DOE F 1325.8

United States Government **Department of Energy (DOE)**

# memorandum

**Savannah River Operations Office (SR)**

DATE: NOV 0 2 2007

REPLY TO ATTN OF: TSD (Mark A. Smith, 803-952-9613)

SUBJECT: Request for Concurrence with Recommendation of the Defense Nuclear Facilities Safety Board (DNFSB) 2004-2 Final Report for the Savannah River Site (SRS) Solid Waste Management Facilities

TO: Dae Y. Chung, Deputy Assistant Secretary for Safety Management and Operations (EM-60), HQ

In accordance with the DNFSB 2004-2 Implementation Plan (IP) Deliverable 8.6.5, please find attached the DNFSB 2004-2 Final Report for the SRS Solid Waste Management Facilities. After completing the evaluation, SRS recommends that no facility modifications be made at this time based on the fact that current operations perform the opening of containers in a temporary radiological containment system. Also this recommendation is based on the fact that with current credited controls in place (a Technical Safety Requirement establishes a Safety Significant inventory limit), radiological doses to the worker and public are below the evaluation guidelines required to establish safety class or any additional safety significant controls. Finally, there is no active confinement ventilation system installed in the Solid Waste Management Facilities.

In accordance with IP deliverable 8.6.5, please provide Program Secretarial Officer concurrence with this recommendation within 90 days of receipt of this report.

If you have any questions, please contact Mark A. Smith at 803-952-9613.

Jeffrey M. Allison
Manager

TSD:MAS:dmy

OSQA-08-0010

Attachment:
2004-2 Final Report for Solid Waste Management Facilities

cc w/attachment:
Dr. Robert C. Nelson (EM-61), HQ
Percy Fountain (EM-3.2), HQ

**SRS SITE EVALUATION TEAM CONCURRENCE**
**Final DNFSB 2004-2 Evaluation Report**

**Facility:** **Solid Waste Management Facility.** WSRC Letter M&O-WMAP-2007-00068, "DNFSB 2004-2 Final Report Transmittal", dated 7/31/07

Reference:

1. Commitment 8.6.3 of DNFSB 2004-2 Implementation Plan Revision 1, dated July 12, 2006
2. Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related Systems, dated July 2006, Revision 1.

In accordance with the references above, the SRS Site Evaluation Team has reviewed and concurs with the submittal of the attached Solid Waste Management Facility final report.

Site Evaluation Team (SET) Concurrence:

Signature on file
Mark A. Smith, DOE-SR, Site Lead for SET

10/25/07
Date

Signature on file
Ken W. Stephens, WSRC Lead for SET

10/25/07
Date

SRS Site Evaluation Team consists of the following personnel:

DOE Site Lead and SET Chairman (Mark A. Smith, OSQA/TSD)
DOE Alternate Site Lead & Safety Basis SME (Don J. Blake, AMWDP/WDED)
DOE Ventilation System and Natural Phenomena Hazards SME (Brent J. Gutierrez, AMWDP/WDED)
WSRC 2004-2 Site Lead Ken W. Stephens (TQS/Nuclear Safety, Transportation, and Engineering Standards Dept. Mgr.)
WSRC Alternate Site Lead & Safety Basis SME (Andrew M. Vincent, M&O Chief Engineer Dept.)
WSRC Ventilation System SME (Scott J. MacMurray, SRNL Facility Engineering)
WSMS Safety Basis SME (Jerry L. Hansen)
WSRC SET Assistant Project Manager (Barbara A. Pollard, Nuclear Safety Dept.)

SRS **SAVANNAH RIVER SITE**
Aiken, SC 29808 • www.srs.gov

RECEIVED
2007 AUG -8 PM 3: 18
MAIL CONTROL

JUL 3 1 2007

M&O-WMAP-2007-00068
RSM Track #: 10048

Mr. Carl A. Everatt, Acting Director
Office of Safety and Quality Assurance
Department of Energy
Savannah River Operations Office
P. O. Box A
Aiken, South Carolina 29802

071169

Dear Mr. Everatt:

**DNFSB 2004-2 FINAL REPORT TRANSMITTAL**

This letter transmits the final report for the N Area Solid Waste Management Facility (SWMF) Hazardous and Mixed Waste (HWMW) Storage Buildings as required by DNFSB Recommendation 2004-2, Active Confinement Ventilation Systems (CVS). SWMF Facility Evaluation Team concurrence is acknowledged in the final report. This transmittal is in accordance with the Department of Energy (DOE) guidance provided in "Ventilation System Evaluation Guidance for Safety Related and Non-Safety Related Systems", Revision 0, January 2006.

Sincerely,

W. A. Morrison, Deputy Manager
Waste Management Area Project

rtd/ccc
Att.
c: M. A. Mikolanis, DOE, 707-H
T. M. Tran, 707-H
T. C. Temple, 707-H
M. A. Smith, 730-B
D. D. McCormack, 730-B
R. J. Giroir, WSRC, 705-3C
S. E. Crook, 704-59E
J. S. MacMurray, 773-43A
R. L. Salizzoni, 703-H
J. L. Hansen, 707-F
A. M. Vincent, 703-H
R. R. Lowrie, 704-4B
B. J. Guiterrez, 707-H
B. Vereen, 730-4B
S. R. Smith, 249-8H
J. S. Evans, 730-1B
D. J. Blake, 707-H
R. T. Duke, 705-3C
M. G. Looper, 704-36E
C. B. Stevens, 704-58E
P. N. Fairchild, 704-35E
R. D. Burns, 704-55E
J. J. Copeland, WSMS
S. J. Snyder, WSMS
WMAP Document Control, 642-E

# Savannah River Site
# Solid Waste Management Facilities
# Hazardous and Mixed Waste Storage Buildings
# Buildings 645-N, 645-2N and 645-4N

**DNFSB Recommendation 2004-2**

**Ventilation System Evaluation**

**Revision 0**

**July 23, 2007**

## Review and Approval

**Facility Evaluation Team Concurrence:**

| | |
|---|---|
| **Tam Tran, Lead, DOE Authorization Basis for SWMF** | 7/31/07 **Date** |
| **Roger Duke, Technical Advisor, WMAP Engineering** | 7/30/07 **Date** |
| **Steve Crook, Manager, WMAP Safety Compliance** | 7/31/07 **Date** |
| **Peter Fairchild, TRU Engineering Lead, WMAP** | 7/30/07 **Date** |

## Table of Contents

## 1.0 Acronyms

CHA – Consolidated Hazard Analysis
CVS – Confinement Ventilation System
CW – Co-located Worker
DNFSB – Defense Nuclear Facilities Safety Board
DOE – Department of Energy
DSA – Documented Safety Analysis
EG – Evaluation Guideline
GS – General Service
HC – Hazard Category
HEPA – High Efficiency Particulate Air
HW – Hazardous Waste
MAR – Material At Risk
MOI - Maximally-Exposed Offsite Individual
MPFL – Maximum Possible Fire Loss
MW – Mixed Waste
NPH – Natural Phenomena Hazard
PC – Performance Category
REM – Roentgen Equivalent Man
SC – Safety Class
SRS – Savannah River Site
SSC – Systems, Structures or Components
SWMF – Solid Waste Management Facilities
TPC – Total Project Cost
TRU – Transuranic

## 2.0 Definitions

Confinement – A building, building space, room, cell, glovebox, other enclosed volume in which air supply and exhaust are controlled and typically filtered.

Confinement System – The barrier and its associated systems (including ventilation) between areas containing hazardous materials and the environment or other areas in the facility that are normally expected to have levels of hazardous materials lower than allowable concentration limits.

Hazard Category – Hazard Category is based on hazard effects of unmitigated release consequences to offsite, onsite and local workers.

Performance Category – A classification based on a graded approach used to establish the Natural Phenomena Hazard design and evaluation requirements for structures, systems and components.

Ventilation System – The ventilation system includes the structures, systems and components required to supply air to, circulate air within, and remove air from a building/facility space by natural or mechanical means.

## 3.0 Executive Summary

This confinement ventilation evaluation is for the Savannah River Site (SRS) Solid Waste Management Facilities (SWMF) for the storage of hazardous and mixed waste(HWMW). Three N Area HWMW storage buildings, 645-N, 645-2N and 645-4N, are addressed in this evaluation. This evaluation was completed in accordance with the Department of Energy (DOE) evaluation guidance (EG) for Defense Nuclear Facility Safety Board (DNFSB) Recommendation 2004-2. These storage buildings currently have no installed active confinement ventilation systems (CVS) and there are no existing plans for systems to be installed.

The facilities collectively comprise a Hazard Category (HC) 3 segment. None of the buildings possess an active or passive airborne release confinement system. The facilities will be evaluated against Defense in Depth (DID) criteria to determine if there is a need for active confinement ventilation systems.

The draft SWMF DSA Upgrade analyzed the bounding accident (a combustible liquid fire) in Hazard Category 3 buildings 645-N, 645-2N and 645-4N. Inventory limits were established to control the onsite worker consequence to a level less than the onsite evaluation criteria. Any CVS subsequently installed in Buildings 645-N, 645-2N and 645-4N would therefore not be credited as either as Safety Class or Safety Significant. A CVS, if installed, would be credited only as a Defense in Depth design feature.

Three options are evaluated in this report. Option 1 includes the design and installation of CVSs in each of the three buildings. Option 2 includes the design and installation of a structure, similar to an existing Savannah River Site (SRS) Mixed Waste Processing Facility (MWPF), inside one of the N Area buildings with primary and secondary confinements. The designs of both options address all of the applicable criteria. Option 3 is current operations, which performs the opening of containers in a temporary radiological containment system.

The Total Project Cost (TPC) range of estimates for Options 1 and 2 are \$7.8M-\$16.8M and \$1.8M-\$3.8M, respectively. Adding a fire suppression system to each building could be as much as three times the cost depending on the choice of suppression technology. Both of these designs adequately mitigate the consequences of the bounding accident occurring inside the confinement areas. Option 3, which is to perform open container operations within a temporary radiological containment system, e.g., a ventilated plastic hut that meets WSRC 5Q requirements, is recommended by the Facility Evaluation Team rather than Option 1 or 2. The FET believes the low operational risk normally involved with open container processing does not justify the expense of either Options 1 or 2 and the low risk is appropriately managed by Option 3.

## 4.0 Introduction

### 4.a Facility Overview

As described in references 1 and 2, the three HWMW Storage Buildings (645-N, 645-2N, and 645-4N) are located within the plant northwest quadrant of N-Area. Each building has been permitted by the SCDHEC to provide interim storage of containerized Mixed Waste and/or Hazardous Waste, Low Level Waste, RCRA empty containers, TSCA waste, and non-hazardous waste. Again, the inventories in the buildings are maintained as Hazard Category 3. Buildings 645-N, 645-2N, and 645-4N are segregated into one or more cells (or bays) and are used to provide interim storage of waste in containers as specified in the current RCRA Permit. These vented metal buildings provide weather shelter for the waste containers. The containers are stored on concrete pads that have surface liquid containment curbs around each side.

Operation of the HWMW buildings includes the handling, sampling, storage, repackaging, lab packing, sorting, and inspection of hazardous waste and mixed waste containers. Only waste that meets the requirements of the WSRC Manual 1S WAC or have approved WAC deviations (Ref. 3) is received. Containers meeting the WAC are transported into the storage building, typically via forklift. The containers may then be re-palletized for space optimization and placed into the proper storage location as directed by the receipt procedure. Waste storage procedures do not permit incompatible wastes to be stored in the same cell. Hazardous and mixed wastes are stored within the buildings until shipped offsite.

### 4.b Confinement Ventilation Strategy

Buildings 645-N, 645-2N and 645-4N do not have a CVS installed. The current DOE-approved, implemented SWMF DSA and the draft SWMF DSA Upgrade have not identified the need for or credited a CVS to mitigate onsite or offsite radiological exposure consequences from accidents that may occur in 645-N, 645-2N and 645-4N. Radiological inventory is limited in these Hazard Category 3 buildings by the Technical Safety Requirements such that releases from these buildings due to accidents analyzed in the DSAs do not pose an undue risk to onsite workers or the public, i.e., offsite Evaluation Guides and onsite evaluation criteria specified in WSRC E7 Procedure 2.25 are not challenged.

### 4.c Major Modifications

Two options requiring major modifications are evaluated in this report. Option 1 includes the design and installation of CVSs in each of the three buildings. Option 2 includes the design and installation of a structure inside one of the N Area buildings with primary and secondary confinements. The design of each option addresses all of the applicable criteria.

## 5.0 Functional Classification Assessment

### 5.a Existing Classification

Buildings 645-N, 645-2N and 645-4N currently do not have a CVS. The following functional classification assessment will therefore consider the functional classification of any CVS that might be installed in any or all of these buildings in the future.

### 5.b Evaluation

This evaluation is based on the hazard and accident analysis results of the draft SWMF DSA Upgrade for Buildings 645-N, 645-2N and 645-54N. The draft DSA Upgrade analysis bounds that in the current DOE-approved and implemented SWMF DSA.

The draft DSA Upgrade analyzed a bounding combustible organic liquid fire in SWMF Hazard Category 3 facilities including the subject buildings. The fire scenario assumed that an entire Hazard Category 3 inventory was contained in a spilled combustible organic liquid that subsequently burns. The unmitigated event resulted in a dose to the 100-meter worker of 269 rem and an offsite dose to the Maximally-Exposed Offsite Individual (MOI) of 0.14 rem. Both the offsite and onsite (100-meter) doses were calculated using 95$^{th}$ percentile meteorology. The MOI consequence did not challenge the offsite Evaluation Guide so no Safety Class preventative or mitigative controls were specified. The onsite worker dose, which exceeded the worker evaluation criteria, is mitigated to approximately 77 rem by a Technical Safety Requirement inventory limit, which serves a Safety Significant function. Since the TSR inventory limit reduced the worker consequence to less than the evaluation criteria, additional Safety Significant controls, such as a CVS, were not specified by the DSA accident analysis. Additional conservatisms that would further reduce the expected dose include the fact that individual waste containers stored in these buildings normally have a very low radiological content compared to the full Hazard Category 3 inventory authorized for these buildings cumulatively. In fact, since the waste in these buildings is typically bulk contaminated combustible liquid, the DSA Upgrade will limit these buildings to no more than 16 PEC each. Additionally, the DSA Upgrade will limit individual containers that could be opened within 645-N, -2N, and -4N to no more than 4 PEC. Thus, the 100-meter worker hazard from a fire involving one of these containers would be much less than the mitigated dose of 77 rem (approximately 20 rem). Dose mitigation would be further enhanced by SRS fire fighting and emergency response actions that would be initiated upon a fire.

If a CVS were to be installed in the subject buildings, it would serve a Defense in Depth safety function since the 100-meter worker has already been mitigated to less than the evaluation criteria. A CVS that utilizes HEPA filtration operating at 99.97% minimum efficiency would further reduce the worker dose to well below 1 rem, assuming that the CVS continues to operate during the fire accident. However, a DID CVS is not required to withstand a credible fire event according to the Ventilation System Evaluation Guidance (Ref. 5).

## 5.c Summary

The draft SWMF DSA Upgrade has analyzed the bounding accident (a combustible liquid fire) in Hazard Category 3 buildings 645-N, 645-2N and 645-4N and has established a Technical Safety Requirement inventory limit that will control the onsite worker consequence to a level less than the onsite evaluation criteria. Also, the unmitigated consequence to the MOI does not challenge the offsite Evaluation Guide. Any CVS subsequently installed in Buildings 645-N, 645-2N and 645-4N would therefore not be credited as either as Safety Class or Safety Significant. A CVS, if installed, would be credited only as a Defense in Depth design feature.

## 6.0 System Evaluation

## 6.a Identification of Gaps and Evaluation

As previously mentioned, Buildings 645-N, 645-2N and 645-4N currently do not have a CVS resulting in the submittal of Table 5.1 containing gaps for all of the criteria. As a result of being HC-3 facilities, Table 5.1 included applicable DID criteria. Two options were evaluated, both of which are designed and estimated to close all of the gaps. Option 1 included the design and installation CVSs in each of the three buildings. Option 2 includes the design and installation of a structure with primary and secondary confinements inside one of the buildings.

## 6.b Modification and Upgrades

### Option 1 – New CVSs for Each Building

Each building has its own confinement ventilation system (CVS) designed to ensure the system and facility meet the DNFSB 2004-2 criteria in accordance with applicable requirements of DOE HDBK 1169-03, ASHRAE, and ASME AG-1 codes and standards. The systems prevent the spread of contamination by ventilating each building at the rate of 8 Air Changes per Hour (ACH). Each system operates continuously maintaining the building, which serves as the primary confinement zone, at the required negative pressure. A new 150KVA transformer will be required to provide adequate power for the new systems. All roof and wall openings are closed and sealed. Doors, single and rollup, are installed to support operations. Air enters the building through engineered openings and exhausts through grilles, ductwork and stack via High Efficiency Particulate Absolute (HEPA) filters of 99.97% efficiency. Duct and filter housing are fabricated from stainless steel. The HEPA filters are procured in accordance with SRS program requirements and designed for in-place testing. Appropriate instruments and alarms are installed to monitor differential pressure and airflow conditions. A new fan slab, stack foundation and duct supports are installed to support the installation of the HEPA filter housing, fan and stack assembly. For a summary description, see Attachment 3.

**Option 1 - Cost Estimate (See Ref. 7)**

A Rough-Order-of Magnitude (ROM) estimate to install a CVS in each building is:

| Building | TPC | Low Range (-30%) | High Range (+50%) |
|---|---|---|---|
| 645-N | $3.7M | $2.6M | $5.5M |
| 645-2N | $4.0M | $2.8M | $6.1M |
| 645-2N | $3.5M | $2.4M | $5.2M |
| Total | $11.2M | $7.8M | $16.8M |

This CVS is not required by the Evaluation Guidance to meet the criterion for withstanding credible fire events. However, the analyzed accident scenario is a full facility fire. Since the building serves as the primary confinement zone for this option, it must be protected. According to the DOE HDBK-1169, Section 10 Fire Protection, a suppression system should be installed for each building to mitigate building and ductwork damage. In addition, the HEPA filters should be made of noncombustible materials with water sprays as required and a fire detection system installed in filter housings. Installing a fire suppression system in each of the buildings could increase the cost by as much as three times depending on the choice of suppression technology.

**Option 2 - Mixed Waste Processing Facility Equivalent**

This option includes the design and installation of a structure inside one of the N Area buildings with primary and secondary confinements. The design and estimate is based on the Mixed Waste Processing Facility (MWPF), which is currently installed on TRU Pad 6 in E-Area. It was designed for performing process activities including: sorting, segregating, characterizing and repackaging of waste. The MWPF is a category 3 facility with GS functional classification of equipment. The performance category for all SSCs is PC-1. The design of enclosures and equipment is such that it can be disassembled, moved and reassembled at another location on SRS.

The 100'x45' building contains both primary and secondary confinement zones with airlocks. The ventilation system was designed to meet the requirements of ERDA 76-21 and the ASHRAE Heating, Ventilation and Air Conditioning Design Guide for DOE Nuclear Facilities. Airflow through the primary and secondary confinement zones is filtered and exhausted. Differential pressures are maintained such that air moves from areas of lesser contamination to areas of greater contamination. Secondary confinement has four to six air changes/hour. Primary confinement has six to ten air changes/hour. The exhaust passes through HEPA filters located upstream of the ventilation exhaust fans. The HEPA filters contain enough capacity to handle the volume of air at a minimum filter efficiency of 99.97%. HEPA filters are nuclear grade and procured in accordance with SRS program requirements. The MWPF employs three ventilation exhaust fans, each with its own HEPA filter banks and ductwork. They are installed such that two can operate continuously while one is being serviced. Interlocks are provided for the supply and exhaust fans to prevent facility air reversals caused by failure of one or more of the exhaust fans. Differential pressure between confinements shall be measured with centrally located instruments. Gages on the secondary and any tertiary confinements shall be readable by personnel entering and operating in the space. Alarms are installed to alert personnel of fan and filter failures. Radioactivity, chemical concentrations and differential pressure are monitored and alarmed. For a summary description of the MWPF ventilation system, see Attachment 5.

### Option 2 - Cost Estimate (See Ref. 8)

The MWPF TEC was estimated in 2001 at $1.5M. This estimate, adjusted for escalation to 2007 dollars and TPC, is $2.5M. Using this as the basis for Option 2, a Rough-Order-of Magnitude estimate to close all the gaps is: $1.8M to $3.8M (-30%/+50%).

The MWPF is designed to meet NFPA 801, Standard for Fire Protection for Facilities Handling Radioactive Materials. It is equipped with a combustible gas detection system, an automatic fire detection system and an alarm system. No additional costs are added to address the fire accident scenario.

### Option 3 – Existing Operations

Existing operations to open containers is performed in a temporary radiological containment system, e.g., a ventilated plastic hut that meets WSRC 5Q requirements. Container opening operations are typically only infrequently performed (several operations per year) within the 645-N, 645-2N and 645-4N buildings. The likelihood of the waste material becoming involved in a fire during one of these infrequent operations would be very low as a result. Also, individual waste containers stored in these buildings normally have a very low radiological content compared to the full Hazard Category 3 inventory authorized for these buildings cumulatively. In fact, since the waste in these buildings is typically bulk contaminated combustible liquid, the DSA Upgrade will limit these buildings to no more than 16 PEC each. Additionally, the DSA Upgrade will limit individual containers that could be opened within 645-N, -2N, and -4N to no more than 4 PEC. Thus, the 100-meter worker hazard from a fire involving one of these containers would be much less than the mitigated dose of 77 rem (approximately 20 rem). Dose mitigation would be further enhanced by SRS fire fighting and emergency response actions that would be initiated upon a fire.

## 7.0 Conclusion

The Total Project Cost (TPC) range of estimates for Options 1 and 2 are $7.8M-$16.8M and $1.8M-$3.8M, respectively. Adding a fire suppression system to each building could be as much as three times the cost depending on the choice of suppression technology. Both of these designs adequately mitigate the consequences of the bounding accident occurring inside the confinement areas. Option 3, which is to perform open container operations within a temporary radiological containment system, e.g., a ventilated plastic hut that meets WSRC 5Q requirements, is recommended by the Facility Evaluation Team. The FET believes the low operational risk normally involved with open container processing does not justify the expense of either Options 1 or 2 and the low risk is appropriately managed by Option 3.

## 8.0 References


1. SWMF DSA, WSRC-SA-22, Revision 6
2. SWMF DSA, WSRC-SA-22, Revision Upgrade A (WSRC Approved)
3. WSRC E7 Procedure 2.25
4. DOE-HDBK-1169-2003, Nuclear Air Cleaning Handbook
5. Ventilation System Evaluation Guidance for Safety Related and Non-Safety –Related Systems, Revision 0
6. DOE-STD-3009-94
7. Estimate Summary Report, 07-06-02h, Rev. 0, issued 6/21/07, HWMW Storage Buildings 645-N, 645-2N, 645-4N
8. Estimate Summary Level Report, Project S-W547, issued 5/24/01, Mixed Waste Processing Facility


## 9.0 Attachments

Attachment 1 – Table 4.3, Confinement Documented Safety Analysis Information
Attachment 2 – Table 5.1, SWMF HWMW Storage Buildings
Attachment 3 – Option 1 Summary Description
Attachment 4 – Option 2 Conceptual Design Package System and Drawings
Attachment 5 – Facility Evaluation Team Biographical Sketches
Attachment 6 – N Area HWMW Facilities Aerial Photograph

# ATTACHMENT 1
## TABLE 4.3, CONFINEMENT DOCUMENTED SAFETY ANALYSIS INFORMATION

| Confinement Documented Safety Analysis Information<br>DNFSB 2004-2 Implementation Plan Table 4.3 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N-Area Facilities | | | Hazard Category 3 | | | | Performance Expectations | | | | |
| Bounding Accidents | Type Confinement | | Doses Bounding Unmitigated/ Mitigated | Confinement Classification | | | Function | Functional Requirements | Performance Criteria | Compensatory Measures | |
| | Active | Passive | | SC | SS | DID | | | | | |
| Cat. 3 Facility Fire (Bulk Liquid Organic Waste) | There are no active confinement ventilation systems. | There are no passive confinement ventilation systems. | Unmitigated<br>Offsite: 1.40E-01 rem<br>Onsite: 2.69E+02 rem | NA | NA | NA | There are no credited DSA ventilation functions required. | There are no DSA ventilation functional requirements. | There are no required DSA ventilation performance criteria. | There are no DSA required compensatory measures for the ventilation system. | |
| 643-29E Facility | | | Hazard Category 2 | | | | Performance Expectations | | | | |
| Bounding Accidents | Type Confinement | | Doses Bounding Unmitigated/ Mitigated | Confinement Classification | | | Function | Functional Requirements | Performance Criteria | Compensatory Measures | |
| | Active | Passive | | SC | SS | DID | | | | | |
| High Inventory Container Fire | There are no active confinement ventilation systems. | There are no passive confinement ventilation systems. | Unmitigated<br>Offsite: 1.10E-01 rem<br>Onsite: 1.05E+02 rem | NA | NA | NA | There are no credited DSA ventilation functions required. | There are no DSA ventilation functional requirements. | There are no required DSA ventilation performance criteria. | There are no DSA required compensatory measures for the ventilation system. | |
| High Inventory Container Explosion | There are no active confinement ventilation systems. | There are no passive confinement ventilation systems. | Unmitigated<br>Offsite: 3.66E-01 rem<br>Onsite: 7.03E+02 rem | NA | NA | NA | There are no credited DSA ventilation functions required. | There are no DSA ventilation functional requirements. | There are no required DSA ventilation performance criteria. | There are no DSA required compensatory measures for the ventilation system. | |
| High Inventory Container Loss of Confinement (Spill) | There are no active confinement ventilation systems. | There are no passive confinement ventilation systems. | Unmitigated<br>Offsite: 5.00E-01 rem<br>Onsite: 9.0E+01 rem | NA | NA | NA | There are no credited DSA ventilation functions required. | There are no DSA ventilation functional requirements. | There are no required DSA ventilation performance criteria. | There are no DSA required compensatory measures for the ventilation system. | |

(1) In accordance with the DOE 2004-2 Evaluation Guidance, storage of approved, closed waste containers is excluded from this evaluation

Attachment 2 – Table 5.1 – SWMF Hazardous and Mixed Waste Storage Buildings

| | TABLE 5.1 - SWMF HAZARDOUS AND MIXED WASTE STORAGE BUILDINGS | |
|---|---|---|
| EVALUATION CRITERIA | DISCUSSION | REFERENCES |
| | Ventilation System - General Criteria | |
| Pressure differential should be maintained between zones and atmosphere | Currently there are no active confinement ventilation systems in these buildings. | DOE-HDKB-1169 (2.2.9) ASHRAE Design Guide |
| Materials of construction should be appropriate for normal, abnormal and accident conditions | Currently there are no active confinement ventilation systems in these buildings. | DOE-HDKB-1169 (2.2.5) ASME AG-1 |
| Exhaust system should withstand anticipated normal, abnormal and accident system conditions and maintain confinement integrity | Currently there are no active confinement ventilation systems in these buildings. | DOE-HDKB-1169 (2.4) ASHRAE Design Guide |
| Confinement ventilation systems shall have appropriate filtration to minimize release | Currently there are no active confinement ventilation systems in these buildings. | ASME AG-1 DOE-HDBK-1169 (2.2.1) |
| | Ventilation System - Instrumentation and Control | |
| Provide system status instrumentation and/or alarms | Currently there are no active confinement ventilation systems in these buildings. | ASME AG-1 DOE-HDBK-1169 ASHRAE Design Guide (Section 4) |
| Interlock supply and exhaust fans to prevent positive pressure differential | Currently there are no active confinement ventilation systems in these buildings. | DOE-HDBK-1169 ASHRAE Design Guide (Section 4) |
| Reliability of control system to maintain confinement function under normal, abnormal and accident conditions | Currently there are no active confinement ventilation systems in these buildings. | DOE-HDBK-1169 (2.4) |

| | | |
|---|---|---|
| Control components should fail safe | Currently there are no active confinement ventilation systems in these buildings. | DOE-HDBK-1169 (2.4) |
| **Resistance to Internal Events - Fire** | | |
| Confinement ventilation systems should not propagate spread of fire | Currently there are no active confinement ventilation systems in these buildings. | DOE-HDBK-1169 (10.1) DOE-STD-1066 |
| **Testability** | | |
| Design supports the periodic inspection and testing of filters and housing, and tests and inspections are conducted periodically | Currently there are no active confinement ventilation systems in these buildings. | DOE-HDBK-1169 (2.3.8) ASME AG-1 ASME N510 |
| Instrumentation required to support system operability is calibrated | Currently there are no active confinement ventilation systems in these buildings. | DOE-HDBK-1169 (2.3.8) |
| **Maintenance** | | |
| Filter service life program should be established | Currently there are no active confinement ventilation systems in these buildings. | DOE-HDBK-1169 (3.1 & App C) |

**Attachment 3 – Option 1 Summary Description**
**Ventilation System Design for Building 645-N, 645-2N and 645-4N**

System Design Description: The ventilation system per this conceptual design will operate continuously on 24/7 365 basis to maintain the building at a negative pressure. The systems will prevent spread of contamination by ventilating each building at the rate of 8 Air Change per Hour (ACH).

**Mechanical and Instrumentation Scope for Buildings 645-N, 645-2N and 645-4N**

The building negative pressure will induce outdoor air into the building thru the engineered openings located at east and west walls. This air will be exhausted by a fan thru the grilles and duct to stack via High Efficiency Particulate Absolute (HEPA) filters of 99.99% efficiency to remove airborne contamination. Duct and filter housing will be fabricated from stainless steel.

For a reliable system operation instruments will indicate differential pressure between the building and atmosphere, prefilter, HEPA filter and system airflow. In addition an alarm signal will be sent to an annunciator panel in building 645-2N administration office for loss of building differential pressure, high PD across prefilter, and HEPA filter and low system airflow conditions. The HEPA filters for theses system will be procured per SRS filter program. The filter housing will be designed to allow in-place testing.

**Civil, Structural and Architectural Scope for Buildings 645-N, 645-2N and 645-4N**

The Civil, Structural, and Architectural scope of this conceptual design includes work to support the ventilation system installation. Building and site modifications will be required as delineated by the following detail scope by building number

645-2N
The roof of the building will need modification to close the roof ridge and roof fans with specific locations and details provided for flashing installations. A new fan slab, stack foundation and duct supports will be required to complete installation of the HEPA filter, fan and stack assembly. Design calculations will be required for the stack, slab and support designs. Civil sitework will be required to provide drainage around the new slab and stack system, including erosion control.

645-4N
The roof of the building will need modification to close the roof ridge and 2 wall bays with specific locations and details provided for flashing installations. A single 3 ft. gate and one (1) 20 ft. wide roll-up door is required to complete the building closure. A new fan slab, stack foundation and duct supports will be required to complete installation of the HEPA filter, fan and stack assembly. Design calculations will be required for the stack, slab and support designs. Civil sitework will be required to provide drainage around the new slab and stack system.

645-N
The roof of the building will need modification to close the roof ridge and two long walls of the building with specific locations and details provided for flashing installations. Two (2) 3 ft. gates and seven (7) 10 ft. wide roll-up doors are required to complete the building closure. A new fan slab, stack foundation and duct supports will be required to complete installation of the HEPA filter, fan and stack assembly. Design calculations will be required for the stack, slab and support designs. Civil sitework will be required to provide drainage around the new slab and stack system.

Note that an Erosion Control Plan for all three (3) buildings will need to be prepared, as well as construction permit support, and Site Clearance permits.

**Electrical Scope for Buildings 645-N, 645-2N and 645-4N**

The electrical scope will provide design to tap into the closest 13.8 KV feeder. The electrical load will require installation of a 200A fused cutout to support the new fans and other electrical components. This will require installation of three (3) conductor #2 15KV with ground shielded cable from the disconnect switch to a new 150 KVA transformer in the area. Drawing changes will include revisions to the Single Line drawing for the area. Completing the power supply will include installation of a NEMA 3R Power Distribution Junction Box on the secondary side of the transformer, and the installation of two (2) – 100A and one (1) – 200A Disconnect Switch on the secondary side of the transformer within 10 feet.

To provide power to buildings 645-N and 645-4N, installation of three (3) conductor #2 tray cable with ground in existing trays and new 1 ½" conduit from the 100A disconnect switch to each fan system and HEPA filter units. Connect respective wiring to the combination starters supplied with the fan system.

To provide power to building 645-2N, installation of three (3) conductor #2/0 tray cable with ground in existing trays and new 1 ½" conduit from the 200A disconnect switch to the fan system and HEPA filter unit in 645-2N. Connect wiring to the combination starters supplied with the fan system.

For each of the buildings, 645-N, 645-2N and 645-4N, install three (3) conductor #12 tray cable in ¾" RMC between the differential pressure gauges and the pressure switches in the HEPA filter assembly. Also required for the alarm system installation, install three (3) conductor #12 tray cable in existing trays and new ¾" conduit from the pressure switches to the administration building 645-1N. To complete the system, install three (3) alarm units in administration building 645-1N.

The scope is based upon the assumption that 13.8 KV will be available close to the buildings and the 150 KVA transformer will be installed next to the existing 225 KVA transformer.

These design features will ensure the system and facility function within the requirements of DNFSB 2004-2 by meeting the applicable requirements of DOE HDBK 1169-03, ASHRAE, and ASME AG-1 codes and standards.

## 7.0 ENVIRONMENTAL CONTROL

### 7.1 Ventilation System

The H&V system shall be designed to meet the requirements of ERDA 76-21 and the American Society of Heating, Refrigeration and Air-conditioning Engineers, Inc. (ASHRAE) Design Guide for Department of Energy Nuclear Facilities.

The designations of the building zones shall be Secondary confinement and Primary Confinement.

Ventilation for the MWPU shall include two systems. The first system is the conditioned Make-up Air System, which serves the Secondary and Primary areas of the facility. The second system is the exhaust air system, which includes the secondary and primary areas, and the air exhausted from secondary and primary areas shall pass through HEPA filtration.

The ventilation system serving the structure shall contain enough HEPA filters to handle the volume of air as required and provide minimum filter efficiency (i.e., 99.97% of 0.3 micron and larger particles).

After passage through the independent paths of filtration, the exhaust shall be discharged to the atmosphere via a stack.

A filter efficiency of 99.97% as determined by Aersol Challenge Agent testing shall be required for all HEPA filters. All filters shall be accessible for periodic Aersol Challenge Agent testing. In addition, HEPA filter housings or ducts shall contain appropriate fittings to allow Aersol Challenge Agent testing.

Design shall provide enough HEPA filter capacity to always have a spare bank available to be placed on-line when changing out HEPA filters.

Instrumentation on HEPA filters shall be provided.

Local exhausters shall be provided around the sort table, the drum vent system, carboy loading station, and drum pump transfer station.

Air locks shall be provided between the secondary and primary areas. Air lock design shall prevent backflow of contamination from areas of higher contamination potential to areas of lower potential by maintaining at a greater negative pressure than the lesser contamination potential areas.

The MWPU will be provided with make-up air that is heated/conditioned and includes humidity control. Two 50% make-up air units will be provided.

Interlocks to stop supply fans make-up if two exhaust fans stop shall be provided to keep from over pressurizing radiological controlled areas and having an air flow reversal.

The HVAC system design shall be considered to accommodate loads of at least 15% greater than the nominal expected loads, through either the initial capacity or provisions for increasing the installed capacity.

The heating and cooling capacity for the air conditioning and heating equipment shall be sized using weather data obtained from local or site weather stations.

Outside air for personal ventilation air requirements shall meet the requirements of ASHRAE HVAC design guide for DOE Nuclear Facilities.

HVAC systems shall satisfy the noise control (NC) levels recommended for various types of spaces and vibration criteria as listed in the ASHRAE handbooks.

All HVAC equipment and systems shall be fabricated, installed, tested, adjusted and balanced in accordance with guidelines in ASHRAE system handbook, AABC Volume A-82, and as required by SRS Engineering Standards.

Air handling units shall comply with ASHRAE standard 90.1, NFPA 90A, AMCA Publication 99, 261 and ARI 430. All fans shall comply with AMCA standard 210 and ASHRAE standard 51. All fans and accessories shall be designed and specified to meet all smoke and flame spread requirements of NFPA 255.

Heating and cooling coils shall comply with ARI 410.

Air-cooled condensers and condensing units shall meet the standards, rating, and testing requirements of ARI 460, and ASHRAE standard 20.

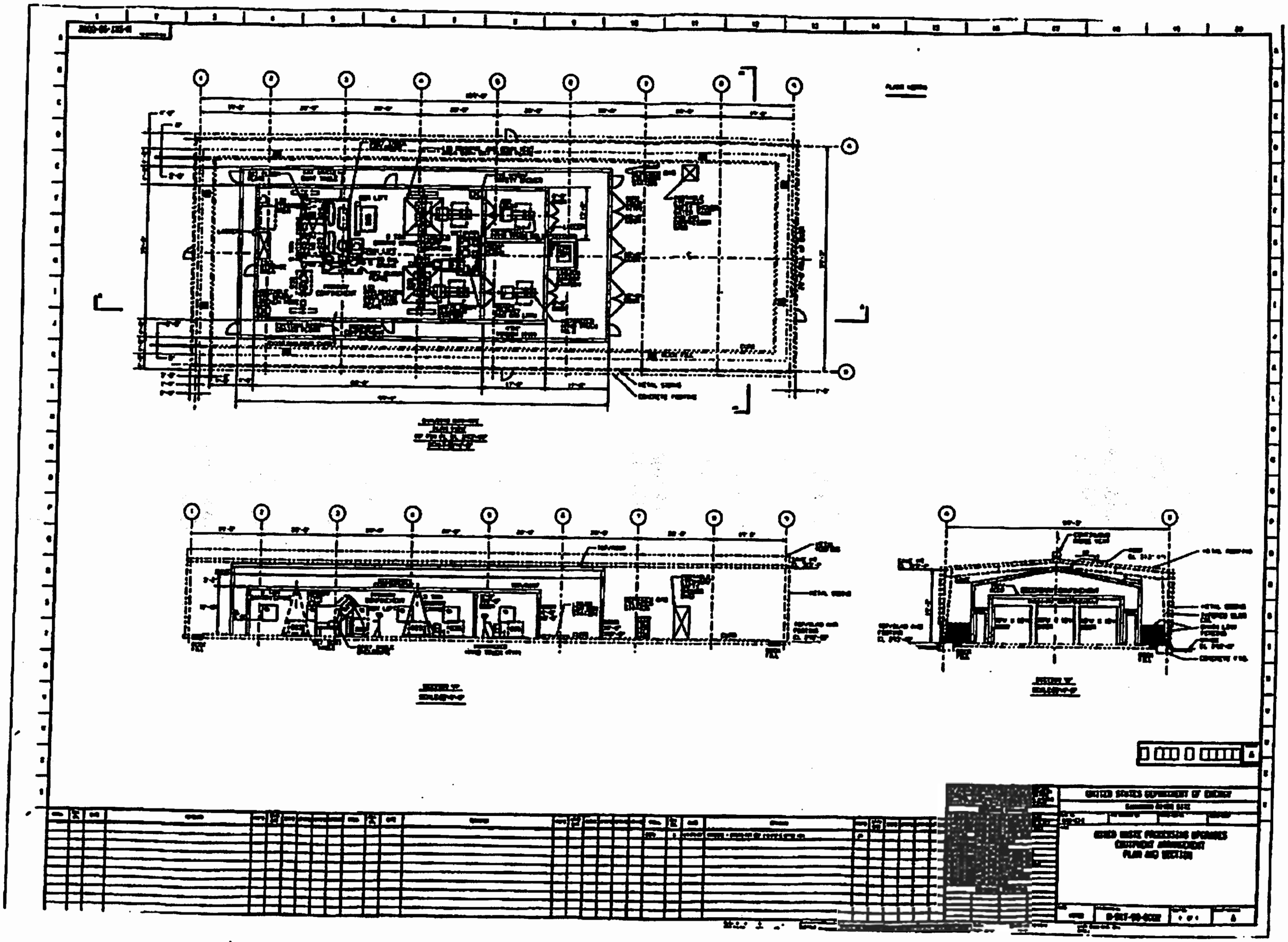
## 7.2 Ventilation Control

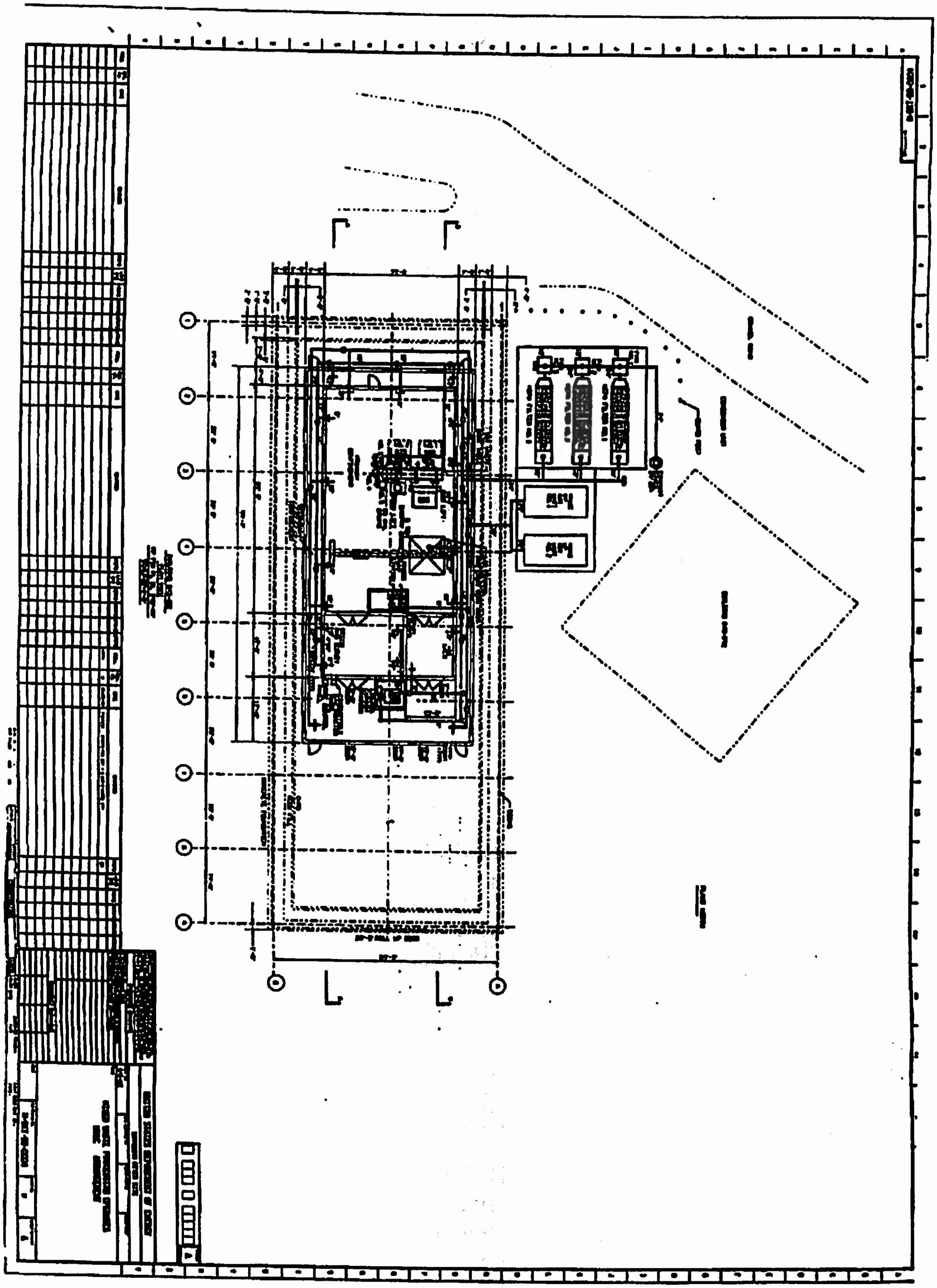
Building pressure differentials shall provide ventilation flow from clean areas and areas of lesser contamination to Radiologically Buffer Areas (RBA) of greater contamination, to HEPA filter systems, and to the exhaust stack. The entire structure shall be kept negative with respect to atmospheric pressure.

Radiologically controlled areas shall be designed to meet ASHRAE requirements for air changes/hour. Secondary confinement shall be four to six air changes/hour and the primary confinement shall be six to ten air changes/hour.

A sequence of operation describing all HVAC controls systems, including interlocks and set points, shall be provided by the design agency during final design.

All branch ducts shall contain a manual volume damper.


UNITED STATES DEPARTMENT OF ENERGY
MIXED WASTE PROCESSING UPGRADES
EQUIPMENT ARRANGEMENT
PLAN AND SECTION



**Attachment 5**
**Facility Evaluation Team Composition and Biographical Sketches**

**R. T. Duke - Technical Advisor, Waste Management Area Project**

Roger Duke has a Bachelor of Mechanical Engineering from Auburn University and a Masters of Mechanical Engineering from University of South Carolina. He has 30 years of experience at the Savannah River Site in Aiken, South Carolina. He has held numerous positions in areas of Project Management and Program Management. Roger has been the Program Manager for Environmental Protection, Soil and Groundwater, Solid Waste and Decontamination and Decommissioning programs. His current position is Technical Advisor for the Waste Management Area Project Engineering Department.

**Tam Tran – Lead, DOE Authorization Basis for Solid Waste Facilities**

Tam Tran has Masters of Science in nuclear engineering and environmental engineering . He has over 20 years of experience with Texas A&M University Research Station, Tennessee Valley Authority, and Savannah River Site. He has held numerous positions in areas of nuclear safety licensing, performance assurance, and nuclear material management . He is currently the DOE Authorization Basis Engineer lead for Solid Waste facilities and operation.

**S. E. Crook – Manager, WMAP Safety Compliance**

Steve Crook has a Bachelor of Science degree in Chemical Engineering from Purdue University. He has 21 years of experience at the Savannah River Site, holding a variety of positions in the waste management area including project engineering, environmental compliance engineering and management, and nuclear safety compliance engineering and management. For the last seven years Steve has been the manager of the Safety Compliance group in Waste Management Area Project engineering. Prior to the Savannah River Site, Steve held several positions in the petrochemical process industry with Monsanto and later duPont as a project engineer and later a process/production engineer in ethylene and coproducts manufacturing.

**P. N. Fairchild – TRU Engineering Lead, Waste Management Area Project**

Mr. Peter Fairchild received a Bachelor of Science degree in Mechanical Engineering from the University of South Carolina in 1988. He has been at the Savannah River Site since 1988 and joined the Waste management Area Project (WMAP) Team in October of 2005. Peter is currently the TRU Engineering Lead for the Waste Management Area Project. Before being assigned to WMAP, he served on the Facility Evaluation Board and a Design Authority Engineer and Maintenance Engineer for Spent Fuel Programs. He has had various other assignments at Savannah River including Separations Works Engineering, where he assisted with the acceptance testing for the H Canyon Warm Crane. Peter also served as Design Authority for Compressed Air and Emergency

Electrical Power Systems for Reactor Restart Division and in Spent Fuel Programs. Peter has been active with several technical committees. He has served as Chairman of the Site Predictive Maintenance Council, Chairman of the Site Lubrication and Filtration Council, Spent Fuel Programs Conduct of Engineering Committee Representative and has supported the Engineering Standards Board on issues related to compressed air, lubrication and diesel fuel quality. He also co-authored the Diesel Fuel Quality chapter of the DOE Backup Power Working Group Handbook and served as a core member of the Electrical Power Research Institute, (EPRI) Diesel Fuel Owners Group.

Attachment 6 – N Area HWMW Facilities Aerial Photograph