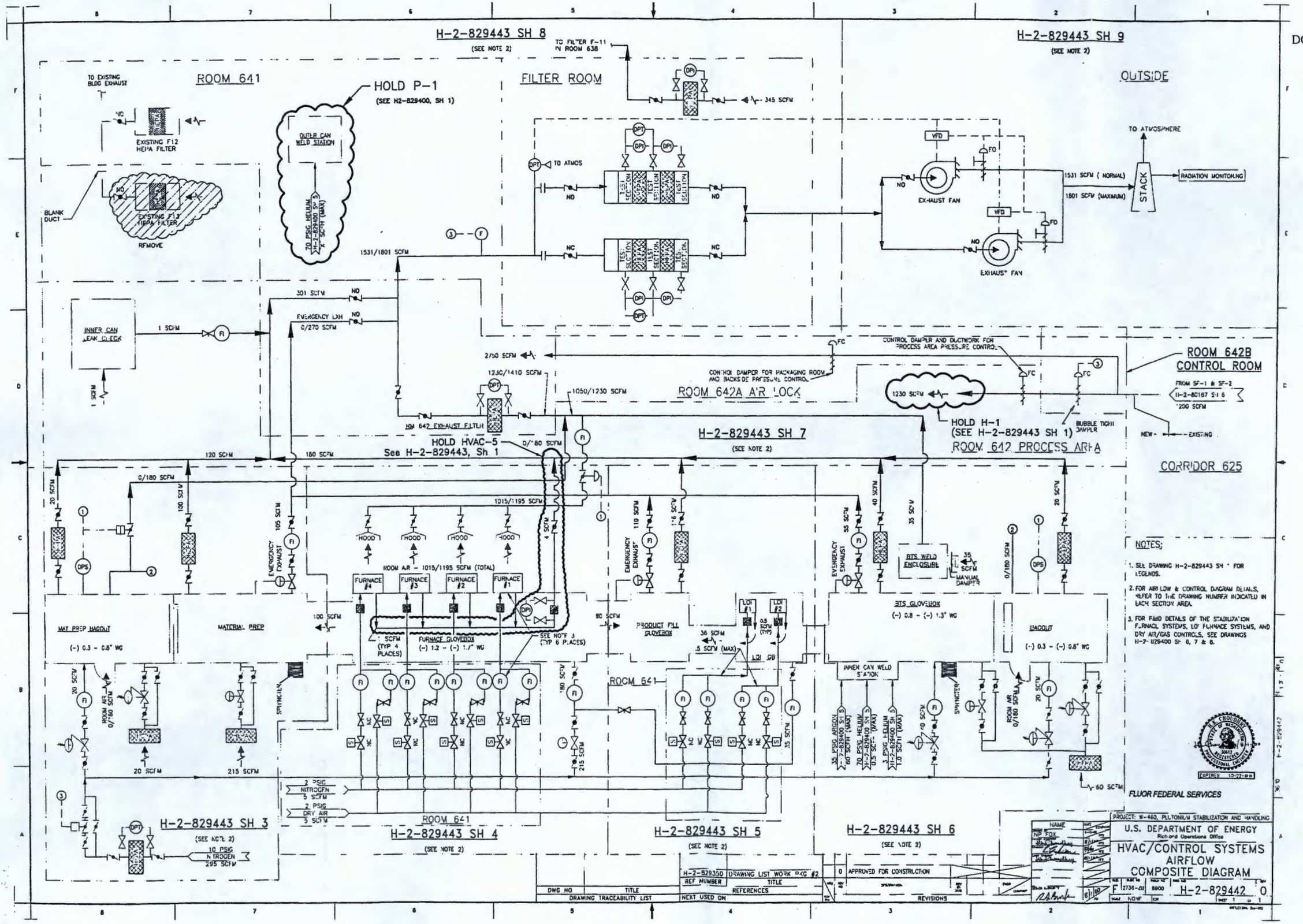
Furnace sketch (1 of 2) supporting Drawing H-2-829969.

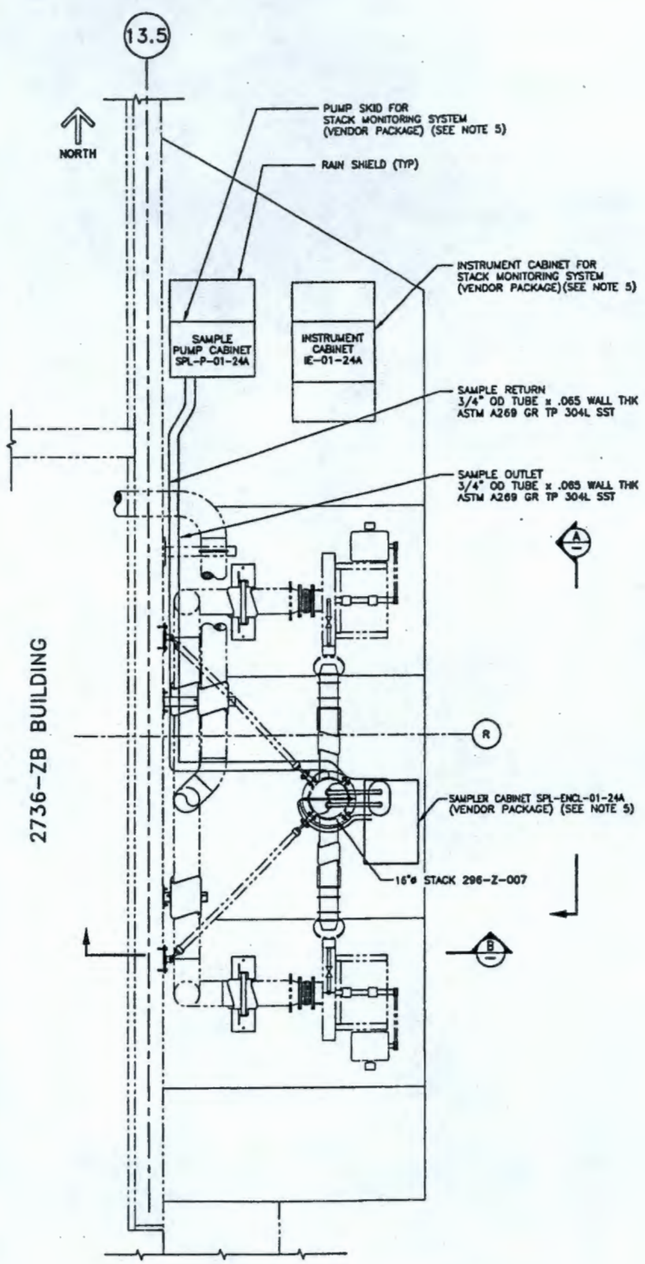



PRELIMINARY

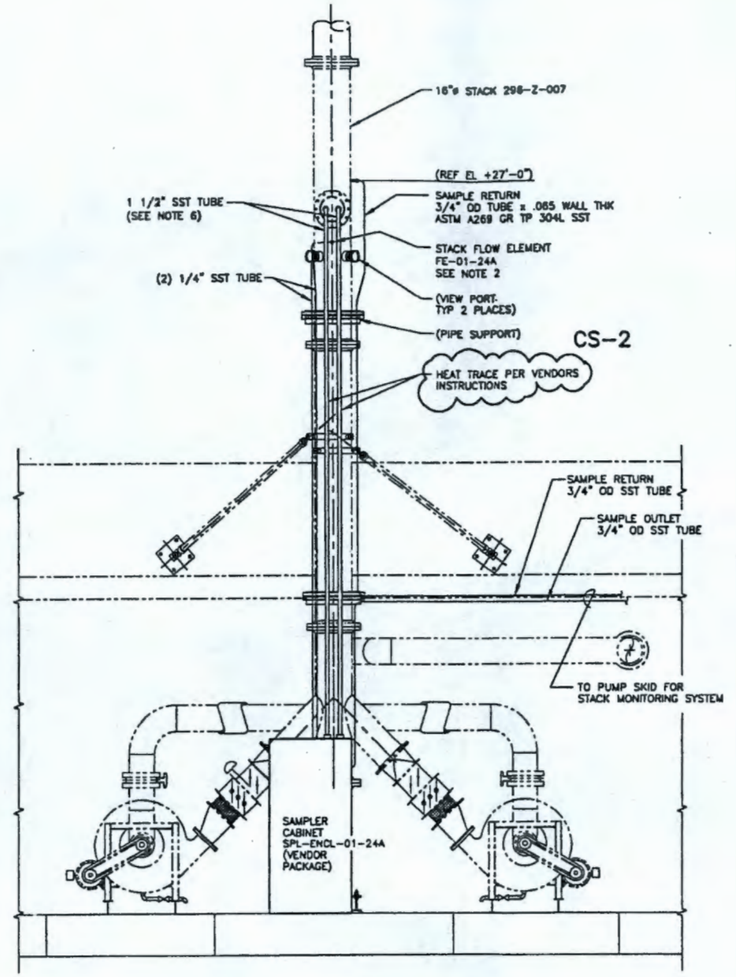
SECTION A–A
SCALE: NONE

Furnace sketch (2 of 2) supporting Drawing H-2-829969.

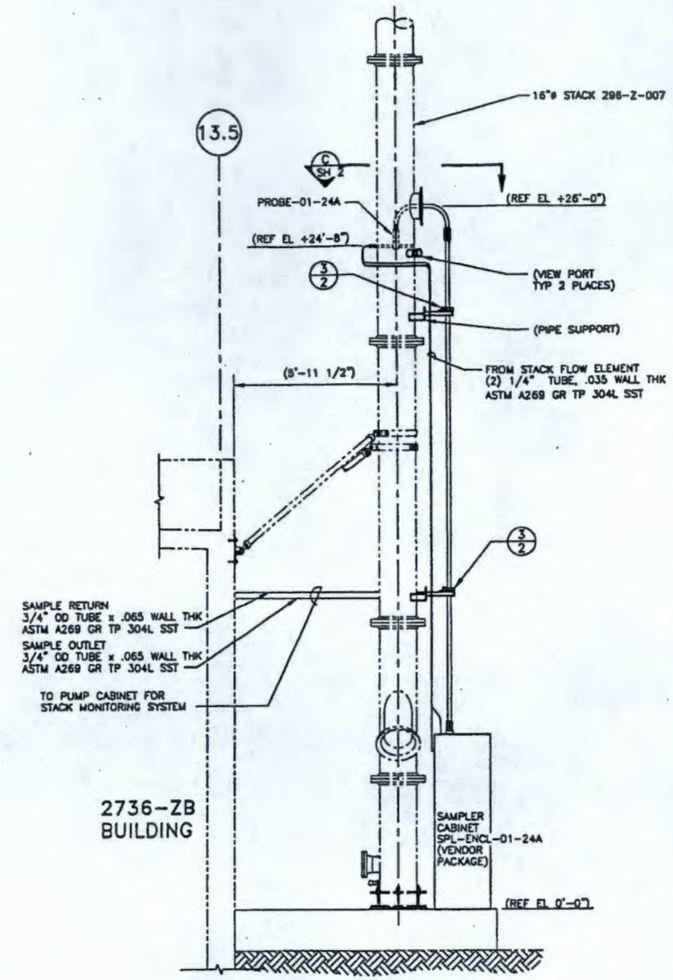

H-2-829443 SH 8
(SEE NOTE 2)
H-2-829443 SH 9
(SEE NOTE 2)
ROOM 641
FILTER ROOM
OUTSIDE
HOLD P-1
(SEE H2-829400, SH 1)
TO FILTER F-11 IN ROOM 638
345 SCFM
TO EXISTING BLDG EXHAUST
EXISTING F12 HEPA FILTER
EXISTING F13 HEPA FILTER
REMOVE
BLANK DUCT
OUTER CAN WELD STATION
TO ATMOS
TEST SECTION
1531/1801 SCFM
EXHAUST FAN
1531 SCFM ( NORMAL)
1801 SCFM (MAXIMUM)
TO ATMOSPHERE
STACK
RADIATION MONITORING
INNER CAN LEAK CHECK
1 SCFM
301 SCFM
EMERGENCY EXH
0/270 SCFM
2/50 SCFM
1230/1410 SCFM
1050/1230 SCFM
ROOM 642A AIR LOCK
CONTROL DAMPER FOR PACKAGING ROOM AND BACKSIDE PRESSURE CONTROL
CONTROL DAMPER AND DUCTWORK FOR PROCESS AREA PRESSURE CONTROL
ROOM 642B CONTROL ROOM
FROM SF-1 & SF-2
200 SCFM
1230 SCFM
HOLD H-1
(SEE H-2-829443 SH 1)
BUBBLE TIGHT DAMPER
ROOM 642 PROCESS AREA
NEW
EXISTING
HM 642 EXHAUST FILTER
HOLD HVAC-5
See H-2-829443, Sh 1
0/180 SCFM
H-2-829443 SH 7
(SEE NOTE 2)
CORRIDOR 625
120 SCFM
180 SCFM
1015/1195 SCFM
HOOD
ROOM AIR - 1015/1195 SCFM (TOTAL)
FURNACE #4
FURNACE #3
FURNACE #2
FURNACE #1
EMERGENCY EXHAUST
110 SCFM
116 SCFM
55 SCFM
40 SCFM
35 SCFM
20 SCFM
BTS WELD ENCLOSURE
MANUAL DAMPER
MAT PREP BAGOUT
(-) 0.3 - 0.8" WG
MATERIAL PREP
100 SCFM
FURNACE GLOVEBOX
(-) 1.2 - (-) 1.7" WG
SEE NOTE 3 (TYP 6 PLACES)
PRODUCT FILL GLOVEBOX
36 SCFM
LOI #1
LOI #2
LOI GB
BTS GLOVEBOX
(-) 0.8 - (-) 1.3" WG
BAGOUT
(-) 0.3 - (-) 0.8" WG
INNER CAN WELD STATION
35 PSIG ARGON H-2-829400 SH 5 60 SCFH (MAX)
70 PSIG HELIUM H-2-829400 SH 5 0.5 SCFH (MAX)
3 PSIG HELIUM H-2-829400 SH 5 1.0 SCFH (MAX)
SPRINKLER
ROOM AIR 0/180 SCFM
20 SCFM
215 SCFM
2 PSIG NITROGEN 5 SCFM
2 PSIG DRY AIR 5 SCFM
10 PSIG NITROGEN 295 SCFM
H-2-829443 SH 3
(SEE NOTE 2)
ROOM 641
H-2-829443 SH 4
(SEE NOTE 2)
H-2-829443 SH 5
(SEE NOTE 2)
H-2-829443 SH 6
(SEE NOTE 2)
60 SCFM
NOTES:
1. SEE DRAWING H-2-829443 SH 1 FOR LEGENDS.
2. FOR AIRFLOW & CONTROL DIAGRAM DETAILS, REFER TO THE DRAWING NUMBER INDICATED IN EACH SECTION AREA.
3. FOR FIELD DETAILS OF THE STABILIZATION FURNACE SYSTEMS, LOI FURNACE SYSTEMS, AND DRY AIR/GAS CONTROLS, SEE DRAWINGS H-2-829400 SH 6, 7 & 8.
FLUOR FEDERAL SERVICES
PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING
U.S. DEPARTMENT OF ENERGY
Richland Operations Office
HVAC/CONTROL SYSTEMS
AIRFLOW
COMPOSITE DIAGRAM
H-2-829442
0
DRAWING LIST WORK PKG #2
REF NUMBER
TITLE
REFERENCES
NEXT USED ON
DWG NO
TITLE
DRAWING TRACEABILITY LIST
0 APPROVED FOR CONSTRUCTION
REVISIONS




PLAN
SCALE: 1/2"=1'-0"




A ELEVATION
SCALE: 1/2"=1'-0"




B SECTION
SCALE: 1/2"=1'-0"

NOTES:

1. FOR GENERAL NOTES SEE H-2-829444.
2. FLOW ELEMENT, ANNUBAR, WITH TEMPERATURE SENSOR, DIETERICH STANDARD, NUMBER DCR-25-16" I.D. - HV250-CD000-MP450-TX4. CS-1
3. SAMPLE PROBE, ANDERSON INSTRUMENTS, RF-2-112. CS-3
4. SAMPLING SYSTEM QUALIFICATIONS BY OTHERS.
5. ATTACH TO CONCRETE PAD PER VENDORS RECOMENDATIONS.
6. SAMPLE PROBE AND LINE (ONLY) ARE "SAFETY CLASS" FOR MONITORING FUNCTION.

HOLD TABLE

| HOLD NO. | DESCRIPTION | EXPECTED RLSE DATE |
|---|---|---|
| CS-1 | FLOW ELEMENT AND STACK TEMPERATURE | PENDING VENDOR INFORMATION |
| CS-2 | HEAT TRACE | PENDING VENDOR INFORMATION |
| CS-3 | SAMPLE PROBE | PENDING PFP REVIEW |

FLUOR FEDERAL SERVICES

| DWG NO | TITLE |
|---|---|
| DRAWING TRACEABILITY LIST | |

| REF NUMBER | TITLE |
|---|---|
| H-2-829350 | DRAWING LIST WORK PACKAGE #2 |
| REFERENCES | |
| NEXT USED ON H-2-829350 | |

| REV NO | DESCRIPTION |
|---|---|
| 0 | APPROVED FOR CONSTRUCTION |
| REVISIONS | |

| NAME | DATE |
|---|---|
| S. SMITH | |
| | |
| | |
| | |

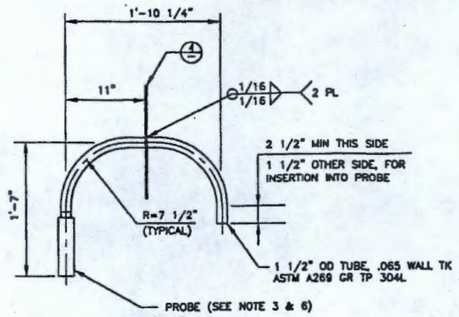
PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

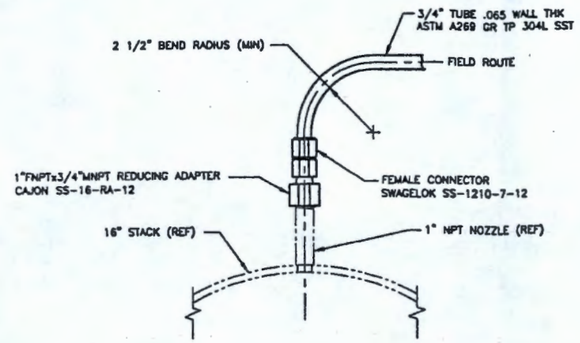
CONTROL SYSTEMS
STACK MONITORING
PLAN & SECTIONS

| SIZE | BLDG NO | SHEET NO | DWG NO | REV |
|---|---|---|---|---|
| F | 2736-ZB | 5001 | H-2-829485 | 0 |

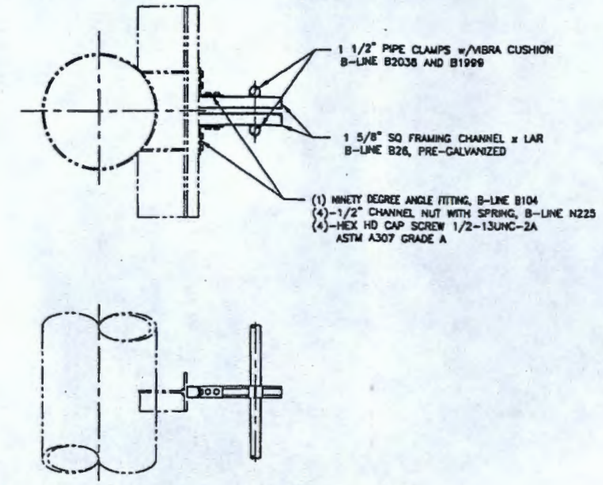
SCALE SHOWN | SHEET 1 OF 2



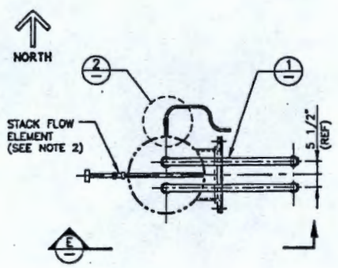

1 DETAIL TYP-2 PLACES
SCALE: 1 1/2"=1'-0"



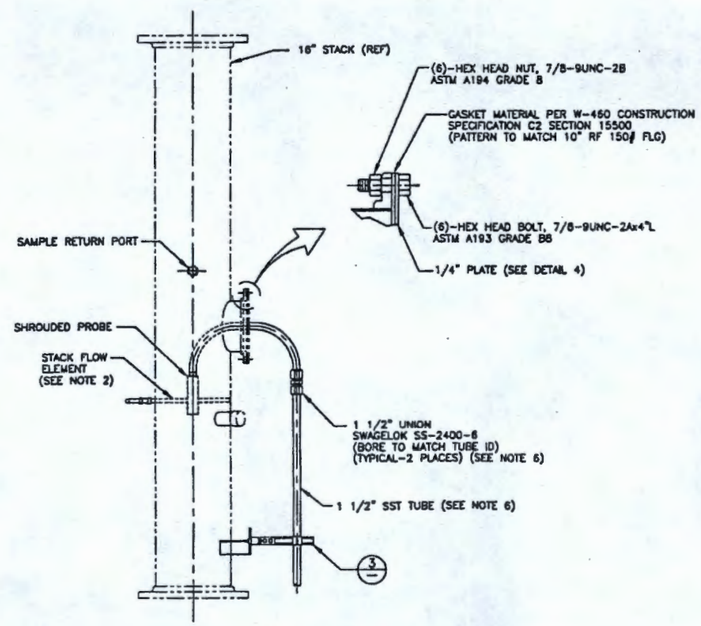

2 DETAIL-SAMPLE RETURN PORT
SCALE: NTS



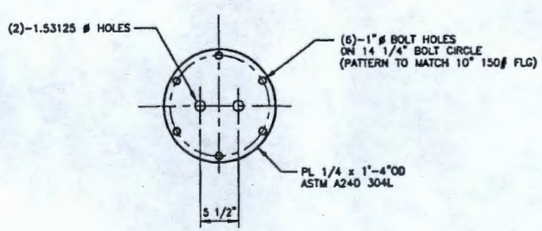

3 DETAIL
SCALE: 1 1/2"=1'-0"




C SECTION
SH 1 SCALE: 1"=1'-0"




E SECTION
SCALE: 1"=1'-0"




4 DETAIL
SCALE: 1 1/2"=1'-0"

FOR NOTES SEE SHEET 1

FLUOR FEDERAL SERVICES

| DWG NO | TITLE |
|---|---|
| DRAWING TRACEABILITY LIST | |

| REF NUMBER | TITLE |
|---|---|
| H-2-829350 | DRAWING LIST WORK PACKAGE #2 |
| REFERENCES | |
| NEXT USED ON SHEET 1 | |

| REV | DESCRIPTION |
|---|---|
| 0 | APPROVED FOR CONSTRUCTION |
| REVISIONS | |

| NAME |
|---|
| S. SMITH |

PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

CONTROL SYSTEMS
STACK MONITORING
PLAN, SECTIONS & DETAILS

| SIZE | PLAN NO | PROJ NO | DWG NO | REV |
|---|---|---|---|---|
| F | 2736-ZB | 5901 | H-2-829485 | 0 |

SCALE SHOWN | SHEET 2 OF

## LINE TYPES:

- HVAC DUCT LINE
- PIPING LINE
- NEW LINE OR EQUIPMENT
- INSTRUMENTATION OR EQUIPMENT
- EXISTING LINE OR EQUIPMENT
- ELECTRICAL SIGNAL
- SOFTWARE/COMMUNICATION SYSTEM LINK ( DATA, SERIAL, PARALLEL)
- PNEUMATIC SIGNAL
- PURCHASED PACKAGE
- FLOW DIRECTION
- INSULATED LINE

## VALVES:

- BALL VALVE (BV)
- GLOBE VALVE (GV)
- BUTTERFLY DAMPER VALVE (BFD)
- 3-WAY VALVE
- NEEDLE VALVE (NV)
- CHECK VALVE (CV)
- GATE VALVE (GV)
- MANUAL DAMPER (D)
- DAMPER VALVE, SPRING OPPOSED
- PRESSURE (VACUUM) BALANCED REGULATOR (PRV), SELF-CONTAINED

## ACTUATORS:

- CYLINDER ACTUATOR, SPRING OPPOSED
- CYLINDER ACTUATOR, SPRING OPPOSED, SINGLE ACTING W/HAND ACTUATOR
- SOLENOID OPERATOR
- HAND ACTUATOR
- PRESSURE BALANCED DIAPHRAGM
- DIAPHRAGM OPERATOR, SPRING OPPOSED

## HVAC & MISCELLANEOUS DEVICES:

- FLANGE
- PRESSURE SENSING TIP (LOCAL)
- PRESSURE SENSING TIP (CORRIDOR 675)
- PRESSURE SENSING TIP (OUTSIDE ATM)
- QUICK CONNECTOR, FEMALE
- QUICK CONNECTOR, MALE
- CONNECT TO LIKE NUMBER
- 120 CFM — AIRFLOW/INFILTRATION
- HEPA — HIGH EFFICIENCY PARTICULATE AIR FILTER (HEPA)
- F-XXX — FILTER
- M — MOTOR AND FAN DRIVE
- BDF-X — CENTRIFUGAL FAN W/ BACK DRAFT DAMPER
- STACK — EXHAUST STACK
- MCC — MOTOR CONTROL CENTER/MOTOR STARTER
- VFD — VARIABLE FREQUENCY DRIVE

## MISCELLANEOUS ABBREVIATIONS

| | |
|---|---|
| ADJ | ADJUSTABLE |
| ATM | ATMOSPHERE |
| BDD | BACK DRAFT DAMPER |
| BTS | BAGLESS TRANSFER SYSTEM |
| BV | BALL VALVE |
| CV | CHECK VALVE |
| D | DAMPER |
| DCS | DISTRIBUTIVE CONTROL SYSTEM |
| DR | DRAIN |
| EF | EXHAUST FAN |
| FC | FAIL CLOSED |
| FO | FAIL OPEN |
| GS | GENERAL SERVICE |
| GV | GATE OR GLOBE VALVE |
| HMI | HUMAN MACHINE INTERFACE (PC) |
| HOA | HAND OFF-AUTO |
| HP | HORSEPOWER |
| LCU | LOCAL CONTROL UNIT |
| LO | LOCKED OPEN |
| NC | NORMALLY CLOSED |
| NO | NORMALLY OPEN |
| NV | NEEDLE VALVE |
| PLC | PROGRAMMABLE LOGIC CONTROLLER |
| SC | SAFETY CLASS |
| SCFM | STANDARD CUBIC FEET PER MINUTE |
| SCR | SILICON CONTROLLED RECTIFIER |
| SP | SET-POINT |
| SS | SAFETY SIGNIFICANT |
| V | VALVE |

## INSTRUMENTATION SYMBOLS:

- XXX / XX 00 — SHARED DISPLAY/CONTROL BY THE MICON
  XXX = SOFTWARE GENERATED ALARM SIGNALS FROM ANALOG INPUT TO MICON
  AAH = ANALYZER ALARM HIGH ($O_2$ LEVEL)
  FAL = FLOW ALARM LOW
  PAL = PRESSURE ALARM LOW
  PDAH = PRESSURE DIFFERENTIAL ALARM HIGH
  PDAL = PRESSURE DIFFERENTIAL ALARM LOW
  TAH = TEMPERATURE ALARM HIGH
- XX / XXXX — INPUT/OUTPUT INTERFACE AT MICON LOCAL CONTROL UNIT (LCU) XX = AI, DI, OR DO
  AI = ANALOG INPUT
  DI = DIGITAL INPUT
  DO = DIGITAL OUTPUT
- XXX / XX 00 — SHARED DISPLAY/CONTROL BY THE PLC/HMI
  XXX = SOFTWARE GENERATED ALARM SIGNALS FROM ANALOG INPUT TO MICON
  AAH = ANALYZER ALARM HIGH ($O_2$ LEVEL)
  FAL = FLOW ALARM LOW
  PAL = PRESSURE ALARM LOW
  PDAH = PRESSURE DIFFERENTIAL ALARM HIGH
  PDAL = PRESSURE DIFFERENTIAL ALARM LOW
  TAH = TEMPERATURE ALARM HIGH
- PLC — PROGRAMMABLE LOGIC CONTROL (PLC) INTERLOCK (SOFT)
- 1 — INTERLOCK LOGIC (-HARDWIRED)
- XX 00 — PANEL FRONT MOUNTED INSTRUMENT
- XX 00 — PANEL REAR MOUNTED INSTRUMENT
- COLOR XX 00 — PANEL FRONT MOUNTED INDICATING LIGHT
  G = GREEN
  R = RED
- COLOR XX 00 — LOCAL MOUNTED INDICATING LIGHT
  G = GREEN
  R = RED
- XX 00 — LOCAL MOUNTED INSTRUMENT
- TE — TEMPERATURE ELEMENT WITH WELL
- TI — TEMPERATURE INDICATOR WITH ELEMENT & WELL
- TE — TEMPERATURE ELEMENT, SURFACE
- TE — TEMPERATURE ELEMENT WITHOUT WELL
- ANALYSIS SENSOR (DEFINED)
- AVERAGING PITOT TUBE W/ FLOW STRAIGHTENING VANES
- I/A — CONVERTER
  I = CURRENT
  P = PNEUMATIC
- FI 00 — VARIABLE AREA FLOWMETER W/INTEGRAL NEEDLE VALVE

## INSTRUMENT IDENTIFICATION LETTERS

| | FIRST-LETTER: MEASURED OR INITIATING VARIABLE | FIRST-LETTER: MODIFIER | SUCCEEDING-LETTERS: READOUT OR PASSIVE FUNCTION | SUCCEEDING-LETTERS: OUTPUT FUNCTION | SUCCEEDING-LETTERS: MODIFIER |
|---|---|---|---|---|---|
| A | ANALYSIS | | ALARM | | |
| B | BURNER, COMBUSTION | | USER'S CHOICE | USER'S CHOICE | USER'S CHOICE |
| C | USER'S CHOICE | | | CONTROL | |
| D | USER'S CHOICE | DIFFERENTIAL | | | |
| E | VOLTAGE | | SENSOR (PRIMARY ELEMENT) | | |
| F | FLOW RATE | RATIO (FRACTION) | | | |
| G | USER'S CHOICE | | GLASS, VIEWING DEVICE | | |
| H | HAND | | | | HIGH |
| I | CURRENT (ELECTRICAL) | | INDICATE | | |
| J | POWER | SCAN | | | |
| K | TIME, TIME SCHEDULE | TIME RATE OF CHANGE | | CONTROL STATION | |
| L | LEVEL | | LIGHT | | LOW |
| M | USER'S CHOICE | MOMENTARY | | | MIDDLE, INTERMEDIATE |
| N | USER'S CHOICE | | USER'S CHOICE | USER'S CHOICE | USER'S CHOICE |
| O | USER'S CHOICE | | ORIFICE, RESTRICTION | | |
| P | PRESSURE, VACUUM | | POINT (TEST) CONNECTION | | |
| Q | QUANTITY | INTEGRATE, TOTALIZE | | | |
| R | RADIATION | | RECORD | | |
| S | SPEED, FREQUENCY | SAFETY | | SWITCH | |
| T | TEMPERATURE | | | TRANSMIT | |
| U | MULTIVARIABLE | | MULTIFUNCTION | MULTIFUNCTION | MULTIFUNCTION |
| V | VIBRATION, MECHANICAL ANALYSIS | | | VALVE, DAMPER, LOUVER | |
| W | WEIGHT, FORCE | | WELL | | |
| X | UNCLASSIFIED | X AXIS | UNCLASSIFIED | UNCLASSIFIED | UNCLASSIFIED |
| Y | EVENT, STATE OR PRESENCE | Y AXIS | | RELAY, COMPUTE, CONVERT | |
| Z | POSITION, DIMENSION | Z AXIS | | DRIVER, ACTUATOR, UNCLASSIFIED | |

## GENERAL NOTES:

1. ABBREVIATIONS ARE IN ACCORDANCE WITH ASME Y1.1-1989.
2. FIRST LETTER "A" (ANALYSIS) IS DEFINED OUTSIDE A TAGGING BUBBLE.
3. SUCCEEDING LETTER "Y" IS DEFINED OUTSIDE A TAGGING BUBBLE, UNLESS THE FUNCTION IS SELF-EVIDENT, I.E.: SOLENOID VALVE.
4. THE TERMS "HIGH" AND "LOW", WHEN APPLIED TO POSITIONS OF VALVES ARE DEFINED AS FOLLOWS:
   - "HIGH" DENOTES THAT THE VALVE IS IN THE FULLY OPEN POSITION
   - "LOW" DENOTES THAT THE VALVE IS IN THE FULLY CLOSED POSITION.
5. INSTRUMENTATION LEGEND AND SYMBOLS ARE GENERALLY IN ACCORDANCE WITH ANSI/ISA S5.1-1984 AND S5.3-1983.
6. SEE CONSTRUCTION DRAWINGS, SPECIFICATIONS AND HNF-6120 FOR IDENTIFICATION OF SPECIFIC SYSTEM, STRUCTURE OR COMPONENT SAFETY CLASSIFICATION.
7. THE SET-POINTS OF PRESSURE REGULATING VALVES (PRV) FOR REGULATING THE GLOVEBOX PRESSURE (VACUUM) ARE NOMINAL VALUES (APPROXIMATELY MIDRANGE BETWEEN FULL OPEN AND FULL CLOSE).
8. ALL INDICATORS AND TRANSMITTERS (FIs, FTs, DPIs AND DPITs) THAT MEASURES PRESSURE DIFFERENTIAL FROM TWO DIFFERENT SOURCES ARE EQUIPPED WITH A 3-VALVE MANIFOLD TO ISOLATE THE INSTRUMENTS FROM THE PROCESS FOR IN-PLACE CALIBRATION AND MAINTENANCE OF THE INSTRUMENTS WITHOUT SHUTTING DOWN THE PROCESS. SEE THE DETAILED DRAWINGS FOR IDENTIFICATIONS OF VALVES.
9. A VALVE THAT IS DESIGNATED AS A SAFETY RELIEF VALVE (SRV) IS INTENDED TO PROTECT AGAINST EMERGENCY PRESSURE CONDITIONS THAT ARE HAZARDOUS TO PERSONNEL AND/OR EQUIPMENT.
10. THE TERM "EMERGENCY EXHAUST" SHOWN ON SHEETS 3, 5, 6 AND 8 ARE CONSTRUED TO MEAN "MAKE-UP EXHAUST" IN CASE THE "NORMAL EXHAUST" COULD NOT MAINTAIN THE DESIRED GLOVEBOX PRESSURE (VACUUM). THE PRESSURE OF THE GLOVEBOXES 642A, 642C AND 642E ARE MAINTAINED AS DESCRIBED IN THE SYSTEM DESCRIPTION ON SHEET 2. HOWEVER, IF THE PRESSURE (VACUUM) DECREASES, IN ANY ONE OF THE GLOVEBOXES, TO -0.5" WG, VALVES PRV-101, PRV-300 OR PRV-501 STARTS OPENING TO "MAKE-UP" THE PRESSURE OF THE RESPECTIVE GLOVEBOX UNTIL THE DESIRED PRESSURE IS ACHIEVED, AND THEN CLOSES.
11. FOR FURNACE TEMPERATURE CONTROLS, AND NITROGEN AND DRY AIR PURGE CONTROLS, SEE DRAWING H-2-829400 SH 6, 7 & 8.
12. INITIALLY THE OPERATING FILTER PLENUM WILL BE USED AND THE STANDBY FILTER WILL BECOME OPERATING FILTER WHEN THE INITIAL FILTER IS SWITCHED TO STANDBY.
13. INITIALLY THE OPERATING EXHAUST AIR FAN WILL BE USED AND THE STANDBY EXHAUST AIR FAN WILL BECOME OPERATING EXHAUST AIR FAN WHEN THE INITIAL EXHAUST AIR FAN IS SWITCHED TO STANDBY.
14. SUFFIX ALL EQUIPMENT, INSTRUMENT AND VALVE TAGGINGS WITH "-258A". FOR EXAMPLE: DPI-101 BECOMES DPIT-101-258A.
15. EQUIPMENT COMPONENT IDENTIFIER NUMBERS SHOULD BE IN ACCORDANCE WITH SD-CP-RD 024.
16. USE PORTABLE ANEMOMETER TO ADJUST THE DAMPER D-700 FOR A FLOW OF 35 SCFM.

## HOLD TABLE

| HOLD NO. | DESCRIPTION | EXPECTED RLSE DATE |
|---|---|---|
| P-2 | PENDING W-460-PSAR RESOLUTION | 9/30/00 |
| HVAC-1 | SUPPLEMENTAL COOLING REQUIREMENTS DUE TO HEAT LOADS OFF FURNACES | 9/30/00 |
| HVAC-5 | STABILIZATION FURNACES EXHAUST FLOW REQUIREMENTS | 9/30/00 |

FLUOR FEDERAL SERVICES

STATE OF WASHINGTON — CHOUDHURY — 30112 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 10-22-00

| DWG NO | TITLE |
|---|---|
| H-2-829350 | DRAWING JS WORK PACKAGE #2 |

DRAWING TRACEABILITY LIST

| REF NUMBER | TITLE | NEXT USED ON |
|---|---|---|
| | REFERENCES | |

| REV | DESCRIPTION |
|---|---|
| 0 | APPROVED FOR CONSTRUCTION |

REVISIONS

NAME: SP Fox

PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

HVAC/CONTROL SYSTEMS
AIRFLOW & CONTROL DIAG
NOTES AND LEGENDS

F | 2738-ZU | 7204 | H-2-829443 | 0

SCALE: NONE | SHEET 1 OF 9

# SYSTEM DESCRIPTION

## ZONE PRESSURE CONTROL

AIRFLOW TO PROCESS ROOM 642 AND THE GLOVEBOXES (6) ARE ACHIEVED BY VENTILATION CONTROL (PRESSURE DIFFERENTIAL), BY DIRECTING AIR FROM THE LESS CONTAMINATED AREAS TOWARD AREAS OF HIGHER CONTAMINATION, THEN TO THE HIGH-EFFICIENCY PARTICULATE AIR (HEPA) FILTERS, BACK DRAFT DAMPERS AND EXHAUST STACK.

| ZONE | REFERENCE POINT | PRESSURE |
|---|---|---|
| I | GLOVEBOXES | -0.30" TO -0.80" WG (BAGOUT/AIRLOCK)<br>-0.80 TO -1.7" WG (MAX) |
| IIB | ROOM 642 | -0.20" TO -0.30" WG |

ZONE I

BAGOUT GLOVEBOXES 642A AND 642F DOORS ARE ADMINISTRATIVELY CONTROLLED. EITHER DIFFERENTIAL PRESSURE SWITCH DPISL-100 OR DPISL-600 AT <0.1" WG OPENS EXHAUST DAMPER PDV-100 AND PARTIALLY CLOSES DAMPER PDV-200 ALLOWING AIRFLOW THROUGH THE RESPECTIVE DOOR. EXHAUST DAMPER PDV-100 IS INTERLOCKED WITH FURNACE HOOD EXHAUST DAMPER PDV-200. WHEN EXHAUST DAMPER PDV-100 IS CLOSED, EXHAUST DAMPER PDV-200 OPENS TO A PRESET MAXIMUM OPENED POSITION. AND WHEN EXHAUST DAMPER PDV-100 IS OPENED, EXHAUST DAMPER PDV-200 CLOSES TO A PRESET MINIMUM CLOSED POSITION, VIA MECHANICAL STOPS, TO MAINTAIN THE EXHAUST FLOW BETWEEN 1015 TO 1135 SCFM.

FOUR GLOVEBOXES ARE BLANKETED WITH INERT GAS (NITROGEN) AND ARE CONTROLLED BY THE NITROGEN GAS SUPPLY PRESSURE REGULATING VALVES PRV-100, PRV-200, PRV-500, PRV-600. THESE GAS SUPPLY VALVES MAINTAIN AND BLANKET THE FOLLOWING GLOVEBOXES WITH NITROGEN GAS WITHIN THE FOLLOWING PRESSURES (VACUUM) RANGES:

| GLOVEBOX | PRESSURE RANGE |
|---|---|
| 642A BAGOUT | - 0.3" TO - 0.8" WG |
| 642A MAT'L PREP. | - 1.2" TO - 1.7" WG |
| 642B, 642C & 642D | - 1.2" TO - 1.7" WG |
| 642E | - 0.8" TO - 1.3" WG |
| 642F | - 0.3" TO - 0.8" WG |

NITROGEN GAS FLOW TO THE LOI GLOVEBOX (4) IS CONTROLLED BY A MANUAL VALVE BFD-400, AND INDICATED LOCALLY AT FLOW INDICATOR FI-400.

THE GLOVEBOXES ARE MONITORED BY OXYGEN SENSORS FOR LOSS OF INERT GAS. ELECTRICAL POWER INTO THE GLOVEBOXES ARE INTERLOCKED TO SHUT OFF AT 4% OXYGEN LEVEL (HIGH OXYGEN LEVEL / LOSS OF INERT GAS), AFTER 5 MINUTES TIME DELAY.

THE FOUR GLOVEBOX PRESSURES WITH RESPECT TO ROOM PRESSURE, ARE INDICATED LOCALLY ON DPISL-100, DPI-200, DPI-500, AND DPISL-600. GLOVEBOXES 642A THRU 642E PRESSURE ARE REMOTELY MONITORED AND ALARMED ON THE HMI SCREEN IN THE SPE CONTROL ROOM AND ON THE MICON SYSTEM.

GLOVEBOXES 642A, 642C & 642E ARE PROVIDED WITH EMERGENCY EXHAUST (MAKEUP) VALVES THAT OPEN WHEN THE GLOVEBOX PRESSURE (VACUUM) DECREASES TO <-0.5" WC.

WHEN BOTH OF THE EXHAUST FANS ARE STOPPED OR WHEN ROOM 642 EXHAUST FILTER HEP-13 IS BEING REPLACED, INTERLOCK FOR LOW-LOW EXHAUST FLOW WITH A SETPOINT OF LESS THAN 250 SCFM IS PROVIDED AT THE EXHAUST FLOW PANEL EP-1-25BA TO AUTOMATICALLY SHUTOFF THE NITROGEN SUPPLY TO GLOVEBOXES AND THUS, MAINTAIN PLUTONIUM CONFINEMENT.

GLOVEBOXES 642A (BAGOUT), 642A (MAT'L PREP), 642E & 642F ARE PROVIDED WITH VACUUM SAFETY RELIEF VALVES SRV-100, SRV-101, SRV-500, AND SRV-600 THAT OPEN AT THE MAXIMUM NEGATIVE PRESSURE OF -3.5 WC. THE VACUUM SAFETY RELIEF VALVES HAVE BYPASS VALVES THAT CAN BE MANUALLY OPENED. THE BYPASS WILL PROVIDE ROOM AIR TO THE GLOVEBOXES WHEN THE NITROGEN GAS SYSTEM IS NO LONGER REQUIRED. DURING SHUTDOWN/MAINTENANCE THE BYPASS VALVES ARE MONITORED WITH A LIMIT SWITCH, WHICH INDICATES THE VALVE POSITION ON THE HMI SCREEN.

ZONE IIB (ROOM 642)

THE SUPPLY AIR TO ROOM 642 IS CONTROLLED BY A MODULATING DAMPER PDV-900. FV-1000 IS HARD WIRED DIRECTLY TO THE EXHAUST FLOW SWITCHES FIT-1000A/FSL-1000A AND FIT-1000B/FSL-1000B WHICH MONITORS THE AIR FLOW IN THE PROCESS EXHAUST LINE. FV-1000 OPENS WHEN THERE IS A NORMAL EXHAUST FLOW IN THE EXHAUST LINE AND THE SUPPLY AIR IS MADE AVAILABLE TO ROOM 642. FV-1000 CLOSES, AND THE SUPPLY AIR TO ROOM 642 IS TERMINATED WHEN THERE IS A LOW-LOW FLOW IN THE EXHAUST LINE. THE MODULATING DAMPER PDV-900 IS CONTROLLED BY THE ROOM PRESSURE DIFFERENTIAL TRANSMITTER, DPIT-900, LOCATED IN ROOM 642. THIS DPIT-900 SENDS AN ANALOG SIGNAL TO THE LOCAL DPIC-900 (IN ROOM 602), AND TO THE MICON SYSTEM OUTPUT. ROOM 642 PRESSURE DIFFERENTIAL RELATIVE TO ATMOSPHERE IS MAINTAINED BETWEEN -0.20" WC AND -0.30" WC.

ZONE III

THE SUPPLY AIR TO ROOM 641 IS CONTROLLED BY A MODULATING DAMPER PDV-901. THIS MODULATING DAMPER PDV-901 IS CONTROLLED BY AN EXISTING CONTROLLER DPC-2 THAT MAINTAINS ROOM PRESSURE DIFFERENTIAL RELATIVE TO ATMOSPHERE. SEE DRAWING H-2-80167 SH 1 FOR SYSTEM DESCRIPTION OF DPC-2.

## PROCESS AREA EXHAUST SYSTEM CONTROL

THE PROCESS AREA EXHAUST SYSTEM CONSISTS OF TWO BANKS OF HEPA FILTER TRAINS AND TWO REDUNDANT VARIABLE SPEED EXHAUST FANS EF-1 AND EF-2 WITH THEIR RESPECTIVE DISCHARGE DAMPERS HV-1110 AND HV-1210.

INITIALLY, THE SPEED OF FAN EF-1 OR EF-2 IS GRADUALLY INCREASED BY A PREDETERMINED RAMP UP TIME, TO OBTAIN THE DESIRED PRESSURE IN THE EXHAUST DUCT AND GLOVEBOXES. THE OPERATOR AT THE MICON STATION, OR LOCALLY AT THE VARIABLE FREQUENCY DRIVE CAN CONTROL THE SPEED OF THE FAN. PLENUM PRESSURE DIFFERENTIAL IS SENSED BY THE DPIT-1000 WHICH SENDS AN ANALOG SIGNAL TO THE LOCAL DPIC-1101 (LOCATED IN ROOM 602), AND TO THE MICON. NORMALLY, THE MICON PDIC-EXH CONTROLS THE FAN SPEED TO MAINTAIN THE CONSTANT PLENUM PRESSURE OF -6.0" WG. IN CASE OF TROUBLE IN THE MICON SYSTEM, THE LOCAL DPIC-1101 WILL MAINTAIN THE CONSTANT PLENUM PRESSURE. WHEN THE OPERATING FAN TRIPS OR THE DISCHARGE DAMPER FAILS TO OPEN, THE STANDBY FAN WILL AUTOMATICALLY START INSTANTANEOUSLY (WITHOUT ANY RAMP UP TIME) AND CLOSE THE FAILED OPERATING FAN DISCHARGE DAMPER. IN CASE THAT THE OPERATING FAN FAILS, AND THE STANDBY FAN FAILS TO OPERATE, BOTH DISCHARGE DAMPERS HV-1110 AND HV-1210 GOES TO FAIL OPEN POSITION. AN INTERLOCK IS PROVIDED VIA LOW-LOW EXHAUST FLOW SENSOR FE-1000 TO SHUT OFF THE NITROGEN GAS SUPPLY VALVE FV-1001.

THE HEPA FILTER EXHAUST TRAINS ARE ADMINISTRATIVELY CONTROLLED, AND MANUALLY SWITCHED FROM THE ACTIVE EXHAUST TRAIN TO THE STANDBY FOR HEPA FILTER REPLACEMENT OR MAINTENANCE.

## INSTRUMENTATION IDENTIFICATION

DPIT - 1 00 - 25BA

- 25BA — SYSTEM DESIGNATOR (SEE NOTE 14)
- 00 — SEQUENTIAL IDENTIFICATION NUMBER
- 1 — COMPONENT/EQUIPMENT (SEE TABLE)
- DPIT — INSTRUMENT IDENTIFICATION (SEE SHEET 1)

### COMPONENT/EQUIPMENT NO TABLE

| NUMBER | DESCRIPTION |
|---|---|
| 1 | GLOVEBOX GB 642A |
| 2 | GLOVEBOX GB-642B |
| 3 | GLOVEBOX GB-642C |
| 4 | GLOVEBOX GB-642D |
| 5 | GLOVEBOX GB-642E |
| 6 | GLOVEBOX GB-642F |
| 7 | BTS WELD ENCLOSURE |
| 8 | INNER CAN LEAK CHECK |
| 9 | ROOM 641 & 642 |
| 10 | HOOD FILTER & FILTER PLENUM |
| 11 | EXHAUST FAN EF-1 |
| 12 | EXHAUST FAN EF-2 |

# IDENTIFICATIONS

## EQUIPMENT IDENTIFICATION

HEP - 1234 - 25BA

- 25BA — SYSTEM DESIGNATOR (SEE NOTE 14)
- 1234 — SEQUENTIAL IDENTIFICATION NUMBER
- HEP — COMPONENT/EQUIPMENT TYPE (SEE TABLE)

### COMPONENT/EQUIPMENT TYPE TABLE

| SYMBOL | DESCRIPTION |
|---|---|
| EF | EXHAUST FAN |
| GB | GLOVEBOX |
| HEP | HEPA FILTER |

## LINE IDENTIFICATION

1" IA - 700 - M7

- M7 — MATERIAL CODE (SEE TABLE)
- 700 — LINE IDENTIFICATION NUMBER
- IA — SYSTEM DESIGNATOR (SEE TABLE)
- 1" — LINE SIZE

### SYSTEM DESIGNATOR TABLE

| SYMBOL | DESCRIPTION |
|---|---|
| DR | DRAIN |
| EXH | EXHAUST |
| I | INSTRUMENT SENSING LINE |
| IA | INSTRUMENT AIR |
| $N_2$ | NITROGEN GAS |
| VI | VENTILATION |

### LINE IDENTIFICATION NUMBER TABLE

| NUMBER | DESCRIPTION |
|---|---|
| 100-199 | UNUSED |
| 200-299 | UNUSED |
| 300-399 | UNUSED |
| 400-499 | UNUSED |
| 500-599 | UNUSED |
| 600-699 | NITROGEN GAS ($N_2$) |
| 700-799 | INSTRUMENT AIR (IA) |
| 800-899 | UNUSED |
| 900-999 | UNUSED |
| 1000-1099 | UNUSED |

### MATERIAL CODE TABLE

| PIPE CODE | DESCRIPTION |
|---|---|
| 131 | 316 SS TUBING, INSTRUMENT |
| 133 | COPPER TUBING, INSTRUMENT |
| M7 | CARBON STEEL PIPE |
| M9 | STAINLESS STEEL PIPE |

# INTERLOCK SCHEDULE

| INTERLOCK | EVENT | ACTION | REF DWG/SH NO |
|---|---|---|---|
| I/1 | BAGOUT GLOVEBOX 642A OR 642F DIFFERENTIAL PRESSURE DECREASES TO <-0.1" WG | OPEN BAGOUT EXHAUST DAMPER PDV-100 & PARTIALLY CLOSE FURNACE HOOD EXHAUST DAMPER PDV-200. | H-2-829443 SH 3, 4 & 6 |
| I/2 | HIGH OXYGEN (LOSS OF NITROGEN) IN GLOVE BOXES 642A, 642C OR 642E | SHUT OFF ELECTRICAL POWER TO GLOVEBOXES IN ROOM 642. AFTER 5 MINUTES TIME DELAY. | H-2-829443 SH 3, 5 & 6<br>H-2-829467 SH 1 |
| I/3 (SS) | LOW-LOW EXHAUST FLOW (SS)<br>(FLOW LESS THAN 250 SCFM) | CLOSE BUBBLE TIGHT DAMPER FV-1000 (SS) AND CLOSE NITROGEN SUPPLY VALVE FV-1001 (SS) | H-2-829443 SH 3, 7 & 8<br>H-2-829487 SH 5 |
| I/4 | HS-1110 IS IN AUTO POSITION, HS-LL5 IS IN EF-1 POSITION, AND HS-EF1 IS IN RUN POSITION<br>- OR -<br>EF-2 SHUTS DOWN | START PRIMARY EXHAUST FAN EF-1, OPEN DAMPER HV-1110, SHUT DOWN EXHAUST FAN EF-2, AND CLOSE DAMPER HV-1210 | H-2-829443 SH 9 |
| I/5 | HS-1210 IS IN AUTO POSITION, HS-LL5 IS IN EF-2 POSITION, AND HS-EF2 IS IN RUN POSITION<br>- OR -<br>EF-1 SHUTS DOWN | START STANDBY EXHAUST FAN EF-2, OPEN DAMPER HV-1210, SHUT DOWN EXHAUST FAN EF-1, AND CLOSE DAMPER HV-1110 | H-2-829443 SH 9 |
| I/6 | HS-EXH IN MICON POSITION<br><br>HS-EXH IN LOCAL POSITION<br>- OR -<br>LOSS OF MICON POWER | MICON CONTROLLER PDIC-EXH ENABLED, AND LOCAL CONTROLLER DPIC-1101 DISABLED<br><br>MICON CONTROLLER PDIC-EXH DISABLED, AND LOCAL CONTROLLER DPIC-1101 ENABLED | H-2-829443 SH 9 |
| I/7 | HS-642 IN MICON POSITION<br><br>HS-642 IN LOCAL POSITION<br>- OR -<br>LOSS OF MICON POWER | MICON CONTROLLER PDIC-642 ENABLED, AND LOCAL CONTROLLER DPIC-900 DISABLED<br><br>MICON CONTROLLER PDIC-642 DISABLED, AND LOCAL CONTROLLER DPIC-900 ENABLED | H-2-829443 SH 7 |
| I/8 | ROOM 642 FIRE/SECURITY ALARM | CLOSE ROOM FILTER EXHAUST ISOLATION VALVE AV-200<br>CLOSE CONTROL DAMPER PDV-900 | H-2-829443 SH 7 |

## OFF-PAGE CONNECTOR IDENTIFICATION

DESCRIPTION
DRAWING NO & SH NO
COORDINATE

NOTE:

1. FOR GENERAL NOTES AND LEGENDS, SEE SHEET 1.

H.K. CHOUDHRY — STATE OF WASHINGTON — 30612 — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 10-22-00

FLUOR FEDERAL SERVICES

| DWG NO | TITLE |
|---|---|
| | DRAWING TRACEABILITY LIST |

| REF NUMBER | TITLE |
|---|---|
| H-2-82935C | DRAWING LIST WORK PACKAGE 2 |
| NEXT USED ON | REFERENCES |

REVISIONS: 0 — APPROVED FOR CONSTRUCTION

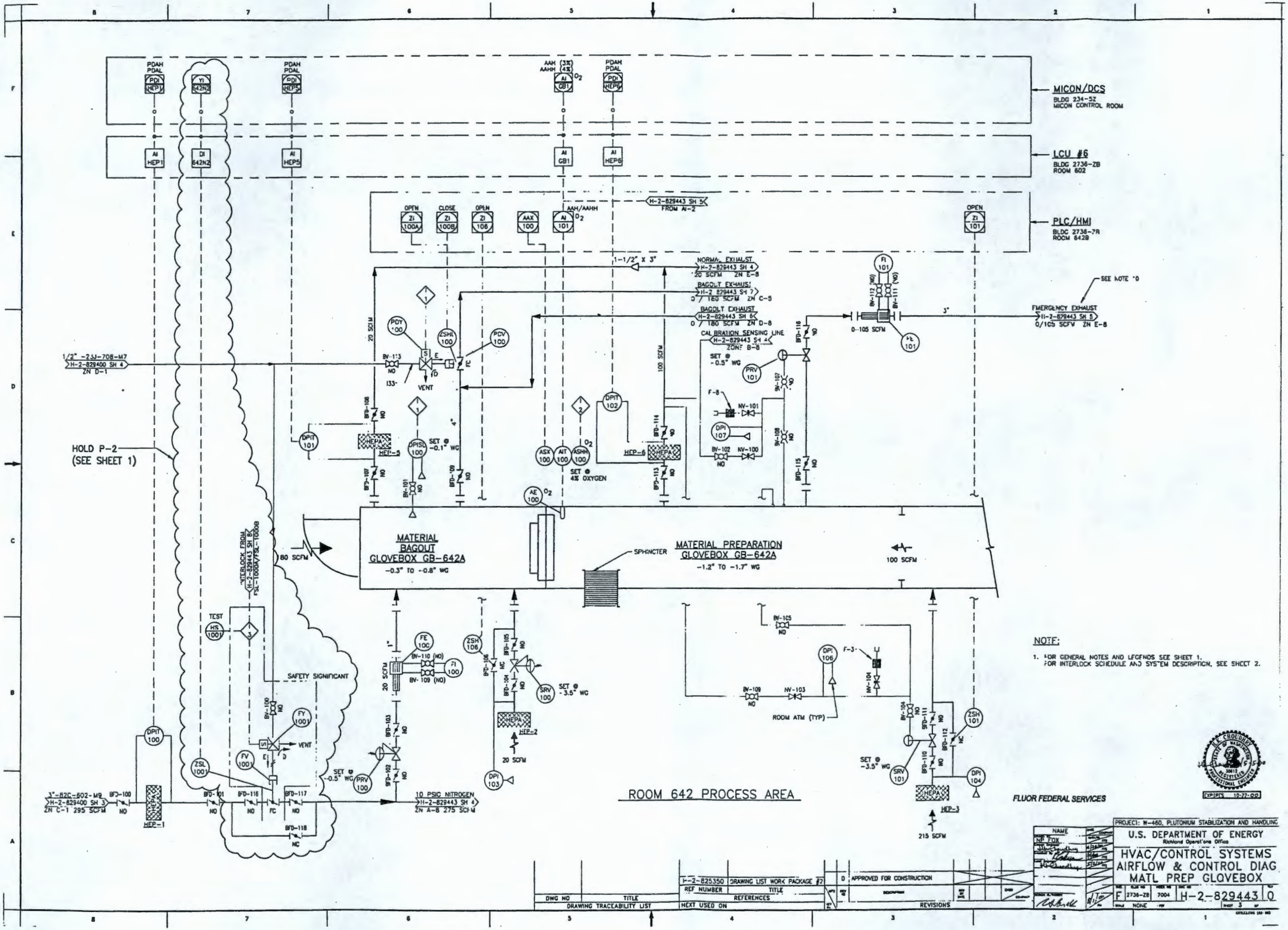
NAME: NP FOX

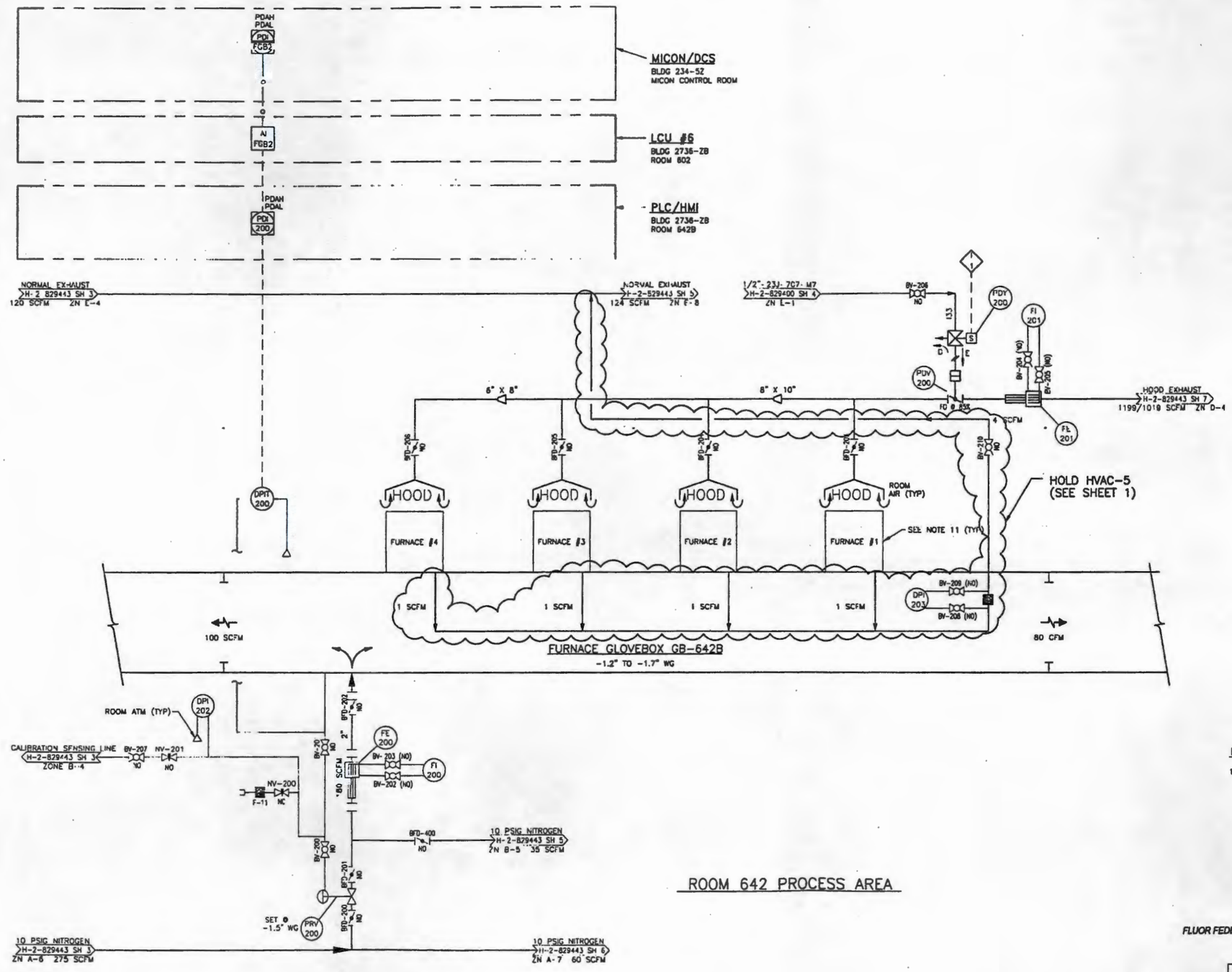
PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

HVAC/CONTROL SYSTEMS AIRFLOW & CONTROL DIAG INTERLOCKS & SYS DESC

SIZE F — 2736-ZB — 7004 — DWG NO H-2-829443 — REV 0
SCALE NONE — SHEET 2


MICON/DCS
BLDG 234-5Z
MICON CONTROL ROOM
LCU #6
BLDG 2736-ZB
ROOM 602
PLC/HMI
BLDG 2736-ZB
ROOM 642B
MATERIAL BAGOUT GLOVEBOX GB-642A
-0.3" TO -0.8" WG
MATERIAL PREPARATION GLOVEBOX GB-642A
-1.2" TO -1.7" WG
SPHINCTER
ROOM 642 PROCESS AREA
HOLD P-2
(SEE SHEET 1)
NORMAL EXHAUST
BAGOUT EXHAUST
CALIBRATION SENSING LINE
EMERGENCY EXHAUST
SEE NOTE 10
SAFETY SIGNIFICANT
10 PSIG NITROGEN
ROOM ATM (TYP)
NOTE:
1. FOR GENERAL NOTES AND LEGENDS SEE SHEET 1.
FOR INTERLOCK SCHEDULE AND SYSTEM DESCRIPTION, SEE SHEET 2.
FLUOR FEDERAL SERVICES
PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING
U.S. DEPARTMENT OF ENERGY
Richland Operations Office
HVAC/CONTROL SYSTEMS
AIRFLOW & CONTROL DIAG
MATL PREP GLOVEBOX
H-2-829443
DRAWING TRACEABILITY LIST
APPROVED FOR CONSTRUCTION
REVISIONS




ROOM 642 PROCESS AREA

NOTE:

1. FOR GENERAL NOTES AND LEGENDS, SEE SHEET 1.
   FOR INTERLOCK SCHEDULE AND SYSTEM DESCRIPTION, SEE SHEET 2.

FLUOR FEDERAL SERVICES

| DWG NO | TITLE | REF NUMBER | TITLE |
|---|---|---|---|
| DRAWING TRACEABILITY LIST | | NEXT USED ON | REFERENCES |
| H-2-829350 | DRAWING LIST WORK PACKAGE #2 | | |

| REV | DESCRIPTION |
|---|---|
| 0 | APPROVED FOR CONSTRUCTION |

REVISIONS

NAME: NP FOX

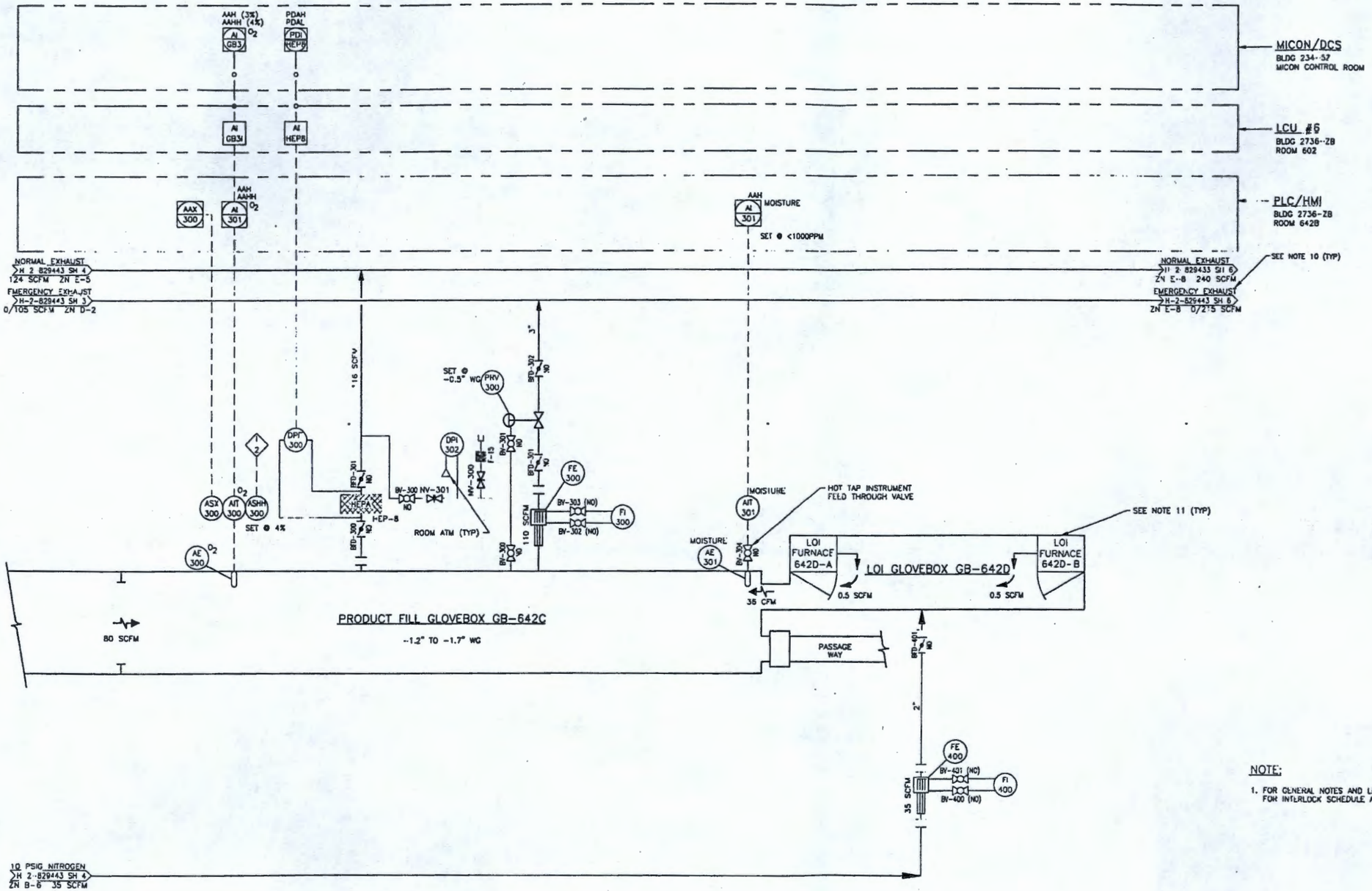
PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

HVAC/CONTROL SYSTEMS
AIRFLOW & CONTROL DIAG
FURNACE GLOVEBOX

F | 2736-ZB | 7004 | H-2-829443 | 0

SCALE NONE




NOTE:

1. FOR GENERAL NOTES AND LEGENDS, SEE SHEET 1.
   FOR INTERLOCK SCHEDULE AND SYSTEM DESCRIPTION, SEE SHEET 2.

ROOM 642 PROCESS AREA

FLUOR FEDERAL SERVICES

EXPIRES 10-22-00

| DWG NO | TITLE |
|---|---|
| DRAWING TRACEABILITY LIST | |

| REF NUMBER | TITLE |
|---|---|
| H-2-829350 | DRAWING LIST WORK PKG #2 |
| NEXT USED ON | REFERENCES |

| REV NO | DESCRIPTION |
|---|---|
| 0 | APPROVED FOR CONSTRUCTION |
| REVISIONS | |

| NAME |
|---|
| NP FOX |

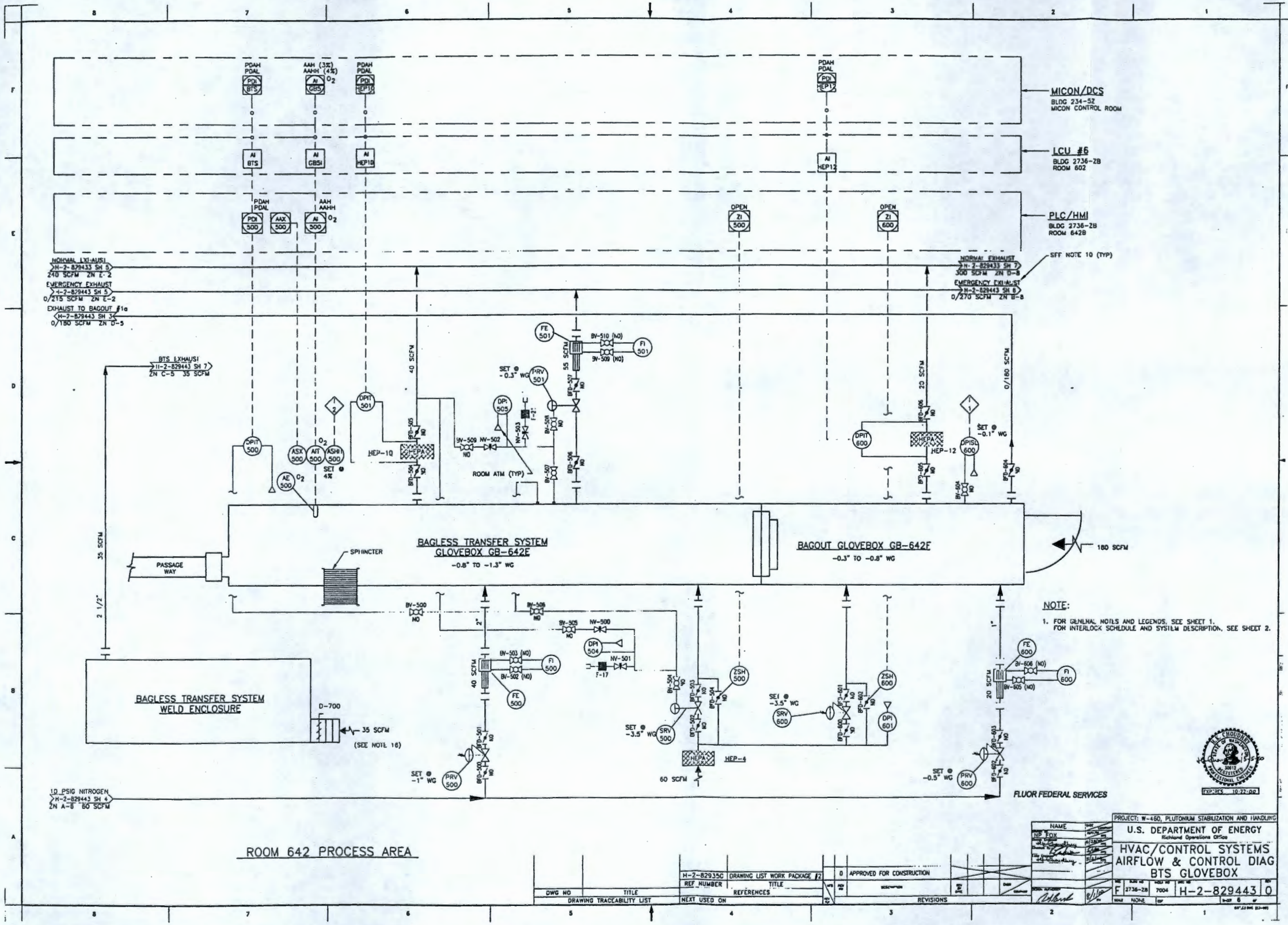
PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

HVAC/CONTROL SYSTEMS
AIRFLOW & CONTROL DIAG
PROD FILL GLOVEBOX

| SIZE | FLOR NO | SHEET NO | DWG NO | REV |
|---|---|---|---|---|
| F | 2736-ZB | 7004 | H-2-829443 | 0 |

SCALE NONE SHEET 5 OF


MICON/DCS
BLDG 234-5Z
MICON CONTROL ROOM
LCU #6
BLDG 2736-ZB
ROOM 602
PLC/HMI
BLDG 2736-ZB
ROOM 642B
SEE NOTE 10 (TYP)
NORMAL EXHAUST
H-2-829433 SH 5
240 SCFM ZN L-2
EMERGENCY EXHAUST
H-2-829443 SH 5
0/215 SCFM ZN E-2
EXHAUST TO BAGOUT #1a
H-7-829443 SH 3
0/180 SCFM ZN D-5
NORMAL EXHAUST
H-2-829433 SH 7
300 SCFM ZN D-8
EMERGENCY EXHAUST
H-2-829443 SH 8
0/270 SCFM ZN B-8
BTS EXHAUST
H-2-829443 SH 7
ZN C-5 35 SCFM
HEP-10
HEP-12
ROOM ATM (TYP)
BAGLESS TRANSFER SYSTEM
GLOVEBOX GB-642E
-0.8" TO -1.3" WG
BAGOUT GLOVEBOX GB-642F
-0.3" TO -0.8" WG
SPHINCTER
PASSAGE WAY
180 SCFM
BAGLESS TRANSFER SYSTEM
WELD ENCLOSURE
D-700
35 SCFM
(SEE NOTE 16)
HEP-4
60 SCFM
10 PSIG NITROGEN
H-2-829443 SH 4
ZN A-6 60 SCFM
NOTE:
1. FOR GENERAL NOTES AND LEGENDS, SEE SHEET 1.
FOR INTERLOCK SCHEDULE AND SYSTEM DESCRIPTION, SEE SHEET 2.
FLUOR FEDERAL SERVICES
EXP: 3/15 10-22-00
ROOM 642 PROCESS AREA
DRAWING TRACEABILITY LIST
DWG NO
TITLE
H-2-829350
DRAWING LIST WORK PACKAGE
REF NUMBER
TITLE
REFERENCES
NEXT USED ON
REVISIONS
0 APPROVED FOR CONSTRUCTION
NAME
NP FOX
PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING
U.S. DEPARTMENT OF ENERGY
Richland Operations Office
HVAC/CONTROL SYSTEMS
AIRFLOW & CONTROL DIAG
BTS GLOVEBOX
F
2736-ZB
7004
H-2-829443
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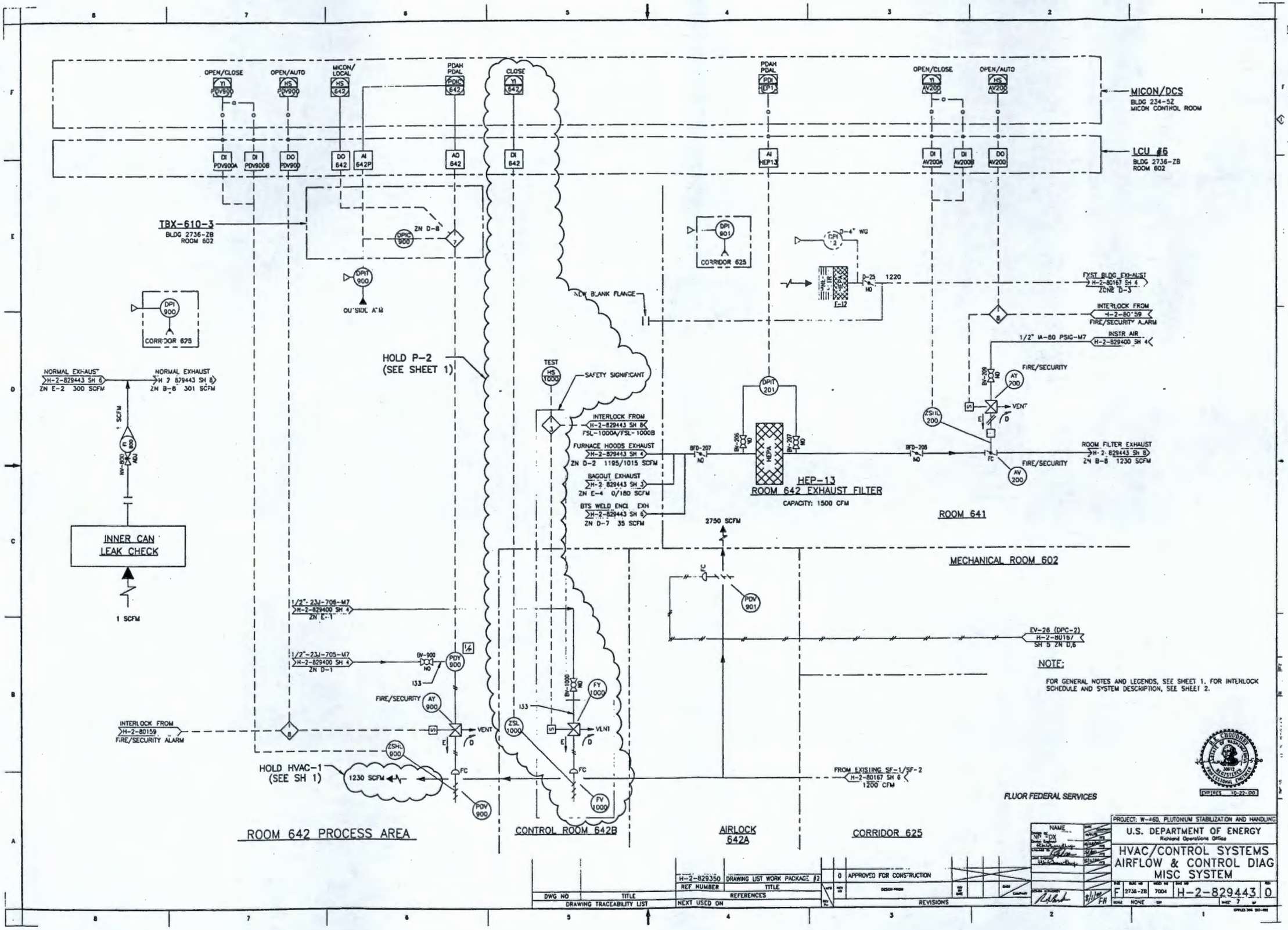
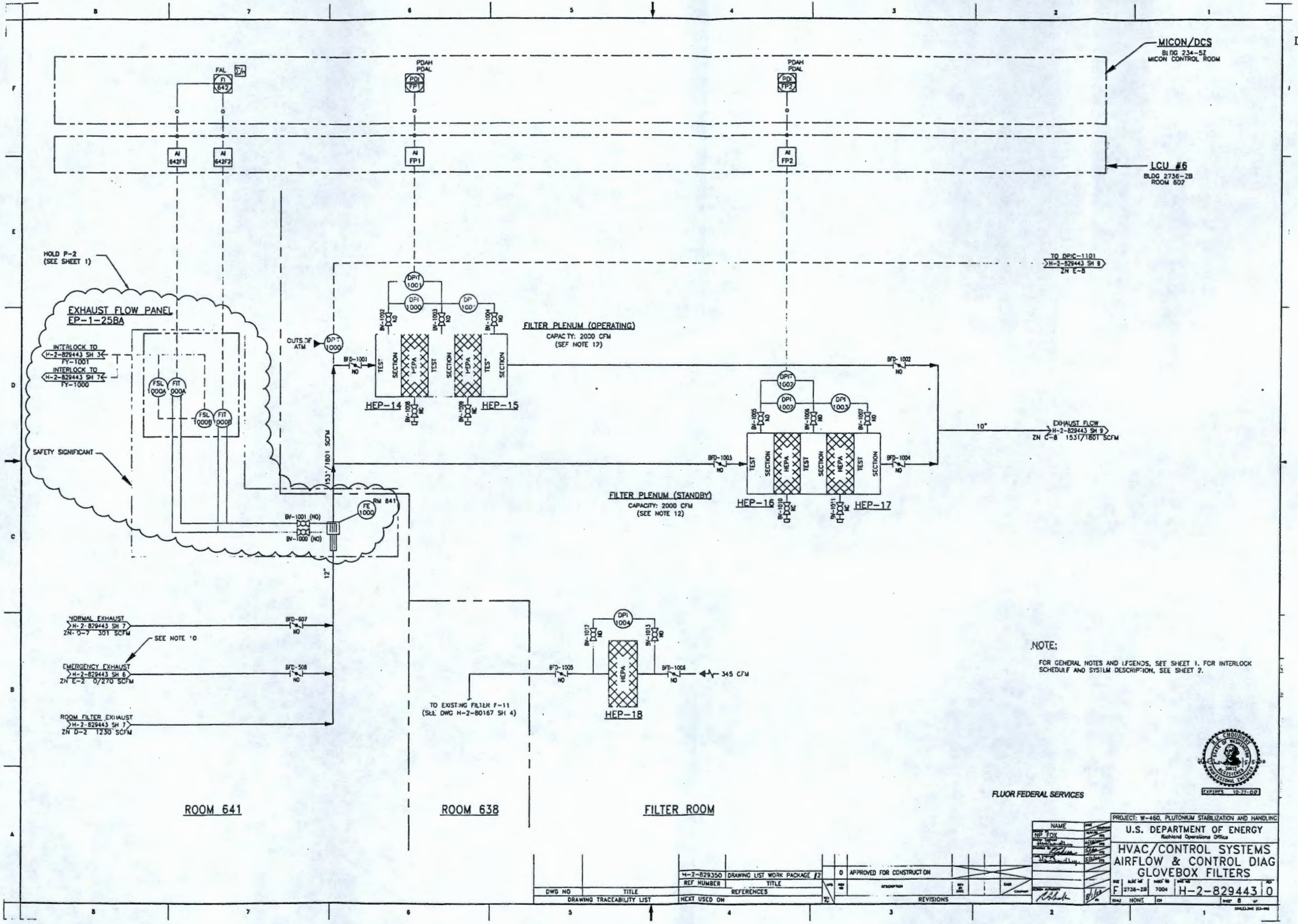
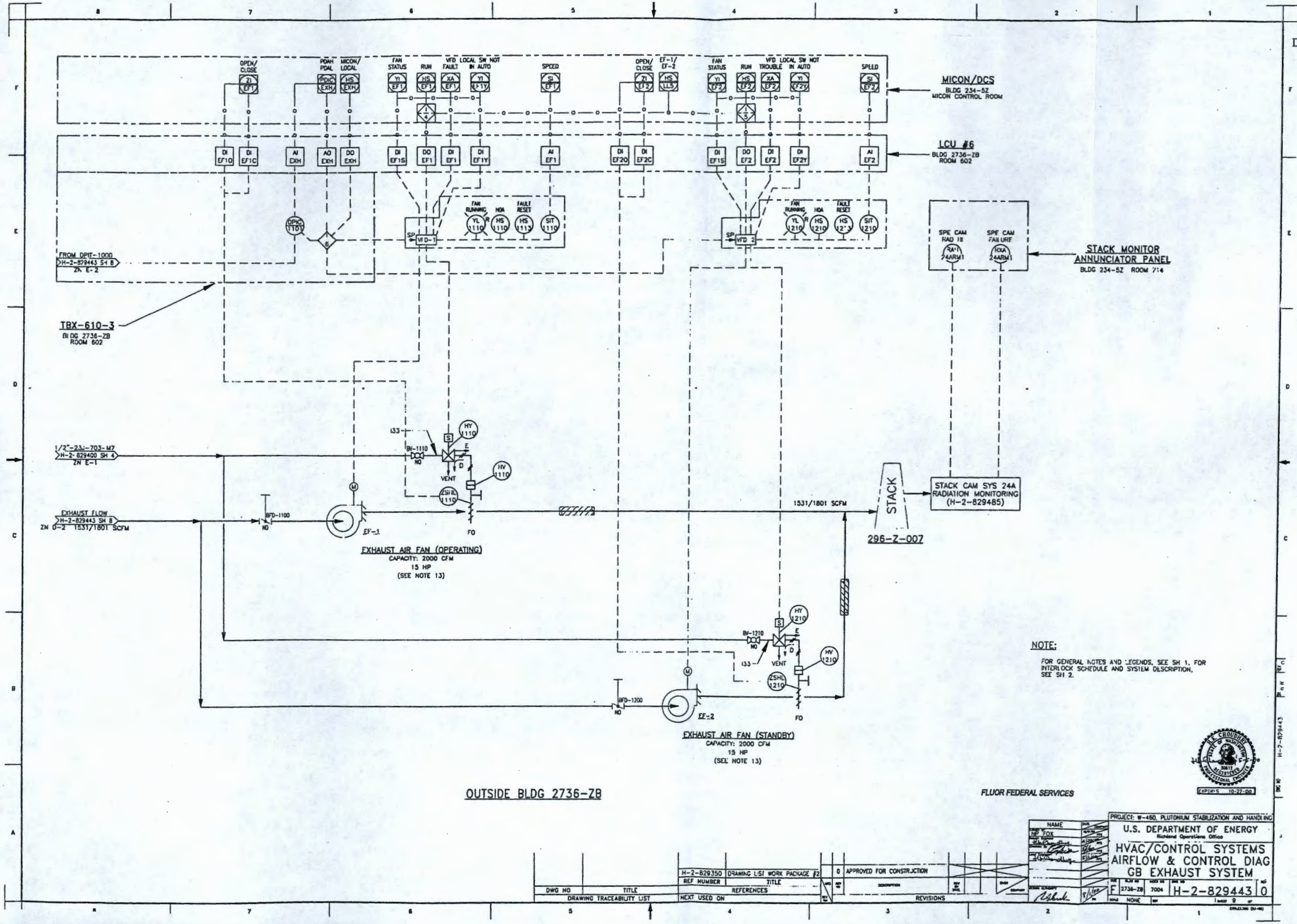
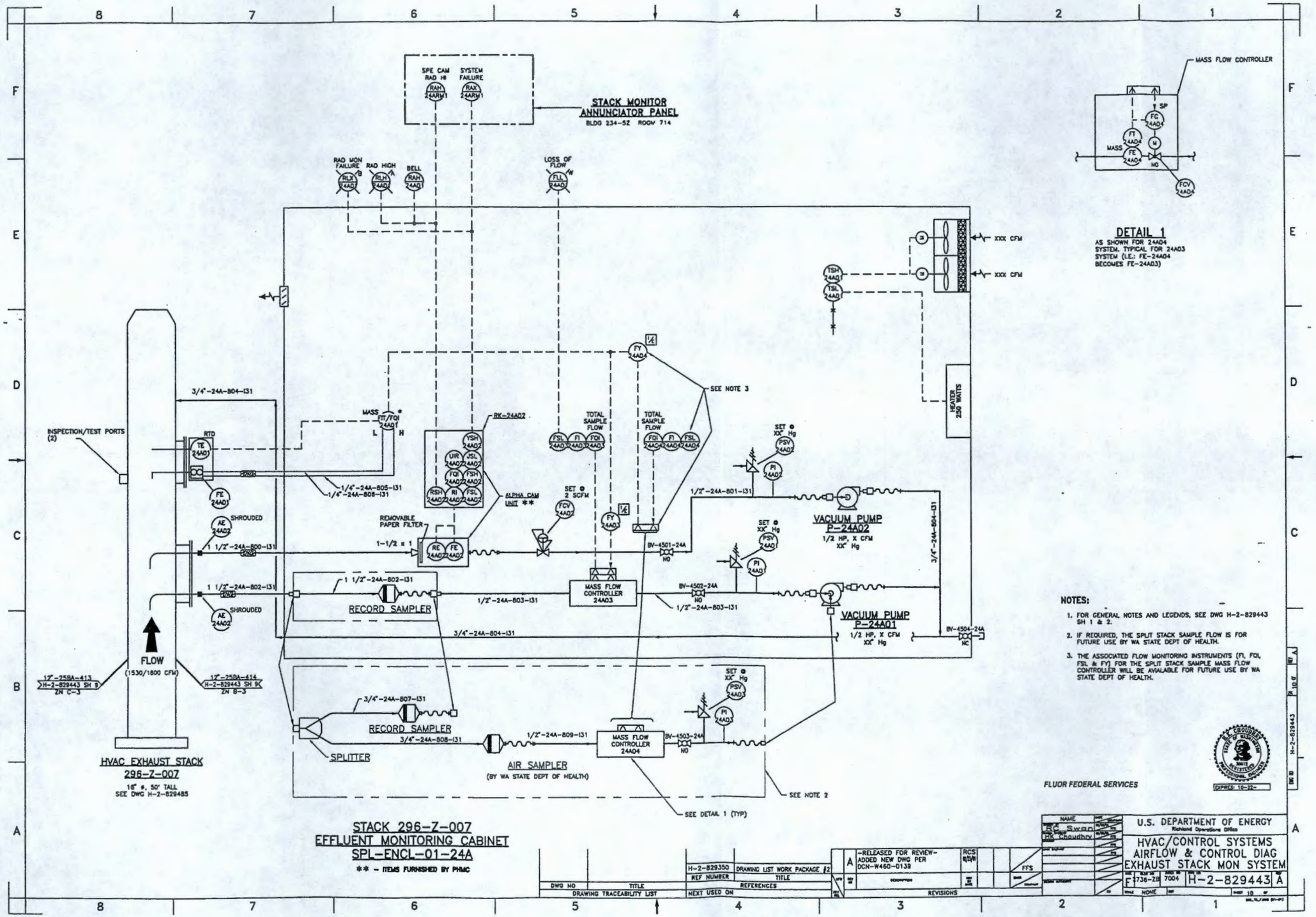

MICON/DCS
BLDG 234-5Z
MICON CONTROL ROOM
LCU #6
BLDG 2736-ZB
ROOM 602
TBX-610-3
BLDG 2736-ZB
ROOM 602
CORRIDOR 625
HOLD P-2
(SEE SHEET 1)
NEW BLANK FLANGE
SAFETY SIGNIFICANT
INTERLOCK FROM
H-2-829443 SH 8
FSL-1000A/FSL-1000B
FURNACE HOODS EXHAUST
H-2-829443 SH 4
ZN D-2 1195/1015 SCFM
BAGOUT EXHAUST
H-2-829443 SH 3
ZN E-4 0/180 SCFM
BTS WELD ENCL EXH
H-2-829443 SH 6
ZN D-7 35 SCFM
HEP-13
ROOM 642 EXHAUST FILTER
CAPACITY: 1500 CFM
ROOM 641
MECHANICAL ROOM 602
2750 SCFM
NORMAL EXHAUST
H-2-829443 SH 6
ZN E-2 300 SCFM
NORMAL EXHAUST
H-2-829443 SH 8
ZN B-8 301 SCFM
INNER CAN
LEAK CHECK
1 SCFM
INTERLOCK FROM
H-2-80159
FIRE/SECURITY ALARM
HOLD HVAC-1
(SEE SH 1)
1230 SCFM
ROOM 642 PROCESS AREA
CONTROL ROOM 642B
AIRLOCK
642A
CORRIDOR 625
FROM EXISTING SF-1/SF-2
H-2-80167 SH 6
1200 CFM
EV-26 (DPC-2)
H-2-80167
SH 5 ZN D,6
EXIST BLDG EXHAUST
H-2-80167 SH 4
ZONE D-3
INTERLOCK FROM
H-2-80159
FIRE/SECURITY ALARM
INSTR AIR
H-2-829400 SH 4
ROOM FILTER EXHAUST
H-2-829443 SH 8
ZN B-8 1230 SCFM
FIRE/SECURITY
VENT
NOTE:
FOR GENERAL NOTES AND LEGENDS, SEE SHEET 1. FOR INTERLOCK SCHEDULE AND SYSTEM DESCRIPTION, SEE SHEET 2.
FLUOR FEDERAL SERVICES
PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING
U.S. DEPARTMENT OF ENERGY
Richland Operations Office
HVAC/CONTROL SYSTEMS
AIRFLOW & CONTROL DIAG
MISC SYSTEM
H-2-829443 0
F 2736-ZB 7004
SCALE NONE
H-2-829350 DRAWING LIST WORK PACKAGE #2
0 APPROVED FOR CONSTRUCTION
DWG NO TITLE
DRAWING TRACEABILITY LIST
REF NUMBER TITLE
REFERENCES
NEXT USED ON
REVISIONS


MICON/DCS
BLDG 234-5Z
MICON CONTROL ROOM
LCU #6
BLDG 2736-ZB
ROOM 602
FAL
FI 642
PDAH
PDAL
PDI FP1
PDI FP2
AI 642F1
AI 642F2
AI FP1
AI FP2
HOLD P-2
(SEE SHEET 1)
EXHAUST FLOW PANEL
EP-1-25BA
INTERLOCK TO
H-2-829443 SH 3
FY-1001
INTERLOCK TO
H-2-829443 SH 7
FY-1000
FSL 1000A
FIT 1000A
FSL 1000B
FIT 1000B
SAFETY SIGNIFICANT
1531/1801 SCFM
RM 641
FE 1000
BV-1001 (NO)
BV-1000 (NO)
12"
CUTS OF ATM
DPIT 1000
BFD-1001
NO
DPI 1001
DPI 1000
DPI 1007
BV-1002
BV-1003
BV-1004
TEST
SECTION
HEPA
HEP-14
HEP-15
BV-1008
BV-1009
FILTER PLENUM (OPERATING)
CAPACITY: 2000 CFM
(SEE NOTE 12)
TO DPIC-1101
H-2-829443 SH 9
ZN E-8
BFD-1002
DPIT 1002
DPI 1002
DPI 1003
BV-1005
BV-1006
BV-1007
10"
EXHAUST FLOW
H-2-829443 SH 9
ZN C-8 1531/1801 SCFM
BFD-1003
BFD-1004
FILTER PLENUM (STANDBY)
CAPACITY: 2000 CFM
(SEE NOTE 12)
HEP-16
HEP-17
BV-1010
BV-1011
NORMAL EXHAUST
H-2-829443 SH 7
ZN D-7 301 SCFM
BFD-607
SEE NOTE 10
EMERGENCY EXHAUST
H-2-829443 SH 6
ZN E-2 0/270 SCFM
BFD-508
ROOM FILTER EXHAUST
H-2-829443 SH 7
ZN D-2 1230 SCFM
TO EXISTING FILTER F-11
(SEE DWG H-2-80167 SH 4)
BFD-1005
DPI 1004
BV-1012
BV-1013
HEPA
HEP-18
BFD-1006
345 CFM
ROOM 641
ROOM 638
FILTER ROOM
NOTE:
FOR GENERAL NOTES AND LEGENDS, SEE SHEET 1. FOR INTERLOCK SCHEDULE AND SYSTEM DESCRIPTION, SEE SHEET 2.
FLUOR FEDERAL SERVICES
EXPIRES 10-22-02
PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING
U.S. DEPARTMENT OF ENERGY
Richland Operations Office
HVAC/CONTROL SYSTEMS
AIRFLOW & CONTROL DIAG
GLOVEBOX FILTERS
F
2736-ZB
7004
H-2-829443
0
SCALE NONE
SHEET 8
H-2-829350
DRAWING LIST WORK PACKAGE
REF NUMBER
TITLE
REFERENCES
DWG NO
TITLE
DRAWING TRACEABILITY LIST
NEXT USED ON
0
APPROVED FOR CONSTRUCTION
REVISIONS
NAME
NF FOX


MICON/DCS
BLDG 234-5Z
MICON CONTROL ROOM
LCU #6
BLDG 2736-ZB
ROOM 602
STACK MONITOR
ANNUNCIATOR PANEL
BLDG 234-5Z ROOM 714
TBX-610-3
BLDG 2736-ZB
ROOM 602
FROM DPIT-1000
H-2-829443 SH 8
ZN E-2
1/2"-23J-703-M7
H-2-829400 SH 4
ZN E-1
EXHAUST FLOW
H-2-829443 SH 8
ZN D-2 1531/1801 SCFM
1531/1801 SCFM
STACK
296-Z-007
STACK CAM SYS 24A
RADIATION MONITORING
(H-2-829485)
EXHAUST AIR FAN (OPERATING)
CAPACITY: 2000 CFM
15 HP
(SEE NOTE 13)
EXHAUST AIR FAN (STANDBY)
CAPACITY: 2000 CFM
15 HP
(SEE NOTE 13)
OUTSIDE BLDG 2736-ZB
NOTE:
FOR GENERAL NOTES AND LEGENDS, SEE SH 1. FOR INTERLOCK SCHEDULE AND SYSTEM DESCRIPTION, SEE SH 2.
FLUOR FEDERAL SERVICES
PROJECT: W-460, PLUTONIUM STABILIZATION AND HANDLING
U.S. DEPARTMENT OF ENERGY
Richland Operations Office
HVAC/CONTROL SYSTEMS
AIRFLOW & CONTROL DIAG
GB EXHAUST SYSTEM
H-2-829443
DRAWING TRACEABILITY LIST
REVISIONS
APPROVED FOR CONSTRUCTION


STACK MONITOR ANNUNCIATOR PANEL
BLDG 234-5Z ROOM 714
SPE CAM RAD HI
SYSTEM FAILURE
RAD MON FAILURE
RAD HIGH
BELL
LOSS OF FLOW
MASS FLOW CONTROLLER
DETAIL 1
AS SHOWN FOR 24A04 SYSTEM. TYPICAL FOR 24A03 SYSTEM (I.E.: FE-24A04 BECOMES FE-24A03)
XXX CFM
HEATED 250 WATTS
SEE NOTE 3
TOTAL SAMPLE FLOW
INSPECTION/TEST PORTS (2)
RTD
SHROUDED
REMOVABLE PAPER FILTER
ALPHA CAM UNIT **
SET @ 2 SCFM
VACUUM PUMP P-24A02
1/2 HP, X CFM XX" Hg
VACUUM PUMP P-24A01
1/2 HP, X CFM XX" Hg
MASS FLOW CONTROLLER 24A03
MASS FLOW CONTROLLER 24A04
RECORD SAMPLER
SPLITTER
AIR SAMPLER
(BY WA STATE DEPT OF HEALTH)
FLOW
(1530/1800 CFM)
HVAC EXHAUST STACK
296-Z-007
16' ø, 50' TALL
SEE DWG H-2-829485
SEE DETAIL 1 (TYP)
SEE NOTE 2
NOTES:
1. FOR GENERAL NOTES AND LEGENDS, SEE DWG H-2-829443 SH 1 & 2.
2. IF REQUIRED, THE SPLIT STACK SAMPLE FLOW IS FOR FUTURE USE BY WA STATE DEPT OF HEALTH.
3. THE ASSOCIATED FLOW MONITORING INSTRUMENTS (FI, FQI, FSL & FY) FOR THE SPLIT STACK SAMPLE MASS FLOW CONTROLLER WILL BE AVAILABLE FOR FUTURE USE BY WA STATE DEPT OF HEALTH.
FLUOR FEDERAL SERVICES
STACK 296-Z-007
EFFLUENT MONITORING CABINET
SPL-ENCL-01-24A
** - ITEMS FURNISHED BY PHMC
U.S. DEPARTMENT OF ENERGY
HVAC/CONTROL SYSTEMS
AIRFLOW & CONTROL DIAG
EXHAUST STACK MON SYSTEM
H-2-829443 A
-RELEASED FOR REVIEW-
ADDED NEW DWG PER DCN-W460-0138
DRAWING TRACEABILITY LIST
REVISIONS

# ATTACHMENT B

# SUMMARY AND SYNOPSIS OF CAP88-PC MODELING

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C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S  R E P O R T

Non-Radon Individual Assessment
Apr 26, 2000 02:58 pm

Facility: Z-Plant
Address: Hanford Site
City: Richland
State: WA Zip: 99336

Source Category:
Source Type: Stack
Emission Year: 2000

Comments: Project W-460

| Effective Dose Equivalent (mrem/year) |
|---|
| 1.67E+03 |

At This Location: 19230 Meters East Southeast
Dataset Name: Project W-460
Dataset Date: Apr 26, 2000 02:58 pm
Wind File: C:\CAP88PC2\WNDFILES\HS200W10.WND

Apr 26, 2000 02:58 pm

SYNOPSIS
Page 1

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 19230 Meters East Southeast
Lifetime Fatal Cancer Risk: 1.17E-02

ORGAN DOSE EQUIVALENT SUMMARY

| Organ | Dose Equivalent (mrem/y) |
|---|---|
| GONADS | 2.79E+02 |
| BREAST | 2.83E+01 |
| R MAR | 1.77E+03 |
| LUNGS | 3.68E+03 |
| THYROID | 2.78E+01 |
| ENDOST | 2.18E+04 |
| RMNDR | 9.71E+02 |
| EFFEC | 1.67E+03 |

Apr 26, 2000 02:58 pm



RADIONUCLIDE EMISSIONS DURING THE YEAR 2000

| Nuclide | Class | Size | Source #1 Ci/y | TOTAL Ci/y |
|---|---|---|---|---|
| PU-239 | Y | 1.00 | 9.9E+01 | 9.9E+01 |
| U-233 | Y | 1.00 | 1.1E+01 | 1.1E+01 |
| AM-241 | W | 1.00 | 4.5E+01 | 4.5E+01 |

SITE INFORMATION

Temperature: 12 degrees C
Precipitation: 16 cm/y
Mixing Height: 1000 m

Apr 26, 2000 02:58 pm



SOURCE INFORMATION

Source Number: 1

Stack Height (m): 15.
Diameter (m): 0.

Plume Rise
Momentum (m/s): 7.
(Exit Velocity)

AGRICULTURAL DATA

| | Vegetable | Milk | Meat |
|---|---|---|---|
| Fraction Home Produced: | 0.000 | 0.000 | 0.000 |
| Fraction From Assessment Area: | 1.000 | 1.000 | 1.000 |
| Fraction Imported: | 0.000 | 0.000 | 0.000 |

Food Arrays were not generated for this run.
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

19230 24380

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

D O S E  A N D  R I S K  E Q U I V A L E N T  S U M M A R I E S

Non-Radon Individual Assessment
Apr 26, 2000 02:58 pm

Facility: Z-Plant
Address: Hanford Site
City: Richland
State: WA Zip: 99336

Source Category:
Source Type: Stack
Emission Year: 2000

Comments: Project W-460

Dataset Name: Project W-460
Dataset Date: Apr 26, 2000 02:58 pm
Wind File: C:\CAP88PC2\WNDFILES\HS200W10.WND

Apr 26, 2000 02:58 pm



ORGAN DOSE EQUIVALENT SUMMARY

| Organ | Selected Individual (mrem/y) |
|---|---|
| GONADS | 2.79E+02 |
| BREAST | 2.83E+01 |
| R MAR | 1.77E+03 |
| LUNGS | 3.68E+03 |
| THYROID | 2.78E+01 |
| ENDOST | 2.18E+04 |
| RMNDR | 9.71E+02 |
| EFFEC | 1.67E+03 |

PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

| Pathway | Selected Individual (mrem/y) |
|---|---|
| INGESTION | 3.86E+01 |
| INHALATION | 1.63E+03 |
| AIR IMMERSION | 1.41E-05 |
| GROUND SURFACE | 5.65E-01 |
| INTERNAL | 1.67E+03 |
| EXTERNAL | 5.65E-01 |
| TOTAL | 1.67E+03 |

NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

| Nuclide | Selected Individual (mrem/y) |
|---|---|
| PU-239 | 9.58E+02 |
| U-233 | 3.97E+01 |
| AM-241 | 6.77E+02 |
| TOTAL | 1.67E+03 |

CANCER RISK SUMMARY

| Cancer | Selected Individual Total Lifetime Fatal Cancer Risk |
|---|---|
| LEUKEMIA | 1.46E-03 |
| BONE | 9.32E-04 |
| THYROID | 3.15E-06 |
| BREAST | 2.34E-05 |
| LUNG | 6.01E-03 |
| STOMACH | 1.68E-05 |
| BOWEL | 9.13E-06 |
| LIVER | 3.18E-03 |
| PANCREAS | 1.24E-05 |
| URINARY | 9.01E-06 |
| OTHER | 1.52E-05 |
| TOTAL | 1.17E-02 |

PATHWAY RISK SUMMARY

| Pathway | Selected Individual Total Lifetime Fatal Cancer Risk |
|---|---|
| INGESTION | 1.84E-04 |
| INHALATION | 1.15E-02 |
| AIR IMMERSION | 2.93E-10 |
| GROUND SURFACE | 1.18E-05 |
| INTERNAL | 1.17E-02 |
| EXTERNAL | 1.18E-05 |
| TOTAL | 1.17E-02 |

Apr 26, 2000 02:58 pm



NUCLIDE RISK SUMMARY

| Nuclide | Selected Individual Total Lifetime Fatal Cancer Risk |
|---|---|
| PU-239 | 7.68E-03 |
| U-233 | 5.23E-04 |
| AM-241 | 3.46E-03 |
| TOTAL | 1.17E-02 |

Apr 26, 2000 02:58 pm

SUMMARY
Page 5

INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)
(All Radionuclides and Pathways)

| | Distance (m) | |
|---|---|---|
| Direction | 19230 | 24380 |
| N | 3.5E+02 | 2.4E+02 |
| NNW | 3.9E+02 | 2.6E+02 |
| NW | 4.3E+02 | 2.9E+02 |
| WNW | 3.1E+02 | 2.1E+02 |
| W | 2.4E+02 | 1.7E+02 |
| WSW | 2.1E+02 | 1.5E+02 |
| SW | 2.4E+02 | 1.7E+02 |
| SSW | 3.1E+02 | 2.1E+02 |
| S | 4.3E+02 | 3.0E+02 |
| SSE | 6.2E+02 | 4.2E+02 |
| SE | 1.2E+03 | 8.1E+02 |
| ESE | 1.7E+03 | 1.1E+03 |
| E | 1.2E+03 | 7.7E+02 |
| ENE | 7.0E+02 | 4.7E+02 |
| NE | 4.9E+02 | 3.3E+02 |
| NNE | 3.6E+02 | 2.5E+02 |

Apr 26, 2000 02:58 pm

SUMMARY
Page 6

INDIVIDUAL LIFETIME RISK (deaths)
(All Radionuclides and Pathways)

| | Distance (m) | |
|---|---|---|
| Direction | 19230 | 24380 |
| N | 2.4E-03 | 1.6E-03 |
| NNW | 2.6E-03 | 1.7E-03 |
| NW | 2.9E-03 | 2.0E-03 |
| WNW | 2.1E-03 | 1.4E-03 |
| W | 1.6E-03 | 1.1E-03 |
| WSW | 1.4E-03 | 9.5E-04 |
| SW | 1.6E-03 | 1.1E-03 |
| SSW | 2.1E-03 | 1.4E-03 |
| S | 3.0E-03 | 2.0E-03 |
| SSE | 4.3E-03 | 2.8E-03 |
| SE | 8.4E-03 | 5.6E-03 |
| ESE | 1.2E-02 | 7.7E-03 |
| E | 8.0E-03 | 5.3E-03 |
| ENE | 4.8E-03 | 3.2E-03 |
| NE | 3.4E-03 | 2.2E-03 |
| NNE | 2.5E-03 | 1.6E-03 |

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# ATTACHMENT C

# 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 are 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. WDOH 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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# ATTACHMENT D

# ASME N509 REQUIREMENTS FOR 296-Z-7

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| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
|---|---|---|---|---|
| | | | | EXHAUST |
| | | | | SYSTEM |
| 1 | Habitability systems (as defined in ASME N509) must meet the requirements of 10 Code of Federal Regulation (CFR), Appendix A, general design criteria 4,5, and 19. | ASME N509 3 | Project W-460 has no habitability systems as defined in ASME N509; therefore, this requirement is not applicable. | NA |
| 2 | Prefilters are required in air-cleaning units when design inlet particulate concentrations and particle size are such that the HEPA filter may be rendered ineffective prematurely. | ASME N509 4.1.a | Prefilters are installed in gloveboxes upstream of all HEPA filters. Post-filters are not required because no sorbent beds are employed. | C |
| 3 | HEPA filters are required in all air-cleaning units when filtration of inlet particulate matter requires a minimum efficiency of 99.97% for particles equal to 0.3 micrometer in size. | ASME N509 4.1.b | Specification HNF-S-0552 complies with ASME AG-1. | C |
| 4 | Adsorbers are required when air cleaning units are designed for removal of iodine and iodine compounds. | ASME N509 4.1.c | Iodine compounds are not anticipated so adsorbers are not included in the design; therefore, this requirement is not applicable. | NA |
| 5 | Moisture separators (demisters) are required when entrained water droplet concentration may be greater than 1 lb of water per 1000 cfm of airflow. | ASME N509 4.1.d | Moisture separators not provided in design because moisture is not expected in airstream. Environmental conditions do not exceed one pound of water per 1000 cfm airflow. | NA |
| 6 | Heaters should be utilized for air-cleaning units when adsorbers exceeds 70% based upon the 1% percentile meteorological conditions (where applicable). For nuclear air treatment systems which are unaffected by outside air meteorological conditions, heaters should be utilized when an accident would result in an air-stream exceeding 70% relative humidity for more than 1 hr. | ASME N509 4.1.e | Heaters not provided in design because there are no charcoal filters and because moisture isn't expected in airstream. Environmental conditions don't exceed 70% relative humidity. There are no other sources of moisture in the facility under normal operating condition nor accident conditions. There is no deluge system provided in the ventilation system. | NA |
| 7 | When adsorbers are used in ESF air-cleaning units, provision shall be made for a postfilter to retain carbon fines. | ASME N509 4.1.f | See requirement 4 response. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
|---|---|---|---|---|
| | | | | **EXHAUST** |
| | | | | **SYSTEM** |
| 8 | Values of the following design parameters shall be specified when invoking this standard and shall be used whenever referenced:<br>(a) Volumetric air flow rate, acfm;<br>1) minimum flow rate;<br>2) maximum flow rate;<br>3) design flow rate;<br>(b) design pressures, in. w.g.;<br>1) maximum operating pressure;<br>2) leak test pressure;<br>3) maximum design pressure;<br>4) structural capability pressure; | ASME N509 4.2 | These design parameters are provided and captured as documentation provided in the ASME N509, Section 8.2 documentation. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
|---|---|---|---|---|
| | | | | **EXHAUST** |
| | | | | **SYSTEM** |
| 9 | Values of the following design parameters shall be specified when invoking this standard and shall be used whenever referenced:<br>c) pressure-time transient (if applicable), in. w.g./sec;<br>d) maximum and minimum gas temperature (F) and density, lb/ft3;<br>e) maximum inlet relative humidity (percent);<br>f) entrained liquid water (mass flow rate), lb/min;<br>g) concentrations of specific contaminants in airstream;<br>h) required decontamination factors for each contaminant;<br>i) component radiation integrated life dose and maximum dose rate (rad.);<br>j) maximum dirty filter pressure differential, in. w.g.; | ASME N509 4.2 | These design parameters are provided and captured as documentation provided in the ASME N509, Section 8.2 documentation, except for:<br>c) Pressure/time transient is not applicable to W-460. It is typically applied to reactor facilities and is used to establish damper parameters that need to operate rapidly in response to sudden changes to atmospheric pressure changes to prevent blowout of HEPA filters and adsorber beds.<br>d) Compliant and is captured in the ASME N509 Section 8.2 documentation.<br>e) Compliant and is captured in the ASME N509 Section 8.2 documentation.<br>f)Entrained liquid water mass is not applicable to this treatment system because there is no moisture addition beyond the low ambient indoor humidity condition.<br>g) The NOC identifies the applicable contaminants.<br>h) The decontamination factor used is $3 \times 10^3$ for each HEPA filter.<br>i) Not applicable for this application<br>j) Compliant and is captured in the ASME N509 Section 8.2 documentation. | c) NA<br>d) C<br>e) C<br>f) NA<br>g) C<br>h) C<br>i) C<br>j) C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
|---|---|---|---|---|
| | | | | EXHAUST |
| | | | | SYSTEM |
| 10 | Values of the following design parameters shall be specified when invoking this standard and shall be used whenever referenced:<br>k) structural loadings;<br>l) duct and housing maximum permissible leak rate (scfm) and associated operating pressure, in. w.g.;<br>m) environmental design conditions including temperature, pressure, and relative humidity;<br>n) expected duration and environmental conditions of storage area;<br>(o) particle size distribution and quantity of aerosols and contaminants under normal and accident conditions (if known);<br>(p) safety classification (ESF or non-ESF);<br>(q) number of adsorber test canisters per adsorber bank;<br>(r) heater capacity, watts, voltage, temperature differential, if applicable. | ASME N509 4.2 | These design parameters are provided and captured as documentation provided in the ASME N509, Section 8.2 documentation, except for:<br>k) Structural loadings are applicable only to high-efficiency particulate (HEP) - 14,-15, -16 and -17 systems. These parameters are used to meet requirements in Section 4.5.<br>l) Compliant and is captured in the ASME N509 Section 8.2 documentation.<br>m) Compliant and is captured in the ASME N509 Section 8.2 documentation.<br>n) Compliant and is captured in the ASME N509 Section 8.2 documentation.<br>o) The NOC identifies the range of particle sizes, aerosols and contaminants.<br>p) Engineered safety feature (ESF) for HEP-14, -15, -16, -17<br>q) Number of adsorber canisters per bank is not applicable to this treatment system. See response to requirement 4<br>r) Heater capacity is not applicable to this treatment system. See response to requirement 6. | k) NA<br>l) C<br>m) C<br>n) C<br>o) C<br>p) C<br>q) NA<br>r) NA |
| 11 | The installed capacity (cfm) of the air cleaning unit shall be no greater than the limiting installed capacity of any bank of components contained in the air cleaning unit through which the airflow must pass. | ASME N509 4.3 | Systems are designed so that the maximum flow does not exceed the filter capacity - See Section 8.2 records. | C |
| 12 | Test canisters shall not be included in determining the installed capacity of any bank or stage of adsorbers. | ASME N509 4.3 | See response to requirement 4. | NA |
| 13 | All parts and components of the air-cleaning unit shall be selected or designed to operate under the environmental conditions (temperature, relative humidity, pressure, radiation, etc.) specified in para. 4.2. | ASME N509 4.4 | Systems were designed to standard operating environmental conditions captured as documentation provided in the ASME N509, Section 8.2 documentation. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
| | | | | SYSTEM |
| 14 | Materials of construction and components shall be selected or treated to limit generation of combustibles and contaminants and to resist corrosion and degradation that would result in loss of function when exposed to the specified environmental conditions for the design life of the component. Environmental qualification requirements are contained in 10 CFR 50.49 and IEEE 323. | ASME N509 4.4 | The system materials were selected consistent with this requirement. | C |
| 15 | Engineered Safety Feature (ESF) systems and all of their components shall be shown, either by testing or by a mathematical technique, to remain functional under the structural loading specified in para. 4.2(k) and described in para. 5.10.3 of ASME N509. | ASME N509 4.5 | See response to requirement 10. | C |
| 16 | The nuclear air treatment system shall be designed to withstand the normal and transient pressures, to which the system may be subjected during its design life, without loss of its ability to perform its design function. | ASME N509 4.6.1 | This requirement states that the requirements that follow in ASME N509, Section 4.6.3 must be followed (requirements 17, thru 21). | C |
| 17 | Nuclear air treatment system operating (static) pressure shall be determined by summing the losses in total pressure of all air path components between the open atmosphere and the point in the system under consideration and deducting one velocity head from the total pressure, if positive, and adding one velocity head to the total pressure, if negative. Losses shall be based on the most severe condition of resistance to rated air flow for the design basis operating condition and will vary throughout the nuclear air treatment system. | ASME N509 4.6.3 | This requirement establishes how the operating pressure is to be calculated. Treatment system fans were selected based on total pressure losses of the system components. Fan specifications (W-460-P-10) reflect operating pressures. Components are typically before the fan and therefore see negative pressures. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
| | | | | SYSTEM |
| 18 | The engineer (as defined in paragraph 3 of ASME N509) shall review the system operation and determine the maximum operating pressure to which the components may be subjected to due to off-normal conditions. | ASME N509 4.6.3 | See response to requirement 17. | C |
| 19 | An engineer (as defined in paragraph 3 of ASME N509) shall include the maximum operating (static) pressure in specifications for all nuclear air treatment system components, including ducts. | ASME N509 4.6.3 | See response to requirement 17. | C |
| 20 | Fan specification requirements shall be based on either total pressure or Fan Static Pressure as defined in para. 5.7 and AMCA 201. | ASME N509 4.6.3 | See response to requirement 17. | C |
| 21 | Calculations shall document the operating pressure as the basis for determining the required test pressure (refer to para. 4.6.4) and for determination of allowable pressure boundary leakage (para. 4.14). | ASME N509 4.6.3 | See response to requirement 17. | C |
| 22 | The pressure to be used to shop and/or field tests air-cleaning units and components (such as ducts, housings, and component mounting frames) to determine air leak rates shall be specified by the engineer (as defined in paragraph 3 of ASME N509). | ASME N509 4.6.4 | The duct and stack test pressure will be specified in the test plan. Test pressure for HEP-14-15-16, and –17 is specified as –22 in. wc. in procurement spec. W-460-P7. Test pressure for all other HEPA filter housings is specified as – 10 in.wc. in construction spec. W-460-C2. | C |
| 23 | The test pressure shall be the static pressure, acting in the direction of the operating pressure. | ASME N509 4.6.4 | The test pressure will be negative upstream of fans and positive downstream in field tests and will be captured as documentation provided in the ASME N509, Section 8.2 documentation. | C |
| 24 | The test pressure shall not be less than 4 in. w.g. for duct and housing leak tests and not less than 1 in. w.g. for mounting frame leak tests and shall not exceed the structural capability of the component (para. 4.6.6). | ASME N509 4.6.4 | See response to requirement 22. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | **EXHAUST** |
| | | | | **SYSTEM** |
| 25 | The test pressure for each component to be tested shall be documented by the engineer (as defined in paragraph 3 of ASME N509) along with the operating pressure (para. 4.6.3) and included by the testing organization in the test procedures. | ASME N509 4.6.4 | These values are included in the ASME N509, Section 8.2 documentation. | C |
| 26 | Nuclear air treatment systems shall be structurally designed to withstand the maximum pressure differential which each component may experience due to normal operating pressure; test pressure; or transient pressure conditions due to rapid closure of dampers, or anticipated system upsets which would render the system inoperable. | ASME N509 4.6.5.1 | The maximum design pressures exceed the operating pressures and pressures found during upset conditions. The only upset condition that might potentially increase the pressure applied to the treatment systems is the inadvertent closing of dampers. In this case the treatment systems might be subjected to the maximum static pressure capable of being produced by the fans. ASME N509 Section 8.2 documentation contains the various pressures. | C |
| 27 | The maximum design pressure shall be equal to or greater than the maximum pressure differential after allowing for the venting effect of permanent openings and pressure relief devices in the system. | ASME N509 4.6.5.1 | See response to requirement 26. | C |
| 28 | Engineered Safety Feature (ESF) nuclear air treatment systems located inside a containment structure shall be designed either to withstand the maximum differential between the primary containment structure design pressure and the normal primary containment structure operating pressure as specified in para. 4.3 of ASME N509; or be equipped with a self-restoring pressure-relief device to limit the pressure differential from the initial post-accident transient to levels that will not cause collapse, structural damage, or loss of function. | ASME N509 4.6.5.2 | The facility does not have a reactor containment structure. This requirement does not apply. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
| | | | | SYSTEM |
| 29 | Positive Pressure. Air-cleaning units and components including ducts located on the discharge side of fan(s) which can be isolated by closure of a downstream damper, or potentially plugged components shall be designed to withstand a positive internal pressure equal to or greater than the peak pressure of the fan(s). | ASME N509 4.6.5.4a | The only components not designed to withstand full positive pressure of the exhaust fans are the backdraft dampers. Failure could occur in the incredible event of a plugged exhaust stack. Downstream isolation control dampers HV-1110 and HV-1210 will withstand full shut-off pressure. | O |
| 30 | Positive Pressure. If provision is made to deenergize fan(s) on high differential pressure or low flow, the components shall be designed to withstand the trip point design pressure plus a margin to include the rate of pressure rise between reaching the pressure setpoint and the time for the instrumentation response, or 10 %, whichever is greater. | ASME N509 4.6.5.4a | There is no provision to de-energize the power to the fans on low flow or high differential pressure. | NA |
| 31 | Negative Pressure. Air-cleaning units and components located on the inlet side of fan(s) which can be isolated by closure of an upstream damper, or potentially plugged components shall be designed to withstand a negative internal pressure equal to or more negative than the peak pressure of the fan(s). | ASME N509 4.6.5.4b | The treatment systems are designed and tested to a pressure greater than that capable of being developed during the analysis. Documentation that supports this is captured as documentation provided in the ASME N509, Section 8.2 documentation. | C |
| 32 | Negative Pressure. If provision is made to deenergize fan(s) on high differential pressure or low flow, the components shall be designed to withstand the trip point design pressure plus a margin to include the rate of pressure rise between reaching the pressure setpoint and the time for the instrumentation response or 10 %, whichever is greater. | ASME N509 4.6.5.4b | There is no provision to de-energize the power to the fans on low flow or high differential pressure; therefore, this requirement is not applicable. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
| | | | | SYSTEM |
| 33 | The maximum design pressure shall be documented by an engineer (as defined in paragraph 3 of ASME N509) by calculation, including the basis for the condition, and included in procurement specifications for manufacturer's design. | ASME N509 4.6.5.6 | This is documented in the ASME N509 Section 8.2 documentation. | C |
| 34 | The structural design capability pressure shall equal or exceed the maximum design pressure and shall be the static pressure to which the air-cleaning unit can be safely loaded without permanent distortion. This pressure is typically a minimum of 1.25 times the maximum design pressure. | ASME N509 4.6.6.1 | This is documented in the ASME N509 Section 8.2 documentation. | C |
| 35 | The engineer (as defined in paragraph 3 of ASME N509) and/or component manufacturer shall document the structural design capability pressure for each component. This documentation shall be provided to the owner. | ASME N509 4.6.6.2 | This is documented in the ASME N509 Section 8.2 documentation. | C |
| 36 | Once-through nuclear air treatment systems with air-cleaning unit located in a clean interspace, exhaust fan shall be located downstream of air-cleaning unit in order to keep air-cleaning unit under negative pressure. Any leakage through fan shaft will be from clean interspace. | ASME N509 4.7.1b | Each of the air treatment systems are located in a cleaner area as depicted in the ASME N509 documentation available from Section 8.2. | C |
| 37 | Once-through nuclear air treatment systems with air-cleaning units located in contaminated spaces or interspaces, the fan shall be located upstream of the air-cleaning unit to prevent infiltration of contaminated air through fan shaft, or into the filter housing downstream of filters thereby bypassing filters. | ASME N509 4.7.1c | These requirements are not applicable because the air treatment system HEPA filter housings are not located in contaminated areas. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
| | | | | SYSTEM |
| 38 | Habitability system outside air ducts routed through clean spaces or interspaces that may convey radioactive air following a release shall be under a negative pressure relative to the spaces. | ASME N509 4.7.2a | Not applicable because W-460 has no habitability systems. | NA |
| 39 | Habitability system makeup air fans shall be located:<br>(1) upstream of air-cleaning unit if air-cleaning unit is in a contaminated space.<br>(2) downstream of air-cleaning unit if air-cleaning unit is in a clean space. | ASME N509 4.7.2b | Not applicable because W-460 has no habitability systems. | NA |
| 40 | The air-cleaning unit shall be designed to keep radiation exposures during maintenance, testing and inspection as low as reasonably achievable As Low As Is Reasonably Achievable (ALARA). | ASME N509 4.8.1 | W-460 meets this requirement, though the intent of this requirement is for man-entry air treatment units. The facility has bag-in-bag-out filter units. | C |
| 41 | The area in which the air-cleaning unit is located shall be served by a clear aisle wide enough to accommodate servicing of internal components and equipment. | ASME N509 4.8.1c | Isles for HEP-14,-15,-16,-17 exceed 4-ft wide. The other units have but a single filter unit with suitable (exceeds the 4-ft clearance) access for maintenance. | C |
| 42 | A sufficiently wide clear area adjacent to the air-cleaning unit housing door or hatch shall be provided to allow servicing. | ASME N509 4.8.1d | See response to requirement 40. | C |
| 43 | Elevated work galleries servicing air-cleaning units shall be designed in accordance with Occupational Safety and Health Act (OSHA) requirements. | ASME N509 4.8.1f | See response to requirement 40. | C |
| 44 | Air-cleaning system ducts that will have to be cleaned out periodically shall be equipped with low leakage access hatches at strategic points. | ASME N509 4.8.1g | See response to requirement 40. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
| | | | | SYSTEM |
| 45 | As minimum, the designer shall provide the appropriate monitoring instruments, alarms and hand switches on or adjacent to each air-cleaning unit and redundant instruments, alarms and hand switches at a remote manned control panel in accordance with tables 4-1 for Engineered Safety Feature (ESF) air-cleaning units and 4-2 for non-ESF air-cleaning units of ASME N509. | ASME N509 4.9.2a | The appropriate instruments and controls are provided. Differential pressure indicators are provided for HEPA filters, HAND-OFF-AUTO, switches for each of the fans, and a lead-lag switch for EF-1 and EF-2. Operating status indication is provided to the facility distributed control system. | C |
| 46 | For non-Engineered Safety Feature (ESF) air-cleaning units, a common alarm of all local alarms shall be provided on the main control room panel for each air-cleaning unit. | ASME N509 4.9.2b | There are no local alarms. | NA |
| 47 | For Engineered Safety Feature (ESF) air-cleaning units, local controls shall be secured to prevent unauthorized use. | ASME N509 4.9.2c | Not applicable. ESF filter units have no local controls. | NA |
| 48 | Local instrumentation and associated mountings (excluding transmitter, hand switches, limit switches, and associated mountings) for Engineered Safety Feature (ESF) air-cleaning units shall be qualified to remain intact, but not necessarily functional under the structural loading and environment specified in paragraph 4.2 (k) of ASME N509. | ASME N509 4.9.3a | No structural analysis has been preformed for local instrumentation. | O |
| 49 | Local transmitters, hand switches, limit switches and associated mountings for Engineered Safety Feature (ESF) air-cleaning units shall be qualified to remain intact and completely functional under the structural loading and environment specified in paragraph 4.2 (k) of ASME N509. | ASME N509 4.9.3b | See response to requirement 48. | O |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
| | | | | SYSTEM |
| 50 | Instrumentation, alarms and hand switches at the remote manned control panel shall be qualified to remain intact and functional for the structural loadings that may occur in the area in which the panel is located. | ASME N509 4.9.3c | See response to requirement 48. | O |
| 51 | This requirement row isn't used in this evaluation. | | | |
| 52 | Each item powered or controlled electrically (fan motor, valve or damper operator, fire protection systems, solenoid valves, etc.) shall be provided with status indication for the energized mode, located in accordance with tables 4-1 for Engineered Safety Feature (ESF) air-cleaning units and 4-2 for non-ESF air-cleaning units of ASME N509, to show the operational status of the item. | ASME N509 4.9.4 | Status indication is provided locally as well as through the distributed control system. Electric power or control only provided to non-ESF systems. | C |
| 53 | Where heat or radioactive decay or heat of oxidation or both may be significant, means shall be provided to remove this heat from the adsorbent beds to limit temperatures to values below 300 degrees F to prevent significant iodine desorption. For this purpose, a minimum circulatory air flow shall be available for all operational modes of the air-cleaning unit and shall be based on the maximum possible radioactivity loading on the adsorbent beds. | ASME N509 4.10 | See response to requirement 4. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | **EXHAUST** |
| | | | | **SYSTEM** |
| 54 | Nuclear air treatment systems shall be designed, fabricated, and installed so as to minimize the use of combustibles. Filter media, sealants, gaskets, and insulation shall meet the requirements of ASME N509, section 5. | ASME N509 4.11.1 | The treatment systems are largely constructed of metallic components and are not combustible. Other component items such as sealants, gaskets, and filter media are discussed in ASME N509 Section 5. | C |
| 55 | When air-cleaning units are provided with adsorbers, a fire detection system shall be installed downstream of each carbon adsorber bank to detect either abnormally elevated temperature or products of combustion. The fire detection system shall be designed to be responsive to the unique features of the installation and application (e.g., low air velocity, stratification). A two-stage alarm shall be provided. The fire detection system shall operate an alarm (first stage) upon detection of temperature above a prearranged set-point and automatically trip fan(s) and isolate the air-cleaning unit. The second stage shall operate an alarm when a fire is detected. Documentation shall be provided to the owner who shows that the fire detection system is designed to be responsive to a fire within the carbon adsorber bed. | ASME N509 4.11.2 | See response to requirement 4. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
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| 56 | A fire hazard analysis shall be performed for all air-cleaning units and components in accordance with 10 Code of Federal Regulations (CFR) 50, Appendix R and National Fire Protection Agency (NFPA) 803, except for adsorbers, consideration shall be given to the type of carbon (or other media) utilized in adsorbers and the potential for fire. | ASME N509 4.11.4 | The fire hazard analysis (HNF-6385, Rev. O) considered components according to 10CFR 50 Appendix R and NFPA 803. Considerations regarding adsorbers is not applicable (see response to requirement 4). | C |
| 57 | For air-cleaning units provided with fire protection by water deluge systems, nozzles shall be piped to an accessible location outside the housing and provided with redundant leak-tight isolation (O.S. & Y) valves and a connection suitable for manual attachment to the plant's fire protection system. | ASME N509 4.11.6 | The fire hazard analysis (HNF-6385, Rev. 0) concluded that fire suppression systems were not required within the air treatment systems; therefore, no suppression systems were installed and this requirement becomes not applicable. | NA |
| 58 | When air-cleaning units are provided with permanently connected fire protection systems, provisions shall be made to activate an alarm upon initiation of flow of extinguishing agent (e.g., water, halon, CO2). | ASME N509 4.11.8 | See the response to requirements 4 and 57. | NA |
| 59 | If carbon does become wet, the wet carbon shall be removed from the absorber to prevent structural damage to the absorber due to chemical interaction. Before placing the air-cleaning unit back in service, the absorber shall be thoroughly dried and visually inspected for corrosion damage. Dried carbon shall be laboratory tested per paragraph 5.2.3 of ASME N509 and absorber leak testing shall be performed per ASME N510-1989. | ASME N509 4.11.9 | See the response to requirements 4 and 57. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
| | | | | SYSTEM |
| 60 | Acoustic linings, thermal insulation, and similar materials shall not be applied to the inside of air treatment system ducts and housings. Materials applied to the outside of ducts and housings shall not prevent access to any bolted construction joint, door, access hatch, or instrument in the housing or ducts or result in penetrations through the pressure boundary which would result in exceeding allowable leakage rates in accordance with paragraph 4 .14. of ASME N509. | ASME N509 4.12 | This is not applicable. There is no insulation on the treatment system. | NA |
| 61 | To ensure that the testing requirements of ASME N509 can be met, sufficient permanently installed halide and dioctyl phthalate (DOP) injection and sampling ports shall be provided to permit accurate testing in accordance with ASME N510. | ASME N509 4.13a | All HEPA filters have permanently installed DOP ports, which are adequate for in-place HEPA filter testing. | C |
| 62 | Where required for proper challenge agent mixing and/or sampling, multiple inlet or outlet distribution manifolds shall be provided to allow injection and sampling per ASME N510. | ASME N509 4.13a | Inlet and outlet sampling manifolds are provided for HEP-14, -15, -16, and –17 and are documented in ASME N509, Section 8.2 documentation.. | C |
| 63 | Sufficient test canisters, of type and quantity, as specified in paragraph 4.13 (b) of ASME N509, or other means of obtaining samples (see Appendix A) of used adsorbent shall be installed, as directed in paragraph 4.13 (b), of ASME N509, in the absorber system to provide a representative determination of the response of the adsorbent to the service environment over the predicted life of the adsorbent. | ASME N509 4.13b | See response to requirement 4. There are no adsorbers. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
| | | | | SYSTEM |
| 64 | Access shall be provided between banks of components in the air-cleaning unit housing to permit physical inspection of both sides of each bank. Components shall not be installed back-to-back on the same or opposite sides of the same mounting frame, or on adjacent mounting frame, or on adjacent mounting frames which are so close as not to permit adequate access space between banks. | ASME N509 4.13c | The bag-in-bag-out units suitably provide for visual inspections. | C |
| 65 | Maximum allowable leakage across the pressure boundary of any portion of a nuclear air treatment system shall be based on health physics requirements. | ASME N509 4.14.1 | Appropriate consideration has been applied for the determination of the allowable leakage rate. | C |
| 66 | The system designer (engineer) shall determine leakage criteria and allowable leakage to meet governing codes, standards, regulations, and plant-specific requirements for required portions of the nuclear air treatment system pressure boundary (ducts, housing, dampers, fans, etc.). The basis for determining the leak rate, the leak rate value (s) and coincident operating (static) pressure shall be documented and provided to the owner. | ASME N509 4.12.2 | Appropriate consideration was provided in the determination of the leakage rate and is documented in ASME N509, Section 8.2 documentation. | C |
| 67 | Air treatment system components shall be designed, fabricated, and installed so as not to exceed allowable leakage at specified operating pressure. Where shop and/or field tests are required by Table 9-1 of ASME N510, the system designer shall specify the test pressure and corresponding maximum allowable leak rate (SCFM). | ASME N509 4.14.3 | See response to requirement 66. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| 68 | Test pressure shall be selected based on the test procedures in ASME N510 and the maximum operating (static) pressure. If the leak rates are measured at a test pressure not equal to the operating static pressure, the measured leak rates shall be converted as shown in Section 4.14.3 of ASME N509 to allow comparison to allowable unit leak rates at operating pressure. | ASME N509 4.14.3 | Test pressures will be equal to the maximum operating static pressure. | NA |
| 69 | High efficiency particulate air (HEPA) filters shall meet the construction, material, test, and qualification requirements of military specification MIL-F-51068, except that listing of manufacturer's HEPA filter products on the U.S. Army's Qualified Products List is not required. Glass fiber media shall conform to the requirements of military specification MIL-F-51079. To be acceptable, filters shall have documentation showing that they have passed designated MIL-F-51068 tests as required in paragraph 5.1 of ASME N509. | ASME N509 5.1 | The entire section of 5.1 is not applicable to the HEPA filters for W-460. This criteria has been replaced with the requirements of Section FC of ASME AG-1. The filters for W-460 comply with the requirements identified in AG-1 except for filter qualification. The filter manufacturers do not have all their filters qualified to the AG-1 criteria. As a result a deviation is currently in place with WDOH allowing non-qualified AG-1 filters. | C |
| 70 | High Efficiency Particulate Air (HEPA) filters for use in containment or in Engineered Safety Feature (ESF) systems shall be metal case type (type II frames as defined by MIL-F-51068) and shall be compatible with the chemical composition of the air stream. Filter systems exposed to temperatures greater than 200 degrees F shall have steel cell sides. | ASME N509 5.1.1 | See item 69. | C |
| 71 | Radiation resistance by High Efficiency Particulate Air (HEPA) filter media shall meet the requirements of MIL-F-51079 and the conditions listed in paragraph 4.2.1 of ASME N509. | ASME N509 5.1.2 | See item 69. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| 72 | A Certificate of Conformance for High Efficiency Particulate Air (HEPA) filters shall be provided to the owner certifying that:<br>(a) the filter assembly has been designed in accordance with para. 5.1;<br>(b) the materials of construction comply with paras. 5.1, 5.1.1, and 5.1.2;<br>(c) the filters and filter media have been qualified in accordance with para. 5.1;<br>(d) the filters and filter media have been tested in accordance with para. 5.1;<br>(e) the filters have been packaged in accordance with para. 6. | ASME N509 5.1.3.1 | See item 69. | C |
| 73 | The following documentation for High Efficiency Particulate Air (HEPA) filters shall be provided to the owner:<br>(a) copies of the production test results required by Military Standards;<br>(b) copies of all filter case material certifications, if required by the owner's purchasing documents. | ASME N509 5.1.3.2 | See item 69. | C |
| 74 | Tray-type and deep bed adsorber cells shall meet the requirements for Type II or Type III cells, respectively, of ASME/ANSI AG-1-1988, Sections FD, Type II Adsorbers, and FE, Type III Adsorbers; and shall be filled with an adsorbent, each batch of which meets the requirements of para. 5.2.3 of ASME N509. | ASME N509 5.2.1 | See response to requirement 4. | NA |
| 75 | Adsorber cells shall be designed and fabricated in accordance with the requirements of paragraph 5.2.2 of ASME N509. | ASME N509 5.2.2 | See response to requirement 4. | NA |
| 76 | Adsorbent media used in Engineered Safety Feature (ESF) and non-ESF absorbers shall meet the requirements of ASME /ANSI AG-1-1988, section FF, Adsorbent Media. | ASME N509 5.2.3.1, 5.2.3.2 | See response to requirement 4. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
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| 77 | For Engineered Safety Feature (ESF) and non-ESF adsorbent, tests shall be conducted on unused adsorbent for the conditions specified in the plant's technical specifications. These tests shall be referred to as benchmark surveillance test. Acceptance criteria shall be in accordance with Technical Specifications. | ASME N509 5.2.3.3 | See response to requirement 4. | NA |
| 78 | Outline drawings showing major dimensions, dimensional tolerances, methods of sealing and baffling and method of installation shall be furnished. The drawings for all absorbers shall show the materials of construction and screen details (hole diameter and spacing, open area) in accordance with the IPA Designers, Specifiers, and Buyers handbook for Perforated Metal. | ASME N509 5.2.4 | See response to requirement 4. | NA |
| 79 | A report giving the information specified in sections FD,FE, and FF of ASME/ANSI AG-1-1988 shall be furnished to the owner. A detailed written procedure for filling and emptying the adsorber shall also be furnished. | ASME N509 5.2.5.1, 5.2.5.2 | See response to requirement 4. | NA |
| 80 | Air-cleaning unit prefilters and postfilters shall be replaceable, extended media, dry type, meeting the requirements for group III filters of Air Conditioning and Refrigeration Institute (ARI) 680, and shall be listed as Class I filters in the current UL building materials directory. Media shall be moisture resistant. | ASME N509 5.3 | ESF filters HEP-14, -15, -16 and –17 are protected upstream by Nuclear Grade HEPA filters exceeding criteria for ARI 680 Group III filters, UL Class I, UL 900 and ASHRAE STD. 52. Prefilters in gloveboxes are specified by manufacture and model number and meet criteria. Post filters are not required as there are no adsorber beds. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| 81 | Air-cleaning unit prefilters and postfilters shall have published ratings, in accordance with Air Conditioning and Refrigeration Institute (ARI) 680 as follows:<br>(a) average atmospheric dust-spot efficiency in accordance with ASHRAE Standard 52, for postfilters of 95 %, and 45 % for prefilters;<br>(b) airflow capacity: same as or greater than HEPA filters for the same filter frame face area. | ASME N509 5.3.1 | See response to requirement 80. | C |
| 82 | A report giving the air-cleaning unit prefilter and postfilter outline dimensions, description of construction, materials of construction, certification of conformance with UL900, and certification of efficiency in accordance with ASHRAE Standard 52 shall be furnished to the owner. | ASME N509 5.3.3 | Reports will be provided. | O |
| 83 | Air-cleaning unit moisture separators shall be of a design that has been qualified by testing in accordance with the procedures described in MSAR-71-45, NYO-3250-6, or an equivalent program. Moisture separators shall be found by test to be capable of performing as specified in paragraph 5.4 (a) and (b) of ASME N509. | ASME N509 5.4 | See response to requirement 5. | NA |
| 84 | Drawings showing the air-cleaning unit moisture separators details of construction, methods of sealing, baffling, and draining, dimensions, dimensional tolerances, resistance characteristics, and method of installation shall be furnished to the owner. The locations and sizes of drains to remove collected water, materials of construction, and other information required to properly install, use, and maintain the moisture separators shall be included on the drawings. | ASME N509 5.4.1 | See response to requirement 83. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
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| 85 | A report showing the results of satisfactory qualifications testing of the type of air-cleaning unit moisture separator proposed shall be furnished to the owner if the equipment has not been previously satisfactorily tested and reported in available published literature as in MSAR-71-45, NYO-3250-6, or other documents of comparable detail. | ASME N509 5.4.2 | See response to requirement 83. | NA |
| 86 | Air-cleaning unit heaters shall be electric and capable of meeting the requirements of paragraph 4.5 of ASME N509 . Heaters shall be designed for replacement without metal cutting or welding. Heaters shall not be attached directly to or grounded to the absorber mounting frame. Heaters shall be physically sized such that face velocity exceeds manufacturer's minimum requirement. | ASME N509 5.5 | Heaters are not installed in any of the systems for W-460. This is based on the information provided in the response to requirement 6, which explains that heaters are not required. Therefore, this requirement is not applicable. | NA |
| 87 | The air-cleaning unit heater stage shall be sized on the basis of heat transfer calculations showing a capability of reducing the maximum expected relative humidity of the entering air stream mixture to approximately 70% in the housing space between the moisture separator or housing inlet (whichever is applicable) and the prefilter stage, at the system design flow rate. The sensible heat produced by the heater stage shall not result in increasing air temperatures to more that 225 degrees F. An over temperature cutoff switch set at this valve shall be provided. | ASME N509 5.5.1 | See the response to requirement 86. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | **EXHAUST** |
| | | | | **SYSTEM** |
| 88 | Drawings showing the details of construction, dimensions, dimensional tolerances, size and location of services (i.e., electrical connections) and method of installation of the air-cleaning unit heaters shall be furnished to the owner. | ASME N509 5.5.2 | See the response to requirement 86. | NA |
| 89 | Heaters in Engineered Safety Feature (ESF) air-cleaning units shall be qualified to meet the requirements of Institute of Electrical and Electronics Engineers (IEEE) 323 and IEEE 344. | ASME N509 5.5.3 | See the response to requirement 86. | NA |
| 90 | A report containing description and results of qualifications testing and the resistance, certification and serial number (s) of the air-cleaning unit heaters purchased shall be furnished to the owner. If small scale model tests are the bases of design, scaled-up calculations must be provided. Heat transfer calculations shall be submitted to the owner if requested. | ASME N509 5.5.4 | See the response to requirement 86. | NA |
| 91 | Air-cleaning unit filter housings shall be designed and constructed to meet the structural and pressure loadings of section 4 of ASME N509. Welding shall conform with paragraph 7.3 of ASME N509. Layout of the housing and banks of components within the housing shall provide for access to both sides of each bank of components for maintenance and testing. For uniform airflow (within plus/minus 20% of average) through each bank of components; the completed housing shall meet the requirements of the airflow uniformity test of ASME N510. | ASME N509 5.6.1 | Vendor data show the filter housings meet the pressure capacities of each system. Also, all filter housings have been pressure tested to the structural capability pressure and have successfully passed.<br><br>Welding certification and qualifications have been provided by the fabricator that meet ASME AG-1 criteria. The ASME AG-1 is being relied upon for the welding criteria. See the response to requirement 150 for further discussion.<br>Having access to both sides of the HEPA filters is not applicable to the systems at W-460, see response to requirements 40 and 64. This requirement applies to walk-in type filter housings, not side load bag-in/bag-out housings, which are used at W-460. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | **EXHAUST** |
| | | | | **SYSTEM** |
| 92 | Air-cleaning unit High Efficiency Particulate Air (HEPA) filter and adsorber mounting frames shall meet the requirements of paragraph 5.6.3 of ASME N509, and shall be sealed into the housing by welding; no mastics, sealants, or caulking compounds shall be used to seal the mounting frame. Duct and fan connections shall be located with respect to the air distribution uniformity requirement specified (within plus/minus 20% of average). Housings shall be tested by the manufacturer in accordance with paragraph 5.6.5 of ASME N509. | ASME N509 5.6.1 | Vendor data show that all HEPA filter housings used for W-460 have seal welded frames. No mastics, sealants, or caulking is used.<br>Single element filters are exempt from airflow uniformity tests. Multiple filter element units (HEP-14, -15, -16, and -17) have test sections provided to ensure uniformity of flow. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | **EXHAUST** |
| | | | | **SYSTEM** |
| 93 | The mechanical design of air-cleaning unit housings shall be in accordance with the requirements of ASME N509 paragraph 5.6.2 (a) housing doors; (b) lighting; (c) drains; (d) housing penetrations; (e) housing connections; (f) flexible connections; and (g) housing drawings. | ASME N509 5.6.2 | a) The housing doors meet the N509 criteria. The housing size is less than the door required, so alternate methods of clamping, replacement, inspection, and testing are provided. Examples of this include only four latching lugs are required, rather than the eight identified in N509.<br>Drawings have been provided for each housing and show the door configuration for each.<br>b) Lighting is not applicable. Lighting in filter housings is required when the filter housing is the walk-in type. All the W-460 ventilation systems are side load housings and there are no inspection windows or access to the filters unless the doors are removed. The reason for non-applicability ties back in with the discussion in (a) pertaining to the doors, the size of doors, and no inspection windows.<br>c) Drains are installed in the housing.<br>d) All filter housing penetrations are seal welded or compression sealed.<br>e) There are no flanged connections on any of the systems for pressure testing. Pressure testing is performed through the aerosol injection or sampling points. The 6 " flanged port was intended for testing large walk-in housings. ASME AG1 does not require a specific sized or flanged port.<br>f) Not applicable, there are no flexible connections between filter housings.<br>g) Drawings of each filter housing have been provided. | a) C<br>b) NA<br>c) C<br>d) C<br>e) NA<br>f) NA<br>g) C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| 94 | Air-cleaning unit mounting frames for all components (moisture separators, prefilters, heaters, HEPA filters, adsorbers, and postfilters) shall be all-welded construction and seal-welded into the housing to prevent trapping of contamination between frame and housing and shall be fabricated in accordance with paragraph 5.6.3 of ASME N509. Drawings of clamping devices for HEPA filters and type II adsorbers cells shall be submitted to the owner prior to fabrication. | ASME N509 5.6.3 | Vendor data supplied show the mounting frames for each system are seal welded into the housing.<br>Clamping device drawings were not provided before fabrication because of proprietary information. As a result, the catalogue information was relied on to satisfy this criteria. | O |
| 95 | Carbon, stainless, and galvanized steel, aluminum, copper, bronze, or glass used for the fabrication of parts, components, air-cleaning units, and systems covered by ASME N509 shall meet the requirements of and be furnished in accordance with American Society of Testing and Materials (ASTM) Standards applicable to the type of material or item. The ASTM number (s) for all such materials and copies of supporting documentation (i.e., test reports and/or materials-manufacturer's certification) shall be filed by the fabricator and made available to the owner. Where a specific ASTM standard is required, the designer shall specify and the fabricator shall use such material. Where post accident spray chemistry may cause H2 generation, the use of any material incompatible with the spray chemistry shall be avoided. | ASME N509 5.6.4.1 | The material used in the W-460 ventilation systems meet the ASTM requirements.<br>Materials are provided by ESL supplies.<br>The post-accident spray chemistry for $H_2$ generation does not apply for the W-460 facility. This is a nuclear power plant accident scenario. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| 96 | Internal and external surfaces of both Engineered Safety Feature (ESF) and non-ESF duct housings located inside containment shall be stainless steel or be treated with a paint or protective coating that meets the requirements of ANSI N101.2 (for light-water reactors) or the requirements for "Severe Exposure" of ANSI N512 (for nuclear facilities other than light-water reactors): the selection, application, and inspection of paints and coatings shall conform to and be documented in accordance with the requirements of American Society of Testing and Materials (ASTM) D3843. | ASME N509 5.6.4.2 | All the filter housings in W-460 are stainless steel as captured in the information provided for ASME N509, Section 8.2 documentation.<br>All ducts inside the facility are stainless steel. The facility does not have a reactor containment area. | C |
| 97 | Internal surfaces of Engineered Safety Feature (ESF) systems located outside of containment shall be stainless steel, galvanized or electrolytic-zinc-coated steel, or treated with a paint or protective coating meeting the requirements of Service Level I of ANSI N512 and table 5-1 of ASME N509. The selection, application, and inspection of paints and protective coatings (including zinc to the extent applicable) shall conform to and be documented in accordance with the requirements of American Society of Testing and Materials (ASTM) 3843. | ASME N509 5.6.4.3 | Internal surfaces of all HEPA filter housings and all ductwork inside facility are stainless steel. The facility does not have a reactor containment area. | C |
| 98 | Internal surfaces of normally operating Engineered Safety Feature (ESF) air cleaning systems shall be treated to meet the requirements of Service Level II of ANSI N512, if environmental conditions do not significantly change between normal and post accident operation. | ASME N509 5.6.4.3 | Surfaces of ESF systems are stainless steel. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| 99 | Nongalvanized carbon steel external surfaces shall be coated or painted for corrosion resistance. Where conditions exist outside of containment (e.g., in systems containing sprays with chemical additives) which restrict the use of aluminum, galvanized or electrolytic-zinc-coated steel, external and internal surfaces of Engineered Safety Feature (ESF) housings shall be in accordance with paragraph 5.6.4.2 of ASME N509. | ASME N509 5.6.4.3 | See response to requirement 98. | C |
| 100 | Galvanized surfaces of Engineered Safety Feature (ESF) air cleaning systems shall meet the requirements of American Society of Testing and Materials (ASTM) A123; electrolytic-zinc-coated surfaces shall meet the requirements of type GS of ASTM A164. Edges of steel sheared after coating, welds, and areas in which the galvanized coating has been removed for any reason shall be treated with inorganic zinc rich paint (qualified to ANSI N101.2) to restore the corrosion resistance of those areas. Galvanized surfaces that have been damaged shall be repaired with an appropriate qualified material per ANSI N101.2. The damaged areas shall be coated to provide an equivalent to the original coating. | ASME N509 5.6.4.5 | Not applicable; ESF systems are stainless steel. | NA |
| 101 | If permanently installed sampling and injection manifolds cannot be provided the air-cleaning unit, then manifolds shall be designed to be removable with each manifold's piece numbered, tagged with permanent metal tags and marked for reinstallation prior to each test. | ASME N509 5.6.5.1 | Manifolds and test ports are permanent for all systems. | NA |
| 102 | As a minimum, injection and sampling manifolds are required between each pair of HEPA filter banks and between each pair of carbon adsorber banks. | ASME N509 5.6.5.1 | The manifold is located before and after the HEPA filter to allow proper aerosol testing. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
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| 103 | For air-cleaning systems with no inlet ducts or no outlet ducts, injection manifolds and sampling manifolds shall be located within the housing. | ASME N509 5.6.5.1 | Not applicable. All systems have ductwork that allows for proper aerosol testing. | NA |
| 104 | Manifolds shall be:<br>(a) located to provide uniform mixing and sampling of the test agent,<br>(b) located to allow for maintenance of the filter elements, and<br>(c) designed such that they do not impair the function of the adjacent filter banks or the structural integrity of the filter frames or housing when subjected to the structural loadings listed in para. 4.2 of ASME N509. | ASME N509 5.6.5.1 | a) The injection and sampling manifolds (test sections) have been factory tested and have been shown to be acceptable.<br>b) The location of the manifolds do not interfere with filter elements.<br>c) The location of the manifolds do not impair the function.<br>Documented in ASME N509, Section 8.2 documentation. | C |
| 105 | Each injection and sampling manifold shall be shown on a drawing which indicates location within the air-cleaning unit housing, distance from components, support detail, tube diameters, hole locations and diameters, location of valves and plugs, manifold identification number, and manifold internal volume. Drawings shall be submitted to the owner for review prior to fabrication and final as-built drawings submitted to the owner after shop testing. Manifold design and location shall be qualified by shop tests per paragraphs 5.6.5.5 and 5.6.5.6 of ASME N509. | ASME N509 5.6.5.1 | The only system with sampling and injection manifolds is HEP-14, -15, -16, and –17.<br>A DETAILED DRAWING IS NOT AVAILABLE FOR THE SAMPLING MANIFOLD BECAUSE OF PROPRIETARY INFORMATION FROM THE MANUFACTURER. As a result, the information contained in the manufacturer's catalogue will be used. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| 106 | Air-cleaning unit housings shall be visually inspected in the shop prior to shipping. Visual inspection shall be performed in accordance with applicable sections of ASME N510-1989 section 5. Observed deficiencies shall be documented on a visual inspection-checklist, required corrective action noted, and results of reinspection documented. Visual inspection documentation shall be transmitted to the owner for his records. | ASME N509 5.6.5.2 | Visual inspections will be performed at the shops of each filter housing manufacturer, and will be documented in ASME N509, Section 8.2 documentation.. | O |
| 107 | All High Efficiency Particulate Air (HEPA) filter frame and adsorber bed welds which could result in leakage bypassing HEPA filters or adsorber beds shall be shop tested with magnetic particle or liquid penetrant in accordance with the requirement in paragraph 7.3 of ASME N509. In addition, each HEPA and adsorber frame shall be pressure leak tested in the shop in accordance with ASME N510, section 7. Leakage shall not be greater than 0.1%. of rated flow. | ASME N509 5.6.5.3 | HEPA filter housing welds will be shop tested with magnetic particles or liquid penetrant.<br>The pressure leak test is an optional test as identified in ASME N510. As a result, this test is being classified as Not Applicable. | O |
| 108 | Air-cleaning unit housings or housing sections shall be leak tested in the shop prior to shipment, in accordance with ASME N510, section 6. Leakage shall be no greater than acceptance criteria provided by the owner. Results of housing leak tests shall be transmitted to the owner for his records. | ASME N509 5.6.5.4 | All the filter housings will be shop tested before being shipped. | O |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| 109 | Airflow distribution testing shall be performed in the shop prior to air-cleaning unit shipment in accordance with ASME N510, section 8 to provide assurance that manufacturer's design provides uniform air distribution. Shop tests shall simulate actual field entrance and exit duct connections as closely as possible. Field testing shall also be conducted in accordance with ASME N510. Acceptance criteria shall be as given in ASME N510. Results of airflow distribution tests shall be documented and transmitted to the owner for his records. | ASME N509 5.6.5.5 | This requirement is only applicable to filter housings HEP –14, -15, -16 and -17. The other housings are excluded because these have only one filter housing in the bank. | O |
| 110 | Air-aerosol mixing uniformity tests shall be performed in the shop for each manifold which is provided by the manufacturer to be mounted within the air-cleaning unit filter housing. Qualification testing of sampling manifolds shall be conducted in accordance with Appendix D of ASME N509. Qualification testing of injection manifolds shall be performed in accordance with ASME N510, Section 9. Results of tests shall be documented and transmitted to the owner. These results shall qualify the design and installation of the sample manifolds prior to shipment. Acceptance criteria shall be as given in ASME N510. Field testing shall also be conducted in accordance with ASME N510 after installation. | ASME N509 5.6.5.6 | This requirement is only applicable to filter housings HEP –14, -15, -16 and -17. The air-aerosol mixing uniformity test will be performed in the shop. The sampling manifold location is standard and can be considered as qualified based on previous similar filter housings. | O |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| 111 | Air-cleaning unit fans shall be selected on the basis of detailed system pressure loss calculations, and shall be capable of producing the specified design flow rates. The system designer shall, in accordance, with Air Movement and Control Association, Inc. (AMCA) 201, prepare a system characteristic curve for design and limiting conditions under which the fans will be required to operate. Fan selection shall also be consistent with the conditions specified in paragraph 5.7.1 of ASME N509. | ASME N509 5.7.1 | Design flow rate calculations were performed on the system and the fan design was based on those calculations. A system curve was not completed, but the operating point for the system was determined by the calculations. The calculations do show the conditions the fans will be operating. This information was provided to the fan manufacturer. Therefore, although a complete system curve was not completed, the operating point was provided for the system, and is documented in ASME N509, Section 8.2 documentation. | C |
| 112 | Engineered Safety Features (ESF) fans shall be tested in accordance with Air Movement and Control Association, Inc. (AMCA) 210 and the applicable special sections of AMCA 211A. Only one fan of each size and type must be tested. Non-ESF fans shall be either rated and listed in accordance with AMCA 211A or tested the same as ESF fans. The rating or fan test shall be based on the standard test configuration most closely representative of the manner in which the fan will be installed in the Nuclear Air Treatment System. | ASME N509 5.7.2 | Vendor data provided by the manufacturer show the fans meet these criteria. Vendor documentation show the fans are tested in accordance with AMCA 210. | C |
| 113 | Copies of the rating report or test report shall be obtained from the fan manufacturer, together with copies of pertinent catalog data, performance data, and operating and service manuals for inclusion with the documentation for the air-cleaning system. Sound ratings for the fan, based on data obtained in accordance with Air Movement and Control Association, Inc. (AMCA) 300 and reported in accordance with AMCA 301, shall be furnished. | ASME N509 5.7.2 | Vendor data provided by the manufacturer show the fans meet these criteria. The sound rating of the fans also were performed and shown to be acceptable per the AMCA 300 criteria. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | **EXHAUST** |
| | | | | **SYSTEM** |
| 114 | Air-cleaning unit fan wheels shall be dynamically balanced prior to final assembly of the fan. Records shall be maintained in the vendor's file. The double amplitude of vibration in any plane measured on the bearing cap at the rotational rotor speed shall not exceed the following:<br>Rotational Speed (rpm) Double Amplitude (mil)<br>600 3.2<br>720 2.7<br>900 2.1<br>1200 1.6<br>1800 1.1<br>3600 0.5<br>Displacement may be interpolated for other speeds. Final balancing shall be performed after fan installation is completed. | ASME N509 5.7.3 | Procurement specification W-460-P-10 requires that the fans be dynamically balanced in accordance with ASME N509, Paragraph 5.7.3 & ASME AG-1. | C |
| 115 | Certified drawings showing outline dimensions, base or mounting dimensions, dimensional tolerances, duct connections, method or details of motor attachment and other information necessary to install, use, and maintain the air-cleaning unit fan shall be furnished to the owner and included in the documentation. The drawings shall also show the recommended motor, belts (if any), couplings, drive units, materials of construction, protective coatings, and lubricants. | ASME N509 5.7.4 | Drawings of the fans showing dimensions, mounting locations, and motor attachment have been provided by the manufacturer.<br>Some of the drawings are actual catalogue cut sheets, which provide the required detail. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| 116 | A report giving a description and results of the air-cleaning unit fan qualification tests shall be furnished to the owner. The report shall include all calculations and descriptions of any analytical or mathematical modeling techniques, a description of any computer codes used with reference to computer code validation documentation, or other tests made in conjunction with the certification or qualification of the fan or fan assembly. | ASME N509 5.7.5 | Vendor data provided by the manufacturer show the fans meet these criteria. No calculations, modeling, or computer codes were used; therefore, this portion is not applicable. | O |
| 117 | Air-cleaning unit fan drive motors shall comply with and be tested and rated in accordance with applicable requirements of National Electrical Manufacturers' Association (NEMA) MG-1, and Institute of Electrical and Electronics Engineers (IEEE) 112A. Performance shall be verified by either test or certification as specified for each requirement. Rated service factor shall be a minimum of 1.0 unless specified otherwise. Motors shall be of the type specified for the intended service and shall have operating characteristics and other criteria as outlined in paragraph 5.8.1 of ASME N509. | ASME N509 5.8.1 | Vendor data provided by the manufacturer show the fans meet these criteria. | C |
| 118 | Fan drives in Engineered Safety Feature (ESF) systems shall comply with Institute of Electrical and Electronic Engineers (IEEE) 323. In addition, drives of ESF systems located inside containment shall be qualified in accordance with IEEE 334. ESF fan drives shall be qualified in accordance with IEEE 344. Motor supports and hangers shall be designed to withstand all seismic and operating loads with the motor in its normal operating orientation without impairment of operating characteristics. | ASME N509 5.8.2 | This is not applicable. Fan systems at W-460 are non-ESF systems. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| 119 | Certified fan drive motor data sheets and dimension drawings showing major dimensions, dimensional tolerances, base or mounting dimensions, and other data needed for installation of the motor shall be furnished to the owner. Documentation specified in Institute of Electrical and Electronic Engineers (IEEE) 323 shall also be furnished for Engineered Safety Feature (ESF) system motors. | ASME N509 5.8.3 | Data for details of mounting the motor are not necessary. The motors are shipped with the fans and the fan drawings show the installation of the motor.<br>The IEEE requirements are not applicable as the fan systems are non-ESF. | C<br>NA |
| 120 | Supplemental parameters, as outlined in paragraph 5.9.2 of ASME N509, shall be considered for each air-cleaning unit damper when established design requirements, in addition to those delineated in paragraph 4.2 of ASME N509. | ASME N509 5.9.2 | The requirements for all the butterfly dampers installed in the system will be from ASME AG-1; which states that if the damper is constructed to ASME B31.1, none of the AG-1 criteria apply. Vendor data show the butterfly dampers meet the ASME B31.1 criteria. | C |
| 121 | Construction of Class A air-cleaning unit dampers shall meet the requirements for valves of ANSI/ASME B31.1. | ASME N509 5.9.3.1 | Not applicable. Air cleaning units use Class A butterfly valves. | NA |
| 122 | Construction Class B air-cleaning unit dampers shall be industrial quality construction: all parts, including frame, blades, pivots, shafts, bearings, linkages and operator, shall be designed to the minimum criteria as outlined in paragraph 5.9.3.2 of ASME N509 (a) frame; (b) blade and shaft; (c) linkage; (d) bearings; and (e) stress. | ASME N509 5.9.3.2 | Not applicable. There are no class B dampers on air cleaning units. | NA |
| 123 | Welding of Construction Class A air-cleaning unit dampers shall comply with the requirements of ANSI/ASME B31.1. Welding of Construction Class B dampers shall comply with paragraph 7.3 of ASME N509. | ASME N509 5.9.4 | Class A butterfly valves meet requirements of ANSI/ASME B31.1. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | **EXHAUST** |
| | | | | **SYSTEM** |
| 124 | Operator torque requirements shall be specified by the air-cleaning unit damper manufacturer. Operators shall be designed to provide a minimum of 1.5 times to torque to meet specified maximum leak rate requirements or dynamic requirements, whichever are greater. Electrically powered operators, solenoid valves, and limit switches used in Engineered Safety Feature (ESF) systems shall be qualified to meet the requirements of Institute of Electrical and Electronic Engineers (IEEE) 323 and IEEE 334. Positive locking devices shall be provided on balancing damper manual operators. | ASME N509 5.9.5 | This is not applicable. The butterfly dampers are being relied on to meet the AG-1 criteria, which allows construction to ASME B31.1. Backdraft dampers rely only on gravity to remain closed, as a result, the operator torque requirement is not applicable.<br>ESF systems (HEP-14, -15, -16,and –17) do not have electrically powered equipment. | NA |
| 125 | Air-cleaning unit dampers with external rotating shafts shall have a mechanical position indicating arm and escutcheon plate; dampers which will be remotely indicated shall also have the necessary switches, relays, or other devices necessary to meet the requirements of paragraph 4.8 of ASME N509. Electrical switches used for remote indication of the damper position in the Engineered Safety Feature (ESF) system which are specified to perform additional safety-related functions shall be required to meet the requirements of Institute of Electrical and Electronic Engineers (IEEE) 323. | ASME N509 5.9.6 | Not applicable; the butterfly dampers will be relying on the AG-1 criteria. Backdraft dampers are not adjustable; therefore, the position indication and other requirements identified in this section are not applicable. | NA |
| 126 | Flow characteristics and pressure drop qualification tests for air-cleaning unit dampers shall be determined in accordance with Air Movement and Control Association (AMCA) 500. Leakage rates and test reports for leakage Classes I, II, and III shall conform to the requirements of paragraph 5.9.7.1 of ASME N509. | ASME N509 5.9.7.1 | Not applicable; the butterfly dampers will be relying on the AG-1 criteria. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | **EXHAUST** |
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| 127 | Each air-cleaning unit damper (except manual balancing dampers) and its accessories shall, as a shop test, be cycled at least 10 times from the full-open to the full-closed position to check the free operation of all parts and correct adjustment, positioning and seating of blades. On completion of cycling, the alignment shall be reworked, if necessary to correct deficiencies before shipment. When shop leakage tests are required, they shall be performed after the cycling test and after the deficiencies have been corrected. | ASME N509 5.9.7.2 | Not applicable; the butterfly dampers will be relying on the AG-1 criteria. | NA |
| 128 | The following described bubble test shall be conducted on each air-cleaning unit leakage Class I damper assembly. The damper assembly shall be bolted to a sealed chamber which is then pressurized to the specified pressure; there shall be no bubbles when tested with a soap solution in accordance with the bubble method of leak detection in ASME N510-1989. | ASME N509 5.9.7.3 | Vendor data showing compliance have been received. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | SYSTEM |
| 129 | The manufacturer of the air-cleaning unit dampers shall furnish the following items to the owner: (a) pressure drop, in. w.g., at design airflow capacity, with AMCA 500 apparatus setup figure; (b) air leakage rate, cfm/ft$^2$, in full-closed position at specified pressure differential, and torque with AMCA 500 apparatus setup figure; (c) maximum torque required by damper, ft-lb; (d) operator torque available in position corresponding to maximum damper torque; (e) shop leak test report when required; (f) IEEE qualification reports on electric-powered operators and electric accessories.<br>All reports, data, and manuals furnished by the manufacturer shall be marked to show the manufacturer's name and damper identification. | ASME N509 5.9.8 | Not applicable; the butterfly dampers will be relying on the ASME AG-1 criteria for the dampers built to ASME B31.1. | NA |
| 130 | Certified drawings showing the general arrangement and principal dimensions of the air-cleaning unit damper equipment including operators and accessories, and cross sections through the equipment shall be submitted to the owner. This shall include size, type, and location of all support connections and other information as required by paragraph 5.9.9 of ASME N509. | ASME N509 5.9.9 | Not applicable to the butterfly dampers. The AG-1 criteria are being applied to those dampers. | NA |
| 131 | Air-cleaning unit dampers shall be prepared for shipment in accordance with paragraph 6.1 of ASME N509. | ASME N509 5.9.10 | This is not applicable to the butterfly dampers. | NA |
| 132 | Coatings for air-cleaning unit dampers shall be in accordance with paragraph 5.6.4 of ASME N509. | ASME N509 5.9.11 | Not applicable to the butterfly dampers. This also is not applicable to the backdraft dampers because these are not coated. | NA |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
| | | | | SYSTEM |
| 133 | The air-cleaning unit duct system shall be designed and constructed to meet the structural and pressure loading and leak tightness of section 4 of ASME N509, while transporting a possibly contaminated or treated air or gas stream from the point (s) of collection to the points (s) of intersection with plant ventilation system or discharge to a plant vent stack. | ASME N509 5.10.1 | All the ductwork meets these criteria. | C |
| 134 | The following supplemental parameters shall be considered for the duct system when establishing design requirements in addition to those delineated in paras. 4.2,4.4,4.5, and 4.6 of ASME N509: (a) duct size (b) methods of support (c) system operating pressure. | ASME N509 5.10.2 | These were considered in all the systems. | C |
| 135 | Air-cleaning unit duct system transverse joints and longitudinal seams shall be designed to retain their structural and sealing integrity when subject to the design loads . | ASME N509 5.10.3.1 | Structural calculations have been completed on the ductwork to show ductwork can withstand the loading, and is documented in ASME N509, Section 8.2 documentation..<br>Ductwork is constructed of schedule pipe. Supports have been analyzed for design loads. | C |
| 136 | Air- cleaning unit duct system stresses and deflections, or charts used to determine them, shall be based on calculation that consider the loads as described in paragraph 5.10.3.2 of ASME N509. | ASME N509 5.10.3.2 | Structural calculations have been completed on the ductwork supports to show the supports can withstand the loading from a seismic event. The items identified in this section have been considered, and are documented in ASME N509, Section 8.2 documentation.. | C |
| 137 | Air-cleaning unit duct system allowable stress shall be 0.6 of the yield stress for loads encountered during normal plant operation and shutdown and shall be 0.9 of the yield stress for combined loads which include the Safe Shutdown Earthquake and Design Basis Tornado. | ASME N509 5.10.3.3 | Structural calculations have been completed on the ductwork supports to show the supports can withstand the loading from a seismic event, and are documented in ASME N509, Section 8.2 documentation. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| 138 | Air-cleaning unit duct system allowable static deflections shall not exceed the following values:<br>(a) plate or sheet: 1/8 in. per ft of the maximum unsupported panel span in direction of airflow but not more than 3/4 in. relative to stiffeners;<br>(b) stiffeners and flange connections: 1/8 in. per ft of span but not more than 3/4 in;<br>(c) flange connection to dampers and fans: 1/360 of the span or 1/8 in. maximum. | ASME N509 5.10.3.4 | Deflections are less than allowables. Ductwork is schedule 10 or heavier. | C |
| 139 | Air -cleaning unit duct construction shall be in accordance with the requirements of paragraph 5.10.4 of ASME N509. | ASME N509 5.10.4 | Ductwork is welded schedule pipe and exceeds requirements. | C |
| 140 | Welding of air-cleaning units ducts shall be in accordance with paragraph 7.3 of ASME N509. | ASME N509 5.10.5 | The ductwork has been welded to these criteria as vendor data show. | C |
| 141 | Materials used in the fabrication of air-cleaning unit duct work shall conform to the requirements of paragraph 5.10.6 of ASME N509. | ASME N509 5.10.6 | The material used in the ductwork meets the criteria identified in Section 5.10.6. | C |
| 142 | Air-cleaning unit duct coatings shall be in accordance with paragraph 5.6.4 of ASME N509. | ASME N509 5.10.7 | Not applicable. No coatings are used on the ductwork. | NA |
| 143 | Except where excluded in paragraph 5.10.8.1 of ASME N509, air-cleaning unit duct sections shall be subjected to air leak tests as described in ASME N510-1989 using the criteria given in paragraph 4.14 of ASME N509. | ASME N509 5.10.8.1 | All the ductwork for W-460 will be pressure tested. The stack is excluded in subparagraph (f). However, the ductwork will be tested for audible leaks as per 5.10.8.1. | O |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | **EXHAUST** |
| | | | | **SYSTEM** |
| 144 | A pressure test shall be performed on those portions of ducts and housings of once-through and recirculation nuclear air treatment systems which could be subjected to fan peak pressure due to closure of dampers on suction or discharge of fan. The test shall be performed at the structural capability pressure established in paragraph 4.6.6 of ASME N509. If required, ducts shall be tested in accordance with structural capability pressure test of ASME N510. Upon completion of the pressure test, ductwork exhibiting permanent distortion or breach of integrity shall be repaired or replaced. The pressure test shall be repeated after repairs until no permanent distortion or breach of integrity is observed. | ASME N509 5.10.8.2 | All the ducts will be pressure tested to these criteria. | O |
| 145 | Prior to declaring the nuclear air treatment system operable, all duct systems shall be balanced to achieve design flow rate at the fan (s) and maintain spaces at the required pressure differential. Upper and lower flow limits shall be established by owner such that design function of the system is maintained and equipment capabilities are not exceeded. | ASME N509 5.10.9 | Balancing will be performed on the systems to ensure the flow rates are at the design set points.<br>Lower and upper flow limits have been established for each system and are documented in ASME N509, Section 8.2 documentation. | O |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | SYSTEM |
| 146 | Air-cleaning unit adsorber cells (Type I or II) shall be prepared for shipping in accordance with applicable section of ANSI/ASME AG-1-1988. Prefilters and after filters shall be packaged in accordance with manufacturer's standard practice. Moisture separators, High Efficiency Particulate Air (HEPA) filters, heaters, Type III absorbers, motors, fans, and dampers shall be crated or skidded, or both in a manner that will protect the item from physical damage and exposure to dirt, weather, (including road spatter), and vibration during shipment and subsequent storage at the installation site for conditions in paragraph 4.2 of ASME N509. Panels shall be bolted to flanges or otherwise attached so they cannot be torn loose during shipping. Unpainted carbon steel surfaces shall be located with a rust inhibitor before packaging. Openings shall be covered in accordance with paragraph 6.1 of ASME N509. | ASME N509 6.1 | Preparation of adsorber cells for shipping is N/A as there are no adsorber cells in the W-460 HVAC system. All filters were packaged by the manufacturer consistent with the specification for HEPA filters (HNF-S-0552), which complies with ASME AG-1. As noted earlier, no moisture separators were provided. For other components, hardware was shipped, received, inspected, and stored as required as evidenced by quality assurance surveillance and nonconformance reports and their resolution. | C |
| 147 | Air- cleaning unit materials and components shall be moved and handled in a manner that does not damage the item or its packaging. Receiving and storage personnel shall be informed of the necessity of proper handling of all components, especially the High Efficiency Particulate Air (HEPA) filters and carbon absorber cells. Adsorbent shall be packaged, and stored in accordance with ANSI/ASME AG-1 section FE. Materials and components shall be stored in accordance with the requirements of paragraph 6.2 of ASME N509. | ASME N509 6.2 | See response to requirement 146. | C |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | SYSTEM |
| 148 | Complete air-cleaning system layout drawings showing the location of housing, ducts, fan dampers, and the other external components in each of three mutually perpendicular planes shall be prepared prior to the start of erection. Drawings shall show all connections, hangers, and anchors, the location and joint details for all welds, and the procedure specification for each weld. The layout drawings shall reference dimension and shop drawings of components, as applicable. Layout shall be checked for interferences with other items to be installed in the area, and conflicts shall be resolved before installation. | ASME N509 7.1 | This documentation was provided in ASME N509, Section 8.2 documentation. | C |
| 149 | All air-cleaning system ducts, housings, fans, dampers, hangers, anchors, and services (electrical, steam, drains, etc.) shall be installed in strict conformance with the layout drawings; deviations of more than the design tolerance from the location in any plane from the position shown in the drawings shall be approved by the system designer or other responsible engineer, and shall be documented by "As-Built" drawings. Assembly and erection of the system shall be in accordance with section 7.2 of ASME N509. | ASME N509 7.2 | This documentation was provided in ASME N509, Section 8.2 documentation. Additionally, the installation will be completed using the drawings. | O |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | SYSTEM |
| 150 | Welding procedures, welders, and welding operators installing and erecting the air-cleaning system shall be qualified in accordance with ANSI/ASME AG-1-1988. Production welds shall be visually inspected in accordance with American Welding Society (AWS) D1.1 standards. Acceptance criteria for welds produced per ASME BPVC Section IX, shall be in accordance with the applicable ASME design section of the Code. Performance qualification tests and samples shall be in conformance with paragraph 7.3 of ASME N509. | ASME N509 7.3 | All welds and documentation will be consistent with ASME AG-1. This documentation will be provided in ASME N509, Section 8.2 documentation. Furthermore, the quality assurance program process will provide evidence that the welding processes employed meet these requirements. | O |
| 151 | The position and alignment of air-cleaning system foundations, anchors, hangers, ducts, housings, dampers, fans, motors, and other components shall be checked and their locations shall be within tolerance as shown on the drawings. Pleats of High Efficiency Particulate Air (HEPA) filters shall be vertical, gaskets of HEPA filters and absorbers shall be securely affixed so that they are not displaced during installation. Clamping devices shall be in place and completely tightened to produce the required gasket compression. Installation personnel shall be instructed in the proper handling of the HEPA filters and carbon cell absorbers prior to the installation and clamping of the filters. | ASME N509 7.4 | As-builts will confirm installation, and components were installed per manufacturer's recommendations. Acceptance testing will validate that this requirement is met. This documentation will be provided in ASME N509, Section 8.2 documentation. | O |
| 152 | The design organization, manufacturers of components, and constructors (including subcontractors) shall each establish and comply with a comprehensive quality assurance program and plan which meets the requirements of ANSI/ASME NQA-1-1986. | ASME N509 8.1 | It cannot be shown that all materials and components for all systems were procured through a NQA-1 program. However, all ESF components have been procured from NQA-1 manufacturers. | O |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | SYSTEM |
| 153 | As a minimum, the following shall be documented and submitted to the owner:<br>Documentation (N509 Section)<br>Design Parameters (4.2)<br>Maximum Operating Pressure (4.6)<br>Test Pressure (4.6)<br>Structural Capability Pressure (4.6)<br>Test Canister Qualification (4.11)<br>Basis and Quantity for Maximum Allowable Leakage (4.14)<br>HEPA Filter Qualification Report (5.1.3)<br>Adsorber Drawings and Qualification Report (5.2.4/5.2.5)<br>Prefilter and Postfilter Qualification Reports (5.4.1)<br>Moisture Separator Drawings and Qualification Report (5.4.1/5.4.2)<br>Heater Drawings and Qualification Report (5.5.2/5.5.4)<br>Housing Drawings (5.6.2g)<br>HEPA and Adsorber Clamping Device Drawings (5.6.3)<br>Manifold Drawings (5.6.5.1)<br>Factory Visual Inspection Reports (5.6.5.2)<br>Factory Housing Leak Test Results (5.6.5.4)<br>Factory Airflow Distribution Test Results (5.6.5.5)<br>Factory Air-Aerosol Mixing Uniformity Test<br>System Layout Drawings (7.1) | ASME N509 8.2 | Vendor drawings and approval data will be provided when available | O |

| Reqmt no. | Requirement text | Requirement source / Sec # | Requirement compliance | Complies Not Applicable Open |
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| | | | | EXHAUST |
| | | | | SYSTEM |
| 153 cont. | Results (5.6.5.6)<br>Fan Drawings and Qualification Test Report (5.7.4/5.7.5)<br>Fan Motor Drawings and Data Sheets (5.8.3)<br>Damper Drawings and Reports (5.9.8)<br>Test Acceptance Criteria (Table 9-1) | | | |
| 154 | Acceptance tests of the air-cleaning system shall be made in accordance with the procedures of ASME N510. All dampers, valves, and controls shall be exercised through their full operating range and shown to be in good operating condition before the start of testing. After completion of acceptance testing, the system shall be sealed and the fan controls locked out to protect the components during the remainder of construction operations at the site. The system designer (engineer) shall provide the acceptance criteria in Table 9-1 of ASME N509 to the owner to incorporate in his acceptance and surveillance test procedure and project specification in accordance with ASME N510 requirements. | ASME N509 9 | This documentation will be provided in ASME N509, Section 8.2 documentation. | O |

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