DOE F 1325.8

United States Government | Department of Energy (DOE)

memorandum

Savannah River Operations Office (SR)

DATE: AUG 3 1 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 2004-2 Final Report for the Savannah River Site (SRS) Evaporator 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 to this memorandum the DNFSB 2004-2 Final Report for the SRS 242-16F, 242-16H and 242-25H Evaporator Facilities. SRS recommends that no modifications or upgrades be made to the 242-16F, 242-16H and 242-25H Evaporator Facilities ventilation systems. 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.

William F. Spader for
Jeffrey M. Allison
Manager

TSD:MAS:dmy

OSQA-07-0124

Attachment:
2004-2 Final Report for Evaporator Facilities

cc w/o 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: **242-16F, 242-16H and 242-25H.** WSRC Letter LWO-LWE-2007-00079, "242-16F, 242-16H and 242-25H Evaporator Facilities DNFSB Recommendation 2004-2, Ventilation System Evaluation"

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 242-16F, 242-16H and 242-25H Evaporator Facilities.

Site Evaluation Team (SET) Concurrence:

Signature on file ______________________ 08/27/07
Mark A. Smith, DOE-SR, Site Lead for SET — Date

Signature on file ______________________ 08/27/07
Ken W. Stephens, WSRC Lead for SET — 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.)

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AUG 2 3 2007

LWO-LWE-2007-00079

Carl A. Everatt, Director
Office of Safety and Quality Assurance
P.O. Box A
Aiken, SC 29808

Dear Mr. Everatt:

Subject: **242-16F, 242-16H and 242-25H Evaporator Facilities DNFSB Recommendation 2004-2, Ventilation System Evaluation**

This letter transmits the final report of DNFSB Recommendation 2004-2, Active Confinement Systems for the 242-16F, 242-16H and 242-25H Evaporators located in the F and H Tank Farms at the Savannah River Site (SRS). This is in accordance with the DOE guidance provided in "Ventilation System Evaluation Guidance for Safety-Related and Non-Safety Related Systems", Revision 0, January 2006.

All three evaporator facilities described herein are identified as Hazard Category 2. Active confinement ventilation systems in these facilities are not safety related due to moderate radiological dose consequences to both on-site and off-site receptors from postulated events. The evaporator ventilation systems are functionally classified as Production Support (PS) and were qualitatively assessed to meet Performance Category 1 (PC-1) criteria for the applicable Natural Phenomena Hazard (NPH) events.

In accordance with DOE 2004-2 evaluation guidance, SRS evaluated the active confinement systems at the 242-16F, 242-16H and 242-25H Evaporators using the Safety Significant (SS) criteria identified in Table 5.1 due to the Hazard Category 2 inventory levels. To assess functionality for applicable NPH events, PC-2 criteria were used. Gaps were identified between the SS criteria and the evaporator ventilation system designs. These gaps were deemed to be discretionary in nature since none of the gaps involved a discrepancy between the Safety Basis requirements and the system designs.

The evaporator ventilation systems are not credited by the Concentration, Storage, and Transfer Facilities (CSTF) Documented Safety Analyses (DSA) for accident mitigation. Installation of modifications would provide limited, if any, dose reductions, and would require significant overall cost to implement. Therefore, based upon the results of this evaluation, the Facility Evaluation Team recommends that no modifications be made to the 242-16F, 242-16H and 242-25H Evaporator ventilation systems.

Facility Evaluation Team Concurrence:

Donald J. Blake — 8/15/07
Donald J. Blake
DOE Safety System Oversight
Date

Byron Neely — 8/14/07
Byron Neely, FET Lead
Tank Farm Mech. Engineering
Date

Sincerely,

Richard L. Salizzoni
Richard L. Salizzoni
Tank Farm Chief Engineer

AUG 2 3 2007

CC:

Dave Olson, 766-H
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LWO-LWE-2007-00079
Revision 0

Savannah River Site
242-16F, 242-16H and 242-25H Evaporator Facilities

DNFSB Recommendation 2004-2 Ventilation System Evaluation

Revision 0

August 2007

SRS savannah river site ®

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PREPARED FOR THE U.S. DEPARTMENT OF ENERGY UNDER CONTRACT NO. DE-AC09SR18500

Review and Approval

Facility Evaluation Team Concurrence:

Donald J. Blake DOE Safety System Oversight	8/15/07 Date
Byron Neely, FET Lead Tank Farm Mech. Engineering	8/14/07 Date
Richard L. Salizzoni Tank Farm Chief Engineer	8/22/07 Date

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Acronyms

CAM	Continuous Air Monitor
CSTF	Concentration, Storage, and Transfer Facilities
CW	Co-located Worker (100 meters)
DBA	Design Basis Accidents
DNFSB	Defense Nuclear Facilities Safety Board
DOE	Department of Energy
DSA	Documented Safety Analysis
EC	Evaluation Criteria
EG	Evaluation Guideline
ETP	Effluent Treatment Project
HA	Hazard Analysis
HEPA	High Efficiency Particulate Air
MAR	Material at Risk
MCC	Motor Control Center
NPH	Natural Phenomena Hazard
PC	Performance Category
PS	Production Support
REM	Roentgen Equivalent Man
SC	Safety Class
SRS	Savannah River Site
SS	Safety Significant
SVS	Secondary Ventilation System
TPC	Total Project Cost
TSR	Technical Safety Requirements
VSD	Variable Speed Drive
WSRC	Washington Savannah River Company

Definitions

Active Confinement Ventilation System	A ventilation system that uses mechanical means (e.g., blower) to circulate air within, and remove air from a building or building space through filtration. (DOE-HDBK-1169-2003, DOE Nuclear Air Cleaning Handbook)
Confinement	A building, building space, room, cell, glovebox, or other enclosed volume in which air supply and exhaust are controlled, and typically filtered. (DOE-HDBK-1169-2003, DOE Nuclear Air Cleaning Handbook)
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 material lower than allowable concentration limits. (DOE-HDBK-1169-2003, DOE Nuclear Air Cleaning Handbook)
Hazard Category	Hazard Category is based on hazard effects of unmitigated release consequences to offsite, onsite and local workers. (DOE-STD-1027-92, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports)
Performance Category	A classification based on a graded approach used to establish the NPH design and evaluation requirements for structures, systems and components. (DOE-STD-1021-93, Natural Phenomena Hazards Performance Categorization Guidelines 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. (DOE-HDBK-1169-2003, DOE Nuclear Air Cleaning Handbook)

Executive Summary

This confinement ventilation system evaluation is for the 242-16F, 242-16H and 242-25H Evaporator Facilities at the Savannah River Site (SRS). This evaluation was developed in accordance with the Department of Energy (DOE) evaluation guidance for Defense Nuclear Facility Safety Board (DNFSB) Recommendation 2004-2. The F and H Tank Farm Evaporators were identified as a part of the SRS Tank Farm 2004-2 evaluation scope. This evaluation included the active ventilation systems in 242-16F, 242-16H and 242-25H Evaporator Cells, 242-25H Evaporator Service Building, and the 242-16H Mercury Removal System.

The three Evaporator Facilities are classified as Hazard Category 2, as given in Table 3.3-10 of Reference 1. The Evaporator Cell ventilation systems and the 242-25H Secondary ventilation system are functionally classified as Production Support (PS) and meet Performance Category 1 (PC-1) criteria for the applicable Natural Phenomena Hazard (NPH) events. This functional classification is based upon the moderate radiological and chemical consequences to both the 100-meter on-site and off-site receptors from the postulated evaporator events, as evaluated in the Concentration, Storage, and Transfer Facilities (CSTF) Documented Safety Analyses (DSA), for the evaporator facilities.

The 242-16H Mercury Removal System Ventilation System was installed to provide an elevated release point for mercury vapors that could be present within the evaporator overhead tanks or the mercury collection/sample station. An elevated release point provides a dispersion mechanism to reduce mercury exposure to facility workers (an Industrial Hygiene concern, not a Safety Basis concern). The system was not installed to address any radiological confinement concerns. Although the 242-16H evaporator is properly classified as a Hazard Category 2 facility, this particular portion of the facility has no significant release potential and was treated as a Hazard Category 3 facility segment for the purposes of performing DNFSB 2004-2 evaluations. As a Hazard Category 3 facility with an active confinement ventilation system, no further 2004-2 evaluations were performed.

The CSTF Hazard Analysis (HA) (Reference 2) identified various evaporator-related hazard events that were further evaluated as Design Basis Accidents (DBAs) in the CSTF DSA. The DBAs include an: evaporator pot explosion; evaporator cell explosion; evaporator overpressurization and evaporator overflow/leak/spill. The unmitigated accident analyses assumed a Leak Path Factor of 1.0 and were performed assuming no active or passive confinement ventilation systems. The CSTF DSA does not identify any hazard events that need to have the evaporator active confinement ventilation systems credited as Safety Class (SC) or Safety Significant (SS) controls. The active confinement ventilation systems for the Evaporator Facilities are not required to be SC or SS due to moderate radiological dose consequences to both the on-site and off-site receptors from the postulated events.

In accordance with the DOE 2004-2 evaluation guidance, SRS evaluated the active confinement ventilation systems at the 242-16F, 242-16H and 242-25H Evaporator Facilities using the SS criteria defined in Table 5.1 based on the Hazard Category 2 inventory levels. To assess functionality for applicable NPH events, PC-2 criteria were used. Gaps were identified between the SS criteria and the facility designs. These gaps were deemed to be discretionary in nature since none of the gaps involved a discrepancy between the Safety Basis requirements and the facility designs.

Installing post accident monitoring capabilities and improving the operational reliability of the ventilation systems would not be cost effective for post accident mitigation. The imposition of post-accident monitoring criterion on the evaporator ventilation systems under the scope of this report is not practical given the likelihood for multiple radiological release paths to exist following a DBA in an Evaporator Facility. Because of the potential for multiple post-accident release

paths, the prudent post-accident monitoring approach is to rely on the use of portable survey equipment as a key element of the SRS Emergency Response Program.

Improving the 242-25H Primary Ventilation System (PVS) reliability during normal operations though not required is desirable. The PVS control system design is not robust, and minor system transients (e.g., removing cell cover seam weather stripping) can interlock the system off. Engineering had previously initiated actions to evaluate the system design for potential modifications that would improve overall system reliability/efficiency. However, this evaluation has not been completed due to other priorities.

A Class 5 cost estimate for the modifications required to close the discretionary gaps was performed by Site Estimating. The estimated cost to close the four identified gaps is $17,361,000 (-30%/+50%).

Because the identified gaps are discretionary and modifications to address these identified gaps would provide limited, if any overall dose reduction, the Facility Evaluation Team recommends that no action be taken to add post accident monitoring capability to the evaporators' ventilation systems. However, it does recommend that the previous action to review the 242-25H PVS design for possible improvements be given a higher priority and that modifications be made to improve its reliability during normal operations based on the review's findings.

1. Introduction

1.1 Evaporator Systems Overview

Radioactive waste is received in the tank farms in liquid form. The volume of this waste is reduced by evaporation to about one-third of its original liquid volume or immobilized as a salt cake thereby increasing usable tank space. To achieve this reduction in liquid volume and its associated gain in tank space, evaporators are provided in each tank farm for the concentration of radioactive waste. There are three operating evaporators, 242-16F, 242-16H and 242-25H (commonly referred to as 2F, 2H, and 3H, respectively) that have active ventilation systems. Each of the three evaporators has an associated evaporator cell ventilation system; the 242-25H evaporator has a secondary ventilation system which ventilates the service building; and 242-16H has a mercury removal system ventilation system. Additional information on the F and H Tank Farm Evaporators is available in Chapter 2 of Reference 1.

1.2 Evaporator Ventilation Systems

The evaporator cell ventilation systems are similar in their design and operation, however, the 242-25H evaporator is newer than the 242-16F and 242-16H evaporators and subsequently its cell ventilation system has been designed to more current codes and standards. For a more in-depth description of the evaporator ventilation systems and their differences refer to Attachments 1, 2, and 3.

The evaporator cell ventilation system maintains a negative pressure on the condenser and evaporator cells to provide cooling, remove flammable gases, and prevent the spread of contamination through joints in the cell covers to the outside environment. An evaporator exhaust blower draws outside air through the condenser cell HEPA filter assembly and through the opening between the cells into the evaporator cell. Each of the exhaust filter assembly contains a pre-filter and HEPA filter contained within a single housing with isolation dampers and a test connection. Air is drawn through the filter assemblies by an exhaust fan. Differential pressure gages and a pressure switch on the exhaust filter assemblies provide local indication of filter loading and a control room alarm for evaporator cell exhaust filter high differential pressure. A Continuous Air Monitor (CAM) provides indication to the control room and actuates an alarm when the radioactivity level of the discharged air is high. In addition, the cell ventilation system components are powered from motor control centers (MCCs) that can receive backup power from associated diesel generators.

The 242-25H Secondary Ventilation System (SVS) ventilates the 242-25H Service Building. The SVS is a once-through induced draft air system, drawing in outside air, distributing the air throughout the ventilated areas, collecting exhaust air through a ductwork system, directing exhaust air through HEPA filter banks, and then discharging the filtered exhaust air to the atmosphere through an elevated discharge stack equipped with a CAM.

The SVS consists of inlet air units, an exhaust air duct system connected to three HEPA filter housings, two redundant centrifugal exhaust fans, and an air discharge stack. Two of the three HEPA filter housings are normally in operation with the third unit in standby. The HEPA filter housings are located inside on the 4th level of the service building structure, and the exhaust fans are mounted on a platform located outside at the same level as the HEPA filter housings. Individual air conditioning units are provided for the electrical equipment rooms.

Each system contains sufficient instrumentation to monitor and control air flows, space temperatures, and the required negative pressures of specified compartments. Monitoring instrumentation includes exhaust air radioactivity detection and alarm. Instrumentation also provides monitoring and alarm of differential pressure across HEPA filters for plant control and maintenance. In addition, instrumentation provides controls and interlocks of critical components to initiate operation of standby units in the event of failure of the operating component.

The 242-16H Mercury Removal System Ventilation System is a once-through induced draft air system that removes mercury vapor and potentially contaminated air from the mercury and overhead tank sample hoods and each overhead tank vent. The exhaust duct is connected to a HEPA filter unit located before the exhaust fan. The filtered air and vapor is expelled by the exhaust fan through an exhaust stack to the atmosphere. The Mercury Removal System Ventilation System exhaust fan is powered from a MCC that can receive backup power from a diesel generator.

The 242-16H Mercury Removal System Ventilation System was installed to provide for an elevated release point for mercury vapors that could be present within the evaporator overhead tanks or the mercury collection/sample station. An elevated release point provides for a dispersion mechanism to reduce mercury exposure to facility workers (an Industrial Hygiene concern, not a Safety Basis concern). The system was not installed to address any radiological confinement concerns. The only radiological release that could occur in this area of the facility is from a leak/spill/overflow from the overhead tanks. The overhead tank material is distillate that is collected during evaporator operation and transferred to the Effluent Treatment Project (ETP). The inhalation dose potential of this material is extremely low (33.1 rem/gal per CSTF DSA Section 3.2.4.9.1) compared to the bounding Material at Risk (MAR) analyzed in the CSTF DSA accident analyses (e.g., 9.8E+07 rem/gal for Bounding Supernate). Due to this low consequence potential, transfers of this material to ETP are not considered to be "waste transfers" and as such the CSTF DSA waste transfer controls do not apply. This low consequence potential is consistent with the Hazard Classification of the receiving facility (i.e., ETP is a Radiological Facility). Although the evaporator is properly classified as a Hazard Category 2 facility, this particular portion of the facility has no significant release potential and was treated as a Hazard Category 3 facility segment for the purposes of performing DNFSB 2004-2 evaluations.

1.3 Major Modifications

There are no Major Modifications currently underway or planned for any of the three tank farm evaporator facilities.

2. Functional Classification Assessment

2.1 Existing Classification

The active confinement ventilation systems in the F and H Tank Farm Evaporator Facilities are functionally classified as PS and PC-1. The 242-16F, 242-16H and 242-25H Evaporator Cells are functionally classified as Safety Class (SC) for PC-3 Tornado/High Wind events and Safety Significant (SS) for a Wildland Fire event.

2.2 Evaluation

There are no SS or SC functions for the existing active confinement ventilation systems associated with the F and H Tank Farm Evaporators. The evaporator ventilation systems are not credited by the CSTF DSA to operate during or following any DBA events, including NPH events.

The CSTF DSA used standard environmental transport/dosimetry methodology and codes (i.e., MACCS and MACCS2 codes) for the determination of radiological consequences to the three receptors of interest (i.e., facility worker, co-located worker, public) during the accident analysis process. These codes applied 50% meteorology at 100 cm surface roughness for the two onsite receptors and 95% meteorology at 100 cm surface roughness for the offsite receptor as part of the radiological dose calculations. The calculated radiological dose for each receptor was compared to the onsite and offsite evaluation guidelines to determine the controls needed and their functional classification.

The CSTF DSA dose calculations did not identify any evaporator events that challenge the 25 rem Evaluation Guideline from DOE-STD-3009-94 for the public (Reference 3) or the 100 rem Co-located Worker (CW) criteria per Washington Savannah River Company (WSRC) Procedure E7 2.25, Functional Classification (Reference 4) as applied at 100-meters. The bounding event, an Evaporator Overpressure (242-16F Evaporator during a seismic event) yielded an unmitigated onsite dose consequence potential of 50.2 rem and less than 0.1 rem to the offsite public. As such, the active confinement ventilation systems in the F and H Tank Farm Evaporators are appropriately classified as PS.

2.3 Summary

The PS functional classification of the existing active confinement ventilation systems for 242-16F, 242-16H and 242-25H Evaporators is appropriate.

3. System Evaluation

SRS evaluated the active confinement ventilation systems at the 242-16F, 242-16H and 242-25H Evaporator Facilities in accordance with Reference 5. Tables 4.3 (Attachments 4, 5, and 6) were developed from the CSTF DSA events. Systems were evaluated and documentation was reviewed to confirm system configuration by the associated System Cognizant Engineers for the evaporators. System configurations were evaluated against the criteria in Table 5.1 and gaps were identified and documented in Attachments 7, 8, and 9.

3.1 *Identification of Gaps*

This assessment evaluated the ventilation systems and supporting structures, systems and components in the 242-16F, 242-16H and 242-25H Evaporator Facilities against SS/PC-2 criteria. The methodology and events chosen were previously documented in Table 4.3 and submitted to DOE (References 6, 7).

The SS classification and the associated attributes in Table 5.1 were used as a guide so that the active confinement ventilation systems could be evaluated to a common set of criteria. Since the use of SS criteria was not mandatory per the CSTF DSA, modifications or closure recommendations to close any identified gap are deemed to be discretionary in nature.

When developing Table 5.1, the following CSTF DSA events were considered:

- Evaporator pot explosion
- Evaporator cell explosion
- Evaporator overpressure
- Evaporator overflow/leaks/spills
- NPH events (i.e., Tornado/High Wind, Seismic, Wildland Fire)

The following is a summary of the four Table 5.1 evaluation criteria (EC) discretionary gaps for the F and H Tank Farm Evaporator ventilation systems.

<u>16F/16H Evaporator Cell Ventilation Systems</u>

Table 5.1 EC - *Post accident indication of filter break-through.*

Gap – There is no installed post-accident monitoring capability. The evaporator cell ventilation system is not credited in the CSTF DSA to operate during or following any DBA event, including NPH events.

<u>25H Evaporator Cell Ventilation System</u>

Table 5.1 EC - *Post accident indication of filter break-through.*

Gap – There is no installed post-accident monitoring capability. The evaporator cell ventilation system is not credited in the CSTF DSA to operate during or following any DBA event, including NPH events.

Table 5.1 EC - *Reliability of control system to maintain confinement function under normal, abnormal and accident conditions.*

Gap - The PVS control system design is not a robust one, and minor system transients (e.g., removing cell cover seam weather stripping) can interlock the system off. The evaporator cell ventilation system is not credited in the CSTF DSA to operate during or following any DBA event, including NPH events.

<u>25H Evaporator Secondary Ventilation System</u>

Table 5.1 EC - *Post accident indication of filter break-through.*

Gap – There is no installed post-accident monitoring capability. The evaporator secondary ventilation system is not credited in the CSTF DSA to operate during or following any DBA event, including NPH events.

3.2 Gap Evaluations

Each of the evaporator active confinement ventilation systems was compared with SS system performance criteria in Table 5.1 of Reference 5. In order to perform this evaluation, ventilation and support systems documentation was reviewed to confirm system configuration. Systems were then evaluated against the criteria in Table 5.1; four gaps that are discretionary in nature were identified and documented in Attachments 7, 8, and 9. Design Authority engineers along with facility support personnel used the gap information to develop scopes of work for the modifications needed to close each gap. The engineers, using these scopes of work, worked with site estimators to develop rough order of magnitude estimates (Class 5 estimates) to perform the modifications.

3.3 Modifications and Upgrades

The discretionary gaps identified in Attachments 7, 8, and 9 were reviewed by the Design Authority Engineer and other Liquid Waste personnel and recommendations for closure of the gaps were developed. The recommendations for closure are summarized below.

The 242-16F, 242-16H and 242-25H Evaporator Cell Ventilation Systems and the 242-25H Evaporator Secondary Ventilation System have no installed post-accident monitoring capability, as covered in Attachments 7, 8, and 9. Installed filter break-through monitoring capability is provided on the Evaporator Cell and Building ventilation systems addressed by this report. However, this instrumentation is provided for routine release monitoring only in compliance with applicable environmental permit requirements/commitments and serves no safety function.

The cost estimate for installing a PC-2 qualified Post Accident Monitoring System for the 242-25H Evaporator Cell Ventilation System and the 242-25H Evaporator Secondary Ventilation System ranged from a low of $5,982,200 to a high of $12,819,000. The cost estimate for installing a PC-2 qualified Post Accident Monitoring System for the 242-16F and 242-16H Evaporator Cell Ventilation Systems ranged from a low of $3,038,000 to a high of $6,510,000 for each system.

The imposition of this post-accident monitoring criterion on the Evaporator ventilation systems under the scope of this report is not practical given the very high likelihood for multiple radiological release paths to exist following a DBA in an Evaporator Facility.

The F and H Tank Farm Evaporator Facilities are open facilities (242-25H Evaporator is enclosed in a service building) and as such are not enclosed by containment structures (e.g., canyon building). There are multiple access openings directly into the evaporator cells that are sealed off by concrete covers (e.g., cell covers) that are held in place by the dead weight of the cover. The evaporator cell cover joints are not designed to be leak tight. Therefore, multiple release points would likely exist following an evaporator/cell explosion, leak/spill, or overpressure event. This would be particularly true for any NPH event since the installed ventilation systems are not qualified to operate during or following such events (with the exception of the evaporator cells during a tornado/high wind event). Significant mitigated releases are those associated with an explosion event that would likely not only render the ventilation systems inoperable, but would also lift cell covers. This situation is further exacerbated due to the potential for multiple accidents to occur as a result of a common mode initiator, in particular due to a seismic event (i.e., potential exists for multiple release mechanisms within the Evaporator Facility). Because of the high potential for multiple post-accident release paths, the prudent post-accident monitoring approach is to rely on the use of portable survey equipment as a key element of the SRS Emergency Response Program (Reference 8, TSR Administrative Control 5.8.2.2).

Improving the 242-25H Primary Ventilation System (PVS) reliability during normal operations though not required is desirable. The PVS control system design is not robust, and minor system transients (e.g., removing cell cover seam weather stripping) can interlock the system off. Engineering had previously initiated actions to evaluate the system design for potential modifications that would improve overall system reliability/efficiency. However, this evaluation has not been completed due to other priorities.

The cost estimate for improving the 242-25H Primary Ventilation System (PVS) reliability ranged from a low of $94,500 to a high of $202,500.

Because the identified gaps are discretionary and modifications to address these gaps would provide limited, if any overall dose reduction, the Facility Evaluation Team recommends that no action be taken to add post accident monitoring capability to the evaporators' ventilation systems. However, it does recommend that the previous action to review the 242-25H PVS design for possible improvements be given a higher priority and that modifications be made to improve its reliability during normal operations based on the review's findings.

4. Conclusion

The 242-16F, 242-16H and 242-25H Evaporator Facilities have active confinement ventilation systems that are functionally classified as PS and meet the PC-1 criteria for applicable NPH events. This functional classification is based upon the moderate radiological and chemical consequences to both the 100-meter on-site and off-site receptors from the postulated events as evaluated in the CSTF DSA for each facility (References 1, 2, 3, and 4). The unmitigated accident analyses assumed a Leak Path Factor of 1.0 and were performed assuming no active or passive confinement ventilation system.

Based upon the results of the Table 4.3 evaluation (Attachment 6), the portion of the 242-16H Evaporator Facility ventilated by the Mercury Removal System Ventilation System was treated as a Hazard Category 3 facility for the purposes of 2004-2. As a Hazard Category 3 facility with an active confinement ventilation system, no further 2004-2 evaluation (i.e., Table 5.1) was required.

The Facility Evaluation Team evaluated the active confinement ventilation systems at the 242-16F, 242-16H and 242-25H Evaporator Facilities in accordance with the Reference 5, using the SS Table 5.1 criteria based on the Hazard Category 2 inventory levels in the evaporators. PC-2 criteria were used to assess functionality for applicable NPH events. The evaluation identified gaps between the ventilation systems' designs and the evaluation criteria. These gaps were considered discretionary because there were no DSA safety related functional requirements associated with the performance criteria.

The total cost of the modifications needed to close the four discretionary gaps associated with the 242-16F, 242-16H and 242-25H Evaporators range from a low of $12,152,700 to a high of $26,041,500. These figures are based on the Class 5 estimate, performed by Site Estimating, of $17,361,000 with a minus 30% and a plus 50% range.

Because the identified gaps were discretionary and modifications to address these identified gaps would provide limited, if any, overall dose reduction, the Facility Evaluation Team recommends that no action be taken to add post accident monitoring capability to the evaporators' ventilation systems. However, it does recommend that the previous action to review the 242-25H PVS design for possible improvements be given a higher priority and that modifications be made to improve its reliability during normal operations based on the review's findings.

References

1. WSRC-SA-2002-00007, Concentration, Storage, and Transfer Facilities Documented Safety Analysis, Rev. 7, Washington Savannah River Company, February 2007.

2. B.A. McKibben, Hazard Analysis for the CST Facility (U), S-CLC-H-00858, Rev. 3, Westinghouse Savannah River Company, Aiken, SC, February 2007.

3 Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses, Change Notice No. 3, DOE-STD-3009-94, U.S. Department of Energy, Washington, DC, March 2006.

4. Conduct of Engineering and Technical Support, WSRC Procedure Manual E7, Procedure 2.25, Functional Classification, Rev. 14, Westinghouse Savannah River Company, November 2004.

5. Deliverables 8.5.4 and 8.7 of Implementation Plan for DNFSB Recommendation 2004-2, Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related Systems, U.S. Department of Energy, Washington, DC, January 2006.

6. WSRC Memorandum LWO-LWE-2007-00029, from R. L. Salizzoni to C. A. Everatt, DNFSB 2004-2 Ventilation Implementation (Table 4.3) Tank Farm Evaporator Cell Ventilation Systems, March 1, 2007.

7. WSRC Memorandum LWO-LWE-2007-00037, from R. L. Salizzoni to C. A. Everatt, DNFSB 2004-2 Ventilation Implementation (Table 4.3) 242-25H Evaporator Secondary Ventilation System, April 18, 2007.

8. S-TSR-G-00001, Concentration, Storage, and Transfer Facilities Technical Safety Requirements (U), Rev. 16, Washington Savannah River Company, Aiken, SC, June 2007.

Attachment 1 – Evaporator Facilities General Arrangement

EVAPORATOR FACILITIES GENERAL ARRANGEMENT

The 242-16F/16H Evaporator Facilities are arranged into three cells and a gang valve house (Figure 1) The evaporator cell contains the evaporator; the condenser cell contains the condenser; and a diked overheads cell contains overheads system components other than the condenser. The gang valve house, located at the upper level of the evaporator building, contains the gang valves for the evaporator cell sump, the steam lift and lance, and the chemical addition tank. The 242-25H Evaporator has the same function and many of the same features as the 242-16F/16H Evaporators. The major difference is the capacity, or size, of the vessel, support systems and the use of a primary and secondary ventilation system.

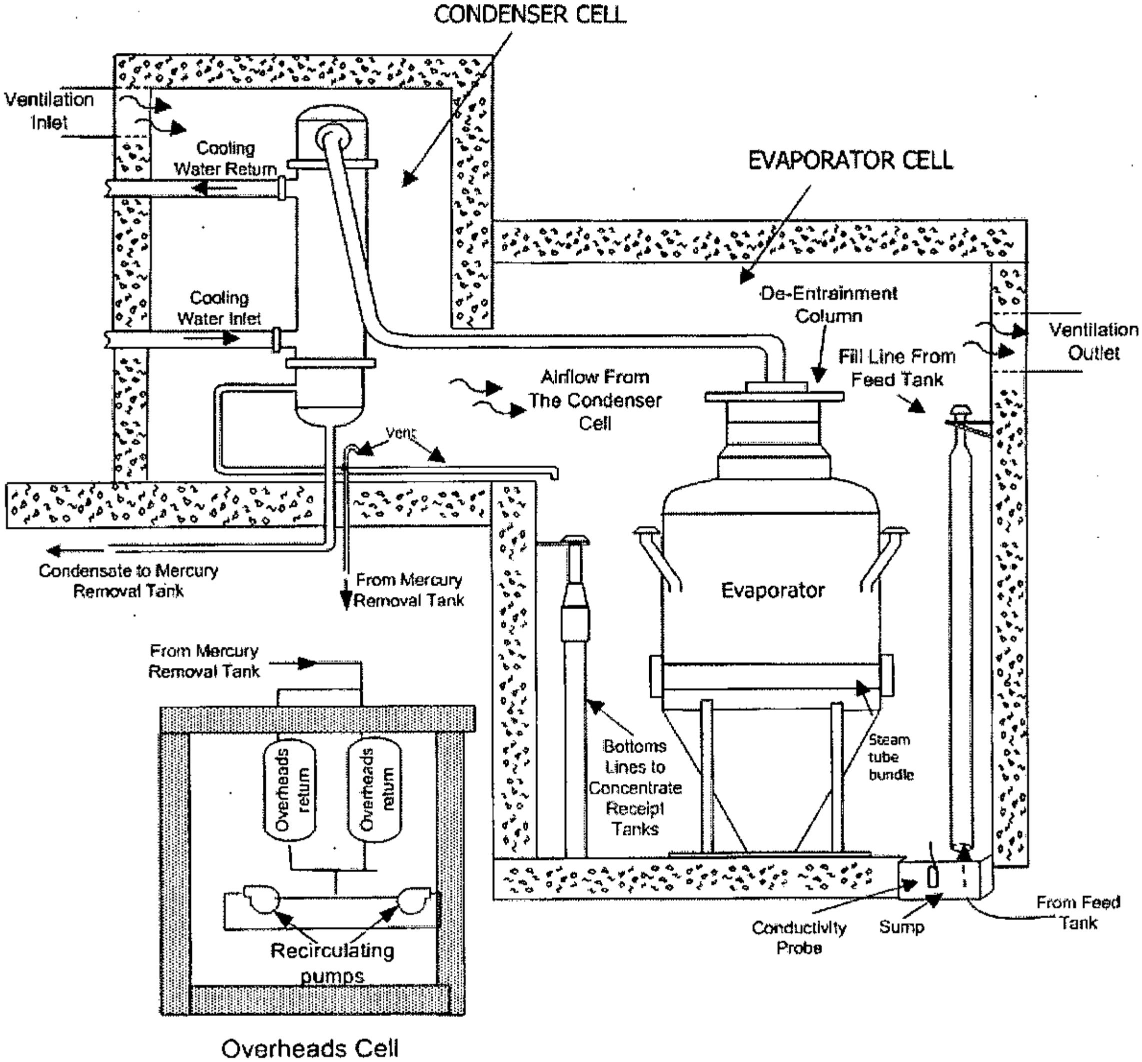

Figure 1

Evaporator Building (Typical)

Note: Arrangement is representative of 242-16F/16H Evaporator Buildings. The 242-25H Evaporator Building contains similar cells with a slightly different arrangement.

242-16F/16H EVAPORATORS

Ventilation Systems

The evaporator cell ventilation system (Figure 2) maintains a negative pressure on the condenser and evaporator cells to provide cooling, remove flammable gases, and prevent the spread of contamination through joints in the cell covers to the outside environment. The evaporator exhaust blower draws outside air through the condenser cell HEPA filter inlet assembly and through the opening between the cells into the evaporator cell. Each of the two exhaust filter assembly contains a pre-filter and HEPA filter contained within a single housing with isolation dampers and a test connection. Air is drawn through the filter assemblies by a single exhaust fan. Differential pressure gages and a pressure switch on the exhaust filter assemblies provide local indication of filter loading and a control room alarm for evaporator cell exhaust filter high differential pressure (dP). A Continuous Air Monitor (CAM) provides indication to the control room and actuates an alarm when the radioactivity level of the discharged air is high. In addition, the cell ventilation system is capable of being powered by a diesel generator.

The 242-16H overhead cell Mercury Removal System Ventilation System removes mercury vapor from the mercury collection station, overhead sample location, and overhead tank vents. The mercury vapor is removed at the sources by the fume collection hoods and exhaust ducts. The mercury vapor is expelled through the exhaust stack via a blower venting to atmosphere.

Since these systems serve no safety functions, they are classified as Production Support systems.

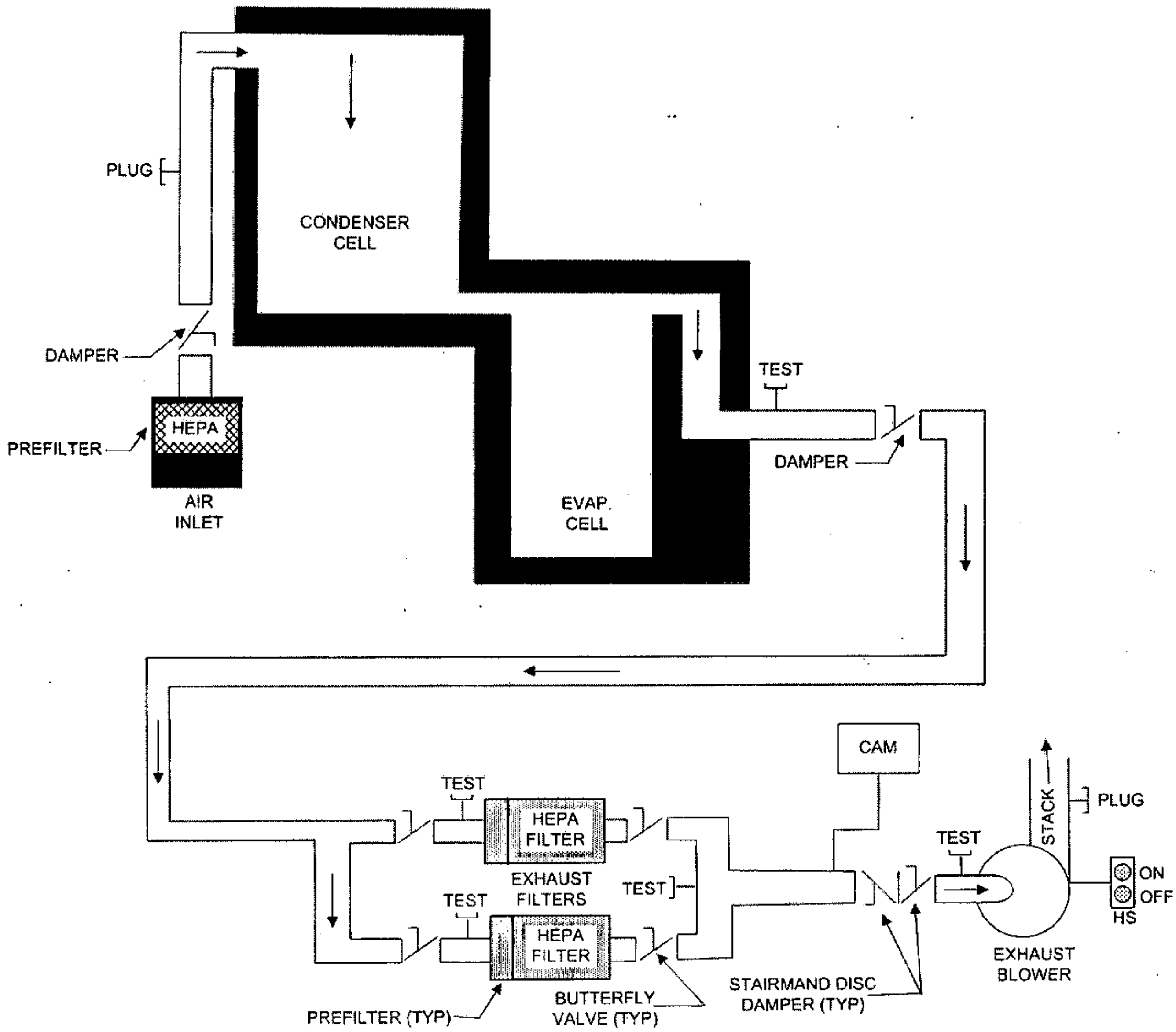

Figure 2

2F/2H Evaporator Cell Ventilation

Attachment 2 – 242-25H Evaporator Ventilation Systems

242-25H (3H) Evaporator

3H Evaporator Primary Ventilation System (PVS)

The 242-25H (3H Evaporator) PVS (Figure 1) is a once-through induced draft air system, drawing in outside air, distributing the air throughout the ventilated areas, collecting exhaust air through a ductwork system, directing exhaust air through HEPA filter banks, and then discharging the filtered exhaust air to the atmosphere through an elevated stack equipped with a CAM. Humidity is reduced in the PVS with steam heating coils to prevent moisture loading of the HEPA filters. Since this system serves no safety function, it is classified as a Production Support system.

Alarms are actuated for the following:

- high CAM activity
- high humidity
- high and low temperatures
- high and low differential pressure across the HEPA filters and pre-filters
- low exhaust and CAM fan flow rates

The PVS serves the evaporator cell and condenser cell. The system has an inlet HEPA filter unit, an air exhaust duct connected to two redundant banks of outlet HEPA filter units, two redundant centrifugal exhaust fans, and an air discharge stack. The inlet HEPA filter unit is located in the condenser cell and the outlet HEPA filter unit and exhaust fans are located downstream of the evaporator cell in the HEPA filter building. The exhaust fans are capable of delivering 3,000 cubic feet per minute. The HEPA filter units contain balancing dampers to maintain the pressure differential between the evaporator and condenser cells, and between the evaporator cell and atmosphere. An alarm is actuated when the differential pressure between the evaporator cell and the atmosphere drops below the setpoint; an interlock switches from the on-line filter and fan train to the standby train when the evaporator cell exhaust vacuum drops below the setpoint. This interlock is also actuated when HEPA filter differential pressure increases above the setpoint, when the pre-filter differential pressure increases above its setpoint, when the exhaust stack CAM detects activity above its setpoint, or when the exhaust duct discharge dampers are closed. In addition, the PVS is capable of being powered by a diesel generator.

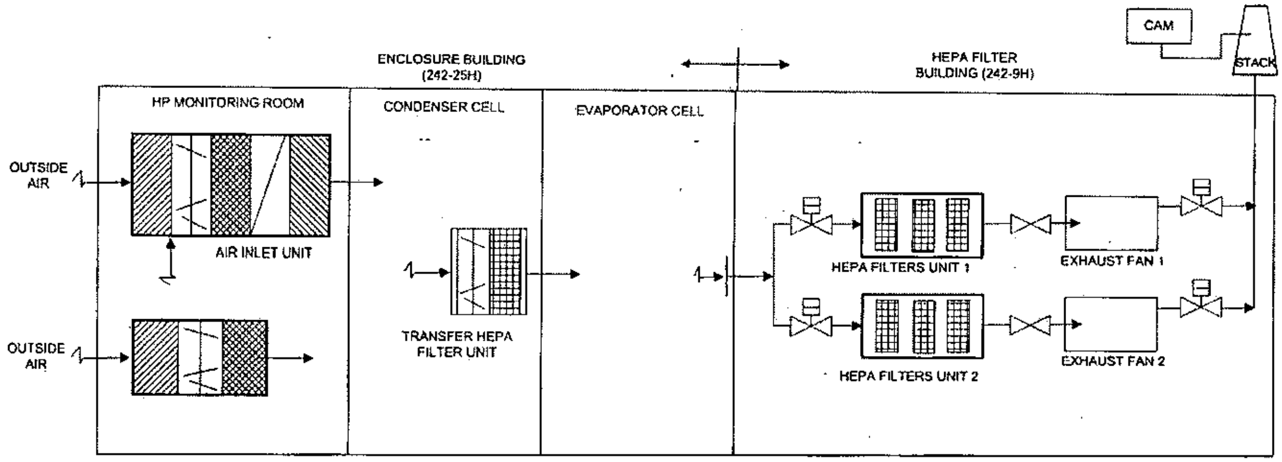

Figure 1

3H Evaporator
Primary Ventilation System

3H EVAPORATOR SECONDARY VENTILATION SYSTEM (SVS)

242-25H EVAPORATOR BUILDING GENERAL ARRANGEMENT

The 242-25H Evaporator building arrangement consists of an Enclosure Building (commonly referred to as the Service Building) that encompasses the evaporator cell, the condenser cell, the overhead cell, the Gravity Drain Line (GDL) cell, truck bay, and four service floors. The Service Building is of structural steel construction, supports the overhead crane, provides platforms and stairs for access to the four floors of the Service Building, and contains support systems. The evaporator, condenser, and overhead cells are contained in the 242-25H Service Building. During maintenance activities in the evaporator and condenser cells, the evaporator cell covers are removed and the evaporator and condenser cells are ventilated by the Secondary Ventilation System (SVS). The Overheads cell is open to the first level of the Service Building and is ventilated by the SVS.

242-25H EVAPORATOR SECONDARY VENTILATION SYSTEM (SVS)

The Secondary Ventilation System (SVS) uses an induced draft system. Two exhaust fans pull air in through inlet air units and two of three filter units (Figure 2). The air is exhausted through a stack, which is monitored by a Continuous Air Monitor (CAM) to ensure there is not a release of contaminated air to the environment.

The SVS consists of inlet air units, an exhaust air duct system connected to three HEPA filter units, two redundant centrifugal exhaust fans, and an air discharge stack. Two of the three HEPA filter units are normally in operation with the third unit in standby. The HEPA filter units are located inside on the 4th level of the enclosure building structure, and the exhaust fans are mounted on a platform located outside at the same level as the HEPA filter units.

The SVS is a once-through induced draft air system, drawing in outside air, distributing the air throughout the ventilated areas, collecting exhaust air through a ductwork system, directing exhaust air through HEPA filter units, and then discharging the filtered exhaust air to the atmosphere through an elevated discharge stack equipped with a CAM. Since this system serves no safety function, it is classified as Production Support system.

There are twelve inlet air units for the SVS. Each unit has an inlet louver, a manual damper, and a medium efficiency filter. The inlet air units are located throughout the buildings to admit the proper amount of air into the various spaces. The motive force to pull air in through the inlet units is the suction (negative pressure) exerted on the spaces by the SVS exhaust fans.

Each system contains sufficient instrumentation to monitor and control air flows, space temperatures, and the required negative pressures of specified compartments. Monitoring instrumentation includes exhaust air radioactivity detection and radiation alarm. Instrumentation also provides monitoring and alarm of differential pressure across HEPA filters for plant control and maintenance. In addition, instrumentation provides controls and interlocks of critical components to initiate operation of the standby unit in the event of failure of the operating component.

SVS Exhaust HEPA Filter Units

The exhaust portion of the SVS consists of exhaust ducts that draw the air out of the various areas served by the SVS. The exhaust ducts join at a common header that serves as the inlet to three HEPA Filter Units. The HEPA Filter Units are identical, each consisting of pneumatic inlet and outlet dampers, a high efficiency pre-filter, and two stages of HEPA filters. During normal operation, two of the filter units will be in service, with the third unit in standby. Each filter in the units is provided with a differential pressure instrument to monitor the condition of the filter. At the outlet of the filter units, the ductwork again joins to form a common header. This common header serves as the suction header for the SVS Exhaust Fans.

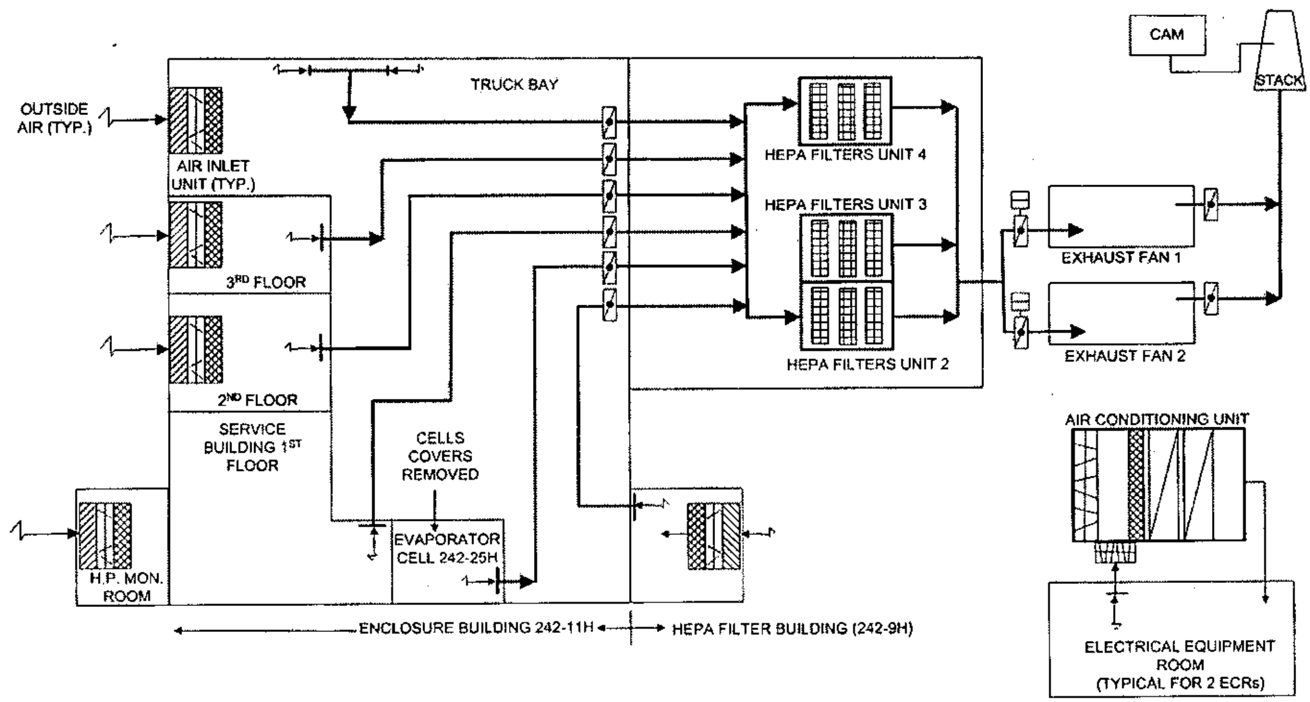

Figure 2

3H Evaporator

Secondary Ventilation System

Attachment 3 – 242-16H Evaporator Mercury Removal System Ventilation System

242-16H Mercury Removal System Ventilation System

The 242-16H Mercury Removal System Ventilation System (Figure 1) is a once-through induced draft air system that removes mercury vapor and air from the mercury and overhead tank sample station enclosure and each overhead tank vent. The mercury vapor and air is removed at the sources by four fume exhaust hoods and exhaust ducting. The exhaust duct is connected to a HEPA filter unit located before the exhaust fan. The filtered air and vapor is expelled by the exhaust fan through an exhaust stack to atmosphere. The Mercury Removal System Ventilation System exhaust fan is powered from a motor control center (MCC) that can receive backup power from a diesel generator. Since this system serves no safety function, it is classified as a Production Support system.

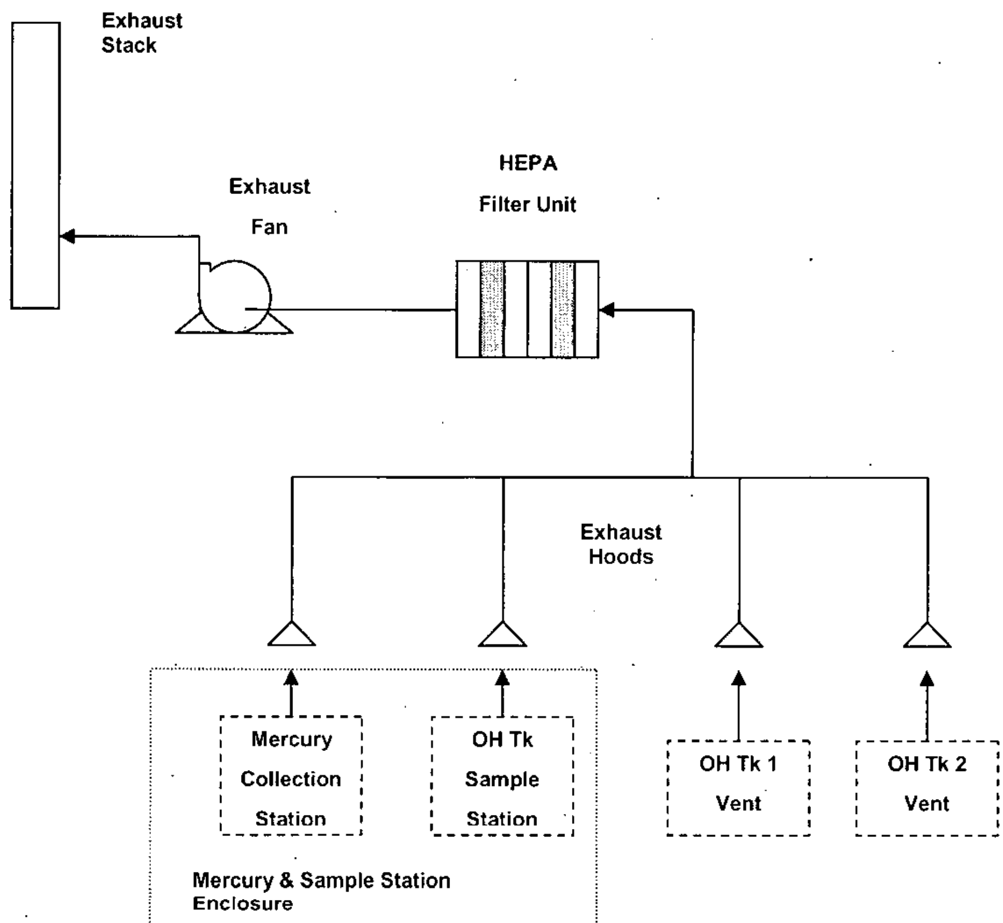

Figure 1

242-16H Mercury Removal System Ventilation System

Attachment 4 – 2004-2 Common Table 4.3 for 2F, 2H, and 3H Evaporator Cell Ventilation

2004 - 2 Common Table 4.3 for 2F, 2H and 3H Evaporator Cell Ventilation										
Confinement Documented Safety Analysis Information										
Tank Farms – Evaporator Cell Ventilation				Hazard Category 2				Performance Expectations		
Bounding Accidents	Type Containment		Doses Bounding Unmitigated/Mitigated [A, B]	Containment Classification			Safety Function	Functional Requirements	Performance Requirements	Compensatory Measures
	Active	Passive		SC	SS	DID				
3.4.2.1 Evaporator Pot Explosion [D]			**Unmitigated** MOI < 0.1 rem, CW = 40 rem **Mitigated** MOI < 0.1 rem, CW = 40 rem				No credit is taken for confinement in this scenario.			
3.4.2.2 Evaporator Cell Explosion [E]			**Unmitigated** MOI < 0.1 rem, CW = 13.7 rem **Mitigated** MOI < 0.1 rem, CW = 13.7 rem				No credit is taken for confinement in this scenario.			
3.4.2.3 Evaporator Overflow/Leaks/Spills [F]			**Unmitigated** MOI < 0.1 rem, CW = 13.1 rem **Mitigated** MOI < 0.1 rem, CW = 13.1 rem				No credit is taken for confinement in this scenario.			
3.4.2.4 Evaporator Overpressure [G]			**Unmitigated** MOI < 0.1 rem, CW = 50.2^{N} rem **Mitigated** MOI < 0.1 rem, CW = 50.2^{N} rem				No credit is taken for confinement in this scenario.			
3.4.2.17 Tornado and High Winds Event Evaporator Pot Explosion [H]		X	**Unmitigated** [C] MOI < 0.1 rem, CW = 40 rem **Mitigated** MOI = 0 rem, CW = 0 rem		X		Confinement for collocated worker protection	Passive gross airborne confinement capability	Maintain structural integrity during and after a PC-2 wind event	None

2004 - 2 Common Table 4.3 for 2F, 2H and 3H Evaporator Cell Ventilation										
Confinement Documented Safety Analysis Information										
Tank Farms – Evaporator Cell Ventilation				Hazard Category 2				Performance Expectations		
Bounding Accidents	Type Containment		Doses Bounding Unmitigated/Mitigated [A, B]	Containment Classification			Safety Function	Functional Requirements	Performance Requirements	Compensatory Measures
	Active	Passive		SC	SS	DID				
3.4.2.17 Tornado and High Winds Event Evaporator Cell Explosion [I]		X	**Unmitigated** [C] MOI < 0.1 rem, CW = 13.7 rem **Mitigated** MOI = 0 rem, CW = 0 rem		X		No credit is taken for confinement in this scenario			
3.4.2.17 Tornado and High Winds Event Evaporator Overflow/Leaks/Spill [I]			**Unmitigated** [C] MOI < 0.1 rem, CW = 13.1 rem **Mitigated** MOI = 0 rem, CW = 0 rem				No credit is taken for confinement in this scenario			
3.4.2.17 Tornado and High Winds Event Evaporator Overpressure [H]		X	**Unmitigated** [C] MOI < 0.1 rem, CW = 50.2[N] rem **Mitigated** MOI = 0 rem, CW = 0 rem		X		Confinement for collocated worker protection	Passive gross airborne confinement capability	Maintain structural integrity during and after a PC-2 wind event	None
3.4.2.18 Seismic Event Evaporator Pot Explosion [J]			**Unmitigated** [C] MOI < 0.1 rem, CW = 40 rem **Mitigated** See Note J				No credit is taken for confinement in this scenario			

2004 - 2 Common Table 4.3 for 2F, 2H and 3H Evaporator Cell Ventilation										
Confinement Documented Safety Analysis Information										
Tank Farms – Evaporator Cell Ventilation				Hazard Category 2				Performance Expectations		
Bounding Accidents	Type Containment		Doses Bounding Unmitigated/Mitigated [A, B]	Containment Classification			Safety Function	Functional Requirements	Performance Requirements	Compensatory Measures
	Active	Passive		SC	SS	DID				
3.4.2.18 Seismic Event Evaporator Overflow/Leaks/Spills [K]			**Unmitigated** [C] MOI < 0.1 rem, CW = 13.1 rem **Mitigated** MOI = <0.1 rem, CW = 0 rem				No credit is taken for confinement in this scenario			
3.4.2.18 Seismic Event Evaporator Overpressure [L]			**Unmitigated** [C] MOI < 0.1 rem, CW = 50.2 rem Mitigated MOI = <0.1 rem, CW = 23.6 rem				No credit is taken for confinement in this scenario			
3.4.2.19 Wildland Fire Evaporator Pot Explosion [M]		X	Unmitigated [C] MOI < 0.1 rem, CW = 40 rem **Mitigated** MOI = 0 rem, CW = 0 rem		X		Confinement for collocated worker protection	Passive gross airborne confinement capability	Maintain structural integrity during and after a wildland fire	None
3.4.2.19 Wildland Fire Evaporator Cell Explosion [M]		X	**Unmitigated** [C] MOI < 0.1 rem, CW = 13.7 rem **Mitigated** MOI = 0 rem, CW = 0 rem		X		Confinement for collocated worker protection	Passive gross airborne confinement capability	Maintain structural integrity during and after a wildland fire	None
3.4.2.19 Wildland Fire Evaporator Overflow/Leaks/Spills [M]		X	**Unmitigated** [C] MOI < 0.1 rem, CW = 13.1 rem **Mitigated** MOI = 0 rem, CW = 0 rem		X		Confinement for collocated worker protection	Passive gross airborne confinement capability	Maintain structural integrity during and after a wildland fire	None
3.4.2.19 Wildland Fire		X	**Unmitigated** [C] MOI < 0.1 rem, CW = 50.2[N] rem		X		Confinement for collocated worker	Passive gross	Maintain structural	None

2004 - 2 Common Table 4.3 for 2F, 2H and 3H Evaporator Cell Ventilation											
Confinement Documented Safety Analysis Information											
Tank Farms – Evaporator Cell Ventilation				Hazard Category 2				Performance Expectations			
Bounding Accidents	Type Containment		Doses Bounding Unmitigated/Mitigated [A, B]	Containment Classification			Safety Function	Functional Requirements	Performance Requirements	Compensatory Measures
	Active	Passive		SC	SS	DID				
Evaporator Overpressure [M]			**Mitigated** MOI = 0 rem, CW = 0 rem				protection	airborne confinement capability	integrity during and after a wildland fire	

NOTES:

A - MOI – Maximally Exposed Offsite Individual; CW – Co-located Worker (100 meters).

B - A Leak Path Factor (LPF) of 1.0 was used in the mitigated and unmitigated analyses. All consequential dose values were taken from the CSTF DSA unless noted otherwise.

C - Consequence values are given on a per evaporator basis and do not reflect the total accumulative consequences of all the coincident releases associated with a Tornado/High Winds, Seismic, or Wildland Fire event.

D - This analysis involves a time-independent stoichiometric detonation of an evaporator pot explosion due to the accumulation of flammable vapors within the vapor space. The bounding unmitigated consequences are associated with a detonation in the 242-25H evaporator during startup with a partial fill. The analysis assumes that the overpressure transient from the explosion will: fail the pot causing its contents to be spilled to the cell; and eject the installed cell ventilation HEPA filters. Therefore, the unmitigated consequences reported for this event include those resulting from the explosion as well as those resulting from the pot, transfer jumper, and HEPA failures. No Safety Class (SC)/Safety Significant (SS) preventive or mitigative controls are required since the unmitigated consequences do not challenge either the Offsite or Onsite Evaluation Guidelines (EGs).

E - This analysis involves a deflagration within an evaporator cell due to the accumulation of flammable vapor resulting from a leak or spill or radioactive waste with the cell. A deflagration was analyzed vice a detonation since the Lower Explosive Limit is not reached within the 10 day accident duration assumed in the analysis. The bounding unmitigated consequences are associated with a deflagration in the 242-16F/16H evaporator cell due to a slow leak from the evaporator system. The analysis assumes that the overpressure transient from the explosion will fail the pot causing its contents to be spilled to the cell and eject the installed cell ventilation HEPA filters. Additionally, the transfer jumper leak that initiated the cell explosion (242-16F & 242-16H only) results in a coincident 15,000 gallons spill into the cell. Therefore, the unmitigated consequences reported for this event include those resulting from the explosion as well as those resulting from the pot, transfer jumper, and HEPA failures. No SC/SS preventive or mitigative controls are required since the unmitigated consequences do not challenge either the Offsite or Onsite EGs. Note that a seismic event is not a credible initiator for a cell explosion.

F - This analysis evaluated a wide spectrum of postulated overflows, leaks, and spills of radioactive waste into an evaporator cell from the evaporator pot and associated jumpers or from a transfer jumper that traverses the cell and bypasses the pot. The bounding unmitigated consequences are associated with a transfer jumper leak within the 242-16F or 242-16H evaporator cells. No SC/SS preventive or mitigative controls are required since the unmitigated consequences do not challenge either the Offsite or Onsite EGs.

G - This analysis analyzed an evaporator overpressure event resulting from a postulated crack in the steam tube bundle. The bounding unmitigated consequences are associated with a crack in the 242-16F evaporator tube bundle. No SC/SS preventive or mitigative controls are required since the unmitigated consequences do not challenge either the Offsite or Onsite EGs.

NOTES:

H - The progression for these events is the same as described above in Notes D and G except that a Tornado/High Winds event is the initiator. The first level of control (SC) credited for these events is the Severe Weather Response Program (Specific Administrative Control - SAC) is credited to ensure that evaporator operations are shutdown (including terminating feed to the pot and steam to the tube bundle). This ensures that sufficient time is available to the operators to prevent a pot explosion and eliminates any overpressure potential. To provide significant defense in depth (SS) the passive gross airborne confinement capability of the evaporator cell is credited as the second level of control.

I - The progressions for these events are the same as described above in Notes E and F except that a Tornado/High Winds event is the initiator. The structural integrity of the Evaporator Cells is credited (SC) to protect the evaporator pot/jumpers and transfer jumpers within the cells from the effects of the Tornado/High Winds such that no leaks/spills occur (and thus no subsequent explosion).

J - The progression for this event is the same as that described in Note D except that a Seismic event is the initiator. Within the ten day accident duration assumed in the analysis, the consequences of this event are bounded by those associated with seismically initiated evaporator pot overpressure event and the two events are mutually exclusive. Therefore the reported mitigated consequences associated with a seismic event include the consequences from an overpressure scenario vice an explosion scenario. No SC/SS preventive or mitigative controls are required for a seismically initiated pot explosion since the resulting consequences are sufficiently low.

K - The progression for this event is the same as that described in Note F except that a Seismic event is the initiator. With the exception of a leak from a transfer jumper (242-16F & 242-16H only), the consequences of this event are bounded by those associated with a seismically initiated evaporator overpressure event and the two events are mutually exclusive. Therefore the reported mitigated consequences associated with a seismic event include the consequences from an overpressure scenario. Additionally offsite consequences associated with a transfer jumper leak are included in the mitigated seismic event consequences. To eliminate onsite consequences associated with a transfer jumper leak, the structural integrity of the transfer jumper is credited (SS PC-2 seismically qualified) to prevent a leak from this jumper.

L - The progression for this event is the same as that described in Note G except that a Seismic event is the initiator. In the unmitigated case the steam supply pressure control valves are assumed to fail open and the associated relief valves are assumed to fail closed such that full steam supply pressure is applied to the evaporator tube bundle and lance (i.e., no pressure reduction occurs). To mitigate the onsite consequences of this event, the 242-16F & 242-16H tube bundle steam supply pressure control valves and relief valves and the 242-25H lance steam supply pressure control valve and relief valve are credited (SS PC-2 seismically qualified) to limit the steam supply pressure and flow.

M - The progressions for these events are the same as described above in Notes D through G except that a Wildland Fire Event is the initiator. The first level of control (SC) credited for this event is the Event Response Program (SAC) that ensures that all evaporator operations are shutdown prior to a wildland fire reaching the evaporator systems thus preventing these accidents. To provide significant defense in depth (SS) the passive airborne confinement capability of the evaporator cell structure is credited as the second level of control (structures are constructed of non-combustible material - reinforced concrete).

NOTES:

N - The onsite consequence of 50.2 rem was derived based on the maximum steam supply pressure of 370 psig as a result of a seismic event (See Note L for details). For the non-seismic case, the steam supply pressure is less than this value so that the resulting onsite consequences would also be less. However, consequences were specifically calculated for the seismic steam supply pressures. Therefore the 50.2 is reported as the bounding consequence for the both the seismic and non-seismic cases.

Attachment 5 – 2004-2 Table 4.3 242-25H Evaporator Secondary Ventilation System

2004 - 2 Table 4.3 for 242-25H Evaporator Secondary Ventilation System

Confinement Documented Safety Analysis Information										
Tank Farms – Evaporator Secondary Ventilation System				Hazard Category 2				Performance Expectations		
Bounding Accidents [C, D]	Type Containment		Doses Bounding Unmitigated/Mitigated [A, B]	Containment Classification			Safety Function	Functional Requirements	Performance Requirements	Compensatory Measures
	Active	Passive		SC	SS	DID				
3.4.2.1 Evaporator Pot Explosion [E]			**Unmitigated** MOI < 0.1 rem, CW = 40 rem **Mitigated** MOI < 0.1 rem, CW = 40 rem				No credit is taken for confinement in this scenario.			
3.4.2.2 Evaporator Cell Explosion [F]			**Unmitigated** MOI < 0.1 rem, CW = 13.7 rem **Mitigated** MOI < 0.1 rem, CW = 13.7 rem				No credit is taken for confinement in this scenario.			
3.4.2.17 Tornado and High Winds Event Evaporator Pot Explosion [G]			**Unmitigated** MOI < 0.1 rem, CW = 40 rem **Mitigated** MOI < 0.1 rem, CW = 40 rem				No credit is taken for confinement in this scenario.			
3.4.2.17 Tornado and High Winds Event Evaporator Cell Explosion [H]			**Unmitigated** MOI < 0.1 rem, CW = 13.7 rem **Mitigated** MOI < 0.1 rem, CW = 13.7 rem				No credit is taken for confinement in this scenario.			

2004 - 2 Table 4.3 for 242-25H Evaporator Secondary Ventilation System

Confinement Documented Safety Analysis Information										
Tank Farms – Evaporator Secondary Ventilation System				Hazard Category 2				Performance Expectations		
Bounding Accidents [C, D]	Type Containment		Doses Bounding Unmitigated/Mitigated [A, B]	Containment Classification			Safety Function	Functional Requirements	Performance Requirements	Compensatory Measures
	Active	Passive		SC	SS	DID				
3.4.2.17 Tornado and High Winds Event Evaporator Overheads Tank Release [I]			**Unmitigated** MOI = Negligible CW = Negligible **Mitigated** MOI = Negligible CW = Negligible				No credit is taken for confinement in this scenario.			
3.4.2.18 Seismic Event Evaporator Overheads Tank Release [I]			**Unmitigated** MOI = Negligible CW = Negligible **Mitigated** MOI = Negligible CW = Negligible				No credit is taken for confinement in this scenario.			
3.4.2.19 Wildland Fire Evaporator Overheads Tank Release [I]			**Unmitigated** MOI = Negligible CW = Negligible **Mitigated** MOI = Negligible CW = Negligible				No credit is taken for confinement in this scenario.			

NOTES:

A - MOI – Maximally Exposed Offsite Individual; CW – Co-located Worker (100 meters).

B - A Leak Path Factor (LPF) of 1.0 was used in the unmitigated analyses. All consequential dose values were taken from the CSTF DSA unless noted otherwise.

C - The CSTF DSA analyzed a mercury vapor release from the 242-25H evaporator (the largest of the three evaporators). The SVS (i.e., HEPA filters) is not designed to reduce the concentration of mercury vapors released during an accident (i.e., it provides no mitigative function). Therefore, the mercury release scenario is not included in this table.

D - Evaporator Overpressure and Evaporator Overflow/Leaks/Spills scenarios are not included in this table because these scenarios do not involve a lifting of the evaporator cell covers and subsequent propagation of the event into the Service Building.

E - This analysis involves a time-independent stoichiometric detonation of the evaporator pot explosion due to the accumulation of flammable vapors within the vapor space. The bounding unmitigated consequences are associated with a detonation in the 242-25H evaporator during startup with a partial fill. The analysis assumes that the overpressure transient from the explosion will fail the pot causing its contents to be spilled to the cell and eject the installed cell ventilation HEPA filters. Based on review of cell design, the evaporator cell will relieve pressure (into the 242-25H Service Building) following an explosion via cell cover lifting, preventing the cell from failing. Therefore, the unmitigated consequences reported for this event include those resulting from the explosion as well as those resulting from the pot and HEPA failures. No Safety Class (SC)/Safety Significant (SS) preventive or mitigative controls are required since the unmitigated consequences do not challenge either the Offsite or Onsite Evaluation Guidelines (EGs).

F - This analysis involves a deflagration within the evaporator cell due to the accumulation of flammable vapor resulting from a leak or spill or radioactive waste with the cell. A deflagration was analyzed vice a detonation since the Lower Explosive Limit is not reached within the 10 day accident duration assumed in the analysis. The bounding unmitigated consequences are associated with a deflagration in the 242-25H evaporator cell due to a slow leak from the evaporator system. The analysis assumes that the overpressure transient from the deflagration will fail the pot causing its contents to be spilled to the cell, eject the installed cell ventilation HEPA filters, and lift the cell covers (i.e., relieve pressure into the 242-25H Service Building). Therefore, the unmitigated consequences reported for this event include those resulting from the explosion as well as those resulting from the pot and HEPA failures. No SC/SS preventive or mitigative controls are required since the unmitigated consequences do not challenge either the Offsite or Onsite EGs. Note that a seismic event is not a credible initiator for a cell explosion.

G - The progression for this event is the same as described above in Note E except that a Tornado/High Winds event is the initiator. The first level of control (SC) credited for this event is the Severe Weather Response Program (Specific Administrative Control - SAC). The program is credited to ensure that evaporator operations are shutdown (including terminating feed to the pot and steam to the tube bundle). This ensures that sufficient time is available to the operators to prevent a pot explosion and eliminates any overpressure potential. To provide significant defense in depth (SS) the passive gross airborne confinement capability of the evaporator cell is credited as the second level of control. The Emergency Response Program serves as a third level of control.

NOTES:

H - The progression for this event is the same as described above in Note F except that a Tornado/High Winds event is the initiator. The structural integrity of the evaporator cell is credited (SC) to protect the evaporator pot and jumpers within the cell from the effects of the Tornado/High Winds such that no leaks/spills occur (and thus no subsequent explosion). The Severe Weather Response Program (Specific Administrative Control - SAC) is the second level of control (SS) to ensure that evaporator operations are shutdown (including terminating feed to the pot and steam to the tube bundle) to minimize any potential post-tornado release. The Emergency Response Program serves as a third level of control.

I - The analysis for this event analyzed a release of the contents of the evaporator overheads tanks from the evaporators as a result of an NPH event. The bounding unmitigated consequences are associated with an overheads system breach resulting in a release of the overheads tank contents to the overheads cell. No SC/SS preventive or mitigative controls are required since the unmitigated consequences were qualitatively judged to be negligible. As given in the CSTF DSA (Table 3.3-3), negligible is defined as < 0.5 rem to the MOI and <5.0 rem to the CW. Therefore, no Offsite or Onsite consequences are attributed to this event.

Attachment 6 – 2004-2 Table 4.3 for Evaporator Mercury Removal System Ventilation System

2004 - 2 Table 4.3 for 2H Evaporator Mercury Removal System Ventilation System

Confinement Documented Safety Analysis Information										
Tank Farms – Mercury Removal System Ventilation System				Hazard Category 2				Performance Expectations		
Bounding Accidents [C]	Type Containment		Doses Bounding Unmitigated/Mitigated [A, B]	Containment Classification			Safety Function	Functional Requirements	Performance Requirements	Compensatory Measures
	Active	Passive		SC	SS	DID				
3.4.2.17 Tornado and High Winds Event Evaporator Overheads Tank Release [D]			**Unmitigated** MOI = Negligible CW = Negligible **Mitigated** MOI = Negligible CW = Negligible				No credit is taken for confinement in this scenario.			
3.4.2.18 Seismic Event Evaporator Overheads Tank Release [D]			**Unmitigated** MOI = Negligible CW = Negligible **Mitigated** MOI = Negligible CW = Negligible				No credit is taken for confinement in this scenario.			
3.4.2.19 Wildland Fire Evaporator Overheads Tank Release [D]			**Unmitigated** MOI = Negligible CW = Negligible **Mitigated** MOI = Negligible CW = Negligible				No credit is taken for confinement in this scenario.			

NOTES:

A - MOI – Maximally Exposed Offsite Individual; CW – Co-located Worker (100 meters).

B - A Leak Path Factor (LPF) of 1.0 was used in the unmitigated analyses. All consequential dose values were taken from the CSTF DSA unless noted otherwise.

C - The CSTF Hazard Analysis analyzed an Overheads Tank breach/release. The radiological consequences from this event were qualitatively judged to be negligible; therefore this event was not carried over into the CSTF DSA as a design basis accident. However, such a breach/release was included in the NPH DBAs for completeness in assessing the cumulative effect of multiple releases resulting from a common cause initiator (e.g., seismic event).

D - The analysis for this event analyzed a release of the contents of the evaporator overheads tanks from the evaporators as a result of an NPH event. The bounding unmitigated consequences are associated with an overheads system breach resulting in a release of the overheads tank contents to the overheads cell. No SC/SS preventive or mitigative controls are required since the unmitigated consequences were qualitatively judged to be negligible. The NPH accident analysis concludes that the consequence contribution from the overheads tank release is 0.0 rem (offsite and onsite).

Attachment 7 – 2004-2 Table 5.1, 242-16F/H Cell Ventilation System Performance Criteria

2004-2 Table 5.1, 242-16F/H Cell Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
	1 - Ventilation System – General Criteria	
Pressure differential should be maintained between zones and atmosphere.	The cell ventilation system is designed to maintain the evaporator condenser and evaporator cells at a lower pressure relative to the environment for normal operating conditions. References M-M6-H-8338, Rev. 19 M-M6-H-8689, Rev. 4 M-M6-F-3024, Rev.12 M-M6-F-2985, Rev. 6 Gap Analysis No gap. The evaporator cell ventilation system is designed to maintain the required pressure differential during normal operations. It is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE-HNBK-1169 (2.2.9) ASHRAE Design Guide, Section 2**
Materials of construction should be appropriate for normal, abnormal and accident conditions.	Materials of construction for the exterior portion of the 242-16F/H Cell Ventilation duct is 16-gauge galvanized steel up to the fan. The HEPA filter housings are standard stainless steel Flanders construction. Gasket material is neoprene. Exhaust fans are constructed of galvanized carbon steel. A portion of the cell ventilation duct is inside the 42" evaporator cell south wall. This duct is 12" schedule 20 stainless steel pipe. References W703243 Rev. 34 Gap Analysis No gap. The evaporator cell ventilation system is designed for normal process operation. The design and materials of construction are compatible with the outdoor conditions typically experienced in the southeastern United States. The current 2H system has operated since 1994 with no signs of material degradation. The current 2F system has operated for more than 20 years with no signs of material degradation.	**DOE Nuclear Air Cleaning Handbook 1169 Section 2.2.5 – Corrosion ASME AG-1**
Exhaust system should withstand anticipated normal, abnormal and accident system conditions and maintain confinement integrity.	The evaporator cell ventilation system was designed for normal operating conditions. Reference M-M6-H-8689, Rev.4 M-M6-F-2985, Rev. 6 W703243, Rev. 34 Gap Analysis No gap. The evaporator cell ventilation system was designed to operate with the evaporator within the specified temperature and flow rate ranges (normal process). It is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE-HNBK-1169 (2.4) ASHRAE Design Guide**

2004-2 Table 5.1, 242-16F/H Cell Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
Confinement ventilation systems shall have appropriate filtration to minimize release.	The HEPA filter house is designed and manufactured to meet ASME N509-2002. The HEPA filter house is a standard Bag-In/Bag-Out Style. HEPA filter house specification consists of 11 and 14 gauge 304 stainless steel. Housing is total welded construction. (Code Welding). Housing conforms to leak tightness per criteria of DOE Nuclear Air Cleaning Handbook. <u>Inlet HEPA Housing and Filter</u> Flanders stainless steel holding frame Type A-4 mounted inside a 16 gauge galvanized steel filter casing. Flanders HEPA filter size GG-F (24" x 24" x 11-½") Model 7C75NL, with channel system, 99.97% efficient, 14 gauge 304 SST frame, neoprene gasket, with seal upstream. Flame resistant urethane pack-to-frame sealant, no separators, SST (4 x4 mesh) faceguard both sides. <u>Exhaust HEPA Cabinet and Filter</u> Flanders Model (E-5) 1 X 1 GG-F2 (304)L Type 1 (Cabinet). Flanders Model GG-F (24" x 24" x 11-1/2") (Filter) 99.97% efficient, 304L SST frame, separatorless, with extractor clips, 3/4" deep channel filled with fluid sealant upstream, SST faceguards both sides. <u>HEPA Filter Specifications</u> Flanders Nuclear Grade HEPA Filter <u>HEPA Filter Performance Testing</u> In-place leak testing of HEPA filter installation is performed in accordance with Manual 2Y1 "*HEPA Filter Testing Procedures*", Procedure 104 "*General Surveillance Testing of HEPA Filters*". In-place leak testing is performed at scheduled intervals for installed testable HEPA filter systems to detect deterioration of filters, gaskets or other causes that could result in leaks. Testing is also done in a manner that will detect airflow that may bypass HEPA filters. A Preventive Maintenance record requires that the HEPA filters be replaced every 7 years. <u>Reference</u> W702287, Rev. 20 W703243, Rev. 34 W703535, Rev. 5 M-M6-H-8689, Rev. 4 M-M6-F-2985, Rev. 6 SRS Engineering Standard 15888 WSRC-TM-95-1, M-SPP-G000243, HEPA Filter Specification <u>Gap Analysis</u> No gap. The HEPA filter system meets the filtration requirements for normal evaporator operation. The evaporator cell ventilation system is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE Nuclear Air Cleaning Handbook 1169 Section 2.2.1 Airborne Particulate and Gases ASME AG-1 Table FC-5140 ASME N509-2002 ASME N510**
	2 - Ventilation System – Instrumentation & Control	
Provide system status instrumentation and/or alarms.	The 2F and 2H cell ventilation systems is instrumented with alarms in the control room for high HEPA filter dP and loss of fan power (motor not running). The 2F and 2H Evaporators cell vacuum is monitored locally via routine operator rounds. <u>Reference</u> M-M6-H-8689, Rev. 4 M-M6-F-2985, Rev. 6 <u>Gap Analysis</u> No gap. Local instrumentation is adequate for normal evaporator operation. The evaporator cell ventilation system is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE Nuclear Air Cleaning Handbook 1169 AHSRAE Design Guide (Section 4) ASME AG-1**

2004-2 Table 5.1, 242-16F/H Cell Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
Interlock supply and exhaust fans to prevent positive pressure differential.	The 2F and 2H evaporator cell ventilation systems are not equipped with a supply fan. Reference M-M6-H-8338, Rev. 19 M-M6-H-8689, Rev. 4 M-M6-F-3024, Rev. 12 M-M6-F-2985, Rev. 6 Gap Analysis No gap.	**DOE-HNBK-1169 ASHRAE Design Guide (Section 4)**
Post accident indication of filter break-through.	The current system in place to detect airborne contamination for the 242-16F&H Evaporator Cell Ventilation systems is an installed Continuous Air Monitor (CAM). References M-M6-H-8689, Rev. 4 M-M6-F-2985, Rev. 6 Gap Analysis Gap – There is no post-accident monitoring capability. The evaporator cell ventilation system is not credited in the DSA to operate during or following any DBA event, including NPH events. There is instrumentation to detect filter breakthrough during normal operation. Additionally, there are multiple Area Radiation Monitors and CAMs throughout the tank farm that could detect a release from an evaporator during normal operations.	**DNFSB Tech 34**
Reliability of control system to maintain confinement function under normal, abnormal and accident conditions.	The 2F/H cell ventilation system has no automatic control features or interlocks. It is strictly a manual system that is controlled by the operator in accordance with approved procedures. The evaporator cell ventilation system is not credited for operating during or after a DSA accident. Reference M-M6-H-8338, Rev. 19 M-M6-H-8689, Rev. 4 M-M6-F-3024, Rev. 12 M-M6-F-2985, Rev. 6 Gap Analysis No gap. The simplicity of the evaporator cell ventilation systems have made them very reliable.	**DOE Nuclear Air Cleaning Handbook 1169 Section 2.4 ASME AG-1**
Control components should fail safe.	The Evaporator Cell Ventilation System does not contain any active control instrumentation. The instruments provide for system monitoring during normal evaporator operation. In the event of loss of power event involving the 242-16F/H Evaporator Cell Ventilation System, the instrumentation and the fan lose power. If power remained in the control room the fan running (off) control room alarm would be activated. In the event of a loss of power the system fails to a passive ventilation system with continued flow through the HEPA filters. Reference M-M6-H-8338, Rev. 19 M-M6-H-8689, Rev. 4 M-M6-F-3024, Rev. 12 M-M6-F-2985, Rev. 6 Gap Analysis No gap. There are no control components for the evaporator cell ventilation system.	**DOE-HNBK-1169 (2.4)**

2004-2 Table 5.1, 242-16F/H Cell Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
	3 - Resistance to Internal Events – Fire	
Confinement ventilation systems should withstand credible fire events and be available to operate and maintain confinement.	Materials of construction for the exterior portion of the 242-16F/H Cell Ventilation duct is 16-gauge galvanized steel up to the fan. The HEPA filter housings are standard stainless steel Flanders construction. These materials are resistant to the effects of fire events. The DSA (Table 3.3-11) documents that there is no credible fire scenario involving the evaporator cells. The ventilation fans are located outdoors. These locations lack any significant combustible materials. The Fire Protection Program ensures that combustible materials are controlled to minimize the potential for fire in such locations. Gap Analysis No gap.	**DOE-HNBK-1169 (10.1) DOE-STD-1066**
Confinement ventilation systems should not propagate spread of fire.	The evaporator cell ventilation system serves only one cell. The condenser cell and the evaporator cell are connected via a large opening. The CSTF TSR's Fire Protection Program (e.g.,. fire detection and suppression systems, combustible loading limits) limits the probability of a damaging fire. The DSA (Table 3.3-11) documents that there is no credible fire scenario involving the evaporator cells. Gap Analysis No gap.	**DOE-HNBK-1169 (10.1) DOE-STD-1066**
	4 - Resistance to External Events – Natural Phenomena – Seismic	
Confinement ventilation systems should safely withstand earthquakes.	The evaporator cell ventilation systems are not credited in Section 3.4.2.18 of the DSA to perform any safety function during or following a seismic event. There are no adverse seismic interaction (i.e., II/I) concerns for this system. Reference WSRC-SA-2002-00007, Rev. 6. Gap Analysis No gap.	**ASME AG-1 AA DOE O 420.1B DOE-HNBK-1169 (9.2), Section 2.4 – Emergency Consideration UBC, 1979 SBC, 1979**
	5 - Resistance to External Events – Natural Phenomena – Tornado/Wind	
Confinement ventilation systems should safely withstand tornado depressurization.	The evaporator cell ventilation systems are not credited in Section 3.4.2.17 of the DSA to perform any safety function during or following a tornado event. References WSRC-SA-2002-00007, Rev. 6. Gap Analysis No gap.	**DOE O 420.1B DOE-HNBK-1169 (9.2), Section 2.4 – Emergency Consideration**

2004-2 Table 5.1, 242-16F/H Cell Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
Confinement ventilation systems should withstand design wind effects on system performance.	The evaporator cell ventilation systems are not credited in Section 3.4.2.17 of the DSA to perform any safety function during or following a high winds event. References WSRC-SA-2002-00007, Rev. 6. Gap Analysis No gap.	**DOE O 420.1B DOE-HNBK-1169 (9.2)**
	6 – Other NP Events	
Confinement ventilation systems should withstand other NP events considered credible in the DSA where the confinement ventilation system is credited.	The evaporator cell ventilation systems are not credited in the DSA to perform any safety function during or following any other NP event. References WSRC-SA-2002-00007, Rev. 6. Gap Analysis No gap.	**DOE O 420.1B DOE-HNBK-1169 (9.2), Section 2.4 – Emergency Consideration**
	7 – Range Fires/Dust Storms	
Administrative Controls should be established to protect confinement ventilation systems from barrier threatening events.	The CSTF TSR's Fire Protection Program limits the combustible growth around the evaporator building such that an external fire would have very limited effects on the facility. The site's emergency procedures and the facility's Event Response Program would limit the effects of external barrier threatening events. The evaporator cell ventilation systems are not credited in Section 3.4.2.19 of the DSA to perform any safety function during or following a Wildfire event. References WSRC-SA-2002-00007, Rev. 6. Gap Analysis No gap.	**DOE O 420.1B**
	8 – Testability	
Design supports the periodic inspection & testing of filters and housing, and test & inspections are conducted periodically.	The HEPA filter housing has been designed and manufactured to meet ASME N509-2002 requirements. HEPA filter housing is the Bag-In/Bag-Out style with the gel-seal technology. Each HEPA filter bank has two ½" quick disconnect type test connections for performance testing (PAO/DOP). In-place leak testing is performed at scheduled intervals for installed testable HEPA filter systems to detect deterioration of filters, gaskets or other causes that could result in leaks. The facility has an establish PM program which requires the HEPA filters to undergo in-place leak testing every 18 months. In-place leak testing is performed for this HEPA filter system in accordance with Site Engineering Standards. References SRS Engineering Standard 15888 Gap Analysis No gap.	**DOE-HNBK-1169 (2.3.8), ASME AG-1, ASME N510**

2004-2 Table 5.1, 242-16F/H Cell Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
Instrumentation required to support system operability is calibrated.	The evaporator cell ventilation system instrumentation is equipped with manifold valves with calibration ports. A PM program and calibration frequencies have been established for the 242-16F&H Evaporator Cell Ventilation instrumentation. Non-safety instrumentation is calibrated periodically as driven by the PM program. M&TE is used for loop calibrations. Gap Analysis No gap.	**DOE-HNBK-1169 (2.3.8), ASME AG-1, ASME AG-1**
Integrated system performance testing is specified and performed.	The evaporator cell ventilation system is simple with regards to equipment and instruments. The evaporator cell ventilation system is a basic, stand alone system that has no integrated function with other facility systems. Given this simplicity and the lack of any standby subsystems/loops/components, integrated system performance is continuously demonstrated during normal system operation. Gap Analysis No gap.	**DOE-HNBK-1169 (2.3.8)**
	9 – Maintenance	
Filter service life program should be established.	The HEPA filter service life program for the Tank Farm conforms to the SRS program governed by ENG-STD-15888. For the evaporator cell ventilation systems, this program is implemented via the Preventative Maintenance Program. The filter service life program ensures that filters are tested prior to installation and periodically during service. Additionally this program ensures that the filters are periodically replaced on a specified schedule. References SRS Engineering Standard 15888 Gap Analysis No gap.	**DOE-HNBK-1169 (3.1 & App C)**
	10 - Single Failure	
Backup electrical power shall be provided to all critical instruments and equipment required to operate and monitor the confinement ventilation system.	The 242-16F/H Cell Ventilation systems are supplied with an alternate power supply (e.g. backup diesel generator). The evaporator cell ventilation systems (including backup power) are not credited in Section 3.4.2.20 of the DSA to perform any safety function during a loss of power event. References E-E2-H-7846, Rev. 8 E-E2-F-2956, Rev. 8 Gap Analysis No gap.	**DOE-HNBK-1169 (2.2.7)**
	11 - Other Credited Functional Requirements	
Address any specific functional requirements for the confinement ventilation system (beyond the scope of those above) credited in the DSA.	The 242-16F&H Evaporator Cell ventilation system is not credited with any safety function in the DSA. References WSRC-SA-2002-00007, Rev. 6 Gap Analysis No gap.	**10 CFR 830 Subpart B**

Attachment 8 – 2004-2 Table 5.1, 242-25H Cell Ventilation System Performance Criteria

2004-2 Table 5.1, 242-25H Cell Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
	1 - Ventilation System – General Criteria	
Pressure differential should be maintained between zones and atmosphere.	The cell ventilation system is designed to maintain the evaporator condenser and evaporator cells at a lower pressure relative to the environment for normal operating conditions. References M-M6-H-9557, Rev. 5 Gap Analysis No gap. The evaporator cell ventilation system is designed to maintain the required pressure differential during normal operations. It is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE-HNBK-1169 (2.2.9) ASHRAE Design Guide, Section 2**
Materials of construction should be appropriate for normal, abnormal and accident conditions.	Material of construction for 242-25H Evaporator ductwork from cell to the fans is fabricated of 304L stainless steel (ASTM A240) per Standard 15890-04-R Level 4 Leakage class rated for 15" pressure. The diameter of the duct from the cell to the fans is 20". The discharge stack is 16" in diameter and fabricated of 20 gauge 304L stainless steel. The HEPA filter housings are standard stainless steel Flanders construction. Exhaust fans are welded steel construction. References G-SYD-H-00101 Rev. 3 Gap Analysis No gap. The design and materials of construction are compatible with normal operating conditions. The system has operated since 1999 with no signs of material degradation. It is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE Nuclear Air Cleaning Handbook 1169 Section 2.2.5 – Corrosion ASME AG-1**
Exhaust system should withstand anticipated normal, abnormal and accident system conditions and maintain confinement integrity.	The evaporator cell ventilation system was designed for normal operating conditions. Reference M-M6-H-9557, Rev. 5 M-M6-H-9558, Rev. 8 Gap Analysis No gap. The evaporator cell ventilation system was designed to operate with the evaporator within the specified temperature and flow rate ranges (normal process). It is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE-HNBK-1169 (2.4) ASHRAE Design Guide**
Confinement ventilation systems shall have appropriate filtration to minimize release.	The inlet and outlet HEPA filter housings are designed and manufactured to meet ASME N509. The HEPA filter housings are standard Bag-In/Bag-Out Style. HEPA filter house specification consists of 14 gauge 304 stainless steel. Housing is total welded construction. (Code Welding). Housing conforms to leak tightness per criteria of DOE Nuclear Air Cleaning Handbook. Inlet HEPA Filter The inlet HEPA filter housing contains a bank of filters 3 high by 1 wide. The HEPA filters are fabricated by Flanders and are each 24" x 24" x 11-½". The filters are designed to be 99.97% efficient. Exhaust HEPA Cabinet and Filter There are two outlet filter trains. Each train consists of a line of pre-filters 3 high by 1 wide and two sets of HEPA filters 3 high by 1 wide. The pre-filters are fabricated per ASHRAE Standard 52-76 and are 85% efficient. The HEPA filters are fabricated by Flanders and are each 24" x 24" x 11 ½". The filters are designed to be 99.97% efficient. HEPA Filter Specifications Flanders Nuclear Grade HEPA Filter HEPA Filter Performance Testing In-place leak testing of HEPA filter installation is performed in accordance with Manual 2Y1 "*HEPA Filter Testing Procedures*", Procedure 104	**DOE Nuclear Air Cleaning Handbook 1169 Section 2.2.1 Airborne Particulate and Gases ASME AG-1 Table FC-5140 ASME N509-2002 ASME N510**

2004-2 Table 5.1, 242-25H Cell Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
	"General Surveillance Testing of HEPA Filters". In-place leak testing is performed at scheduled intervals for installed testable HEPA filter systems to detect deterioration of filters, gaskets or other causes that could result in leaks. Testing is also done in a manner that will detect airflow that may bypass HEPA filters. A Preventive Maintenance record requires that the HEPA filters be replaced every 7 years. <u>Reference</u> M-M6-H-9557, Rev. 5 M-M6-H-9558, Rev. 8 SRS Engineering Standard 15888 WSRC-TM-95-1, M-SPP-G000243, HEPA Filter Specification <u>Gap Analysis</u> No gap. The HEPA filter system meets the filtration requirements for normal evaporator operation. The evaporator cell ventilation system is not credited in the DSA to operate during or following any DBA event, including NPH events.	
	2 - Ventilation System – Instrumentation & Control	
Provide system status instrumentation and/or alarms.	The 3H cell ventilation system is instrumented with dP instrumentation between zones (i.e., cells) as well as across the pre-filters and HEPA filters. Instrumentation is also provides fan status. All of the indications and alarms are routed to the control room via the DCS. <u>Reference</u> M-M6-H-9557, Rev. 5 M-M6-H-9558, Rev. 8 <u>Gap Analysis</u> No gap. Instrumentation is adequate for normal evaporator operation. The evaporator cell ventilation is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE Nuclear Air Cleaning Handbook 1169 AHSRAE Design Guide (Section 4) ASME AG-1**
Interlock supply and exhaust fans to prevent positive pressure differential.	The 3H evaporator cell ventilation system is not equipped with a supply fan. <u>Reference</u> M-M6-H-9557, Rev. 5 M-M6-H-9558, Rev. 8 <u>Gap Analysis</u> No gap.	**DOE-HNBK-1169 ASHRAE Design Guide (Section 4)**
Post accident indication of filter break-through.	The current system in place to detect airborne contamination for the 242-25H Evaporator Cell Ventilation systems is an installed Continuous Air Monitor (CAM). <u>References</u> M-M6-H-9558, Rev. 8 <u>Gap Analysis</u> Gap – There is no installed post-accident monitoring capability. Post-accident monitoring is provided with portable instruments. The evaporator cell ventilation system is not credited in the DSA to operate during or following any DBA event, including NPH events. There is instrumentation to detect filter breakthrough during normal operation. Additionally, there are multiple Area Radiation Monitors and CAMs throughout the tank farm that could detect a release from an evaporator during normal operations.	**DNFSB Tech 34**

2004-2 Table 5.1, 242-25H Cell Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
Reliability of control system to maintain confinement function under normal, abnormal and accident conditions.	Monitoring of the ventilation system indications and alarms is in the 241-2H Control Room which is manned by Operations personnel continuously. Operation of the 242-25H Evaporator Cell Ventilation system is controlled by operating procedures. System control is maintained during abnormal and accident conditions using Abnormal Operating Procedures (AOP) and Emergency Operating Procedures (EOP). Reference M-M6-H-9557, Rev. 5 M-M6-H-9558, Rev. 8 Gap Analysis Gap – The evaporator cell ventilation system design is not a robust design for normal operations. Small system transients (e.g., weather stripping removed from cell covers' seam) can result in the system being interlocked off. This is not the result of a single components' malfunction, but in the overall design of the system. The evaporator cell ventilation system is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE Nuclear Air Cleaning Handbook 1169 Section 2.4 ASME AG-1**
Control components should fail safe.	The Evaporator Cell Ventilation will switch from one train to the standby train when certain indications from instrumentation are received (e.g., high HEPA dP, low vacuum). If any of the process conditions which caused the transfer occur again, the fan will shutdown and outlet dampers will close. The outlet dampers will fail in the closed position upon loss of power or control signal. Also, high radiation detected by the CAM will also cause the fans to trip offline and close the outlet damper. This mitigates the spread of contamination. The evaporator cell ventilation system is not credited for operating during or after a DSA accident. Reference M-M6-H-9557, Rev. 5 M-M6-H-9558, Rev. 8 Gap Analysis No gap.	**DOE-HNBK-1169 (2.4)**
	3 - Resistance to Internal Events – Fire	
Confinement ventilation systems should withstand credible fire events and be available to operate and maintain confinement.	The DSA does not credit the evaporator cell ventilation system for preventing or mitigating a fire event. The DSA (Table 3.3-11) documents that there is no credible fire scenario involving the evaporator cells. The ventilation fans are located in a concrete building. This location lacks any significant combustible materials. The Fire Protection Program ensures that combustible materials are controlled to minimize the potential for fire in such locations. Material of construction for 242-25H Evaporator ductwork from cell to the fans is fabricated of 304L stainless steel. The HEPA filter housings are standard stainless steel Flanders construction. These materials are resistant to the effects of fire events. References Site Map Gap Analysis No gap.	**DOE-HNBK-1169 (10.1) DOE-STD-1066**

2004-2 Table 5.1, 242-25H Cell Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
Confinement ventilation systems should not propagate spread of fire.	The evaporator cell ventilation system serves the evaporator and condenser cells. The condenser cell and the evaporator cell are connected via a large opening that contains a heavily shielded plug. Piping and ventilation duct goes through the plug. The site's Fire Protection Program (e.g.,. fire detection and suppression systems, combustible loading limits) limits the probability of a damaging fire. The DSA (Table 3.3-11) documents that there is no credible fire scenario involving the evaporator cells. References SW11.4-EOP-001 Rev. 11 Gap Analysis No gap.	**DOE-HNBK-1169 (10.1) DOE-STD-1066**
	4 - Resistance to External Events – Natural Phenomena – Seismic	
Confinement ventilation systems should safely withstand earthquakes.	The evaporator cell ventilation systems are not credited in Section 3.4.2.18 of the DSA to perform any safety function during or following a seismic event. There are no adverse seismic interaction (i.e., II/I) concerns for this system. Reference UBC, 1979 SBC, 1979 WSRC-SA-2002-00007, Rev. 6 Gap Analysis No gap.	**ASME AG-1 AA DOE O 420.1B DOE-HNBK-1169 (9.2), Section 2.4 – Emergency Consideration**
	5 - Resistance to External Events – Natural Phenomena – Tornado/Wind	
Confinement ventilation systems should safely withstand tornado depressurization.	The evaporator cell ventilation systems are not credited in Section 3.4.2.17 of the DSA to perform any safety function during or following a tornado event. References WSRC-SA-2002-00007, Rev. 6 Gap Analysis No gap.	**DOE O 420.1B DOE-HNBK-1169 (9.2), Section 2.4 – Emergency Consideration**
Confinement ventilation systems should withstand design wind effects on system performance.	The evaporator cell ventilation systems are not credited in Section 3.4.2.17 of the DSA to perform any safety function during or following a high winds event. References WSRC-SA-2002-00007, Rev. 6 Gap Analysis No gap.	**DOE 0420.1B DOE-HNBK-1169 (9.2)**
	6 – Other NP Events	

2004-2 Table 5.1, 242-25H Cell Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
Confinement ventilation systems should withstand other NP events considered credible in the DSA where the confinement ventilation system is credited.	The evaporator cell ventilation systems are not credited in the DSA to perform any safety function during or following any other NP event. References WSRC-SA-2002-00007, Rev. 6. Gap Analysis No gap.	**DOE O 420.1B DOE-HNBK-1169 (9.2), Section 2.4 – Emergency Consideration**
	7 – Range Fires/Dust Storms	
Administrative Controls should be established to protect confinement ventilation systems from barrier threatening events.	The facility's Fire Protection Program limits the combustible growth around the evaporator building such that an external fire would have very limited effects on the facility. The site's emergency procedures and the facility's Event Response Program would limit the effects of external barrier threatening events. The evaporator cell ventilation systems are not credited in Section 3.4.2.19 of the DSA to perform any safety function during or following a Wildfire event. References WSRC-SA-2002-00007, Rev. 6 Gap Analysis No gap.	**DOE O 420.1B**
	8 – Testability	
Design supports the periodic inspection & testing of filters and housing, and test & inspections are conducted periodically.	The HEPA filter housing has been designed and manufactured to meet ASME N509 requirements. HEPA filter housing is the Bag-In/Bag-Out style with the gel-seal technology. Each HEPA filter bank has test connections for performance testing (PAO/DOP aerosol testing). In-place leak testing shall be performed at scheduled intervals for installed testable HEPA filter systems to detect deterioration of filters, gaskets or other causes that could result in leaks. The facility has an establish PM program which requires the HEPA filters to undergo in-place leak testing every 18 months. In-place leak testing is performed for this HEPA filter system in accordance with Site Engineering Standards. References SRS Engineering Standard 15888 Gap Analysis No gap.	**DOE-HNBK-1169 (2.3.8), ASME AG-1, ASME N510**
Instrumentation required to support system operability is calibrated.	The evaporator cell ventilation system instrumentation is equipped with manifold valves with calibration ports. A PM program and calibration frequencies have been established for the 242-25H Evaporator Cell Ventilation instrumentation. Non-safety instrumentation is calibrated periodically as driven by the PM program. M&TE is used for loop calibrations. Gap Analysis No gap.	**DOE-HNBK-1169 (2.3.8), ASME AG-1, ASME AG-1**

2004-2 Table 5.1, 242-25H Cell Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
Integrated system performance testing is specified and performed.	Air balancing was performed on the 242-25H Evaporator Cell Ventilation during startup testing. Preventive Maintenance program validates automatic transfer of online fan to the standby fan during interlock checks. This periodic testing of automatic functions verifies the integrated operation within the system. The Secondary Ventilation System (evaporator support building system) interlocks off upon loss of the Primary Ventilation System. Periodic testing of this automatic function verifies integrated operation with that system. No additional integrated system performance testing is performed on the 242-25H Cell Ventilation system. Modifications made to the system are required to be tested as part of Post Modification Testing to ensure compliance with system performance requirements. Gap Analysis No gap.	**DOE-HNBK-1169 (2.3.8)**
	9 – Maintenance	
Filter service life program should be established.	The HEPA filter service life program for the Tank Farm conforms to the SRS program governed by ENG-STD-15888. For the evaporator cell ventilation systems, this program is implemented via the Preventative Maintenance Program. The filter service life program ensures that filters are tested prior to installation and periodically during service. Additionally this program ensures that the filters are periodically replaced on a specified schedule. References SRS Engineering Standard 15888 Gap Analysis No gap.	**DOE-HNBK-1169 (3.1 & App C)**
	10 - Single Failure	
Backup electrical power shall be provided to all critical instruments and equipment required to operate and monitor the confinement ventilation system.	The 242-25H Cell Ventilation systems are supplied with an alternate power supply (e.g. backup diesel generator). The evaporator cell ventilation systems (including backup power) are not credited in Section 3.4.2.20 of the DSA to perform any safety function during a loss of power event. References E-E2-H-8085 Rev. 3 Gap Analysis No gap.	**DOE-HNBK-1169 (2.2.7)**
	11 - Other Credited Functional Requirements	
Address any specific functional requirements for the confinement ventilation system (beyond the scope of those above) credited in the DSA.	The 242-25H Evaporator Cell ventilation system is not credited with any safety function in the DSA. References WSRC-SA-2002-00007, Rev. 6 Gap Analysis No gap.	**10 CFR 830 Subpart B**

Attachment 9 – 2004-2 Table 5.1, 242-25H Evaporator Secondary Ventilation System Performance Criteria

2004-2 Table 5.1, 242-25H Evaporator Secondary Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
	1 - Ventilation System – General Criteria	
Pressure differential should be maintained between zones and atmosphere.	The Secondary Ventilation System is designed to maintain its various zones at their design pressure differentials and all zones at a pressure lower than atmospheric for normal operating conditions. There are interlocks with the Primary Ventilation System (services the Evaporator and Condenser Cells) to prevent a differential pressure inversion between zones serviced by the Primary and Secondary Ventilation Systems. <u>References</u> M-M6-H-7725, Rev. 4 M-M6-H-7726, Rev. 6 G-SYD-H-00101, Rev. 3 <u>Gap Analysis</u> No gap. The system is designed to maintain the required pressure differential during normal operations. It is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE-HNBK-1169 (2.2.9) ASHRAE Design Guide, Section 2**
Materials of construction should be appropriate for normal, abnormal and accident conditions.	The Secondary Ventilation System ductwork upstream of the HEPA filter housings is 304L stainless steel (ASTM A240) up to the point where it enters the truckwell. These duct sections are seal welded at joints and flanged with gaskets at equipment. After it enters the truckwell, the ductwork is galvanized carbon steel up to the HEPA filter housings. The HEPA filter housings are 304L stainless steel and are standard Flanders construction. The ductwork downstream of the HEPA filter housings is galvanized carbon steel as is the exhaust stack. Discharge ducts from each SVS exhaust fan discharge into a common exhaust stack. Exhaust fans are constructed of carbon steel. Ductwork upstream of the fans to the HEPA Filter Housings and from the HEPA Filter Housings to the isolation dampers is designed to withstand the maximum vacuum that can be developed by an operating fan. Ductwork is constructed to Level 4 Leakage Class, 15" W.G. static pressure requirements. <u>References</u> M-M6-H-7725, Rev. 4 M-M6-H-7726, Rev. 6 G-SYD-H-00101, Rev. 3 <u>Gap Analysis</u> No gap. The design and materials of construction are compatible with normal operating conditions. The system has operated since 1999 with no signs of material degradation. It is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE Nuclear Air Cleaning Handbook 1169 Section 2.2.5 – Corrosion ASME AG-1**
Exhaust system should withstand anticipated normal, abnormal and accident system conditions and maintain confinement integrity.	The Secondary Ventilation System was designed for normal operating conditions. <u>Reference</u> M-M6-H-7725, Rev. 4 M-M6-H-7726, Rev. 6 G-SYD-H-00101, Rev. 3 <u>Gap Analysis</u> No gap. The system was designed to operate within the specified temperature, pressure, and flow rate ranges for normal operation. It is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE-HNBK-1169 (2.4) ASHRAE Design Guide**
Confinement ventilation systems shall have appropriate filtration to minimize release.	The Secondary Ventilation System HEPA filter housings are designed and manufactured to meet ASME N509 and ASME N510. The HEPA filter housings are standard Bag-In/Bag-Out Style. HEPA filter housings are constructed of 14 gauge 304L stainless steel. Housings are total welded construction (Code Welding) and conform to leak tightness per criteria of the DOE Nuclear Air Cleaning Handbook. <u>Exhaust HEPA Cabinet and Filter</u> Three HEPA filter housings are used in the system. The units are composed of eight compartments arranged as follows in the direction of air	**DOE Nuclear Air Cleaning Handbook 1169 Section 2.2.1 Airborne**

2004-2 Table 5.1, 242-25H Evaporator Secondary Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
	flow: inlet plenum, pre-filter section, test section, HEPA section, test section, HEPA section, test section, and outlet plenum. Each HEPA section is four high by three wide and contains filter cartridges sized 24 inches wide x 24 inches high x 11.5 inches deep. Inlet and outlet plenums are 30 inches wide and have 25 inch x 69 inch flanged openings for bolted connection to ductwork. The first two test sections are 28 inches wide and the last section is 24 inches wide. The filters are designed to be 99.97% efficient. Each unit is designed for 12,000 cfm so that two units are normally in operation (with the third in standby) to handle the 24,000 cfm flow through the system. Each individual HEPA filter (24" x 24" x 11.5") is rated for 1000 cfm airflow. HEPA Filter Specifications Flanders Nuclear Grade HEPA Filter Reference G-SYD-H-00101, Rev. 3 M-M6-H-7725, Rev. 4 M-M6-H-7726, Rev. 6 SRS Engineering Standard 15888 WSRC-TM-95-1, M-SPP-G000243, HEPA Filter Specification Gap Analysis No gap. The HEPA filter system meets the filtration requirements for normal operation. The system is not credited in the DSA to operate during or following any DBA event, including NPH events.	**Particulate and Gases ASME AG-1 Table FC-5140 ASME N509-2002 ASME N510**
	2 - Ventilation System – Instrumentation & Control	
Provide system status instrumentation and/or alarms.	The Secondary Ventilation System is instrumented with dP instrumentation between zones as well as across the pre-filters and HEPA filters. Instrumentation also provides fan status. All of the indications and alarms are routed to the control room via the DCS. Reference M-M6-H-7725, Rev. 4 M-M6-H-7726, Rev. 6 G-SYD-H-00101, Rev. 3 Gap Analysis No gap. Instrumentation is adequate for normal operation. The system is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE Nuclear Air Cleaning Handbook 1169 AHSRAE Design Guide (Section 4) ASME AG-1**
Interlock supply and exhaust fans to prevent positive pressure differential.	The Secondary Ventilation System is not equipped with a supply fan. Reference M-M6-H-7725, Rev. 4 M-M6-H-7726, Rev. 6 G-SYD-H-00101, Rev. 3 Gap Analysis No gap.	**DOE-HNBK-1169 ASHRAE Design Guide (Section 4)**

2004-2 Table 5.1, 242-25H Evaporator Secondary Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
Post accident indication of filter break-through.	The Secondary Ventilation System has an installed Continuous Air Monitor (CAM) downstream of the HEPA filters to detect airborne contamination during normal operation. References M-M6-H-7725, Rev. 4 G-SYD-H-00101, Rev. 3 Gap Analysis Gap – There is no installed post-accident monitoring capability. Post-accident monitoring is provided with portable instruments. The system is not credited in the DSA to operate during or following any DBA event, including NPH events. In addition to the system's CAM, there are multiple Area Radiation Monitors and CAMs throughout the tank farm that could detect a release from an evaporator during normal operations.	**DNFSB Tech 34**
Reliability of control system to maintain confinement function under normal, abnormal and accident conditions.	The Secondary Ventilation System's indications and alarms in the 241-2H Control Room are monitored by Operations personnel continuously. Operation of the system is controlled by operating procedures. System control is maintained during abnormal and accident conditions using Abnormal Operating Procedures (AOP) and Emergency Operating Procedures (EOP). Reference M-M6-H-7725, Rev. 4 M-M6-H-7726, Rev. 6 G-SYD-H-00101, Rev. 3 Gap Analysis No gap. The system is not credited in the DSA to operate during or following any DBA event, including NPH events.	**DOE Nuclear Air Cleaning Handbook 1169 Section 2.4 ASME AG-1**
Control components should fail safe.	The Secondary Ventilation System will switch from the online train to the standby train when certain indications from instrumentation are received (e.g., high HEPA dP, low flow). If any of the process conditions which caused the transfer occur again, the fan will shutdown and outlet dampers will close. The outlet dampers will fail in the closed position upon loss of power or control signal. Also, high radiation detected by the CAM or indication that the Primary Ventilation System is not operating will also cause the fans to trip offline and close the outlet dampers. This mitigates the spread of contamination. Reference J-J2-H-7877, Rev. 3 G-SYD-H-00101, Rev. 3 Gap Analysis No gap. The system is not credited for operating during or after a DSA accident.	**DOE-HNBK-1169 (2.4)**
	3 - Resistance to Internal Events – Fire	
Confinement ventilation systems should withstand credible fire events and be available to operate and maintain confinement.	The Secondary Ventilation system (including the exhaust stack) and filter housings are constructed of 304L stainless steel or galvanized carbon steel. These materials are resistant to the effects of fire events. The DSA does not credit the Secondary Ventilation System for preventing or mitigating a fire event. The DSA documents that there is no credible fire scenario involving the evaporator building and radioactive releases from the evaporator cell. References WSRC-SA-2002-00007, Rev. 6 S-CLC-H-00858, Rev. 3 Gap Analysis No gap.	**DOE-HNBK-1169 (10.1) DOE-STD-1066**

2004-2 Table 5.1, 242-25H Evaporator Secondary Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
Confinement ventilation systems should not propagate spread of fire.	The design and construction of the Secondary Ventilation system (e.g., non-cascading flow through adjacent rooms, solid ventilation ducts that traverse rooms) supports the prevention of fire propagation from one area of the building to an adjacent area. Additionally, the site's Fire Protection Program (e.g.,. fire detection and suppression systems, combustible loading limits) limits the probability of a damaging fire. The DSA does not credit the Secondary Ventilation System for preventing or mitigating a fire event. The DSA documents that there is no credible fire scenario involving the evaporator building and radioactive releases from the evaporator cell. <u>References</u> WSRC-SA-2002-00007, Rev. 6 S-CLC-H-00858, Rev. 3 <u>Gap Analysis</u> No gap.	**DOE-HNBK-1169 (10.1) DOE-STD-1066**
	4 - Resistance to External Events – Natural Phenomena – Seismic	
Confinement ventilation systems should safely withstand earthquakes.	The Secondary Ventilation System is not credited in DSA Section 3.4.2.18 to perform any safety function during or following a seismic event. There are no adverse seismic interaction (i.e., II/I) concerns for this system. <u>Reference</u> UBC, 1979 SBC, 1979 WSRC-SA-2002-00007, Rev. 6 <u>Gap Analysis</u> No gap.	**ASME AG-1 AA DOE O 420.1B DOE-HNBK-1169 (9.2), Section 2.4 – Emergency Consideration**
	5 - Resistance to External Events – Natural Phenomena – Tornado/Wind	
Confinement ventilation systems should safely withstand tornado depressurization.	The Secondary Ventilation System is not credited in DSA Section 3.4.2.17 to perform any safety function during or following a tornado event. <u>References</u> WSRC-SA-2002-00007, Rev. 6 <u>Gap Analysis</u> No gap.	**DOE O 420.1B DOE-HNBK-1169 (9.2), Section 2.4 – Emergency Consideration**
Confinement ventilation systems should withstand design wind effects on system performance.	The Secondary Ventilation System is not credited in DSA Section 3.4.2.17 to perform any safety function during or following a high winds event. <u>References</u> WSRC-SA-2002-00007, Rev. 6 <u>Gap Analysis</u> No gap.	**DOE O 420.1B DOE-HNBK-1169 (9.2)**
	6 – Other NP Events	

2004-2 Table 5.1, 242-25H Evaporator Secondary Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
Confinement ventilation systems should withstand other NP events considered credible in the DSA where the confinement ventilation system is credited.	The Secondary Ventilation System is not credited in the DSA to perform any safety function during or following any other NP event. References WSRC-SA-2002-00007, Rev. 6 Gap Analysis No gap.	**DOE O 420.1B DOE-HNBK-1169 (9.2), Section 2.4 – Emergency Consideration**
	7 – Range Fires/Dust Storms	
Administrative Controls should be established to protect confinement ventilation systems from barrier threatening events.	The facility's Fire Protection Program limits the combustible growth around the evaporator building such that an external fire would have very limited effects on the facility. The site's emergency procedures and the facility's Event Response Program would limit the effects of external barrier threatening events. The Secondary Ventilation System is not credited in DSA Section 3.4.2.19 to perform any safety function during or following a wildfire event. References WSRC-SA-2002-00007, Rev. 6 Gap Analysis No gap.	**DOE O 420.1B**
	8 – Testability	
Design supports the periodic inspection & testing of filters and housing, and test & inspections are conducted periodically.	The HEPA filter housing has been designed and manufactured to meet ASME N509 and ASME N510 requirements. HEPA filter housings are the Bag-In/Bag-Out style with the gel-seal technology. Each HEPA filter bank has test connections for performance testing (PAO/DOP aerosol testing). In-place leak testing is performed at scheduled intervals for installed testable HEPA filter systems to detect deterioration of filters, gaskets, or other causes that could result in leaks. The facility has an established preventive maintenance program which requires the HEPA filters to undergo in-place leak testing every 18 months. In-place leak testing is performed for this HEPA filter system in accordance with Site Engineering Standards. HEPA Filter Performance Testing In-place leak testing of HEPA filter installation is performed in accordance with Manual 2Y1 "*HEPA Filter Testing Procedures*", Procedure 104 "*General Surveillance Test of HEPA Filters*". In-place leak testing is performed at scheduled intervals for installed testable HEPA filter systems to detect deterioration of filters, gaskets or other causes that could result in leaks. Testing is also done in a manner that will detect airflow that may bypass HEPA filters. A preventive maintenance record requires that the HEPA filters be replaced every 7 years. References SRS Engineering Standard 15888 Gap Analysis No gap.	**DOE-HNBK-1169 (2.3.8), ASME AG-1, ASME N510**
Instrumentation required to support system operability is calibrated.	The Secondary Ventilation System instrumentation is equipped with manifold valves with calibration ports. A preventive maintenance program and calibration frequencies have been established for the system's instrumentation. M&TE is used for loop calibrations. Gap Analysis No gap.	**DOE-HNBK-1169 (2.3.8), ASME AG-1, ASME AG-1**

2004-2 Table 5.1, 242-25H Evaporator Secondary Ventilation System Performance Criteria

Evaluation Criteria	Discussion	Reference
Integrated system performance testing is specified and performed.	Air balancing was performed on the Secondary Ventilation System during startup testing and again following modification in 2003. Yearly monitoring is in place via the preventive maintenance program for the sections of the ventilation system modified in 2003. The preventive maintenance program verifies automatic transfer of the online train to the standby train during interlock checks. This periodic testing of automatic functions verifies the integrated operation within the system. The Secondary Ventilation System interlocks off upon loss of the Primary Ventilation System (evaporator cell ventilation system). Periodic testing of this automatic function verifies integrated operation with that system. No additional integrated system performance testing is currently performed on the system. Modifications made to the system are required to be tested as part of Post Modification Testing to ensure compliance with system performance requirements. Gap Analysis No gap.	**DOE-HNBK-1169 (2.3.8)**
	9 – Maintenance	
Filter service life program should be established.	The HEPA filter service life program for the Tank Farm conforms to the SRS program governed by ENG-STD-15888. For the Secondary Ventilation System, this program is implemented via the preventive maintenance program. The filter service life program ensures that filters are tested prior to installation and periodically during service. Additionally, this program ensures that the filters are replaced on a specified schedule. References SRS Engineering Standard 15888 Gap Analysis No gap.	**DOE-HNBK-1169 (3.1 & App C)**
	10 - Single Failure	
Backup electrical power shall be provided to all critical instruments and equipment required to operate and monitor the confinement ventilation system.	The Secondary Ventilation System is supplied with an alternate power supply (e.g., backup diesel generator). The system, including backup power, is not credited in Section 3.4.2.20 of the DSA to perform any safety function during a loss of power event. References WSRC-SA-2002-00007, Rev. 6 E-E2-H-8085, Rev. 3 E-E2-H-8101, Rev. 7 Gap Analysis No gap.	**DOE-HNBK-1169 (2.2.7)**
	11 - Other Credited Functional Requirements	
Address any specific functional requirements for the confinement ventilation system (beyond the scope of those above) credited in the DSA.	The Secondary Ventilation System is not credited with any DSA safety function. References WSRC-SA-2002-00007, Rev. 6 Gap Analysis No gap.	**10 CFR 830 Subpart B**

Attachment 10 – F/H Tank Farm Evaporator Facility Evaluation Team

Don Blake – DOE-SR, AMWDP/WDED, Safety System Oversite

Donald J. Blake is a Nuclear Engineer in the Department of Energy Savannah River Operations Office, Waste Disposition Project, Engineering Division. He has over 20 years of engineering experience in the nuclear field. He holds a Bachelor of Science in Mechanical Engineering from West Virginia University. His primary responsibilities include safety system oversight of the Tank Farm Facilities and review of Tank Farm safety basis documents. In addition, he provides oversight of the engineering activities associated with the Waste Disposition Project. He has participated on several readiness reviews for High Level Waste Facilities, focusing on the safety basis and engineering related activities such as design, testing, and maintenance. Prior to joining DOE in 1994, Mr. Blake held positions in the Nuclear Engineering Department of the Charleston Naval Shipyard, including Shift Refueling Engineer, Assistant Chief Refueling Engineer, Nuclear Reactor Refueling Equipment Branch Chief, and Nuclear Performance Assessment Division Head.

Byron Neely - WSRC, FET Lead, Tank Farm Mechanical Engineering

Byron Neely has a Bachelor of Science in Mechanical Engineering from the University of South Carolina. He has worked at WSRC over 27 years in the areas of Reactor Operations, Training, Maintenance, and Engineering. He was a certified Reactor Senior Supervisor, managed central support and line Maintenance organizations, and most recently is managing an Engineering group within the Tank Farms.

Phillip Norris – WSRC, Lead, Tank Farm System Cognizant Engineer

Phillip Norris has a Bachelor of Science in Mechanical Engineering from the University of Alabama at Birmingham. He has worked at WSRC for 16 years in the F and H Tank Farms. During this period his assignments have included subject matter expert input to the development of the Tank Farm DSAs in 1998 and 2002, including support of the hazard analysis and functional classification; tank farm ventilation systems engineer; and evaporator engineer. His most recent assignment was the Lead Tank Farm System Cognizant Engineer.

David Rochelle – WSRC, Tank Farm System Cognizant Engineer

David Rochelle has fifteen years of engineering experience in the nuclear field. He has a Bachelor of Science degree in Chemical Engineering. His employment at the Savannah River Site began in 1991. While at the Savannah River Site, he has worked in the following capacities: pre-design documentation development, systems engineering development, H-Tank Farm Shift Technical Engineer, 3H Evaporator Cognizant Engineer, and 3H Evaporator Ventilation Systems Cognizant Engineer. He is currently serving as the 3H Evaporator Cognizant Engineer.

Terry Allen – WSRC, Tank Farm System Cognizant Engineer

Terry Allen has been with the WSRC for over 25 years in various engineering positions. Terry holds a Bachelor of Science in Engineering and a Masters of Science in Chemical Engineering from the University of Louisville, Louisville, Kentucky. For the last 7 years, he has been the cognizant engineer for the 242-16H (2H) Evaporator System. In this position, he is responsible for technical reviews, configuration control, USQs, environmental compliance reviews and protection of the facility design basis. Terry provides day-to-day engineering field support for the 2H Evaporator and backup support for the 242-25H (3H) Evaporator. The evaporator building ventilation systems are considered to be part of the evaporator system.

Lynh Nguyen – WSMS, Safety Analysis Engineer

Lynh Nguyen has worked in the private sector as an environmental and process engineer at a chemical facility. She was a startup test engineer for several of the facility chemical processes. Lynh Nguyen has 9 years work experience in the field of safety analysis for Safety Basis documentation at the Savannah River Site. Her expertise has been in performing Hazard Analysis, Hazard Assessment Documentation, Auditable Safety Analysis, Health and Safety Plan, Chemical Analysis and Regulatory Services. She has developed and revised Documented Safety Analyses for DOE nuclear facilities. She has developed and implemented Hazards Analysis and Functional Classification training for various DOE nuclear facilities.

Thomas Digsby – WSMS, Safety Analysis Engineer

Thomas Digsby enlisted in the US Navy's Nuclear Power Program, where he served in the Nuclear Submarine Force. Thomas has worked in the commercial nuclear power and the DOE nuclear complex for 28 years. He was a Shift Operating Supervisor with a Senior Reactor Operating license at a commercial nuclear generating facility. As a safety analysis engineer he has developed and revised safety basis documents for DOE nuclear facilities and DOD high hazard chemical facilities. He has designed and developed Safety Analysis training programs for DOE.

Herman Kunis – WSRC, SNF QA

Herman Kunis has a Bachelor of Engineering degree from Stevens Institute of Technology. He worked in the Nuclear Power Industry, on Research Reactors, and at Savannah River as a Quality Assurance Engineer and QA Engineering Manager. At SRS he has been part of the Liquid Waste Quality Assurance organization for 17 years. He is currently on rotational assignment with the Spent Fuel Project.

Cliff Kirkland – WSRC, Tank Farm Operations

Cliff Kirkland has a Bachelor of Science degree in Electrical Engineering from Clemson University. He has been employed at SRS since 1989. He has held a broad spectrum of engineering positions that have included Design Engineer, Maintenance Engineer, System Engineer, and Shift Technical Engineer. In 1998, he transitioned over to Operations Management. He has held varying positions with increasing levels of responsibility from First Line Manager to Deputy Operations Manger, including his most recent assignments as Project Owner for Safety Basis Implementations.