Department of Energy
Washington, DC 20585

December 31, 2009

The Honorable John E. Mansfield
Vice Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, N.W., Suite 700
Washington, DC 20004-2901

Dear Mr. Vice Chairman:

Enclosed are the review results for Environmental Management (EM) site evaluation reports of facility ventilation capabilities performed by Headquarters (HQ). Deliverables for high priority facilities were provided by the Department of Energy's letter dated June 8, 2007; updated information is provided in Enclosure 1. These reports fulfill commitment 8.6.5 of Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2, *Confinement Ventilation.*

Per Secretary Chu's letter, dated July 29, 2009, the HQ review ensured that the site reports "appropriately reflect the ventilation system guidance (including the review criteria) and that an evaluation of the cost and benefit of proposed modifications to close any gaps between the facility ventilation capabilities and the guide's review criteria was performed." The results of these cost and benefit evaluations are a list of potential upgrade projects for EM facilities, described in the individual reports. These reports have been reviewed by the EM Technical Authority Board (TAB) and the Chief Nuclear Safety.

Since the reports address dozens of facilities at six sites, the TAB will perform a cross-cutting review of these potential upgrade projects, in order to ensure consistency among sites, complete several reviews that the TAB directed be re-performed, and establish an integrated priority list. This further review will be completed by June 25, 2010.

If you have any further questions or need additional information regarding our plans, please contact me at (202) 586-7709 or Dr. Steven L. Krahn, Deputy Assistant Secretary for Safety and Security Program at (202) 586-5151.

Sincerely,

Inés R. Triay
Assistant Secretary for
Environmental Management

Enclosures (9)

DEFENSE NUCLEAR FACILITIES SAFETY BOARD RECOMMENDATION 2004-2
ENCLOSURES

1. Summary of Deliverable Actions Determined by Environmental Management Headquarters' Review

2. Memorandum to Richard B. Provencher, Deputy Manager, Idaho Operations Office, Evaluation of Idaho Facility Ventilation Systems in Response to Defense Nuclear Facilities Safety Board Recommendation 2004-2, Final Reports, dated December 10, 2009

3. Memorandum to David C. Moody, Manager, Carlsbad Field Office, Evaluation of Waste Isolation Pilot Plant Ventilation Systems in Response to Defense Nuclear Facilities Safety Board Recommendation 2004-2, Final Reports, dated December 7, 2009

4. Memorandum to Shirley Olinger, Manager, Office of River Protection, Evaluation of the 242A Evaporator Facility Ventilation System in Response to Defense Nuclear Facilities Safety Board Recommendation 2004-2, Final Report, dated, December 24, 2009

5. Memorandum to John R. Eschenberg, Assistant Manager for Environmental Management, Oak Ridge Office, Evaluation of Oak Ridge Office Environmental Management Ventilation Systems in Response to Defense Nuclear Facilities Safety Board Recommendation 2004-2, Final Reports, dated December 23, 2009

6. Memorandum to David A. Brockman, Manager, Richland Operations Office, Evaluation of Richland Operations Office Ventilation Systems in Response to Defense Nuclear Facilities Safety Board Recommendations 2004-2, Final Reports, dated December 23, 2009

7. Memorandum to Jeffery M. Allison, Manager, Savannah River Operations Office, Evaluation of Savannah River Site Facility Ventilation Systems in Response to Defense Nuclear Facilities Safety Board Recommendation 2004-2, Final Reports, dated December 29, 2009

8. Memorandum to Richard Provencher, Deputy Manager, Idaho Operations Office, Evaluation of Advanced Mixed Waste Treatment Facility Ventilation Systems in Response to Defense Nuclear Facilities Safety Board Recommendation 2004-2, dated December 30, 2009

9. Memorandum to Shirley Olinger, Manager, Office of River Protection, Approval of Supplemental System Evaluation and Associated Gaps for Active Confinement Ventilation Systems in the Waste Treatment and Immobilization Plant Pretreatment and High-Level Waste Facilities in Response to Defense Nuclear Facilities Safety Board Recommendation 2004-2, dated July 9, 2009

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ENCLOSURE 1

Summary of Deliverable Actions Determined by Environmental Management Headquarters' Review

High Priority Facilities

Waste Treatment Plant (WTP)
Memorandum and Independent Review Panel (IRP) report on Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 review of ventilation systems dated July 9, 2009, is enclosed, completing commitment 8.6.5 for the WTP. This documentation was previously transmitted to the Board staff via email.

Advanced Mixed Waste Treatment Plant (AMWTP)
Memorandum and IRP report on DNFSB Recommendation 2004-2 review of ventilation systems date December 30, 2009, is enclosed, completing commitment 8.6.5 for the AMWTP.

U233 Project
The 3019 major modification project design is currently being completed, consistent with DOE-STD-1189; consistent with the approach discussed in our letter dated June 8, 2007. EM has recently completed an evaluation of the existing ventilation system in Building 3019, this evaluation will be incorporated into a crosscutting review discussed in this letter. EM will continue to follow this project to ensure that an appropriate confinement ventilation system is designed.

Medium and Low Priority Facilities

Office of River Protection (ORP) 242 Evaporator Facility
The gap identified with respect to DOE-STD-1066 will be further evaluated as part of a revision to the facility's Fire Hazard Analysis and a determination whether modifications are needed.

Oak Ridge Office (ORO) Liquid Low-Level Waste System
The ventilation systems were not evaluated against the safety significant criteria of the evaluation guidelines, as was required for a Hazard Category 2 facility. The TAB instructed the field team to re-perform the evaluation against safety-significant criteria, instead of defense-in-depth. This report was received on December 18, 2009; the results will be incorporated into the cross-cutting review discussed in this letter.

Richland (RL) Waste Encapsulation and Storage Facility

The ventilation systems were not evaluated against the safety significant criteria of the evaluation guidelines, as was required for a Hazard Category 2 facility. The TAB instructed the field team to re-perform the evaluation against safety-significant criteria, instead of defense-in-depth. DOE-RL is developing a schedule for completion of this re-evaluation; the results will be incorporated into the cross-cutting review discussed in this letter.

Savannah River Site (SRS) Tank Farm Waste Tank and Transfer Facility

An equivalent process to that required by DNFSB Recommendation 2004-2 was conducted during the Documented Safety Analysis (DSA) upgrade process for the Tank Farm Waste Tank and Transfer Facility. Vulnerabilities identified, equivalent to "gaps" are identified and prioritized in the DSA. These vulnerabilities are required to be updated annually and tracked for execution as funding becomes available.

Savannah River Site (SRS) H-Canyon and HB-Line Facilities

Upgrades to the H-Canyon and HB-Line ventilation systems are being evaluated during the H-Canyon and HB-Line Safety Basis upgrade. The safety basis document is under review by DOE-SR. The TAB requested a briefing on the results of the Safety Basis Upgrade upon approval, and a presentation on the DOE-SR conclusions on ventilation system upgrades in light of current and future missions of H-Canyon and HB-Line.

Savannah River Site (SRS) Savannah River National Laboratory (SRNL) and Savannah River Site (SRS) F&H Area Analytical Laboratories

The TAB recommended that DOE-SR review the potential for unfiltered and unmonitored releases from "tertiary" clean areas of these buildings and determine if closure of identified gaps for the tertiary area ventilation is warranted.

SEPARATION

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Department of Energy
Washington, DC 20585

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MEMORANDUM FOR RICHARD B. PROVENCHER
DEPUTY MANAGER
IDAHO CLEANUP PROJECT

FROM: DR. STEVEN L. KRAHN
ACTING ASSISTANT DEPUTY SECRETARY FOR
SAFETY AND SECURITY PROGRAM
ENVIRONMENTAL MANAGEMENT

SUBJECT: Evaluation of Idaho Facility Ventilation Systems in Response to Defense Nuclear Facilities Safety Board Recommendation 2004-2, Final Reports

Based on review of the information included in the subject reports, evaluation by the Defense Nuclear Facilities Safety Board (DNFSB) 2004-2 Independent Review Panel, the Environmental Management Technical Advisory Board, and input from the Office of the Chief of Nuclear Safety, the reports are approved with the following considerations:

- The review for the Idaho Nuclear Technology and Engineering Center Fuel Storage Area and the Idaho Nuclear Technology and Engineering Center Irradiated Fuel Storage Facility concludes that the ventilation systems were appropriately evaluated against the safety significant criteria associated with the established DNFSB 2004-2 evaluation guidelines and adequately met them.

- The review for the Idaho Nuclear Technology and Engineering Center Laboratory Facilities concludes that the ventilation systems were appropriately evaluated against the safety significant criteria associated with the established DNFSB 2004-2 evaluation guidelines with a single gap identified with respect to the lack of an interlock between the supply and exhaust fans. Closure of the identified gap is not recommended since interlocking of the two fans: 1) is not a credited function in the Documented Safety Analysis (DSA); 2) could result in a loss of ventilation flow to another building; and 3) would only result in contamination spread in the building with the loss of exhaust flow.

- The review for the Idaho Nuclear Technology and Engineering Center Process Equipment Waste Evaporation Facility concludes that the ventilation systems were appropriately evaluated against the safety significant criteria associated with the established DNFSB 2004-2 evaluation guidelines with a single gap identified with respect to the lack of an interlock between the supply and exhaust fans. Closure of the identified gap is not recommended since although there is no interlock between the supply and exhaust fans they are:

1) procedurally shutdown by operators when the alarm sounds indicating a loss of exhaust air; 2) not a credited function in the DSA; 3) evaporation operations are being discontinued; and 4) consequences of the event are limited to contamination spread with the loss of exhaust flow.

If you have any further questions, please contact me at (202) 586-5151.

Attachments

cc:
D. Chung, EM-2
F. Marcinowski, EM-3
M. Gilbertson, EM-50

INDEPENDENT REVIEW

OF

Idaho Nuclear Technology and Engineering Center (INTEC) Fuel Storage Area Ventilation System Evaluation Report

August 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Idaho Nuclear Technology and Engineering Center (INTEC) Fuel Storage Area Ventilation System Evaluation Report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The INTEC Fuel Storage Area is Hazard Category 2 and is designed with a combination of passive structures and a ventilation system for contamination control and worker protection. The facility Documented Safety Analysis (DSA) does not credit the ventilation system for mitigation of analyzed hazard release events and therefore does not classify the system as safety significant or safety class

As specified in the 2004-2 Ventilation System Evaluation Guide for Hazard Category 2 facilities, the performance criteria for safety significant ventilation systems were used to evaluate the ventilation system. The conclusion of the evaluation is that the design features of the facility ventilation system meet the performance criteria for safety significant ventilation systems as specified in Table 5.3 of the 2004-2 Ventilation System Evaluation Guide.

The IRP concludes that the INTEC Fuel Storage Area ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Idaho Nuclear Technology and Engineering Center (INTEC) Fuel Storage Area Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Idaho Nuclear Technology and Engineering Center (INTEC) Fuel Storage Area Ventilation System Evaluation report utilizing the process and criteria outlined in Department of Energy's (DOE's)*Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the INTEC Fuel Storage Area Ventilation System Evaluation report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The INTEC Fuel Storage Area (FSA) began operations in April 1984, and has a specified design life of 40 years. The original mission of the FSA was to provide short-term underwater storage of fuels destined to be reprocessed in the Fluorinel Dissolution Process Area. When the decision to end fuel reprocessing was made in April 1992, the mission of the FSA changed to receiving and storing nuclear fuel for an undefined interim period. Fuel receipt and storage at the FSA is continuing until a decision is made regarding the ultimate disposition of the fuel or until alternative fuel storage options, such as dry storage, are selected, and implemented. In accordance with a settlement agreement with the State of Idaho, the U.S. Department of Energy , and the U.S. Navy, all fuel must be removed from the FSA pools by December 31, 2023.

The primary FSA operations and/or operating systems include truck and cask receiving; fuel handling; fuel cutting (not performed in the past and not currently intended to be performed in the future) and preparation; water treatment and management; HVAC; and waste management. Truck and cask receiving operations occur in the truck receiving and the cask receiving and decontamination areas. These receipt operations include receiving cask shipments, decontaminating and venting casks, and transporting casks to different locations within and between the cask receiving and decontamination area and the fuel unloading pools.

Building ventilation is designed to maintain pressure within the fuel storage area below atmospheric pressure to ensure that building exhaust is directed through a high efficiency particulate air (HEPA) filter system. Pressures are progressively lower from clean areas such as offices to potentially contaminated and likely contaminated areas.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The INTEC Fuel Storage Facility ventilation evaluation appropriately followed the process outlined in the 2004-2 Ventilation System Evaluation Guide in developing the Data Collection Table used to identify accidents, their unmitigated consequences, and the confinement strategy based upon the Documented Safety Analysis (DSA) in effect at the time of the analysis, SAR-113, "Safety Analysis Report for the CPP-666 Fuel Storage Area (FSA)," and the draft of the next annual update. The major difference between these documents was the conversion of the unmitigated accident analyses from the Radiological Safety Analysis Computer (RSAC)-5 INL-developed analysis code to the DOE Toolbox MELCOR Accident Consequence Code System 2 (MACCS2). Accident conclusions did not change as a result of using the MACCS2 code. The Facility Evaluation Team (FET) performing the functional classification evaluation reviewed the DSA to identify applicable release scenarios and confinement conditions assumed in determining the consequences of mitigated and unmitigated releases, and determine if ventilation is properly classified based upon how/if it was used to mitigate events. Based on their evaluation, the FET concluded that the Fuel Storage Facility ventilation system was not credited with any event mitigation and therefore did not need to be classified as either safety class or safety significant. The ventilation system is utilized for contamination control for the protection of workers.

The IRP concluded that FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The INTEC Fuel Storage Facility Ventilation Report evaluated the Fuel Storage Facility building confinement ventilation systems utilizing the safety significant criteria from the 2004-2 Ventilation Evaluation Guide (as called for in the Guide for Hazard Category 2 facilities).. The INTEC Fuel Storage Facility Ventilation System Evaluation Report

documents the systematic evaluation of the ventilation systems against the 2004-2 performance criteria that was carried out to identify any performance gaps. The FET concluded that there were no gaps against the 2004-2 criteria.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

4. CONCLUSIONS

IRP concludes that the INTEC Fuel Storage Area Ventilation System Evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the INTEC Fuel Storage Area Ventilation System Evaluation.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman, Office of Health, Safety and Security
Robert Nelson, IRP Member, Office of Environmental Management

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the INTEC Fuel Storage Facility evaluation, a detailed-full IRP team review was not determined to be necessary.

INDEPENDENT REVIEW

OF

Idaho Nuclear Technology and Engineering Center (INTEC) Irradiated Fuel Storage Facility Ventilation System Evaluation Report

August 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Idaho Nuclear Technology and Engineering Center (INTEC) Irradiated Fuel Storage Facility Ventilation System Evaluation report utilizing the process and criteria outlined in Department of Energy's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The INTEC Irradiated Fuel Storage Facility (CPP-603) is Hazard Category 2 and is designed with a combination of passive structures and a ventilation system for contamination control and worker protection. The facility Documented Safety Analysis (DSA) does not credit the ventilation system for mitigation of analyzed hazard release events and therefore does not classify the system as safety significant or safety class. The Facility Evaluation Team performing the ventilation review evaluated the DSA accidents to determine whether the ventilation system was appropriately classified and concluded that is was correctly classified.

As specified in the 2004-2 Ventilation System Evaluation Guide for Hazard Category 2 facilities, the performance criteria for safety significant ventilation systems were used to evaluate the ventilation system. The conclusion of the evaluation was that the design features of the facility ventilation system meet the performance criteria for safety significant ventilation systems, as specified in Table 5.3 of the 2004-2 Ventilation System Evaluation Guide.

The IRP concludes that the INTEC Irradiated Fuel Storage Facility ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Idaho Nuclear Technology and Engineering Center (INTEC) Irradiated Fuel Storage Facility Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Idaho Nuclear Technology and Engineering Center (INTEC) Irradiated Fuel Storage Facility Ventilation System Evaluation report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the INTEC Irradiated Fuel Storage Facility Ventilation System Evaluation report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria); and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The INTEC Irradiated Fuel Storage Facility is designed to provide safe, interim, fuel storage pending retrieval of the stored fuel for final disposal. To meet this goal, the main operations performed in the facility include receiving spent nuclear fuels from other facilities, repackaging and conditioning fuels for interim storage, safely storing fuels, and packaging fuels for removal from the facility. The facility mission will continue until all fuels have been removed. It is projected that the facility will continue to store fuel until 2035.

The Irradiated Fuel Storage Facility functional areas include the (1) cask receiving area, (2) cask transfer pit and permanent containment structure, (3) fuel handling cave, (4) fuel storage area, (5) control room/instrument room, and (6) crane maintenance area. In addition to these functional areas, other miscellaneous facility support areas include a

standby generator room (inactive); a heating, ventilating, and air conditioning (HVAC) equipment area; and an access building area.

Building ventilation is designed to maintain pressure within the fuel storage area below atmospheric pressure to ensure that building exhaust is directed through a high efficiency particulate air (HEPA) filter system. Pressures are progressively lower from clean areas such as offices to potentially contaminated and likely contaminated areas.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The INTEC Irradiated Fuel Storage Facility ventilation evaluation appropriately followed the process outlined in the 2004-2 Ventilation System Evaluation Guide in developing the Data Collection Table used to identify accidents, their unmitigated consequences, and the confinement strategy based upon the Documented Safety Analysis (DSA) in effect at the time of the analysis, SAR-114, "Safety Analysis Report for the Irradiated Fuel Storage Facility (IFSF)." The Facility Evaluation Team (FET) performing the functional classification evaluation reviewed the DSA to identify applicable release scenarios and confinement conditions assumed in determining the consequences of mitigated and unmitigated releases, and determine if ventilation is properly classified based upon how/if it was used to mitigate events. The FET concluded that the Fuel Storage Facility ventilation system was not credited with any event mitigation and therefore did not need to be classified as either safety class or safety significant. The ventilation system is utilized for contamination control for the protection of workers.

The IRP concluded that FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The INTEC Irradiated Fuel Storage Facility ventilation report evaluated the building confinement ventilation system utilizing the safety significant criteria from the 2004-2 Ventilation Evaluation Guide (as called for in the Guide for Hazard Category 2 facilities). The INTEC Irradiated Fuel Storage Facility Ventilation System Evaluation Report documents the systematic evaluation of the ventilation systems against the 2004-2 performance criteria that was carried out to identify any performance gaps. No gaps were identified .

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

4. CONCLUSIONS

IRP concludes that the INTEC Irradiated Fuel Storage Facility ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the INTEC Irradiated Fuel Storage Facility Ventilation System Evaluation.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman, Office of Health, Safety and Security
Robert Nelson, IRP Member, Office of Environmental Management

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the INTEC Irradiated Fuel Storage Facility evaluation, a detailed-full IRP team review was not determined to be necessary.

INDEPENDENT REVIEW

OF

Idaho Nuclear Technology and Engineering Center (INTEC) Laboratory Facilities Ventilation System Evaluation Report

August 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Idaho Nuclear Technology and Engineering Center (INTEC) Laboratory Facilities Ventilation System Evaluation report utilizing the process and criteria outlined in Department of Energy's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The INTEC Laboratory Facilities are Hazard Category 2 and are designed with a combination of passive structures and ventilation systems for contamination control and worker protection. The Laboratory Facilities Documented Safety Analysis (DSA) does not credit the ventilation systems for mitigation of analyzed hazard release events and therefore does not classify the system as safety significant or safety class.

The Site and Facility Evaluation Teams performing the ventilation review evaluated DSA accidents to determine whether the ventilation systems was appropriately classified and concluded that is was correctly classified. As specified in the 2004-2 Ventilation System Evaluation Guide for Hazard Category 2 facilities, the performance criteria for safety significant ventilation systems were used to evaluate the ventilation system. The Evaluation Teams concluded that ventilation systems meet all but one of the safety significant criteria. The performance gap is that there is not an interlock between the supply and exhaust fans.

The Evaluation Teams analyzed the impact of modifying the ventilation system to close the gap and found that because two laboratory facility buildings share the same supply fan, interlocking the supply fan to cause it to shutdown with the loss of an exhaust fan in one building would cause loss of ventilation flow and contamination control concerns in the other building. Since, interlocking of the two fans is not a credited function in the DSA and could result in a loss of ventilation flow to another building, the Evaluation Teams concluded that closure of the gap was not appropriate.

The IRP concludes that the INTEC Laboratory Facilities ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Idaho Nuclear Technology and Engineering Center (INTEC) Laboratory Facilities Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Idaho Nuclear Technology and Engineering Center (INTEC) Laboratory Facilities Ventilation System Evaluation report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the INTEC Laboratory Facilities Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The INTEC Laboratory Facilities are classified as Hazard Category 2 facilities and are designed with a combination of passive structures and a ventilation system for contamination control and worker protection. The Documented Safety Analysis (DSA) does not require that the ventilation system be safety-significant or safety-class system, structure or component (SSC). Therefore, DSA does not identify functional requirements and performance criteria for the confinement ventilation system.

The primary confinement systems for the INTEC Laboratory Facilities consist of hoods, gloveboxes, and a hot cell. The laboratory hoods and hot cell rely on air velocity to confine gases and prevent airborne materials from being released into the laboratory. The laboratory gloveboxes are sealed enclosures operated by gloves built into the gloveboxes. These systems are vented through roughing and high efficiency particulate air (HEPA)

filters to the roofs of buildings CPP-602 or CPP-630 or to the Atmospheric Protection System (APS) in building CPP-649 via the building CPP-601 east vent tunnel, which vents to the Main Stack. In accordance with procedures, HEPA filters in the ventilation exhaust system are periodically checked for excess pressure drop. When the pressure drop is too high and flow cannot be maintained, or efficiency is too low, the filters are replaced. Building ventilation is designed to maintain pressure within the fuel storage area below atmospheric pressure to ensure that building exhaust is directed through a HEPA filter system. Pressures are progressively lower from clean areas such as offices to potentially contaminated and likely contaminated areas.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The process used by the Site and Facility Evaluation Teams in performing the functional classification evaluation was to review the DSA to identify applicable release scenarios and confinement conditions assumed in determining the consequences of mitigated and unmitigated releases, and determine if ventilation is properly credited as a safety-significant or safety-class system. If ventilation is credited, the DSA would also be reviewed to identify credited system functions and required performance criteria.

The hazard analysis in the facility DSA evaluated credible scenarios for releases due to fire, breach of confinement, explosion, external events, and natural phenomena hazards. There are no credible criticality scenarios. Credible bounding scenarios evaluated are a facility fire, an earthquake, and confinement breaches.

The hazard and accident analyses in the DSA do not credit the confinement ventilation system for any event; therefore, the system is not designated safety-significant or safety-class and functional requirements and performance criteria are not identified. The ventilation system provides protection for workers under the purview of the radiation protection program (contamination control).

The IRP concluded that the Evaluation Teams appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The Evaluation Teams evaluated the building confinement ventilation systems utilizing the safety significant criteria from the 2004-2 Ventilation Evaluation Guide (as called for in the Guide for Hazard Category 2 facilities). The system evaluation involved a review of the Fire Hazards Analysis and the DSA. A facility walk down was performed by the Evaluation Teams. The system evaluation results demonstrate that these systems meet each performance criteria for a safety significant system in all but one case. The performance gaps identified was that the supply and exhaust fans are not interlocked to prevent a confinement pressurization if the supply fan operates while the exhaust fan is down.

3.3 Evaluation of physical modifications to enhance safety performance

The Evaluation Teams analyzed impact of modifying the ventilation system to close the gap and found that because two laboratory facility building share the same supply fan, interlocking the supply fan to cause it to shutdown with the loss of an exhaust fan in one building would cause loss of ventilation flow and contamination control concerns in the other building. Specifically, CPP-602 and CPP-601 share the same supply fan. Interlocking the supply fan with the CPP-602 exhaust fan could result in a loss of ventilation flow through CPP-601. CPP-601 is undergoing decontamination and dismantlement. Interlocking of the supply and exhaust fans is not a function credited by the INTEC Laboratory Facility DSA. Since, interlocking of the two fans is (1) not a credited function in the DSA, (2) could result in a loss of ventilation flow to another building, and (3) would only result in contamination spread in the building with the loss of exhaust flow, the Evaluation Teams concluded that closure of the gap was not appropriate.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

4. CONCLUSIONS

Based on the results of the hazard and accident analyses, the INTEC Laboratory Facilities confinement ventilation systems are not required to be designated as safety-significant or safety-class. The ventilation systems are defense-in-depth for protection for workers under the purview of the radiation protection program (contamination control). The systems were evaluated against the performance attributes expected of safety-significant ventilation systems and meet all but one of those attributes. There is not a interlock between the supply and exhaust fans. Interlocking of the two fans is not a credited function in the DSA and interlocking could result in a loss of ventilation flow to another facility.

IRP concludes that the INTEC Laboratory Facilities ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the INTEC Laboratory Facilities Ventilation System Evaluation.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman, Office of Health, Safety and Security
Robert Nelson, IRP Member, Office of Environmental Management

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the INTEC Laboratory Facilities evaluation, a detailed-full IRP team review was not determined to be necessary.

INDEPENDENT REVIEW

OF

Idaho Nuclear Technology and Engineering Center (INTEC) Process Equipment Waste Evaporator (PEWE) Facility Ventilation System Evaluation Report

August 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Idaho Nuclear Technical and Engineering Center (INTEC) Process and Equipment Waste Evaporator (PEWE) Ventilation System Evaluation Report utilizing the process and criteria outlined in Department of Energy's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The PEWE is a Hazard Category 2 facility designed with a combination of passive structures and a ventilation system for contamination control and worker protection. The Evaporator Facility Documented Safety Analysis (DSA) does not credit safety the ventilation system for mitigation of analyzed hazard release events and therefore does not classify the system as significant or safety class.

The Site and Facility Evaluation Teams performing the ventilation review evaluated DSA accidents to determine whether the ventilation systems was appropriately classified and concluded that is was correctly classified. As specified in the 2004-2 Ventilation System Evaluation Guide for Hazard Category 2 facilities, the performance criteria for safety significant ventilation systems were used to evaluate the ventilation system. The Evaluation Teams concluded that ventilation systems meet all but one of the safety significant criteria. The performance gap is that there is not an interlock between the supply and exhaust fans.

The Evaluation Teams analyzed performance capability of the ventilation system to determine the safety benefit of closure of the gap. Although, there is no interlock between the supply and fans, the supply fans are procedurally shutdown by operators upon indication of a loss of exhaust air. Furthermore, since there is no safety credit for this interlock function required by the PEWE DSA and consequences of the event are limited to contamination spread, the Evaluation Teams concluded that gap closure was not warranted.

The IRP concludes that the INTEC PEWE ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's
Review of the
Idaho Nuclear Technical and Engineering Center (INTEC)
Process and Equipment Waste Evaporator (PEWE)
Ventilation System Evaluation Report

1. INTRODUCTION

The DNFSB Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Idaho Nuclear Technical and Engineering Center (INTEC) Process and Equipment Waste Evaporator (PEWE) Ventilation System Evaluation Report utilizing the process and criteria outlined in DOE's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the INTEC PEWE to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The INTEC PEWE was originally constructed form 1950 to 1952, and began operation in 1953 to treat radioactive liquid waste from INTEC processes. The PEWE is located in the Rare Gas Plant/Waste Building. The PEWE reduces the volume of hazardous waste needed to be stored. The PEWE evaporates the wastes, producing concentrated wastes (bottoms) and vapor condensates (overheads). Originally, the concentrated bottoms were sent to the Tank Farm Facility and overheads were transferred to the Service Waste System. In preparation for Tank Farm Facility closure, transfers of newly generated liquid waste solutions to the Tank Farm Facility are administratively prohibited as of September 30, 2005. Currently, the concentrated bottoms are drained to a bottoms tank for transfer or recycling for further processing.

Confinement of the liquid radioactive waste in the PEWE collection systems in the Fuel Process Building and the Westside Waste Holdup Tank System, and the Rare Gas

Plant/Waste Building is provided by the collection tanks and vessels, the concrete walls, and liners of the cells and vaults where the tanks and vessels are located. The vessel off gas system (VOG) is directly connected to the process off gas (POG) portion of the INTEC Atmospheric Protection System (APS). The VOG maintains a vacuum on the PEWE System vessels. The VOG and POG APS provide high-efficiency particulate air (HEPA) filtration prior to discharge to the INTEC Main Stack.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The Site Evaluation Team and the Facility Evaluation Team (Evaluation Teams) reviewed the DSA to identify applicable release scenarios and confinement conditions assumed in determining the consequences of mitigated and unmitigated releases, and determine if ventilation is properly classified as not being a safety significant or safety class system.

The IRP concluded that the Evaluation Teams appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The Evaluation Teams evaluated the building confinement ventilation system utilizing the safety significant criteria from the 2004-2 Ventilation Evaluation Guide (as called for in the Guide for Hazard Category 2 facilities). The system evaluation involved a review of the Fire Hazards Analysis and the DSA. A facility walk down was performed by the Evaluation Teams.

The system evaluation results demonstrate that these systems meet all but one of the attributes of a safety significant system. The performance gap identified is that the PEWE supply and exhaust fans are not interlocked.

3.3 Evaluation of physical modifications to enhance safety performance

The Evaluation Teams analyzed performance capability of the ventilation system to determine the safety benefit of closure of the gap.

Although, there is no interlock between the supply and fans and they will not automatically shutdown on a high pressure condition, the supply fans are procedurally shutdown by operators when the alarm sounds indicating a loss of PEWE exhaust air. Since there is (1) no safety credit for this interlock function required by the PEWE DSA, (2) evaporation operations within the PEWE will be discontinued either this or next year, and (3) consequences of the event are limited to contamination spread, the Evaluation Teams concluded that gap closure was not warranted.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

4. CONCLUSIONS

Based on the results of the hazard and accident analyses, the PEWE confinement ventilation system is not required to be designated as safety-significant or safety-class. The ventilation system is defense-in-depth for protection for workers under the purview of the radiation protection program (contamination control). The system was evaluated against the performance attributes expected of safety-significant ventilation systems and meets all but one of those attributes. There is not an interlock between the supply and exhaust fans. There are no plans to upgrade this system to include an interlock.

IRP concludes that the INTEC PEWE Facility ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the INTEC PEWE Ventilation System Evaluation.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman, Office of Health, Safety and Security
Robert Nelson, IRP Member, Office of Environmental Management

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the INTEC PEWE evaluation, a detailed-full IRP team review was not determined to be necessary.

SEPARATION

PAGE

Department of Energy
Washington, DC 20585

DEC 07 2009

MEMORANDUM FOR DAVID C. MOODY
MANAGER
CARLSBAD FIELD OFFICE

FROM: DR. STEVEN L. KRAHN
ACTING DEPUTY ASSISTANT SECRETARY FOR
SAFETY AND SECURITY PROGRAM
ENVIRONMENTAL MANAGEMENT

SUBJECT: Evaluation of Waste Isolation Pilot Plant Ventilation Systems in Response to Defense Nuclear Facilities Safety Board Recommendation 2004-2, Final Reports

Based on a review of the information included in the subject reports, evaluation by the Defense Nuclear Facilities Safety Board (DNFSB) 2004-2 Independent Review Panel, the Environmental Management Technical Advisory Board, and input from the Chief of Nuclear Safety Office, the report is approved with the following considerations:

- The review concluded that the Waste Isolation Pilot Plant ventilation systems were appropriately evaluated against safety significant criteria associated with the established DNFSB 2004-2 evaluation guidelines and adequately meet them.

If you have any further questions, please contact me at (202) 586-5151.

Attachments

Independent Review

of

Waste Isolation Pilot Plant (WIPP) Contact Handled Surface Confinement Ventilation System 411 HV01 Ventilation System Evaluation Report

July 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Waste Isolation Pilot Plant (WIPP) Contact Handled Surface Confinement Ventilation System 411 HV01 Ventilation System Evaluation Report utilizing the process and criteria outlined in the Department of Energy's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The WIPP facility is classified as a Hazard Category 2 facility based upon its radioactive material inventory. The WIPP facility evaluation team (FET) performing the ventilation system review appropriately evaluated the Contact Handled Surface Confinement Ventilation System's functional classification and determined that it was properly classified as a Defense in Depth system. Furthermore, the FET appropriately evaluated the ventilation system against the 2004-2 Ventilation System Evaluation Guide performance criteria (at the Safety Significant level as specified in the 2004-2 Ventilation System Evaluation Guide for Hazard Category 2 facilities) and determined that it met all the criteria.

The IRP concludes that the WIPP Contact Handled Surface Confinement Ventilation System 411 HV01 Ventilation System Evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Waste Isolation Pilot Plant Contact Handled Surface Confinement Ventilation System 411 HV01 Ventilation System Evaluation Report

1.0 INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Waste Isolation Pilot Plant (WIPP) Contact Handled Surface Confinement Ventilation System 411 HV01 Ventilation System Evaluation Report utilizing the process and criteria outlined in the Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the WIPP Contact Handled Surface Confinement Ventilation System 411 HV01 Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2.0 FACILITY AND VENTILATION SYSTEM OVERVIEW

The WIPP site is a repository for low-level radioactive waste. Waste is characterized and shipped to WIPP in packages for disposal in the repository. The container that the waste is packaged in prior to loading into transportation containers (road casks) provides primary containment. There is no planned normal operation at WIPP that allows for waste to be present external to the waste package container primary containment. The waste container packages that are used for disposal are removed from the transportation containers (road casks) in the Waste Handling Building (WHB). From the time the packages are removed until they are placed in the repository, the packages are contained within facilities and structures with active confinement ventilation systems.

Contact Handled (CH) surface handling operations are performed in the CH portion of the WHB. The CH Surface Confinement Ventilation System (CVS) 411 HV01 provides the active CVS for the CH surface waste handling operations.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The WIPP hazard classification category was determined in accordance with DOE Standard 1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*. The material at risk for the determination of the categorization was defined as the maximum radiological contents of a single 55-gallon drum of CH waste which is 80 plutonium-239 equivalent curies (PE-Ci). Since this inventory exceeds the Hazard Category 2 minimum threshold of 56 Ci for Pu-239, the WIPP is categorized as a Hazard Category 2 facility.

The WIPP CVSs are designed to provide confinement barriers utilizing high efficiency particulate air (HEPA) filtration to limit releases of airborne radioactive contaminants. Exhaust stacks are designed with elevated discharges and fresh air supply intakes located away from the exhaust vents. The ventilation systems provide pressure differentials that are maintained between building interior zones and the outside environment. The WHB ventilation systems continuously filter the exhaust air from waste handling areas to reduce the potential for release of radioactive effluents to the environment. Airlocks for ventilation differential pressure control are electrically interlocked.

The CH Surface CVS is not credited in the site Documented Safety Analysis (DSA) analyzed accident scenarios to control a hazardous release. The CH Surface CVS[1] performs a Defense in Depth function for the WIPP site. The facility evaluation team (FET) used the site process (contained in its procedure WP 09-CN3023) to evaluate the existing site functional classification of the CH Surface CVS. The FET determined that the CH surface CVS had the proper functional classification per WP 09-CN3023.

The IRP concluded that the FET appropriately reviewed the functional classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

Section 5.1 of the 2004-2 Ventilation System Evaluation Guide specifies that all Hazard Category 2 nuclear facilities that do not challenge or exceed the evaluation guideline will utilize Safety Significant performance criteria as identified in Table 5-1 Guide. In accordance with the Guide, the FET appropriately chose to evaluate the ventilation system against Safety Significant criteria.

[1] Additionally, the FET reviewed the site procedure for compliance with DOE Standard 3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis*, criteria for functionally classifying for site systems and found it to be appropriate.

The CH Surface CVS report included a brief description of how the system met the criteria.

The FET evaluation concluded that the 2004-2 Ventilation System Evaluation Guide Safety Significant performance criteria were adequately met by the CH Surface CVS. No performance gaps were identified.

The IRP concluded that evaluation of the ventilation system against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

4.0 CONCLUSIONS

The IRP concludes that the WIPP Contact Handled Surface Confinement Ventilation System 411 HV01 Ventilation System Evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5.0 RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the WIPP Contact Handled Surface Confinement Ventilation System 411 HV01 Ventilation System Evaluation Report.

6.0 REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman, Office of Health, Safety and Security
Robert Nelson, IRP Member, Office of Environmental Management

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate level of detail and rigor.

A detailed, full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan; was not performed with an appropriate level of detail or rigor (after consultation with the report developers); or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the WIPP Contact Handled Surface Confinement Ventilation System 411 HV01 Ventilation System Evaluation Report review, a detailed IRP team review was not determined to be necessary.

Independent Review

of

Waste Isolation Pilot Plant (WIPP) Contact Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation Report

July 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Waste Isolation Pilot Plant (WIPP) Contact Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation Report utilizing the process and criteria outlined in the Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The WIPP facility is classified as a Hazard Category 2 facility based upon its radioactive material inventory. The WIPP facility evaluation team (FET) performing the ventilation system review appropriately evaluated the Contact Handled Underground Confinement Ventilation System's functional classification and determined that it was properly classified as a Safety Significant system. Furthermore, the FET appropriately evaluated the ventilation system against the 2004-2 Ventilation System Evaluation Guide Safety Significant performance criteria and determined that it met all the criteria.

The IRP concludes that the WIPP Contact Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Waste Isolation Pilot Plant Contact Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation Report

1.0 INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Waste Isolation Pilot Plant (WIPP) Contact Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation Report utilizing the process and criteria outlined in the Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the WIPP Contact Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2.0 FACILITY AND VENTILATION SYSTEM OVERVIEW

The WIPP site is a repository for low-level radioactive waste. Waste is characterized and shipped to WIPP in packages for disposal in the repository. The container that the waste is packaged in prior to loading into transportation containers (road casks) provides primary containment. There is no planned normal operation at WIPP that allows for waste to be present external to the waste package container primary containment. The waste container packages that are used for disposal are removed from the transportation containers (road casks) in the Waste Handling Building (WHB). From the time the packages are removed until they are placed underground in the repository, the packages are contained within facilities and structures with active confinement ventilation systems.

The WIPP underground (UG) consists of the waste disposal area, construction area, north area, and the waste shaft station area. The Contact Handled (CH) and Remote Handled (RH) waste disposal area is a 100 acre area on a horizon located 2,150 feet beneath the

surface in a deep, bedded salt formation. The CH Underground Confinement Ventilation System (CVS) VU01 provides the active CVS for the CH underground waste handling operations.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The WIPP hazard classification category was determined in accordance with DOE Standard 1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*. The material at risk for the determination of the categorization was defined as the maximum radiological contents of a single 55-gallon drum of CH waste which is 80 plutonium-239 equivalent curies (PE-Ci). Since this inventory exceeds the Hazard Category 2 minimum threshold of 56 Ci for Pu-239, the WIPP is categorized as a Hazard Category 2 facility.

Significant accidents in the underground evaluated in the Documented Safety Analysis are prevented by use of numerous controls. The CH UG CVS is classified as a Safety Significant (SS) system that is credited for preventing prompt, significant radiological or chemical exposure to workers.[1] The facility evaluation team (FET) used the site process (contained in its procedure WP 09-CN3023) to evaluate the existing site functional classification of the CH Underground CVS. The FET determined that the CH underground CVS had the proper functional classification per WP 09-CN3023.

The IRP concluded that the FET appropriately reviewed the functional classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

In accordance with the Guide, the FET appropriately chose to evaluate the ventilation system against SS criteria. The FET identified there were no gaps between the *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety Related Systems* (VSEG) evaluation criteria and the installed system's SS functional design or performance expectations.

The CH underground CVS report included a brief description of how the system met the criteria. The evaluation verified all the VSEG established performance criteria for SS CVS systems were adequately met by the CH Underground CVS. No performance gaps were identified.

The IRP concluded that evaluation of the ventilation system against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

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[1] Additionally, the FET reviewed the site procedure for compliance with DOE Standard 3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis*, criteria for functionally classifying the site systems and found it to be appropriate.

4.0 CONCLUSIONS

The IRP concludes that the WIPP Contact Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation was performed in accordance with the criteria in the DNFSB 2004-2 System Evaluation Guide.

5.0 RECOMMENDATION

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the WIPP Contact Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation.

6.0 REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman, Office of Health, Safety and Security
Robert Nelson, IRP Member, Office of Environmental Management

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate level of detail and rigor.

A detailed, full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan; was not performed with an appropriate level of detail or rigor (after consultation with the report developers); or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the WIPP Contact Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation Report review, a detailed IRP team review was not determined to be necessary.

Independent Review

of

Waste Isolation Pilot Plant (WIPP) Remote Handled Underground Confinement Ventilation System VU01 System Evaluation Report

July 2009

Executive Summary

The DNFSB Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Waste Isolation Pilot Plant (WIPP) Remote Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation Report utilizing the process and criteria outlined in DOE's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The WIPP facility is classified as a Hazard Category 2 facility based upon its radioactive material inventory. The WIPP facility evaluation team (FET) performing the ventilation system review appropriately evaluated the Remote Handled Underground Confinement Ventilation System's functional classification and determined that it was properly classified as a Defense in Depth system. Furthermore, the FET appropriately evaluated the ventilation system against the 2004-2 Ventilation System Evaluation Guide performance criteria (at the Safety Significant level as specified in the 2004-2 Ventilation System Evaluation Guide for Hazard Category 2 facilities) and determined that it met all the criteria.

The IRP concludes that the WIPP Remote Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation was performed in accordance with the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Waste Isolation Pilot Plant Remote Handled Underground Confinement Ventilation System UV01 Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Waste Isolation Pilot Plant (WIPP) Remote Handled Underground Confinement Ventilation System UV01 Ventilation System Evaluation Report utilizing the process and criteria outlined in the Departmetn of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the WIPP Remote Handled Underground Confinement Ventilation System UV01 Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The WIPP site is a repository for low level radioactive waste. Waste is characterized and shipped to WIPP in packages for disposal in the repository. The container that the waste is packaged in prior to loading into transportation containers (road casks) provides primary containment. There is no planned normal operation at WIPP that allows for waste to be present external to the waste package container primary containment. The waste container packages that are used for disposal are removed from the transportation containers (road casks) in the Waste Handling Building (WHB). From the time the packages are removed until they are placed underground in the repository, the packages are contained within facilities and structures with active confinement ventilation systems.

The WIPP underground (UG) consists of the waste disposal area, construction area, north area, and the waste shaft station area. The Contact Handled (CH) and Remote Handled (RH) waste disposal area is a 100 acre area on a horizon located 2,150 feet beneath the surface in a deep, bedded salt formation. The RH Underground Confinement Ventilation System (CVS) VU01 provides the active CVS for the RH underground waste handling operations.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The WIPP hazard classification category was determined in accordance with DOE-STD-1027-92. The material at risk for the determination of the categorization was defined as the maximum radiological contents of a single 55-gallon drum of CH waste which is at 80 plutonium-239 equivalent curies (PE-Ci). Since this inventory exceeds the Hazard Category 2 minimum threshold of 56 Ci for Pu-239, the WIPP is categorized as a Hazard Category 2 facility.

Significant accidents in the underground evaluated in the DSA are prevented by use of numerous controls. The RH UG CVS is classified as a Safety Significant (SS) system that is credited for preventing prompt, significant radiological or chemical exposure to workers.[1] The facility evaluation team (FET) used the site process (contained in its procedure WP 09-CN3023) to evaluate the existing site functional classification of the RH Underground CVS. The FET determined that the RH underground CVS had the proper functional classification per WP 09-CN3023.

The IRP concluded that the FET appropriately reviewed the functional classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

In accordance the Guide, the FET appropriately chose to evaluate the ventilation system against SS criteria. The FET identified there were no gaps between the *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety Related Systems* (VSEG) evaluation criteria and the installed system's SS functional design or performance expectations.

The CH underground CVS report included a brief description of how the system met the criteria.

The FET evaluation verified all the VSEG established performance criteria for SS CVS systems were adequately met by the CVS.

[1] Additionally, the FET reviewed the site procedure for compliance with DOE Standard 3009 criteria for functionally classifying the site systems and found them to be appropriate.

The IRP concluded that evaluation of the ventilation system against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

4. CONCLUSIONS

IRP concludes that the WIPP Remote Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation was performed in accordance with the criteria in the DNFSB 2004-2 System Evaluation Guide.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the WIPP Remote Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman, Office of Health, Safety and Security
Robert Nelson, IRP Member, Office of Environmental Management

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the WIPP Remote Handled Underground Confinement Ventilation System VU01 Ventilation System Evaluation Report review, a detailed-full IRP team review was not determined to be necessary.

Independent Review

of

Waste Isolation Pilot Plant (WIPP) Remote Handled Surface Confinement Ventilation System 411 HV02 Ventilation System Evaluation Report

July 2009

Executive Summary

The DNFSB Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Waste Isolation Pilot Plant (WIPP) Remote Handled Surface Confinement Ventilation System 411 HV02 Ventilation System Evaluation Report utilizing the process and criteria outlined in DOE's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The WIPP facility is classified as a Hazard Category 2 facility based upon its radioactive material inventory. The WIPP facility evaluation team (FET) performing the ventilation system review appropriately evaluated the Remote Handled Surface Confinement Ventilation System's functional classification and determined that it was properly classified as a Defense in Depth system. Furthermore, the FET appropriately evaluated the ventilation system against the 2004-2 Ventilation System Evaluation Guide performance criteria (at the Safety Significant level as specified in the 2004-2 Ventilation System Evaluation Guide for Hazard Category 2 facilities) and determined that it met all the criteria.

The IRP concludes that the WIPP Remote Handled Surface Confinement Ventilation System 411 HV02 Ventilation System Evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Waste Isolation Pilot Plant Remote Handled Surface Confinement Ventilation System 411 HV02 Ventilation System Evaluation Report

1.0 INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Waste Isolation Pilot Plant (WIPP) Remote Handled Surface Confinement Ventilation System 411 HV02 Ventilation System Evaluation Report utilizing the process and criteria outlined in the Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the WIPP Remote Handled Surface Confinement Ventilation System 411 HV02 Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2.0 FACILITY AND VENTILATION SYSTEM OVERVIEW

The WIPP site is a repository for low-level radioactive waste. Waste is characterized and shipped to WIPP in packages for disposal in the repository. The container that the waste is packaged in prior to loading into transportation containers (road casks) provides primary containment. There is no planned normal operation at WIPP that allows for waste to be present external to the waste package container primary containment. The waste container packages that are used for disposal are removed from the transportation containers (road casks) in the Waste Handling Building (WHB). From the time the packages are removed until they are placed in the repository, the packages are contained within facilities and structures with active confinement ventilation systems.

Remote Handled (RH) surface handling operations are performed in the RH portion of the WHB. The RH Surface Confinement Ventilation System (CVS) 411 HV02 provides the active CVS for the RH surface waste handling operations.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The WIPP hazard classification category was determined in accordance with DOE Standard 1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*. The material at risk for the determination of the categorization was defined as the maximum radiological contents of a single 55-gallon drum of CH waste, which is 80 plutonium-239 equivalent curies (PE-Ci). Since this inventory exceeds the Hazard Category 2 minimum threshold of 56 Ci for Pu-239, the WIPP is categorized as a Hazard Category 2 facility.

The WIPP CVSs are designed to provide confinement barriers utilizing high efficiency particulate (HEPA) filtration to limit releases of airborne radioactive contaminants. Exhaust stacks are designed with elevated discharges and fresh air supply intakes located away from the exhaust vents. The RH portion of the WHB has two ventilation systems, one for the RH bay and the other for the hot cell complex. Each system maintains pressure differential between areas of low potential for airborne radioactive material and those of higher potential. The WHB ventilation systems continuously filter the exhaust air from waste handling areas to reduce the potential for release of radioactive effluents to the environment. Airlocks for ventilation differential pressure control are electrically interlocked.

The RH Surface CVS is not credited in the site Documented Safety Analysis (DSA) analyzed accident scenarios to control hazardous release. The RH Surface CVS[1] performs a Defense in Depth function for the WIPP site. The facility evaluation team (FET) used the site process (contained in its procedure WP 09-CN3023) to evaluate the existing site functional classification of the RH Surface CVS. The FET determined that the RH surface CVS had the proper functional classification per CP 09-CN3023.

The IRP concluded that the FET appropriately reviewed the functional classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

Section 5.1 of the 2004-2 Ventilation System Evaluation Guide specifies that all Hazard Category 2 nuclear facilities that do not challenge or exceed the evaluation guideline will utilize Safety Significant performance criteria as identified in Table 5-1 Guide. In

[1] Additionally, the FET reviewed the site procedure for compliance with DOE Standard 3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis*, criteria for functionally classifying for site systems and found it to be appropriate.

accordance with the Guide, the FET appropriately chose to evaluate the ventilation system against Safety Significant criteria.

The RH Surface CVS report included a brief description of how the system met the criteria. The FET evaluation concluded that the 2004-2 Ventilation System Evaluation Guide Safety Significant performance criteria were adequately met by the RH Surface CVS.

The IRP concluded that evaluation of the ventilation system against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

4.0 CONCLUSIONS

The IRP concludes that the WIPP Remote Handled Surface Confinement Ventilation System 411 HV02 Ventilation System Evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5.0 RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the WIPP Remote Handled Surface Confinement Ventilation System 411 HV02 Ventilation System Evaluation.

6.0 REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman, Office of Health, Safety and Security
Robert Nelson, IRP Member, Office of Environmental Management

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate level of detail and rigor.

A detailed, full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan; was not performed with an appropriate level of detail or rigor (after consultation with the report developers); or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the WIPP Remote Handled Surface Confinement Ventilation System 411 HV02 Ventilation System Evaluation Report review, a detailed IRP team review was not determined to be necessary.

SEPARATION

PAGE

Department of Energy
Washington, DC 20585

DEC 24 2009

MEMORANDUM FOR SHIRLEY OLINGER
MANAGER
OFFICE OF RIVER PROTECTION

FROM: DR. STEVEN L. KRAHN
ACTING DEPUTY ASSISTANT SECRETARY FOR
SAFETY AND SECURITY PROGRAM
ENVIRONMENTAL MANAGEMENT

SUBJECT: Evaluation of the 242A Evaporator Facility Ventilation System in Response to Defense Nuclear Facilities Safety Board Recommendation 2004-2, Final Report

During a Department of Energy (DOE), Environmental Management (EM) Technical Authority Board (TAB) meeting on November 16, 2009, the Defense Nuclear Facilities Safety Board (DNFSB) reviewed an initial version of the subject report. Since the report had not been accomplished against Safety Significant review criteria, the TAB requested that DOE, Office of River Protection (ORP) revise the report.

Based on review of the information included in the subject revised report, evaluation by the DNFSB 2004-2 Independent Review Panel, the EM TAB, and input from the Chief of Nuclear Safety Office, the report is approved with the following considerations.

- The gap identified with respect to DOE-STD-1066 will be further evaluated upon receipt of a revision to the revised Fire Hazard Analysis and a determination made if the ORP approval will be required for any associated equivalency(s) and/or exemption(s).

If you have any further questions, please call me at (202) 586-5151.

Attachments

cc:
D. Chung, EM-2
F. Marcinowski, EM-3
M. Gilbertson, EM-50

INDEPENDENT REVIEW

OF

Office of River Protection
242-A Evaporator
Ventilation System Evaluation Report

December 2009

Executive Summary

The Defense Nuclear Facility Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed Richland Operations Office Hanford Site 242-A Evaporator Facility Ventilation System Evaluation Report utilizing the process and criteria outlined in Department of Energy's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The 242-A Evaporator is designed to reduce waste volume and the number of Double Shell Tanks (DSTs) required to store liquid waste generated at the Hanford Site. The process uses a conventional, forced-circulation, vacuum evaporation system operating at low pressure and low temperature to concentrate radioactive waste solutions. The 242-A Evaporator has active ventilation systems. The ventilation systems work in concert with the facility floor plan (zones) to direct airflow from areas of lesser contamination potential to areas of greater contamination potential. Airlocks separate potentially contaminated areas from non-contaminated areas. Exhaust air passes through a cleanup system consisting of two stages of HEPA filters. The 242-A Evaporator is a Hazard Category 2 nuclear facility. The ventilation system has been classified as defense in depth.

The Facility Evaluation Team (FET) performing the ventilation system evaluation reviewed the functional classification of the system and concluded that it was correctly classified as defense in depth. As a Hazard Category 2 nuclear facility, however, the 242-A Evaporator Facility Ventilation System was correctly evaluated against the Safety Significant level as specified in the 2004-2 Ventilation System Evaluation Guide. Two gaps were identified.

The IRP concludes that the ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Office of River Protection (ORP) 242-A Evaporator Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facility Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Office of River Protection 242-A Evaporator Ventilation System Evaluation Report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the ORP 242-A Evaporator Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The K1 ventilation system services contaminated areas of the 242-A Building. Provisions are required to maintain confinement pressure differentials within the facility and to ensure that discharges of radioactive materials meet applicable regulations. The K1 exhaust stream is HEPA filtered, monitored for the presence of radioactive materials, and sampled to ensure that release limits are not exceeded.

The K1 ventilation system performs two safety functions: (1) maintains contaminated areas at a negative pressure relative to atmospheric and (2) filters and monitors exhaust air to ensure releases of radioactive and hazardous materials are within guidelines and ALARA.

The K1 ventilation system is a once-through air system. The K1 supply fan supplies outside air throughout the ventilated areas. Negative air pressure is maintained in K1 serviced areas. Air is drawn through two parallel two-stage HEPA filter enclosures and discharged through an elevated stack by one of two K1 exhaust fans. The discharge stack

is equipped with stack sampling system record sampler and Continuous Air Monitor (CAM). The exhaust portion of the K1 ventilation system consists of exhaust ducts that draw the air out of the various areas served by the K1 system. The exhaust ducts join at a common header that serves as the inlet to the two HEPA units. Each HEPA filter in the units is provided with a differential pressure instrument to monitor the condition of the filter. The exhaust fans are powered from a motor control center that can receive backup power from a diesel generator. The K1 system contains sufficient instrumentation to monitor and control air flows and the required negative pressures of specified compartments. Monitoring instrumentation includes exhaust air radioactivity detection and alarm. 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.

The 242-A Evaporator has been in operation for 30 years. The facility is expected to continue with service for many more years. Evaporator upgrades have been identified which will extend the life of the facility to support the mission. One such upgrade involved the K1 exhaust system. The K1 exhaust system has provided building ventilation and contamination control since the 1970s. Several components of this exhaust system will be replaced as part of an ongoing facility life extension program. The K1 exhaust upgrade will be conducted as part of the overall Tank Farm ARRA project. Upgrades to the supply side of the K1 system were conducted and completed during Phase I in fiscal years 2007 and 2008.

The K1 exhaust system upgrade replaces all exhaust equipment downstream of the underground ventilation duct. The underground duct, not part of the scope of the modification is comprised of 4 sections that connect to a single inlet manifold header. This header is located north of the evaporator room. The upgrade involves design and procurement of all major components excluding the inlet manifold header. These components will be assembled and factory acceptance tests conducted. Once work is completed at the 242-A Evaporator to install all components of the K1 exhaust upgrade, operational acceptance tests will be performed by Washington River Protection Solutions. In addition to component upgrades, modifications will include the addition of a fire screen to the inlet duct, a third HEPA housing, and changing the HEPA filter instrumentation design from the use of separate pressure switches (for control room alarms) and pressure indicators (for local indication) to a single combined pressure differential indicator transmitter which indicates locally and sends a signal to the remote monitoring and control system.

The active K1 confinement ventilation system in the 242-A Evaporator is functionally classified as general service.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The FET performing the system evaluation, reviewed determination of bounding unmitigated consequences presented in the DSA and concluded that the quantitative dose consequences were determined in accordance with DOE-STD-3009-94 and do not challenge the DOE-STD-3009-94 evaluation guideline. The ventilation system is not credited for reducing event consequences to a lower risk bin. The control suites identified in the DSA focus on preventive measures and inventory limits as well as the secondary containment systems such as the process cell in lieu of the ventilation system. The FET concluded that the ventilation systems associated with the 242-A Evaporator System are appropriately classified as defense in depth.

The IRP concluded that the ORP FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Ventilation System Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The ORP FET ventilation report evaluated the 242-A Evaporator building confinement ventilation systems utilizing safety significant performance category 2 criteria from the 2004-2 Ventilation Evaluation Guide. The Report provides a systematic evaluation of the existing ventilation system against the 2004-2 performance criteria to identify any gaps along with a subsequent evaluation to evaluate potential remaining gaps post life extension upgrades. .

Two gaps were identified that will remain. Fire suppression features have not been provided inside HEPA filter housing as recommended by DOE-STD-1066, *Fire Protection Design Criteria*, and following modification the underground duct work may be vulnerable to a seismic event. The ventilation system is not credited in the DSA to operate or maintain confinement integrity during or following any DBA or NPH events.

3.3 Evaluation of physical modifications to enhance safety performance

2004-2 Ventilation System Evaluation Guide specifies that an evaluation of physical modifications that may be appropriate to enhance the ventilation system in the areas where the current confinement ventilation system does not meet the 2004-2 evaluation criteria should be performed.

A cost/benefit analysis was not performed to replace the underground ducting due to the extensive nature of the modification and the fact that addressing the gap would provide limited, if any, overall dose reduction. With respect to fire protection of the filter housing, a revision to the FHA will document any gaps with DOE-STD-1066 and ORP approval will be required for any associated equivalency(s) and/or exemption(s). A rough order of magnitude cost estimate was performed for adding a deluge system to the

planned modification. The design and installation was estimated at $1.1 M which does not include costs for cold weather protection and the significantly increased lifecycle cost for surveillance of the system. Additionally, a deluge system will introduce the potential for flooding from inadvertent system activation or leaks, and worker exposure from routine operations to maintain the deluge system. The FET does not recommend any changed to the planned modification.

4. CONCLUSIONS

IRP concludes that the ORP 242-A Evaporator ventilation system evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the ORP 242-A Evaporator dependent upon future approval of a resolution that addresses fire safety requirements for HEPA filter housings.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman
Robert Nelson; IRP Member EM

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For this evaluation, a detailed-full IRP team review was not determined to be necessary.

Hanford Site 242-A Evaporator Facility

DNFSB Recommendation 2004-2 Ventilation System Evaluation

RPP-RPT-43806 Revision 0

E. Rensink

Date Published
November 2009

washington **river**
protection *solutions*

Prepared for the U.S. Department of Energy
Office of River Protection

Contract No. DE-AC27-08RV14800

Review and Approval

Facility Evaluation Team Concurrence:

Chris Harrington — 11/20/09
Chris Harrington
DOE Engineering Services Division Director
Date

FOR H. BERMAN — 11/20/09
Herb Berman,
Chief Engineer
Date

Diane M. Cato — 11/20/09
Diane M. Cato, FET Lead
Tank Farm Projects Engineering
Date

EXECUTIVE SUMMARY

This confinement ventilation system evaluation is for the 242-A Evaporator Facility at the Hanford Site. This evaluation was developed in accordance with the Department of Energy (DOE) evaluation guidance for Defense Nuclear Facility Safety Board (DNFSB) Recommendation 2004-2. This evaluation included the existing K1 Exhaust ventilation system and the K1 Exhaust ventilation system following proposed K1 Exhauster upgrade (Reference 2) that will replace several components of the existing system.

The 242-A Evaporator Facility is classified as Hazard Category 2, as given in Section 3.3.2.2 of the Documented Safety Analyses (DSA) Reference 1. The 242-A Evaporator K1 ventilation system is functionally classified as general service. This functional classification is based upon the low radiological and chemical consequences to both the 100-meter on-site and off-site receptors from the postulated evaporator events, as evaluated in the DSA, for the evaporator facility.

The 242-A Evaporator Hazard and Accident Analysis presented in Chapter 3 of the DSA, identified and analyzes three events at the evaporator to determine the potential worst case consequences from 242-A Evaporator activities. These events are:

- SPILL – a spill from a seismic event or other initiator that collapses the 242-A Building structure damaging the evaporator cell cover block and causing it to fall on the C-A-1 vessel releasing its contents.
- FIRE – a fire from an unidentified initiator ignites the combustibles in the evaporator room causing gaskets to fail and spray slurry onto the fire boiling the slurry and dispersing the contaminated steam.
- DEFLAGRATION or DETONATION – flammable gas accumulates in the evaporator headspace with an ignition source present resulting in a deflagration or detonation that releases evaporator contents

These three events bound the risk and consequences for all planned and unplanned 242-A Evaporator events postulated in Chapter 3. The unmitigated accident analyses assumed a Leak Path Factor of 1.0 and were performed assuming no active or passive confinement ventilation systems. The DSA does not identify any hazard events, including Natural Phenomena Hazard (NPH) events that need to have the evaporator active confinement ventilation system (or any passive ventilation) 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 low radiological and chemical consequences to both the on-site and off-site receptors from the postulated events.

In accordance with the DOE 2004-2 evaluation guidance as requested by ORP, Washington River Protection Solutions (WRPS) evaluated the active K1 ventilation system at the 242-A Evaporator Facility 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. Three gaps were identified between the SS criteria and the existing system. An upgrade to the K1 exhaust is planned. Following the planned modification, only two gaps were identified between the SS criteria and the expected ventilation system design.

The first gap following the planned modification being that the underground ductwork may not withstand a seismic event was discretionary and modifications to address these gaps would provide limited, if any, overall dose reduction, a cost/benefit analysis was not performed to replace the underground ducting.

The second gap being that the proposed modification does not include provision for a deluge system. A revision to the FHA is required for the modification. The revised FHA will document any gaps with DOE-STD-1066 and ORP approval will be required for any associated equivalency(s) and/or exemption(s). It is expected there will be a gap as the planned modification does not include an automatic or manual deluge system or associated features like automatic fire detection, demisters, water drains, and lighting and window viewing ports. The release consequences from the facility fire are low and do not require SC or SS controls. Inclusion of the deluge system is expected to increase the project cost by over one million dollars, will significantly increase the life cycle cost of the facility and introduce the potential for flooding from inadvertent system activation or leaks, and worker exposure from routine operations to maintain the deluge system. The expected increased cost and worker risk would not be offset by any marginal increase in radiological control benefit from a deluge system. Additionally, the ventilation upgrade project is being accomplished with American Recovery & Reinvestment Act (ARRA) funding, so any significant delay in project start by a change in requirements to include a deluge system, might jeopardize the ARRA funding window, and preclude the planned upgrade to the ventilation system

Based on the discussions above, and the DSA analyses supporting a general service system, the Facility Evaluation Team recommends that no action be taken to modify the scope of the planned modification.

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Abbreviations and Acronyms

AC	Administrative Control
ALARA	As Low As Reasonably Achievable
ARRA	American Recovery & Reinvestment Act
CAM	Continuous Air Monitor
CW	Co-located Worker (100 meters)
DBA	Design Basis Accidents
DNFSB	Defense Nuclear Facilities Safety Board
DOE	Department of Energy
DSA	Documented Safety Analysis
DST	Double Shell Tank
EC	Evaluation Criteria
EG	Evaluation Guideline
HA	Hazard Analysis
HEPA	High Efficiency Particulate Air
MAR	Material at Risk
MCC	Motor Control Center
NPH	Natural Phenomena Hazard
PC	Performance Category
REM	Roentgen Equivalent Man
SC	Safety Class
SMP	Safety Management Program
SS	Safety Significant
SSC	Structures Systems and Components
TEDE	Total effective dose equivalent
TPC	Total Project Cost
TSR	Technical Safety Requirements
WRPS	Washington River Protection Solutions

1.0 INTRODUCTION

1.1 EVAPORATOR SYSTEMS OVERVIEW

Radioactive waste was received and stored in the tank farms in liquid form. The 242-A Evaporator is designed to reduce waste volume and the number of Double Shell Tanks (DSTs) required to store liquid waste generated at the Hanford Site. The process uses a conventional, forced-circulation, vacuum evaporation system operating at low pressure (approximately 60 Torr) and low temperature (approximately 50 °C [122 °F]) to concentrate radioactive waste solutions. The 242-A Evaporator has active ventilation systems. The ventilation systems work in concert with the facility floor plan (zones) to direct airflow from areas of lesser contamination potential to areas of greater contamination potential. Airlocks separate potentially contaminated areas from non-contaminated areas. Exhaust air passes through a cleanup system consisting of two stages of HEPA filters to ensure that releases meet DOE guidelines established in DOE O 5400.5 and are as low as reasonably achievable (ALARA).

1.2 EVAPORATOR VENTILATION SYSTEM

Operating the 242-A Evaporator generates several different waste streams including gaseous effluents. The K1 ventilation system services contaminated areas of the 242-A Building. Provisions are required to maintain confinement pressure differentials within the facility and to ensure that discharges of radioactive materials meet applicable regulations. The K1 exhaust stream is HEPA filtered, monitored for the presence of radioactive materials, and sampled to ensure that release limits are not exceeded.

The K1 ventilation system performs two safety functions: (1) maintains contaminated areas at a negative pressure relative to atmospheric and (2) filters and monitors exhaust air to ensure releases of radioactive and hazardous materials are within guidelines and ALARA.

The K1 ventilation system services the following contaminated or potentially contaminated areas:

- Evaporator room
- Pump room
- Load-out and hot-equipment storage room
- Condenser room
- Ion exchange room
- Loading room

The flow distribution to the rooms is shown in Figure 1 and Figure 2.

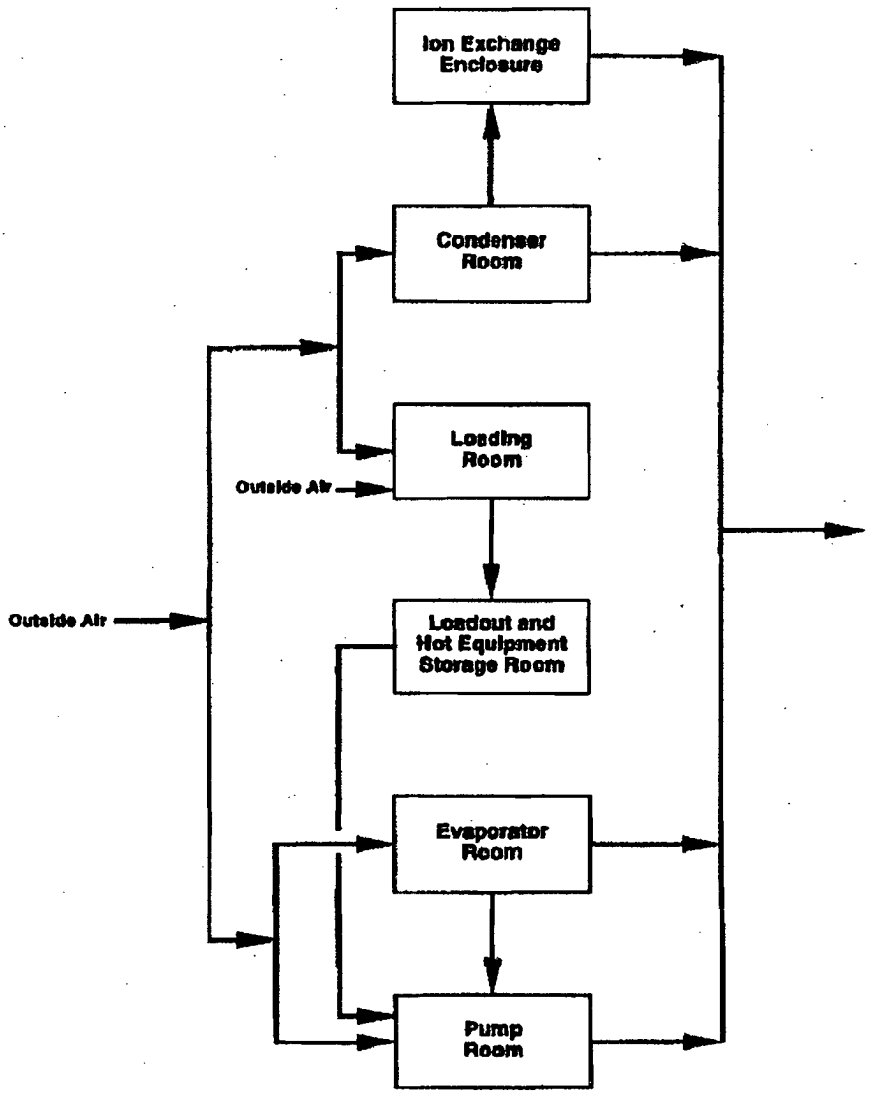

Figure 1 242-A Evaporator Building K1 Ventilation System Flow Distribution (Typical)

Note: Arrangement is representative of 242-A Evaporator Building.

systems documentation was reviewed to confirm system configuration. The system was then evaluated against the criteria in Table 5.1; as documented in Attachment 2.

Because the gap related to the underground ductwork to withstand a seismic event was discretionary and modifications to address these gaps would provide limited, if any, overall dose reduction, a cost/benefit analysis was not performed to replace the underground ducting.

As discussed in Table 5.1, a revision to the FHA is required for the modification. The revised FHA will document any gaps with DOE-STD-1066 and ORP approval will be required for any associated equivalency(s) and/or exemption(s). A rough order of magnitude cost estimate was performed for adding a deluge system to the planned modification. The design and installation was estimated at $1.1 M (WRPS estimate #2654). This does not include costs for cold weather protection and the significantly increased lifecycle cost for surveillance of the system. Additionally, a deluge system will introduce the potential for flooding from inadvertent system activation or leaks, and worker exposure from routine operations to maintain the deluge system.

Because these gaps are discretionary, the facility evaluation team does not recommend any change to the planned modification. The expected increased cost and worker risk would not be offset by any marginal decrease in radiological dose reduction. Additionally, the ventilation upgrade project is being accomplished with ARRA funding, so any significant delay in project start by a change in scope to address the discretionary gaps might jeopardize the ARRA funding window, and preclude the planned upgrade to the ventilation system

4.0 CONCLUSION

The 242-A Evaporator Facility has an active K1 ventilation system that is functionally classified as general service and meets the PC-1 criteria for applicable NPH events. This functional classification is based upon the low radiological and chemical consequences to both the 100-meter on-site and off-site receptors from the postulated events as evaluated in the 242-A Evaporator DSA (References 1). The unmitigated accident analyses assumed a Leak Path Factor of 1.0 and were performed assuming no active or passive confinement ventilation system.

The Facility Evaluation Team evaluated the K1 ventilation system and the proposed K1 exhauster upgrade (Reference 2) at the 242-A Evaporator Facility in accordance with the Reference 7, using the SS Table 5.1 criteria based on the Hazard Category 2 inventory levels in the evaporator. PC-2 criteria were used to assess functionality for applicable NPH events. The evaluation identified three gaps between the existing system design and the evaluation criteria and two gaps between expected ventilation system following the planned modification and the evaluation criteria. Based on the discussions above, and the DSA analyses supporting a general service system, the Facility Evaluation Team recommends that no action be taken to modify the scope of the planned modification

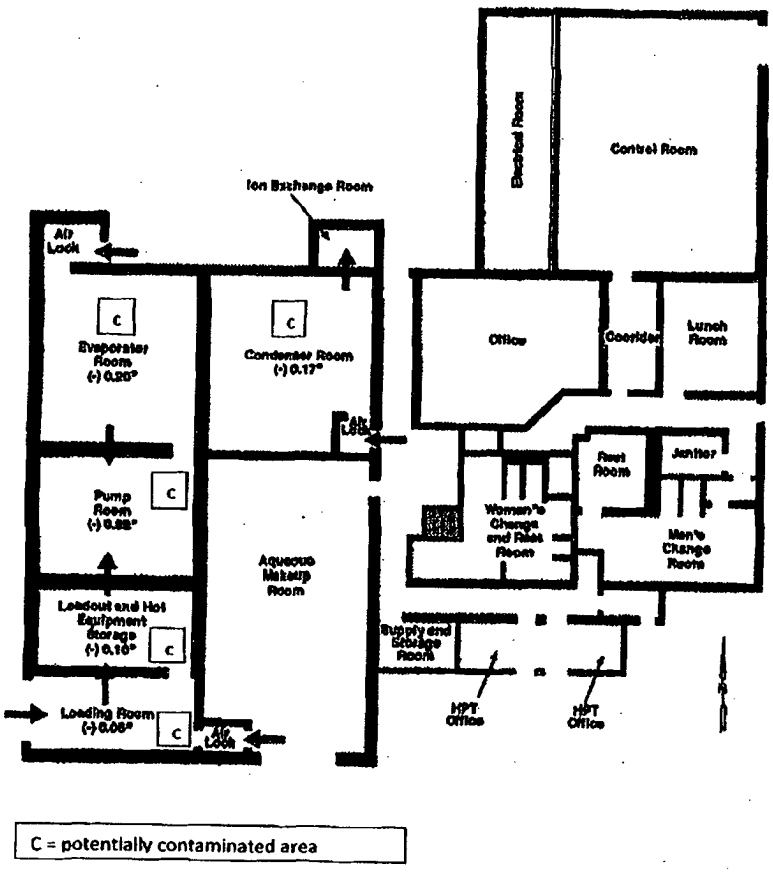

Figure 2 242-A Evaporator Building Negative Air Pressure Maintenance (Typical)

Note: Arrangement is representative of 242-A Evaporator Building. Arrows indicate direction of flow

The K1 ventilation system includes an air supply system and an air exhaust system. The primary components of the K1 ventilation system are listed below and shown in Figure 3:

- Preheat coil K1-2-1
- Roll filter (prefilter) K1-7-1
- Bag (final) filter K1-11-1
- Supply fan K1-5-1
- Electric heater HTR-K1-4-2
- Cooling coil K1-3-1
- Reheat coils K1-4-1 and K1-4-7
- Prefilters K1-15-1 and K1-15-2
- HEPA filters K1-6-1 through 4
- Automatic dampers K1-FD-1-1 and K1-FD-1-2
- Exhaust fan K1-5-2
- Exhaust fan K1-5-3
- Evaporator room recirculation fan K1-9-1 (not shown).

The K1 ventilation system is a once-through air system. The K1 supply fan (K1-5-1) supplies outside air throughout the ventilated areas as shown in Figure 1. The ion exchange room is empty; the condenser room contains the condensers and condensate collection tank; the loading room contains no installed equipment; the load-out and hot equipment storage room contains sampling equipment for sampling the evaporator feed and process slurry; the evaporator room contains the evaporator vessel; and the pump room contains the recirculation pump, slurry pump, and process jumpers. Negative air pressure is maintained in K1 serviced areas as shown in Figure 2. Air is drawn through two parallel two-stage HEPA filter enclosures and discharged through an elevated stack by one of two K1 exhaust fans (K1-5-3 or K1-5-2). The discharge stack is equipped with stack sampling system record sampler and Continuous Air Monitor (CAM).

The exhaust portion of the K1 ventilation system consists of exhaust ducts that draw the air out of the various areas served by the K1 system. The exhaust ducts join at a common header that serves as the inlet to two HEPA Filter Units. The HEPA Filter Units are identical, each consisting of manual inlet and outlet dampers, a pre-filter, and two stages of HEPA filters. During normal operation, both filter units are in service. Each HEPA 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 K1 Exhaust Fans. Both fans feed exhaust air to a single stack that is equipped with air sample stack monitoring equipment. The exhaust fans are powered from a motor control center (MCC) that can receive backup power from a diesel generator. The K1 exhauster is shown in Figure 4.

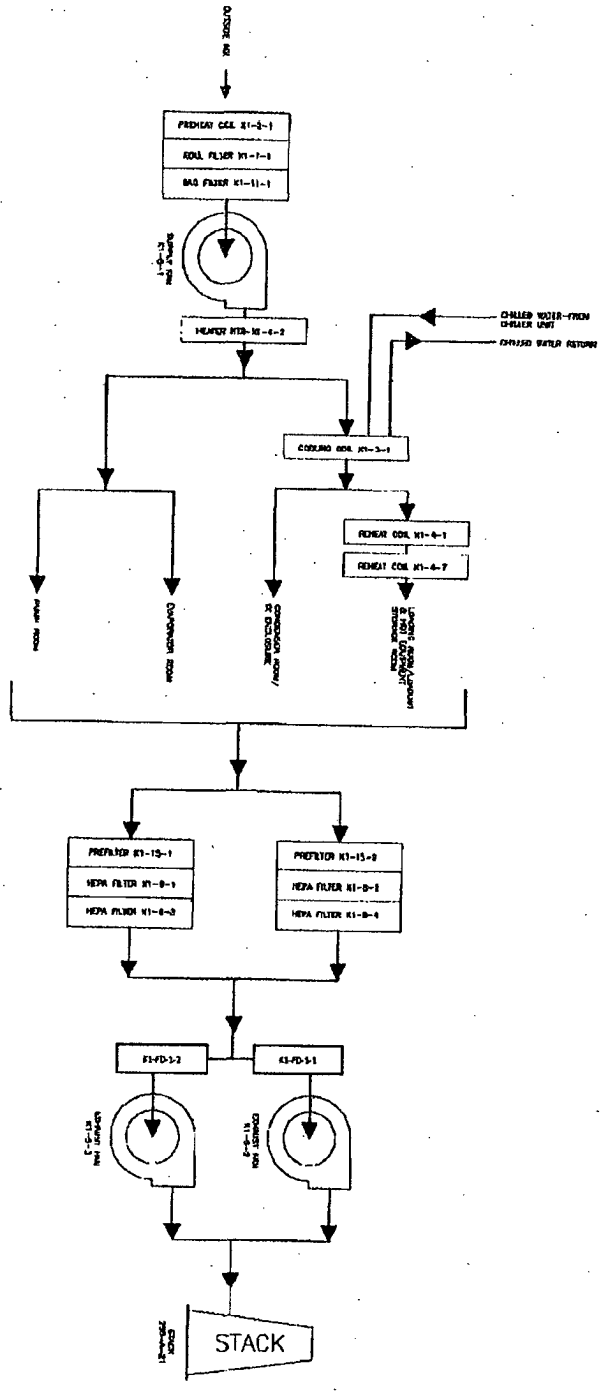

Figure 3 242-A Evaporator K1 Ventilation System Components

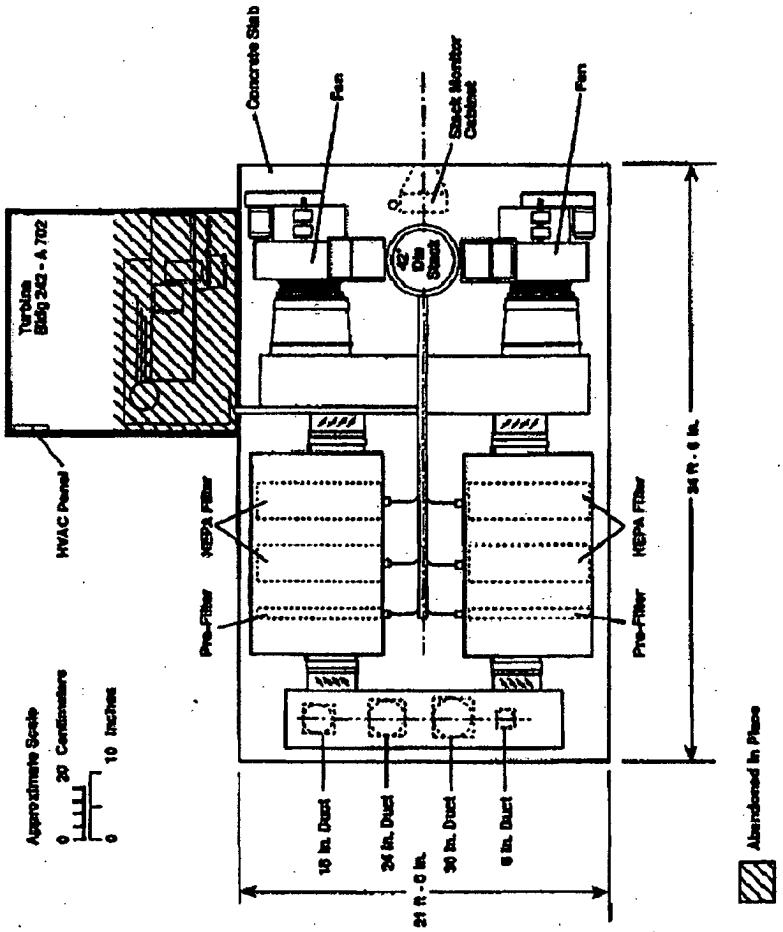

Figure 4 242-A Evaporator Exhauster

The K1 ventilation system is equipped with several status signals:

- High CAM activity
- CAM low flow
- CAM failure
- Record sample low flow
- high and low differential pressure across the HEPA filters
- low exhaust flow rate

The K1 ventilation system contains sufficient instrumentation to monitor and control air flows 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 the standby unit in the event of failure of the operating component.

1.3 MODIFICATIONS

The 242-A Evaporator has been in operation for over 30 years. The facility is expected to continue with service for many more years. Evaporator upgrades have been identified which will extend the life of the facility to support the mission. One such upgrade involves the K1 exhaust system. The K1 exhaust system has provided building ventilation and contamination control since the 1970s. Several components of this exhaust system will be replaced as part of an ongoing facility life extension program. The K1 exhaust upgrade will be conducted as part of the overall Tank Farm ARRA project. Upgrades to the supply side of the K1 system were conducted and completed during Phase I of Project E-528, in fiscal years 2007 and 2008.

The K1 exhaust system upgrade replaces all exhaust equipment downstream of the underground ventilation duct as shown in Figure 5. The underground duct, not part of the scope of the modification, shown in Figure 5 is comprised of 4 sections that connect to a single inlet manifold header. This header is located north of the evaporator room. The upgrade will be conducted in three stages. Stage I involves the design and procurement of all major components excluding the inlet manifold header. These components will be assembled and factory acceptance tests will be conducted in accordance with Reference 2. Stage II is for work scope conducted at the 242-A Evaporator to install all components of the K1 exhaust upgrade including connections to facility electrical services and facility control systems and monitoring systems. Stage II work scope will include the inlet manifold duct design, fabrication and field installation activity. Stage II will be performed in accordance with Reference 3. Stage III involves operational acceptance testing (OAT). The OAT for the K1 exhaust upgrade will be prepared and performed by Washington River Protection Solutions (WRPS).

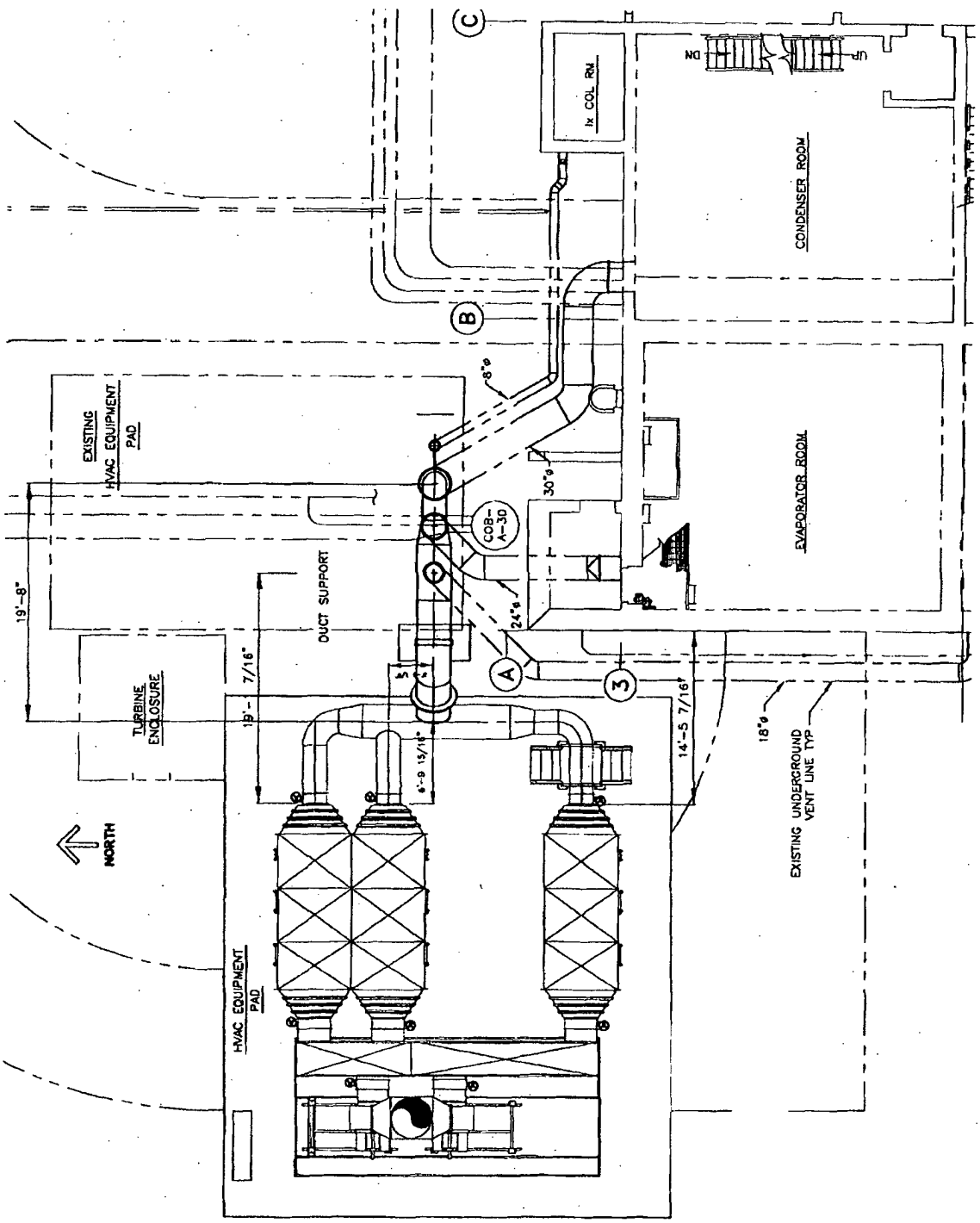

Figure 5 242-A Evaporator K1 Exhauster (Upgrade)

Components of the K1 exhaust upgrade include:

- Support bases
- Ductwork
- Isolation valves
- Dampers
- Filter train assembly
- Common switching plenum
- Exhaust fan and motor
- Stack
- Power Distribution System
- Instrumentation
- Stack Sampling and Monitoring System
- Permanent Stack Platform

In addition, the upgrade includes the following required and anticipated modifications to the original system configuration:

- A fire screen will be added to the inlet duct
- A third HEPA filter housing will be added
- HEPA filter instrumentation design will be changed from the use of separate pressure switches (for control room alarms) and pressure indicators (for local indication) to a single combined pressure differential indicator transmitter which indicates locally and sends a signal to the remote monitoring and control system.

The upgrade will not alter the function and operating parameters of the K1 system. The nominal system flow rate will remain at or near the rate described in Reference 4.

2.0 FUNCTIONAL CLASSIFICATION ASSESSMENT

2.1 EXISTING CLASSIFICATION

The active K1 confinement ventilation system in the 242-A Evaporator is functionally classified as general service.

2.2 EVALUATION

There are no safety significant (SS) or safety class (SC) functions for the existing K1 ventilation system associated with the 242-A Evaporator. The K1 ventilation system is not credited by the 242-A Evaporator DSA to operate during or following any design basis accident (DBA) events, including natural phenomena hazard (NPH) events.

The methodology used in the DSA for hazard analysis is based on the safety analysis and risk assessment handbook (SARAH) Reference 6. The purpose of the hazards analysis was to identify and assess the significance of a comprehensive set of potential hazardous conditions for the 242-A Evaporator. From this set of hazardous conditions, representative and bounding sets of accidents were selected for further analysis; the result is a comprehensive set of controls. In accordance with the SARAH, the hazards analysis was performed as an unmitigated hazards analysis. Hazards that can contribute to the uncontrolled release of radioactive or hazardous materials (called hazardous conditions) were systematically and comprehensively identified through the hazards analysis process. Results of this accident analysis were used to identify safety-related structure system and components (SSCs) for the appropriate accidents and hazardous conditions identified.

The risk of hazardous conditions on three potential receptors was estimated: (1) the maximally exposed offsite individual (MOI), a value integrated around all directions at the actual site boundary distance; (2) a person located 100 m from the facility (co-located worker, or CW); and (3) the facility worker (FW).

The DSA did not identify any evaporator events that challenge the Evaluation Guideline of 25 rem total effective dose equivalent (TEDE) for the MOI (where 1 rem is considered to be challenging the evaluation guideline) or the radiological consequences to the collocated worker when calculated and compared to the 25 rem TEDE evaluation guideline for "moderate" consequences and the 100 rem TEDE evaluation guideline for "high" consequences (SARAH).

The bounding accident events described in the DSA include:

- SPILL from the C-A-1 evaporator vessel releasing its contents. This bounding accident results in an unmitigated dose consequence of 3.7 rem to the CW and 3.3 mrem for the MOI. The risks to the CW and MOI are sufficiently low to not warrant additional credited controls to lower risk. The risk to the FW is considered high and requires significant reduction by the consideration of safety-significant SSCs and/or TSRs. FW safety is achieved through implementation of the identified SSC's TRS-ACs, and defense in depth controls described in the DSA. (Note: In practice, personnel are restricted from entering the evaporator room when the 242-A Evaporator is operating.) The K1 ventilation is not credited in this accident as a control risk reduction feature for the FW. Therefore the K1 ventilation system is appropriately classified as general service for the bounding spill accident.

- Fire in the evaporator room. This bounding accident results in an unmitigated cumulative dose consequence of 9.8 rem to the CW and 30 mrem for the MOI. Consequences to the FW were qualitatively determined not to be significant. Therefore, there is no need for safety-significant SSCs, or for TSR level AC controls. Worker safety is primarily achieved through implementation of emergency response requirements. Declaring the 242-A evaporator room and pump room walls, floors, and cover blocks a safety significant design feature also provides protection for FW personnel. Furthermore, workers are restricted from being in the proximity of vessel C-A-1 when the evaporator is charged. The K1 ventilation is not credited in this accident as a control risk reduction feature. Therefore the K1 ventilation system is appropriately classified as general service for the bounding fire accident.

- DEFLAGRATION or DETONATION in the evaporator headspace. This bounding accident results in an unmitigated cumulative dose consequence of 21 rem to the CW and 63 mrem for the MOI. The risk to the MOI is considered not significant. The risk for the CW and FW are considered moderate and requires reduction by the consideration of SSCs, TSR-ACs, and defense in depth controls. Further facility worker safety is provided by TSR-AC requirement that restricts workers from being in the proximity of vessel C-A-1 when the evaporator is charged. FW and CW safety is achieved through implementation of the identified SSC's, TRS-ACs, and defense in depth controls described in the DSA. The K1 ventilation is not credited in this accident as a control risk reduction feature for the FW or CW. Therefore the K1 ventilation system is appropriately classified as general service for the bounding deflagration or detonation accident.

2.3 SUMMARY

The general service functional classification of the K1 confinement ventilation systems for 242–A Evaporator is appropriate.

3.0 SYSTEM EVALUATION

WRPS evaluated the K1 confinement ventilation systems at the 242-A Evaporator Facility in accordance with Reference 7. Tables 4.3 (Attachment 1) was developed from the 242-A Evaporator DSA events. Systems were evaluated and documentation was reviewed to confirm system configuration by the associated System Engineer for the evaporator. System configurations were evaluated against the criteria in Table 5.1, as requested by ORP, and documented in Attachment 2.

3.1 IDENTIFICATION OF GAPS

This assessment evaluated the ventilation systems and supporting SSCs in the 242-A Evaporator Facility against SS/PC-2 criteria. The methodology and events chosen were previously documented in Table 4.3.

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. This evaluation involved the existing K1 system and the proposed K1 exhauster upgrade.

When developing Table 5.1, the following 242-A Evaporator DSA events were considered:

- Evaporator bounding spill event
- Evaporator fire in the evaporator room
- Evaporator deflagration or detonation in the evaporator vessel
- Credible NPH events (wind, seismic, snow loading, volcano/ashfall loading)

The following is a summary of the Table 5.1 evaluation criteria (EC) discretionary gaps for the 242-A Evaporator ventilation system and existing K1 exhauster:

Criteria: Confinement ventilation systems should withstand credible fire events and be available to operate and maintain confinement

Gap: The K1 ventilation system does not include ember screens or a manual or automatic deluge system, nor is it separated from the facility by a fire wall as required by DOE-STD-1066. The gap to DOE-STD-1066 requirements for a deluge system includes automatic fire detection, demisters, water drains and lighting and window viewing ports. However, the ventilation system is not credited in the DSA to operate or maintain confinement integrity during or following any DBA events.

Criteria: Confinement ventilation systems should safely withstand earthquakes

Gap: The underground ductwork and the above grade portions of the exhaust system may not withstand seismic loading, however the evaporator ventilation systems are not credited in the DSA to perform any safety function during or following a seismic event

Criteria: Design supports the periodic inspection & testing of filters and housing, and test & inspections are conducted periodically.

Gap: The current design does not include test connections that allow the HEPA filter banks to be tested individually.

The 242-A Evaporator K1 exhauster upgrade includes provisions for ember screens, individual test ports for HEPA banks, and PC-2 loading. This eliminates one of the gaps and reduces the scope of the other two. The following is a summary of the Table 5.1 evaluation criteria (EC) discretionary gaps following the K1 exhauster upgrade:

Criteria: Confinement ventilation systems should withstand credible fire events and be available to operate and maintain confinement

Gap: A revision to the FHA is required for the modification. The revised FHA will document any gaps with DOE-STD-1066 and ORP approval will be required for any associated equivalency(s) and/or exemption(s). It is expected there will be a gap as the planned modification does not include an automatic or manual deluge system or associated features like automatic fire detection, demisters, water drains, and lighting and window viewing ports. However, the ventilation system is not credited in the DSA to operate or maintain confinement integrity during or following any DBA events.

Criteria: Confinement ventilation systems should safely withstand earthquakes

Gap: Following the modification, the only portion of the ventilation system that may be vulnerable to seismic event is the underground duct work as it is not within the scope of the modification. However the evaporator ventilation systems are not credited in the DSA to perform any safety function during or following a seismic event.

3.2 GAP EVALUATIONS

The 242-A Evaporator K1 ventilation system was compared with SS system performance criteria listed in Table 5.1 of Reference 7. In order to perform this evaluation, ventilation and support

5.0 REFERENCES

1. HNF-14755, Documented Safety Analysis for the 242-A Evaporator, Rev. 2-B, Washington River Protection Solutions, May 2009.
2. RPP-SPEC-36062, Procurement Specification for the 242-A Evaporator K1 Exhaust Ventilation System, Rev. 0, Washington River Protection Solutions, Richland, Washington, July 2009.
3. Requisition # 197877, Statement of Work, BMA #30519: 242-A K1 Ventilation Upgrade Installation Design, Washington River Protection Solutions, Richland, Washington, November 2009.
4. H-2-830594, Sht. 2, 242-A Evaporator HVAC P & ID, Rev. 4, US Department of Energy, Office of River Protection, April 2009.
5. 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
6. HNF-8739, Hanford Safety Analysis and Risk Assessment Handbook (SARAH), Rev. 1, Fluor Hanford, Richland, Washington, December 2004
7. 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.
8. Radiation Protection of the Public and the Environment, DOE Order 5400.5, U.S. Department of Energy, Washington, DC, February 1990.

Attachment 1

2004-2 Common Table 4.3 for 242-A Evaporator Ventilation System

Table 4.3 Confinement Documented Safety Analysis Information										
242-A Evaporator K1 Ventilation System				Hazard Category 2				Performance Expectations		
Bounding Accidents	Containment Type		Doses Unmitigated/ Mitigated MOI = Offsite CW = Onsite	Containment Class			Safety Function	Functional Requirements	Performance Requirements	Compensatory Measures
	Active	Passive		SC	SS	DID				
3.4.2.1 Bounding Spill Event. [1]	None credited	None credited (LPF=1.0)	Unmitigated **MOI < 0.1 rem CW = 3.7 rem** Mitigated **MOI < 0.1 rem CW = 3.7 rem**	None Required	None Required	None Required	No credit is taken for confinement by the K1 ventilation system in this scenario.	NA	NA	NA
3.4.2.2 Fire in Evaporator Room. [2]	None credited	None credited (LPF=1.0)	Unmitigated **MOI < 0.1 rem CW = 9.8 rem**[3] Mitigated **MOI < 0.1 rem CW = 9.8 rem**[3]	None Required	None Required	None Required	No credit is taken for confinement by the K1 ventilation system in this scenario.	NA	NA	NA
3.4.2.3 Deflagration or Detonation in Evaporator Vessel.[4]	None credited	None credited (LPF=1.0)	Unmitigated **MOI < 0.1 rem CW = 21 rem** Mitigated **MOI < 0.1 rem CW = 21 rem**	None Required	None Required	None Required	No credit is taken for confinement by the K1 ventilation system in this scenario.	NA	NA	NA

[1] Seismic event collapses 242-A Building structure damaging an evaporator room roof cover block and causing it to fall on the C-A-1 vessel releasing the C-A-1 vessel contents. This scenario bounds all spill/leak incidents caused by mechanical, external, and natural phenomena based initiators that can cause loss of containment of the slurry in the C-A-1 vessel.

[2] Ignition of transient combustibles in evaporator room cause gaskets to fail, slurry to leak, and the contaminated air or stream to be dispersed. This scenario bounds all non-deflagration or detonation fire incidents caused by mechanical, external, and natural phenomena based initiators.

[3] Previously reported consequences of 3.2 rem. were recalculated in the safety basis amendment to update the 242-A Evaporator room fire accident {Ref: CH2M-0801446 and 08-NSD-33}

[4] Flammable gas accumulates in the evaporator vessel due to a loss of vacuum with ignition from an unidentified initiator. The evaporator vessel is damaged, slurry is released into the air, and the contaminated air is dispersed. This scenario bounds all deflagration, detonation, and explosion events caused by mechanical, external, and natural phenomena based initiators

Attachment 2

2004-2 Table 5.1, 242-A K1 Ventilation System Performance Criteria

2004-2 Table 5.1, 242-A K1 Ventilation System Performance Criteria		
Evaluation Criteria	**Discussion**	**Reference**
1 - Ventilation System – General Criteria		
Pressure differential should be maintained between zones and atmosphere.	The K1 ventilation system is designed to maintain the evaporator room and pump room at a lower pressure relative to the environment for normal operating conditions. These rooms are monitored by PDIT-K1-304, -304A and -305 to ensure differential pressure are maintained within the limits. The K1 ventilation system meets section 2.2.9 of DOE-HDBK-1169 References H-2-830594, Sht. 2 Gap Analysis No gap Change following Modification None References RPP-SPEC-36062, Section 3.1.2 and Appendix E "P&ID Design Sketches" Gap Analysis No gap.	**DOE-HDBK-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 K1 Ventilation exhaust duct is 16-gauge galvanized steel up to the fan. The HEPA filter housings are standard stainless steel Flanders construction. Exhaust fans are constructed of galvanized carbon steel. A portion of the K1 ventilation exhaust duct is underground. These ducts are 8, 18, 24, and 30 in. in diameter and meet at a common header at the equipment pad. The ducts are schedule 10-gage black steel pipe. The design and materials of exterior construction are compatible with the outdoor conditions typically experienced in the northwestern United States. The materials of construction are compatible with the conditions expected following abnormal conditions or accidents involving spill of process fluids. There are no other toxic materials or acids in the airstream that will damage the ventilation equipment. The current K1 system has operated with no signs of material degradation. References H-2-69295, H-2-69297, H-2-69299 Sht. 1, HNF-14755 Section 2.6.1.1 Gap Analysis No gap Change following Modification The ducting for the above grade portion of the ventilation exhaust system from the plenum up to the stack will be stainless steel. References RPP-SPEC-36062, Section 3.2.1 and Section 3.3.2 Gap Analysis No gap.	**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 K1 ventilation system was designed for normal and abnormal operations. Although it is not credited in the DSA to operate or maintain confinement integrity during or following any DBA event, including NPH events, conditions expected following the various spill events will not impact the K1 ventilation exhaust system as the materials of construction are compatible with the process fluid. In the event of a loss of normal power the ventilation system exhaust and supply fan shutdown (K1-5-3 and K1-5-1 respectively) and the VCS continues to operate and enables the backup exhaust fan (K1-5-2) to operate on backup power with continued flow through the HEPA filters. Since the supply fan (K1-5-1) is not on backup power, the pressure in the pump and evaporator rooms is maintained negative. If backup power is disabled, control dampers fail in a safe position to ensure the pressure in the pump and evaporator rooms is maintained negative. Additionally, the K1 ventilation system is not impacted by deflagration in the evaporator vessel as that is exhausted by the vessel vent system. Impacts to the system from Fire and NPH events are discussed later. Reference	**DOE-HDBK-1169 (2.4) ASHRAE Design Guide**

2004-2 Table 5.1, 242-A K1 Ventilation System Performance Criteria		
Evaluation Criteria	**Discussion**	**Reference**
	HNF-14755, Section 2.4.2.1.5.1 Gap Analysis No gap. Change following Modification None References RPP-SPEC-36062, Section 3.2.5 Gap Analysis No gap.	
Confinement ventilation systems shall have appropriate filtration to minimize release.	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 and ASME N510. The flow capacity of the HEPA filters is 1000 cfm at pressure differential of 1" wg. The K1 ventilation system is not credited to operate or maintain confinement integrity during or following any DBA event, thus the accident analysis makes no assumptions regarding decontamination factors for the HEPA filters. Exhaust HEPA Cabinet and Filter 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, separator less, with extractor clips, 3/4" deep channel filled with fluid sealant upstream, SST faceguards both sides. HEPA Filter Specifications Flanders Nuclear Grade HEPA Filter, HNF-S-0552 HEPA Filter Performance Testing In-place leak testing of HEPA filter installation is performed in accordance with Maintenance Procedure 3-VBP-656, "242-A Evaporator HEPA Filter In-Place Leak Test (Aerosol Test)". In-place leak testing is performed annually 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. The HEPA filters are replaced when needed based on results of testing. Reference HNF-S-0552, RPP-16922 Section 14.7.3, 3-VBP-656, RPP-11413, RPP-CALC-34584 Gap Analysis No gap. Change following Modification The above grade portion of the ventilation exhaust system will be fabricated and assembled to meet the requirements of ASME N509-2002, ASME N510-1989, and ASME AG-1. The SPEC calls out a filter housing that will accept Nuclear Grade HEPA filters sized 24" x 24" x 11-1/2", fluid seals. The HEPA filter housing will be a 3 x 3 filter array, style Bag-In/Bag-Out, with filter extractors. HEPA filter housing will be constructed of stainless steel. Engineering calculation will determine required gage thickness. The new filter housing is total (100%) welded construction. The filter housing will be designed to be pressure decay leak tested to meet the requirements of ASME N510, Section 6 to not exceed 0.1% of the housing volume per hour at the system leak test pressure as defined in ASME AG-1 for leakage Class I (Table SA-B-1310). HEPA filter element holding frames at each filter position will be designed to be pressure decay leak tested in accordance with the requirement of ASME N510, Section 7 to not exceed 0.1% of the housing volume per hour at the system leak test pressure as defined in ASME AG-1 for leakage Class I (Table SA-B-1310). The flow capacity of the Nuclear Grade HEPA filters is 1250 – 1500 cfm at 1.3" wg initial pressure differential. References RPP-SPEC-36062, Section 3.1 and Section 3.3.2	**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-A K1 Ventilation System Performance Criteria		
Evaluation Criteria	**Discussion**	**Reference**
	Gap Analysis No gap.	
2 - Ventilation System – Instrumentation & Control		
Provide system status instrumentation and/or alarms.	The K1 ventilation system is instrumented with alarms in the control room for high HEPA filter dP and loss of fan power (motor not running). The K1 ventilation system pressures are monitored locally via routine operator rounds and also alarmed and displayed on the ventilation control system (VCS). Reference H-2-830594, Sht.5, TO-620-020, TF-OR-PWR-03, ARP-T-601-VCS, A-2 Gap Analysis No gap. Change following Modification The new system will additionally allow for information only monitoring of ventilation pre-filter and HEPA filter differential pressure readings on the Evaporator Monitoring and Control System (MCS). References RPP-SPEC-36062, Section 3.3.4 and Appendix E "P&ID Design Sketches" Gap Analysis No gap.	**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 K1ventilation system are equipped with a supply fan that is interlocked (hardwire and software) to shutdown on loss of power to the exhaust fans (K-5-3) or increased pressure in the evaporator or pump rooms. Low pressure alarms for 1st and 2nd stage HEPA filters will notify operators of filter breakthrough.. Reference H-2-830594, Sht. 5, HNF-14755 Section 2.5.9.8.5. Gap Analysis No gap. Change following Modification None References RPP-SPEC-36062, Section 3.1.4 and Section 3.3.4 Gap Analysis No gap.	**DOE-HDBK-1169 ASHRAE Design Guide (Section 4)**

2004-2 Table 5.1, 242-A K1 Ventilation System Performance Criteria		
Evaluation Criteria	**Discussion**	**Reference**
Post accident indication of filter break-through.	The K1 ventilation system has an installed Continuous Air Monitor (CAM) to detect increased levels of radiation in the exhaust stack. CAM indications and alarms are monitored on the MCS. Pressure differential across the HEPA filters is indicated at gages located locally and is monitored on the MCS. Although it is not credited in the DSA to operate or maintain confinement integrity during or following any DBA event, including NPH events, local monitoring of HEPA filter pressure differential is expected to be available. The K1 Ventilation System has indication of filter break through (post accident) and meets the intent of DNFSB Tech 34. References FF-01 Record Sampler, H-2-830594, Sht. 2 Gap Analysis No gap Change following Modification None References RPP-SPEC-36062, Section 3.3.4 Gap Analysis No gap	**DNFSB Tech 34**
Reliability of control system to maintain confinement function under normal, abnormal and accident conditions.	In addition to local monitoring, the K1 ventilation system has automatic control features and interlocks. Although the evaporator cell ventilation system is not credited for operating during or after a DSA accident, the control system is expected to be available. The control system is powered by the backup power supply source in the event of loss of normal power. Additionally, the ventilation system has the capability to be operated manually and during loss of air supply the damper actuator control arm can be manually moved and locked in place with adjusting screw. Reference H-2-830594 Sht. 5, HNF-14755 Section 2.5.9.8.5 and Section 4.4.1. Gap Analysis No gap Change following Modification None References RPP-SPEC-36062 Section 3.3.4 and Appendix E "P&ID Design Sketches" Gap Analysis No gap.	**DOE Nuclear Air Cleaning Handbook 1169 Section 2.4 ASME AG-1**

2004-2 Table 5.1, 242-A K1 Ventilation System Performance Criteria		
Evaluation Criteria	**Discussion**	**Reference**
Control components should fail safe.	Exhaust fan K1-5-3 is the primary operating exhaust fan. In the event of a total loss of power, the ventilation system exhaust (K1-5-3) and supply (K1-5-2) fans will shutdown. The damper upstream of the backup exhaust fan (K1-5-2) is air operated fail open and the damper upstream of the other exhaust fan (K1-5-3) is air operated fail closed. Thus, the pressure in the pump and evaporator rooms is maintained negative. UPS provides power for instruments to ensure safe shutdown of the facility. Reference H-2-830594 Sht. 2 and Sht. 5, HNF-14755 Section 2.5.9.8.3 and Section 2.5.9.8.5 Gap Analysis No gap. Change following Modification The pneumatic dampers K1-FD-1-1 and K1-FD-1-2 will be replaced with electric actuated dampers. References RPP-SPEC-36062 Section 3.1.3.6, and Appendix B Gap Analysis No gap.	**DOE-HDBK-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 HEPA filter housings are constructed of stainless steel. The K-1 prefilters are designed to the requirements of UL 900 (Class1). These materials are resistant to the effects of fire events. The HEPA filters are designed to UL 586. The Fire Hazards Analysis (FHA) documents that the design of the filters will withstand the expected gas temperatures generated during Evaporator Room fire and ignition of the filters during an Evaporator Room fire is not expected. A fire in the Evaporator or pump room is expected to load the K1 exhaust HEPA filters to approximately half of the loading necessary to expose the HEPA filters to their burst pressure of 10 in. WG. [Ref: HNF-SD-WM-FHA-024, Section 6.1 and 6.4.10]. The FHA could not rule out the possibility that a burning brand (ember) could reach the filters, resulting in a burn through. The ventilation fans are located outdoors. These locations lack any significant combustible materials. The DSA (Table 3.3-11) documents the fire scenario (range fire) involving the 242-A Evaporator facility. The Fire Protection Program is allocated as a control to ensure that combustible materials are controlled to minimize the potential for fire in such locations. Although not credited in the FHA, the portions of the facility that contain combustibles are covered by a sprinkler system. The K-1 ventilation system does not include ember screens or an automatic or manual deluge system, nor is the filter plenum housing separated from the adjacent building by a fire wall. Reference HNF-14755 Section 3.4.2.2, HNF-WM-SD-FHA-024 Gap Analysis There is a gap as the K1 ventilation system does not include ember screens or an automatic or manual deluge system, nor is it separated from the facility by a fire wall as required by DOE-STD-1066. The gap to DOE-STD-1066 requirements for a deluge system includes automatic fire detection, demisters, water drains and lighting and window viewing ports. However, the ventilation system is not credited in the DSA to operate or maintain confinement integrity during or following any DBA events. Change following Modification An ember screen in the inlet damper assembly is specified to address the vulnerability related to filter burn through caused by embers. The fire screen will be located at least 20 feet upstream of the pre-filter. The pre-filter will be at least 36" upstream of the final HEPA filter. The filter enclosure will be approximately 15 feet from the nearest facility wall. References RPP-SPEC-36062, Section 3.1.2, Section 3.3.2.2. Note the fire screen is referenced in the K1 procurement specification. The design and installation activity associated with the fire screen will be performed to SOW, Requisition # 197877, "BMA #30519: 242-A K1 Ventilation Upgrade Installation Design".	**DOE-HDBK-1169 (10.1) DOE-STD-1066**

2004-2 Table 5.1, 242-A K1 Ventilation System Performance Criteria		
Evaluation Criteria	**Discussion**	**Reference**
	Gap Analysis A revision to the FHA is required for the modification. The revised FHA will document any gaps with DOE-STD-1066 and ORP approval will be required for any associated equivalency(s) and/or exemption(s). It is expected there will be a gap as the planned modification does not include an automatic or manual deluge system or associated features like automatic fire detection, demisters, water drains, and lighting and window viewing ports. However, the ventilation system is not credited in the DSA to operate or maintain confinement integrity during or following any DBA events.	
Confinement ventilation systems should not propagate spread of fire.	The 242-A evaporator and pump room ventilation system are vented in parallel. A fire in the evaporator or pump room (Medium Fire FHA Section 6.1) would be vented directly to the outside via the K1 HEPA filter banks and exhaust fans. The Fire Protection Program (e.g., fire detection and suppression systems) and TSR limits on combustible loading limits the probability of a damaging fire. The DSA (Table 3.3-11) documents that the FIR-2 is the credible fire scenario involving the evaporator and pump rooms. The ventilation system materials of construction are resistant to the effects of fire events. The exposed west wall of the 242-A Evaporator is 22 inch thick concrete, which exceeds the requirements of a 4 hr resistive barrier. Reference HNF-14755 Section 3.4.2.2 Gap Analysis No gap Change following Modification None References RPP-SPEC-36062, Section 3.3.2 Gap Analysis No gap	**DOE-HDBK-1169 (10.1) DOE-STD-1066**
4 - Resistance to External Events – Natural Phenomena – Seismic		

2004-2 Table 5.1, 242-A K1 Ventilation System Performance Criteria		
Evaluation Criteria	**Discussion**	**Reference**
Confinement ventilation systems should safely withstand earthquakes.	The 242-A Evaporator facility structure and foundation were designed and constructed to withstand a .25g seismic event and have qualitatively been evaluated to meet current PC-2 seismic criteria in TFC-ENG-STD-06. The safety significant facility structure does not include the K1 ventilation system filter housings or the K1 ventilation stack. The concrete slab on which the filter housing and fans are mounted and the underground ductwork may not withstand seismic loadings. The evaporator ventilation systems are not credited in the DSA to perform any safety function during or following a seismic event. Reference HNF-14755 , Section 2.4.2.1.5 Seismic Design and Section 4.4.1.2 System Description, TFC-ENG-STD-06 Gap Analysis There is a gap as the underground ductwork and the above grade portions of the exhaust system may not withstand seismic loading, however the evaporator ventilation systems are not credited in the DSA to perform any safety function during or following a seismic event. Change following Modification The above grade portion of the ventilation exhaust system shall be designed to meet the Performance Category (PC-2) structural loading requirements specified in TFC-ENG-STD-06 except for HEPA filter housings and HEPA filter frames which will meet the applicable requirements of ASME AG-1 References RPP-SPEC-36062 Section 3.2.5 and TFC-ENG-STD-06 Gap Analysis There is a gap. Following the modification, the only portion of the ventilation system that may be vulnerable to seismic event is the underground duct work as it is not within the scope of the modification. However the evaporator ventilation systems are not credited in the DSA to perform any safety function during or following a seismic event.	**ASME AG-1 AA** **DOE O 420.1B** **DOE-HDBK-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 Hanford Site does not have a design-basis tornado. References HNF-14755, Section 2.4.2.1.2 Tornado Loadings Gap Analysis No gap. Change following Modification None Gap Analysis No gap.	**DOE O 420.1B** **DOE-HDBK-1169 (9.2), Section 2.4 – Emergency Consideration**

2004-2 Table 5.1, 242-A K1 Ventilation System Performance Criteria		
Evaluation Criteria	**Discussion**	**Reference**
Confinement ventilation systems should withstand design wind effects on system performance.	The evaporator cell ventilation system was originally designed to withstand 70mph wind without impact to operation or the atmospheric reference header and has been evaluated to meet the PC-2 wind design load requirements of TFC-ENG-STD-06 and DOE-STD-1020-2002. References HNF-14755, Section 4.4.1, TFC-ENG-STD-06 Gap Analysis No gap. Change following Modification The above grade portion of the ventilation exhaust system including anchorages shall be designed to withstand PC-2 wind loads. A "Three-Second Gust Wind Velocity" of 91 mph, importance factor of 1.0, and exposure Category C shall be used for all wind design per TFC-ENG-STD-06. References RPP-SPEC-36062 Section 3.2.5.2, TFC-ENG-STD-06 Gap Analysis No gap.	**DOE O 420.1B DOE-HDBK-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.	Flooding is not considered a credible event for 200 East Area of the Hanford Site. The 242-A Evaporator structure has been evaluated to withstand ashfall loading (20 lb/ft^2) combined with snow loading (20 lb/ft^2). Analysis of the exterior portions of the ventilation system were not found as the criteria was not considered applicable for general service equipment and the evaporator cell ventilation systems are not credited in the DSA to perform any safety function during or following any other NPH event such as ash fall, or snow loads. However, the facility would receive at least two hours notice of significant snow accumulation or ash fall. TF-AOP-013 would trigger evaluation and shutdown of the evaporator if needed. The evaporator can be shut down in 30 minutes. References HNF-14755 Section 4.4.1, TF-AOP-013 Gap Analysis No gap. Change following Modification Snow loading per TFC-ENG-STD-06 is specified in the procurement specification. This will bound the ashfall loading. References RPP-SPEC-36062 Section 3.2.5.3, TFC-ENG-STD-06 Gap Analysis No gap.	**DOE O 420.1B DOE-HDBK-1169 (9.2), Section 2.4 – Emergency Consideration**
7 – Range Fires/Dust Storms		

2004-2 Table 5.1, 242-A K1 Ventilation System Performance Criteria		
Evaluation Criteria	**Discussion**	**Reference**
Administrative Controls should be established to protect confinement ventilation systems from barrier threatening events.	The 242-A Evaporator 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 areas external to the building are sprayed with pre-emergent herbicide in the fall and with post-emergent herbicide in the spring. The portion of the ventilation system that is external to the building is surrounded by a chain link fence to prevent transient combustibles (like tumbleweeds) from being blown into the area. The facility performs daily inspections of this area so any combustibles that are caught in the fence can be removed. There are no ignition sources adjacent to the filter frames. The site's emergency procedures and the facility's Event Response Program would further limit the effects of external barrier threatening events. If a range fire is determined to be headed towards site facilities, TF-AOP-007 will trigger evaluation and shutdown of the evaporator if needed. The evaporator can be shut down in 30 minutes. Similarly TF-AOP-008 covers dust storms. The evaporator cell ventilation systems are not credited in the DSA to perform any safety function during or following a range fire event. References HNF-14755, Section 3.4.2.2.4, TF-AOP-007, TF-AOP-008, TF-OR-A-02 Gap Analysis No gap. Change following Modification None. 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.	Each HEPA filter bank has two ½" quick disconnect type test connections for performance testing with aerosol. In-place leak testing is performed for this HEPA filter system in accordance with Site Engineering Standards. In-place leak testing of HEPA filter installation is performed in accordance with Maintenance Procedure 3-VBP-656, "242-A Evaporator HEPA Filter In-Place Leak Test (Aerosol Test)". In-place leak testing is performed annually 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. The HEPA filters are replaced when needed based on results of testing. References RPP-16922 Section 14.7.3, 3-VBP-656 Gap Analysis There is a gap as the current design does not include test connections that allow the HEPA filter banks to be tested individually. Change following Modification The new filter housing will be fitted with test sections that allow for HEPA filter banks to be tested individually. The filter housings/test sections shall be tested for air-aerosol mixing uniformity in accordance with the requirements of ASME N510, Section 9. Qualification testing of sampling manifolds shall be conducted in accordance with ASME AG-1, non-mandatory Appendix HA-D. Qualifications testing of challenge aerosol injection manifolds shall be performed in accordance with ASME N510, Section 9. Acceptance criteria shall be as given in ASME N510, Section 9. References RPP-SPEC-36062, Section 4.1.3 Gap Analysis No gap.	**DOE-HDBK-1169 (2.3.8), ASME AG-1, ASME N510**

2004-2 Table 5.1, 242-A K1 Ventilation System Performance Criteria		
Evaluation Criteria	**Discussion**	**Reference**
Instrumentation required to support system operability is calibrated.	The K1 ventilation instrumentation and control system (VCS) is equipped with manifold valves with calibration ports. A PM program and calibration frequencies have been established for the 242-A Evaporator K1 Ventilation instrumentation. M&TE is used for loop calibrations. Gap Analysis No gap References H-2-830594, Sht. 2 and Sht. 5 RPP-16922, Section 5.1.1 RPP-16922, Table 14-2 Change following Modification None Gap Analysis No gap.	**DOE-HDBK-1169 (2.3.8), ASME AG-1, ASME AG-1**
Integrated system performance testing is specified and performed.	The K1 ventilation system is simple with regards to equipment and instruments. Functional testing of the ventilation interlocks were performed as part of the testing following installation in 2008. A PM program and calibration frequencies have been established for the ventilation instrumentation and interlocks. Reference 242-A-HVAC-TRR-1.0 Gap Analysis No gap. Change following Modification New instruments will be calibrated and the system will be tested prior to receipt. After delivery and installation, the system, including instrumentation and interlocks, will be tested again via Operational Acceptance Test procedure (OAT). The OAT will be prepared and performed to Project Start-Up and Testing Procedures (i.e., TFC-PRJ-SUT-C-02 and TRC-PRJ-SUT-C-03). References RPP-SPEC-36062, Section 5.4 and Section 5.6.6.8 Gap Analysis No gap.	**DOE-HDBK-1169 (2.3.8)**
9 – Maintenance		
Filter service life program should be established.	The HEPA filter service life program for the 242-A Evaporator conforms to the requirements of the Hanford Site Air Operating Permit and TFC-ENG-STD-07, Ventilation System Design Standard. For the 242-A Evaporator K1 ventilation systems, these requirements are implemented via the Preventative Maintenance (PM) Program. The HEPA filter service life program ensures that filters are tested prior to installation and annually during service. During operation, HEPA filter differential pressure is monitored for indications of loading. There are no toxic materials or acids in the airstream that will damage the HEPA filters. References PMs EE-02290 and EE-02291 (PMs and PM history can be found in the TOC CHAMPS PM system), TFC-ENG-STD-07 Gap Analysis No gap. Change following Modification None Gap Analysis No gap.	**DOE-HDBK-1169 (3.1 & App C)**

2004-2 Table 5.1, 242-A K1 Ventilation System Performance Criteria		
Evaluation Criteria	**Discussion**	**Reference**
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 K1 Ventilation systems are supplied with an alternate power supply (e.g. backup diesel generator). The K1-5-2 and associated controls are supplied by the backup power. The K1 ventilation systems (including backup power) are not credited in the DSA to perform any safety function during a loss of power event. References HNF-14755, Section 2.6.1.1 and Section 2.8.1. Gap Analysis No gap Change following Modification None Gap Analysis No gap.	**DOE-HDBK-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-A Evaporator K1 ventilation system is not credited with any safety function in the DSA. References HNF-14755, Section 3.4.2.2. Gap Analysis No gap Change following Modification None Gap Analysis No gap.	**10 CFR 830 Subpart B**

Attachment 3

WRPS, 242-A Evaporator Facility, K1 Exhaust System, Evaluation Team

Christopher Harrington, ORP, Engineering and Nuclear Safety
Richard Garrett, WRPS, Deputy Chief Engineer, Engineering
Diane Cato, WRPS, Engineering Manager, Tank Farms Projects
Steve Briggs, WRPS, Project Manager, TFP Project Construction
Rebecca Raven, WRPS, Operations Manager, 242-A Evaporator
Maurice Higuera, WRPS, DSA Subject Matter Expert, Nuclear Safety
James Keene, WRPS, Fire Protection Engineer, Industrial Safety
Russell Flye, WRPS, Ventilation Engineering Discipline Lead, Engineering
G. Eric Rensink, Vista Engineering

SEPARATION

PAGE

Department of Energy
Washington, DC 20585

DEC 23 2009

MEMORANDUM FOR JOHN R. ESCHENBERG
ASSISTANT MANAGER FOR
ENVIRONMENTAL MANAGEMENT
OAK RIDGE OFFICE

FROM: DR. STEVEN L. KRAHN
ACTING DEPUTY ASSISTANT SECRETARY FOR
SAFETY AND SECURITY PROGRAM
ENVIRONMENTAL MANAGEMENT

SUBJECT: Evaluation of Oak Ridge Office Environmental Management Facility Ventilation Systems in Response to Defense Nuclear Facilities Safety Board Recommendations 2004-2, Final Reports

Based on review of the information included in the subject reports, evaluation by the Defense Nuclear Facilities Safety Board (DNFSB) 2004-2 Independent Review Panel, the Environmental Management Technical Advisory Board, and input from the Chief of Nuclear Safety Office, the reports are approved with the following considerations.

- For the TRU Waste Processing Facility the review concludes that the ventilation systems were appropriately evaluated against the safety significant criteria associated with the established DNFSB 2004-2 evaluation guidelines and adequately met them.

- For the Portable Units, the review concludes that the ventilation systems were appropriately evaluated against the safety significant criteria associated with the established DNFSB 2004-2 evaluation guidelines with a single gap identified with respect to the lack of an interlock between the supply and exhaust fans. Closure of the identified gap is not recommended since interlocking of the two fans is (1) not a credited function in the DSA, (2) could result in a loss of ventilation flow to another building, and (3) could potentially result in contamination spread in the building with the loss of exhaust flow. The Environmental Management Technical Advisory Board (TAB) concluded that due to the temporary nature of these units, they should not have been included in these evaluations, and asked that they be deleted from further Recommendation 2004-2 consideration.

- For the Molten Salt Reactor Experiment, the review concludes that the evaluations were done in accordance with evaluation guidelines and two performance gaps were identified. The field evaluation team concluded that closure of the gaps was not warranted because the facility has removed the reactor fuel and is transitioning to surveillance and maintenance. The TAB accepted these conclusions.

- For the Fission Product Development Laboratory the review concludes that the review was done in accordance with evaluation guidelines and three performance gaps were identified. The field evaluation team concluded that closure of the gaps was not warranted because the facility has no current mission and there are plans to D&D the facility. The TAB accepted these conclusions however, they asked for a description of the current material condition of the facility to assess whether a new mission might be a possibility and whether this facility has been identified for work under the American Recovery and Reinvestment Act (ARRA). If a change to the facility status is made, reconsideration of the identified gaps will be required.

- For the Liquid Low-Level Waste System the original review concluded that the ventilation systems were not appropriately evaluated against the safety significant criteria associated with the established DNFSB 2004-2 evaluation guidelines since this is a Category 2 facility. The TAB requested that this facility be verified as a Hazard Category 2 facility, which was subsequently accomplished. With that established, the TAB instructed that the field team should re-perform the evaluation against safety-significant criteria instead of defense-in-depth. The re-evaluation has been recently received and will be evaluated by the end of January 2010.

If you have any further questions, please call me at (202) 586-5151.

Attachments

INDEPENDENT REVIEW

OF

Oak Ridge
Portable Units
Ventilation System Evaluation Report

July 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Oak Ridge Office (ORO) Portable Units Ventilation System Evaluation report utilizing the process and criteria outlined in the Department of Energy's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

ORO Portable Units are utilized to vent and purge legacy waste drums prior to receipt at the Transuranic (TRU) Waste Processing Facility. The location for performing this activity is in the portable unit which can be relocated to each storage facility to minimize TRU waste drum handling. The portable unit is of robust construction and features explosion proof electrical equipment, High Efficiency Particulate Air (HEPA) filtered ventilation, and dry chemical fire suppression. The portable unit has previously been used for missions such as disposition of shock sensitive materials and repackaging of radiological and mixed waste. There are no residual materials remaining in the portable units from these activities other than minor surface contamination. This activity is categorized as a Hazard Category 2 activity since the drums with the highest inventory of radiological material are greater than Hazard Category 2. The portable unit is not treated as a separate facility in the Documented Safety Analysis (DSA) because of its proximity to the facilities where the drums are currently stored.

The ORO Facility Evaluation Team (FET) reviewed the system function classification as part of the ventilation evaluation in accordance with the 2004-2 Ventilation System Evaluation Guide and concluded it was appropriately classified as Safety Significant.

The FET performing the review identified gaps between the ORO Portable Units ventilation system and the 2004-2 Ventilation System Evaluation Guide but concluded that resolution of the gaps was not mandatory in accordance with the criteria provided in the 2004-2 Ventilation System Evaluation Guide (i.e., gap resolution was discretionary). The FET evaluated the gaps and concluded that the gaps were acceptable because of unique aspects of the operations of the Portable Units and compensatory measures that are in place. No modifications were recommended.

The IRP concludes that the ventilation system evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Oak Ridge Office Portable Units Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Oak Ridge Office (ORO) Portable Units Ventilation System Evaluation Report utilizing the process and criteria outlined in the Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the ORO Portable Units Ventilation System Evaluation report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, (between the existing ventilation system and applicable performance criteria); and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

Newly-generated drums of Transuranic (TRU) waste are required to have vents to relieve the potential buildup and pressurization from gas generation and a sampling port for headspace gas sampling. The Melton Valley Solid Waste Storage Facility TRU facilities contain a large number of legacy waste drums that are not vented. These drums must be vented and the headspace gas sampled for explosive gases and total volatile Organic Compounds (VOCs) before receipt at the TRU Waste Processing Facility. They are brought into compliance with these requirements through the vent and purge process, which is performed inside a portable unit using a remotely actuated pneumatic driver unit configured to install the filter vents/sample ports. The location for performing this activity is in the portable unit which can be relocated to each storage facility to minimize TRU waste drum handling.

The portable units consist of structures similar in construction to a Sealand container mounted atop a heavy duty trailer. The portable units are not designed to withstand significant natural phenomena hazard events. The portable units are not likely to be used during inclement weather for personnel safety considerations. Seismic events are

unpredictable, but would at worst tip the portable unit over. An exhaust fan and High Efficiency Particulate Air (HEPA) filter are mounted on the portable unit and draw air from the compartment. This provides some confinement of radiological hazards that could be released in the enclosure.

The only scenarios in the Documented Safety Analysis (DSA) that are exclusively associated with this system are those tied to operational upsets during the vent and purge process. These events are primarily deflagration and fire, and are limited to single container events.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The ORO Portable Units ventilation evaluation appropriately followed the process outlined in the 2004-2 Ventilation System Evaluation Guide in developing the Data Collection Table used to identify accidents, their unmitigated consequences, and the confinement strategy based upon the DSA. Furthermore, the Data Collection Table included the performance expectation for the ventilation systems.

The determination of bounding unmitigated consequences presented in the DSA was reviewed by the FET. It was determined that the quantitative dose consequences are determined in accordance with DOE-STD-3009-94 and do not challenge the evaluation guideline (it is noted that the analyses of fire and deflagration included in the DSA have been determined to be conservative relative to the recently issued standard [DOE-STD-5506-2007] for evaluating TRU waste). The HEPA filter system is identified in the DSA as a Defense in Depth control that is elevated to a Safety Significant classification but is not credited for significantly reducing event consequences. The control suites identified in the DSA focus on preventative measures and inventory limits as well as the portable unit structure and drum lid restraints to minimize releases to reduce risk associated with identified events to acceptable levels.

The FET concluded that the ventilation system for the ORO Portable Units is appropriately and conservatively classified as Safety Significant. The IRP concludes that this functional evaluation was appropriately performed in accordance with the 2004-2 Ventilation System Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The ORO Portable Units ventilation report evaluated the ventilation system utilizing the Safety Significant criteria from the 2004-2 Ventilation Evaluation Guide. The ORO Portable Units Ventilation System Evaluation Report provides a systematic evaluation of the ventilation systems against the 2004-2 performance criteria to identify any gaps.

Three gaps were identified, lack of filters on air inlets, no local alarm on system to indicate operability issues, and no real-time monitoring for filter breakthrough.

In addition, the FET identified that there was a potential for the HEPA filters to plug upon discharge of the Dry Chemical fire extinguishing agent. However, since the extinguishing agent's agent function is to eliminate the potential that a fire, if initiated, could propagate and challenge the HEPA confinement system, this was not identified as a gap. After discharge of the Dry Chemical agent, HEPA filters would be replaced prior to any future operation of the system.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

3.3 Evaluation of physical modifications to enhance safety performance

2004-2 Ventilation System Evaluation Guide specifies that an evaluation of physical modifications that may be appropriate to enhance the ventilation system in the areas where the current confinement ventilation system does not meet the 2004-2 evaluation criteria should be performed. In this respect, the ORO FET reviewed each of the gaps as follows.

The first gap, lack of filters on air inlet gaps was determined to be acceptable. Inlet air enters the portable unit through inlet louvers near the floor and through unsealed joints. Material in-leakage is not considered to be a concern. The DSA does not credit the portable unit and ventilation system for providing significant confinement. The physical volume of the portable unit will minimize pressurization of the unit in the event of a deflagration. Material released in the event of a fire in the unit will preferentially be exhausted through the ventilation system.

The second gap, no local alarm on system to indicate operability issues was determined to be acceptable. The portable unit HEPA filtered ventilation system is not equipped with alarms that would indicate filter DP problems, fan failure, etc. The lack of a local alarm indicating operability issues is addressed by the fact that the unit is operated locally and facility workers are in attendance outside the portable unit and next to the HEPA filter system the entire time the unit is operating. Operational issues would be identified during operation. These aspects of portable unit operation are considered compensatory measures.

The third identified gap, no real-time monitoring for filter breakthrough was determined to be acceptable. Normal operations in the portable unit do not result in release of significant levels of contamination. However, in accordance with the Radiological Protection Safety Management Program, a filter paper air monitor is positioned on the stack exhaust and is routinely monitored during operation. This would indicate breakthrough that may not be apparent by a drop in DP on the gages. Normal operating procedures require video surveillance of remote drum operations which would alert operators to an accident inside the unit (deflagration, fire) and initiate response actions. Also, because the system is not run continuously, the filter DP gages are read after startup and before remote operations in the unit commence.

The ORO Facility Evaluation Team thus recommended, due to the low risk associated with the identified gaps, the gaps do not need to be closed at this time.

The IRP concluded that ORO evaluation of the physical modifications was appropriately performed in accordance with the 2004-2 Ventilation System Evaluation Guide.

4. CONCLUSIONS

IRP concludes that the ORO Portable Units Evaluation Report was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation system Evaluation Guide.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the ORO Portable Units Ventilation System Evaluation Report.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman
Robert Nelson, IRP Member EM

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For this evaluation, a detailed-full IRP team review was not determined to be necessary.

INDEPENDENT REVIEW

OF

Oak Ridge
Liquid Low-Level Waste System
Ventilation System Evaluation Report

July 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Oak Ridge Office (ORO) Liquid Low-Level Waste (LLLW) System Ventilation System Evaluation Report utilizing the process and criteria outlined in Department of Energy's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The LLLW System at Oak Ridge National Laboratory (ORNL) consists of tanks, process equipment, and interconnecting pipelines used for collection, volume reduction, transfer, and storage of LLLW generated at various facilities. The LLLW System facilities are located at various sites in Bethel Valley and Melton Valley at ORNL. LLLW generated by ORNL facilities is collected at the source facilities, transferred to the LLLW evaporator facility for treatment and volume reduction, and pumped from Bethel Valley through underground pipeline to Melton Valley for storage in existing tanks. LLLW generated in the Melton Valley area may be similarly pumped through the same pipeline to the LLLW evaporator facility for volume reduction and subsequent return for storage.

The LLLW system includes three waste tank systems at Buildings 2537, 7830, and 7856 which are categorized as Hazard Category 2 facilities and are the focus of this evaluation. The ventilation systems at these facilities are classified as defense in depth.

The Facility Evaluation Team (FET) performing the ventilation system evaluation reviewed the functional classification of the systems and concluded that they were correctly classified as defense in depth. They evaluated against the 2004-2 Ventilation System Evaluation Guide performance criteria at the defense in depth level in lieu of the Safety Significant level as specified in the 2004-2 Ventilation System Evaluation Guide for Hazard Category 2 facilities) and determined that it met all the criteria.

The IRP concludes that although the ventilation systems evaluation was performed correctly in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide for a defense in depth system, the IRP was unable to evaluate whether the system would meet the criteria established for the Safety Significant level.

Results of Independent Review Panel's Review of the Oak Ridge Office Liquid Low-Level Waste System Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Oak Ridge Office (ORO) Liquid Low-Level Waste (LLLW) Ventilation System Evaluation Report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the ORO LLLW Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The Evaporator Service Tank Facility, Building 2537 contains three 50,000-gal underground collection and storage tanks used to collect and store both dilute and concentrated Liquid Low Level Waste (LLLW). As dilute LLLW is collected from the Bethel Valley and Melton Valley collection systems, it is stored in one of the service tanks. The tanks and vaults are designed for containment of radioactive liquids and provide double containment. Primary confinement of the LLLW in the Evaporator Service Tank facility is provided by the service tanks and their associated piping and equipment. Secondary confinement for the LLLW is provided by stainless-steel-lined concrete vault structures.

Approximately 700 cubic feet per minute (cfm) of air is supplied to the vault containing tanks W-21 and W-22 through a roughing filter, a pre-filter, and a back-flow preventer. The vault containing tank W-23 receives approximately 350 cfm of supply air from a separate inlet through a roughing filter, a pre-filter, and a back-flow preventer. Both of these air streams are discharged through the cell ventilation system filters at Building

2568, to the central ORNL Gaseous Waste Disposal System. The tank ventilation system has separate air intakes for each tank which draw fresh air through a back-flow preventer, roughing filter, pre-filter, and high efficiency particulate air (HEPA) filter. Each tank exhausts through an individual demister and a common roughing and HEPA filter before discharging through the off-gas system filters at Building 2568 to the central ORNL Gaseous Waste Disposal System.

The Melton Valley Storage Tank (MVST) Facility, Building 7830 contains eight 50,000-gal storage tanks (installed in two underground vaults) which provide storage capacity for concentrated LLLW from the evaporator. The storage tanks are equipped with liquid-level indicators, temperature measuring devices, and sampling devices. Instrument readouts are available at the local control house located above grade immediately south of the pipe tunnel and storage tanks.

Primary confinement for the LLLW is provided by the storage tanks and the interconnecting pipes, valves, and pumps. Secondary confinement is provided by stainless-steel-lined concrete vaults surrounding the tanks and piping. Cell and tank off-gas from the MVST Facility cannot be discharged through the central ORNL Gaseous Waste Disposal System because of the facility's remote location. Therefore, following filtration, exhaust is discharged to the atmosphere locally. Separate ventilation systems are provided for the storage tanks, the vaults, the pipe tunnel, and the control house.

Each vault receives approximately 1000 cfm of fresh air through a roughing filter and a pre-filter. This combines with 375 cfm of air from the pipe tunnel, is swept through the cell and discharges to the atmosphere through a fire barrier, a roughing filter, HEPA filter, and the vault exhaust stack. The pipe tunnel receives 800 cfm of fresh air through a roughing filter and a pre-filter. Of this, 700 cfm joins the cell ventilation through the vaults and the remaining 100 cfm passes through the sampling area and is discharged with the tank off-gas.

The Melton Valley Storage Tanks Annex, Building 7856 provides long term storage capacity for the liquid low-level radioactive waste system at the ORNL. Building 7856 houses six tank vaults, each containing a 100,000-gal horizontal, cylindrical tank. The tanks and tanks vaults are provided with a once-through, HEPA-filtered ventilation system. The LLLW transferred and stored in Building 7856 is within at least two layers of confinement at all times during normal operations. The primary confinement is made up of the six 100,000-gal storage tanks, their ventilation systems, the interconnecting and transfer piping, pumps, and valves. Secondary confinement is provided by the stainless steel liners in the tank vaults, pump and valve vault, and the valve box; by secondary confinement piping in the underground transfer pipeline; and by the vault HVAC systems.

Two HVAC systems provide confinement functions for Building 7856: the vault ventilation system and the tank ventilation system. The vault ventilation system provides once-through ventilation for each of the six tank vaults and for the pump and valve vault. Outside air is drawn through inlet filters, a backflow preventer, a roughing, filter, and a pre-filter. Exhaust air is directed through two exhaust filter units where is passes through a pre-filter and a HEPA filter. The tank ventilation system provides once-through

ventilation for the six 100,000 gal storage tanks. Outside air is filtered through one of two inlet filter units passing through a roughing filter, a pre-filter and a HEPA filter. The exhaust ducts from each tank join in a header in the pump and valve vault where the air is directed through a pre-filter and two HEPA filters.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The Facility Evaluation Team performing the system evaluation, reviewed determination of bounding unmitigated consequences presented in the DSA and concluded that the quantitative dose consequences were determined in accordance with DOE-STD-3009-94 and do not challenge the DOE-STD-3009-94 evaluation guideline. The ventilation systems are not individually credited for reducing event consequences to a lower risk bin. The control suites identified in the DSA focus on preventive measures and inventory limits as well as the secondary containment systems such as the vaults in lieu of the ventilation systems. The FET concluded that the ventilation systems associated with LLLW System are appropriately and conservatively classified as defense in depth.

The IRP concluded that the ORO FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Ventilation System Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The ORO LLLW System Ventilation Report utilizing the defense-in-depth criteria from the 2004-2 Ventilation Evaluation Guide in lieu of the Safety Significant level as specified in the 2004-2 Ventilation System Evaluation Guide for Hazard Category 2 facilities. The ORO LLLW System Evaluation Report provides a systematic evaluation of the ventilation systems against the 2004-2 performance criteria to identify any gaps. No gaps were identified against the defense in depth criteria.

The IRP concludes that although the ventilation systems evaluation was performed correctly in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide for a defense in depth system, the IRP was unable to evaluate whether the system would meet the criteria established for the Safety Significant level.

4. CONCLUSIONS

IRP concludes that the ORO Liquid Low-Level Waste System ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the ORO Liquid Low-Level Waste System Ventilation System Evaluation Report.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman
Robert Nelson, IRP Member EM

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For this evaluation, a detailed-full IRP team review was not determined to be necessary.

INDEPENDENT REVIEW

OF

Oak Ridge Office Fission Product Development Laboratory Ventilation System Evaluation Report

July 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Oak Ridge Office (ORO) Fission Product Development Laboratory Ventilation System Evaluation report utilizing the process and criteria outlined in Department of Energy's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The ORO Fission Product Development Laboratory is a partially deactivated Hazard Category 2 nuclear facility that no longer has a programmatic mission and has been transitioned to the Environmental Management Program to be deactivated and decommissioned. The facility is undergoing transitional surveillance and maintenance and limited deactivation activities until assets are available for final decommissioning. Although all process-related activities have been discontinued in Building 3517, the facility still contains radioactive and hazardous materials. Surveillance and maintenance includes activities such as performing facility walk-downs to detect changing conditions, monitoring the ventilation systems to verify that they are operating within specified parameters.

The Laboratory's Cell Ventilation System provides negative pressure to the hot cells and the resulting air in-leakage into the hot cells keeps the rest of the building (except the airlocks) under negative pressure relative to the outside pressure. The Cell Ventilation System exhausts through high efficiency air filters. The Cell Ventilation System if functionally classified as safety significant.

The ORO Facility Evaluation Team (FET) concluded that the ventilation system associated with Building 3517 is appropriately and conservatively classified as safety significant. The FET reviewed Cell Ventilation System utilizing the safety significant performance criteria in the 2004-2 Ventilation System Evaluation Guide and identified three performance gaps, i.e., materials of construction, no real-time monitoring for final filter breakthrough, and the ventilation system is not designed or credited to withstand an event where the building, hot cells or ductwork integrity is lost. The ORO FET recommended no modifications at this time primarily due to there being no current mission for the Fission Product Development Laboratory and future plans to deactivate and decommission it.

The IRP concludes that the ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Oak Ridge Office Fission Product Development Laboratory Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Oak Ridge Office (ORO) Fission Product Development Laboratory Ventilation System Evaluation Report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the ORO Fission Product Development Laboratory Ventilation System Evaluation report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The ORO Fission Product Development Laboratory is a partially deactivated Hazard Category 2 nuclear facility that no longer has a programmatic mission and has been transitioned to the Environmental Management Program to be deactivated and decommissioned. The facility is undergoing transitional surveillance and maintenance and limited deactivation activities until assets are available for final decommissioning. Although all process-related activities have been discontinued in Building 3517, the facility still contains radioactive and hazardous materials.

Building 3517 is served by two ventilation systems: the Cell Ventilation System (CVS) and the Process Off-Gas System (POG). The CVS provides negative pressure to the hot cells. In-leakage into the hot cells keeps the rest of the building (except the airlocks) under negative pressure relative to the outside pressure. An air inlet damper located on the west side of the second level acts as a vacuum relief device, preventing pressure within the building from becoming too negative. The building is sealed and equipped

with airlock entries for personnel and vehicles. The air-lock doors are gasketed. Cell ventilation exhaust air passes through 30 inch diameter concrete ducts to the filters in the underground filter pit, Building 3547, and Building 3548 filter houses. The exhaust then passes through 30 inch metal ducting to the Building 3623 filter house prior to being discharged through the ORNL 3039 stack. The filters in Building 3623 are HEPA filters. The filters in Buildings 3547 and 3548, while HEPA filters, are considered roughing filters. Exhaust fans are part of the ORNL 3039 stack ventilation system. The 3517 CVS boundary ends with the outlet dampers from the 3623 filter house.

The POG system keeps the LLLW tanks under negative pressure with respect to their cells, inhibiting migration of contamination from the tanks into the cells. Exhaust from the process off-gas system goes to the scrubber in Building 3092 and then exhausts through the ORNL 3039 stack. The 3517 process off-gas system ends where the ducts exit the building.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The ventilation systems are currently classified as a safety significant system in the Documented Safety Analysis (DSA). The Facility Evaluation Team (FET) performing the ventilation evaluation reviewed the determination of bounding unmitigated dose consequences presented in the DSA and concluded that the dose consequences were determined in accordance with DOE-STD-3009-94 and do not challenge the evaluation criteria. The FET concluded that the CVS, HEPA filtered ventilation system associated with Building 3517 is appropriately and conservatively classified as safety significant.

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Ventilation System Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The ORO Fission Product Development Laboratory Evaluation Report included a brief description of how the ventilation systems met the safety significant performance criteria in the 2004-2 Ventilation System Evaluation Guide and identified reference documents used as part of the review. The ORO System Evaluation Report identified three gaps with respect to the DNFSB 2004-2 Evaluation Guidance. The first gap is that some of the ductwork that runs underground is made of Reinforced Concrete Pipe. Though this material does not specifically meet the recommendation from DOE Handbook for ductwork (all-welded stainless or carbon steel construction). The second gap identified was that there is no real-time monitoring for final filter breakthrough. The final gap identified is that the CVS is not designed or credited to withstand an event where the building, hot cells or ductwork integrity is lost.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

3.3 Evaluation of physical modifications to enhance safety performance

For the first gap, the ORO FET stated that although the underground ductwork was constructed of reinforced concrete and not all-welded stainless or carbon steel, the duct has a fairly good resistance to corrosion. The air ducted through these pipes is non-corrosive ambient air carrying particulate matter which reduces the need for the corrosion protection properties of stainless steel. As such, the ORO determined that the identified gap is acceptable based on the similar nature of the material and the fact that non-corrosive air passes through the ducting.

For the second gap, the ORO FET evaluation states that the final filter located in Building 3623 has DP gauges monitoring the status of the filter. The gauges are checked visually on a set weekly schedule in accordance with the Technical Safety Requirement as established by engineering judgment and the fact that no activities are routinely conducted in the cells. A filter break through would result in an increase in airflow being evacuated. This would increase the cell and building DPs, but may not set off the audible alarms associated with the 3517 building and cell differential pressures. The filter break through would be seen as a much reduced filter DP on the monitoring gauges and would induce corrective action at the next cyclic inspection. Modifications to the Building 3623 filter to provide real time monitoring have not been made and non are planned, primarily due to the age and current mission of the facility. The final filter in Building 3623 is preceded by two sets of non-credited roughing filters located in the underground filter pit and above ground structure. These filters are HEPA quality filters and as defense-in-depth components serve to reduce/prevent contamination release through stack 3039 in case of a 3623 filter break through, but are not credited in the DSA as providing any mitigation to releases. As such, the ORO FET determined the identified gap to be acceptable.

The final gap concerns the ventilation system to withstand an event where the building, hot cells or ductwork integrity is lost. Modifications were made to the building in 1992 based on the findings of a 1989 Seismic Evaluation to implement recommendations. The building is now expected to be able to withstand a severe earthquake. The cells are massive with 4 foot thick concrete walls therefore the likelihood of a cell being breached is very low. However, the ductwork above and below ground can be affected by natural phenomenon and be breached. Modifications have not been made to the existing ductwork and none are planned, primarily due to the age and the current S&M mission of the facility. As the mission of the facility changes to deactivation and decommissioning, modifications to the building and system would be re-evaluated. The DSA recognizes that the building, cells, and ductwork may not survive natural phenomena events and does not credit the CVS with mitigating the release. As such, the ORO FET determined the identified gap to be acceptable.

The IRP concluded that the ORO FET evaluation was appropriately performed in accordance with the 2004-2 Ventilation System Evaluation Guide with consideration of the current S&M status of the building.

4. CONCLUSIONS

IRP concludes that the ORO Fission Product Development Laboratory Ventilation System Evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the ORO Fission Product Development Laboratory Ventilation System Evaluation Report.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman, Office of Health, Safety and Security
Robert Nelson, IRP Member, Office of Environmental Management

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For this evaluation, a detailed-full IRP team review was not determined to be necessary.

INDEPENDENT REVIEW

OF

Oak Ridge Office
Molten Salt Reactor Experiment Facility
Ventilation System Evaluation Report

August 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Oak Ridge Office (ORO) Molten Salt Reactor Experiment Facility Ventilation System Evaluation report utilizing the process and criteria outlined in Department of Energy's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The ORO Molten Salt Reactor Experiment Facility is currently a Hazard Category 2 nuclear facility that was originally operated as a concept test for the use of molten salt containing uranium as the fuel for the reactor. The reactor operated in the late 1960s and was shut down in 1969. At that time, the fuel salt was removed from the reactor and stored in two duel drain tanks in the facility. The Containment Ventilation System was designed to vent the secondary containment structure, principally the reactor cell, drain tank cell and other service cells, during the reactor experiment. The systems continued to operate in this capacity until the current fuel salt disposition project was initiated to remove the uranium from the salts. The ventilation system was augmented to provide secondary confinement for process equipment. The process equipment includes the equipment to sparge the salt, remove the fuel as uranium hexafluoride (UF_6), and trap the UF_6. Since this report was accomplished, molten salt has been removed from the facility and the facility has transitioned to surveillance and maintenance as a Hazard Category 2 nuclear facility awaiting decommissioning.

The ORO Facility Evaluation Team (FET) concluded that the ventilation system associated with the Molten Salt Reactor Experiment Facility is appropriately and conservatively classified as safety significant. ORO evaluated the ventilation system performance against the 2004-4 Ventilation System Evaluation Guide and identified two performance gaps, i.e., the ventilation system does not maintain its integrity for Design Basis Accident fire and natural phenomena hazards, and the ventilation system controls are not fail-safe. The criteria identified as gaps were not considered by the ORO FET to be necessary for the ventilation system to perform the credited mitigative function. This conclusion is consistent with the requirements in the Molten Salt Reactor Experiment Safety Basis.

The IRP concludes that the ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Oak Ridge Office Molten Salt Reactor Experiment Facility Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Oak Ridge Office (ORO) Molten Salt Reactor Experiment Facility Ventilation System Evaluation Report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the ORO Molten Salt Reactor Experiment Facility Ventilation System Evaluation report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The ORO Molten Salt Reactor Experiment Facility was originally operated as a concept test for the use of molten salt containing uranium as the fuel for the reactor. The reactor operated in the late 1960s and was shut down in 1969. At that time, the fuel salt was removed from the reactor and stored in two duel drain tanks in the facility. Flush salt was run through the reactor to remove residual uranium and stored in the fuel flush drain tank. These drain tanks are located in a below grade cell next to the reactor cell. The fuel and flush salt was allowed to cool and solidify. The Containment Ventilation System was designed to vent the secondary containment structure, principally the reactor cell, drain tank cell and other service cells, during the reactor experiment. The systems continued to operate in this capacity until the current fuel salt disposition project was initiated to remove the uranium from the salts. The ventilation system was augmented to provide secondary confinement for process equipment. The process equipment includes the

equipment to sparge the salt, remove the fuel as uranium hexafluoride (UF_6), and trap the UF_6.

The Molten Salt Reactor Experiment ventilation system is credited to protect facility workers from potential releases of hazardous gases. Since release of significant quantities of process gases is possible only during certain fuel disposition processes, the ventilation system is only credited for these specific operations. The minimum differential pressure associated with each ventilation system enclosure is designated to correspond to a ventilation flow rate sufficient to remove any anticipated release within the enclosure. The ventilation system enclosure pressures are monitored daily when an applicable process is in the Operation Mode. The checks ensure the credited minimum flow exists in the enclosures. When UF_6 is released in the air, it immediately hydrolyzes into a solid aerosol. The main High Efficiency Particulate Air (HEPA) filters are credited with reducing the quantity of uranium that may be released through the stack should there be a release in the facility.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The system is currently classified as a safety significant system in the Documented Safety Analysis (DSA). Once the uranium and hazardous gases are removed from the facility (accomplished post submittal of this evaluation report) the ventilation system will no longer be considered a safety significant system. Since the Molten Salt Reactor Experiment Facility remains a Hazard Category 2 nuclear facility requiring, at a minimum, an evaluation against safety-significant criteria the evaluation would be unchanged. The ORO Facility Evaluation Team (FET) evaluated the system per Deliverable 8.5.4 and 8.7 of the Implementation Plan for DNFSB 2004-2, *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related Systems.*

The determination of bounding unmitigated consequences presented in the DSA was reviewed by the FET. The FET found that the quantitative dose consequences are determined in accordance with DOE-STD-3009-94 and do not challenge the evaluation guideline for the public and co-located workers. The ventilation system is identified in the Molten Salt Reactor Experiment Facility Safety Basis Documents as a safety significant system which is credited with reducing the consequences to facility workers during hazardous gas releases. Specific performance criteria include maintaining differential pressures within the credited enclosures and across HEPA filters in the main filter pit. Quantitative filtering efficiency criteria are also identified in the Technical Safety Requirements.(TSR) .

The FET concluded that the Molten Salt Reactor Experiment Facility ventilation system is appropriately and conservatively classified as safety significant for specified processes and mitigative measures.

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The ORO Molten Salt Reactor Experimental Facility Evaluation Report included a brief description of how the ventilation systems met the criteria and specified reference documents used as part of the review.

The ORO FET System Evaluation Report identified two gaps with respect to the DNFSB 2004-2 Ventilation System Evaluation Guidance. The first gap is that the ventilation system does not maintain its integrity for Design Basis Accident (DBA) fire and natural phenomena hazards (NPH). The second gap identified was that the ventilation system controls are not fail safe.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

3.3 Evaluation of physical modifications to enhance safety performance

For the first gap, the ORO FET stated that the integrity of the ventilation system can not be certified for design basis NPH such as earthquakes and tornados. In addition the ventilation system would not survive an unmitigated DBA major facility fire. The ventilation system is not credited by the Safety Basis to perform any mitigative function for these types of events. The safety of facility workers is based on prompt evacuation of the process area during these NPH and fire events. Given the requirements from the Molten Salt Reactor Experiment Safety Basis, the identified gap is determined to be acceptable. Additionally, the fuel salt has been effectively removed from the facility post this evaluation.

For the second gap, the ORO FET evaluation states that the ventilation system is a manually operated system in that the fans and baffles are manually operated and have no automatic response to events. The system strategy is based on the mitigative function of the system for potential accidents. The system is designed to remain operating if there is a release of hazardous gas in the facility. There is no event in the Molten Salt Reactor Experiment Facility Safety Basis that takes credit for the ventilation system when a concurrent ventilation system failure and release is involved (e.g., during an earthquake). The Molten Salt Reactor Experiment Safety Basis specifically addresses ventilation system failures during operations. The TSR requires that access to the affected area is controlled immediately, and the system is restored within 8 hours. If restoring the system cannot be achieved in the prescribed time, then all reagent gas feed valves must be closed, uranium transfers suspended, and the affected process placed in a mode where the ventilation system is not required. These requirements meet the intent of a fail-safe system. Given the requirements from the Molten Salt Reactor Experiment Safety Basis, the identified gap is determined to be acceptable. Additionally, the fuel salt has been effectively removed from the facility post this evaluation and the facility has transitioned to surveillance and maintenance as a Hazard Category 2 nuclear facility awaiting decommissioning..

The IRP concluded that the ORO FET evaluation was appropriately performed in accordance with the 2004-2 Ventilation System Evaluation Guide with consideration of the requirements of the Safety Basis.

4. CONCLUSIONS

IRP concludes that the ORO Molten Salt Reactor Experiment Facility Ventilation System Evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman
Robert Nelson, IRP Member EM

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For this evaluation, a detailed-full IRP team review was not determined to be necessary.

Independent Review

of

Oak Ridge Operations (ORO)
TRU Waste Processing Center (TWPC)
Ventilation System Evaluation Report

July 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Oak Ridge Operations (ORO) TRU Waste Processing Center (TWPC) DNFSB Recommendation 2004-2 Process Building (PB) Ventilation System Evaluation Report utilizing the process and criteria outlined in the Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The TWPC, located in the Melton Valley area of the ORO, is responsible for retrieval, treatment and packaging of Transuranic (TRU)/Alpha low level radioactive waste for offsite disposal. The TWPC PB is a Hazard Category 2 facility. The maximum dose from the design basis accident (fire in a glovebox) is well below the Evaluation Guidelines (EGs) to the public.

The current confinement strategy for the TWPC facility is to utilize active safety significant confinement ventilation systems in conjunction with passive building structure in accordance with the criteria established in DOE-STD-3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses.*

The IRP concludes that the TWPC PB ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide. No gaps were identified.

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the TWPC PB Ventilation System Evaluation.

Results of Independent Review Panel's Review of the TRU Waste Processing Center (TWPC) Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Oak Ridge Operations (ORO) TRU Waste Processing Center (TWPC) Processing Building (PB) Ventilation System Evaluation Report utilizing the process and criteria outlined in the Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the TWPC PB Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, (between the existing ventilation system and applicable performance criteria); and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The TWPC, located in the Melton Valley area of the ORO, is responsible for retrieval, treatment and packaging of TRU/Alpha low level radioactive waste for offsite disposal. The TWPC PB is a Hazard Category 2 facility with very little potential for accidents that result in consequences approaching the Evaluation Guidelines (EGs) to the public or off-site workers.

The current confinement strategy for the TWPC facility is to utilize active safety significant confinement ventilation systems in conjunction with passive building structure in accordance with the criteria established in DOE-STD-3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses.*

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The TWPC PB ventilation evaluation appropriately followed the process outlined in the 2004-2 Ventilation System Evaluation Guide in developing the Data Collection Table used to identify accidents, their unmitigated consequences, and the confinement strategy based upon the Documented Safety Analysis Report for the TWPC. Furthermore, the Data Collection Table included the performance expectation for the ventilation systems.

For the TWPC, the PB ventilation system is designated as active safety-significant. Based upon this evaluation, ORO determined that the TWPC PB Ventilation System was appropriately functionally classified as Safety Significant.

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The TWPC PB ventilation report evaluated the TWPC PB confinement ventilation systems utilizing the safety significant criteria from the 2004-2 Ventilation Evaluation Guide. The TWPC Ventilation System Evaluation Report provides a systematic evaluation of the ventilation systems against the 2004-2 performance criteria to identify any gaps. No gaps were identified.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

4. CONCLUSIONS

IRP concludes that the TWPC PB ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the TWPC PB Ventilation System Evaluation.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman, Office of Health, Safety and Security
Robert Nelson, IRP Member, Office of Environmental Management

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the TWPC PB evaluation, a detailed-full IRP team review was not determined to be necessary.

SEPARATION

PAGE

Department of Energy
Washington, DC 20585

DEC 2 3 2009

MEMORANDUM FOR DAVID A. BROCKMAN
MANAGER
RICHLAND OPERATIONS OFFICE

FROM: DR. STEVEN L. KRAHN
ACTING DEPUTY ASSISTANT SECRETARY FOR
SAFETY AND SECURITY PROGRAM
ENVIRONMENTAL MANAGEMENT

SUBJECT: Evaluation of Richland Operations Office Facility Ventilation Systems in Response to Defense Nuclear Facilities Safety Board Recommendations 2004-2, Final Reports

Based on review of the information included in the subject reports, evaluation by the Defense Nuclear Facilities Safety Board (DNFSB) 2004-2 Independent Review Panel, the Environmental Management Technical Advisory Board (TAB), and input from the Chief of Nuclear Safety Office, the reports are approved with the following considerations.

- For the T-Plant Complex concludes that the ventilation systems were appropriately evaluated against the safety significant criteria associated with the established DNFSB 2004-2 evaluation guidelines with four gaps each being identified for T-Canyon and 2706-T/2706-TA. Closure of the gaps is not recommended at this time by the FET due to the high cost and only moderate benefit. If modifications to the T Plant Complex are made in the future to support future TRU missions, the status of the active confinement ventilation system will need to be revisited.

- For the Waste Receiving and Processing Facility concludes that the ventilation systems were appropriately evaluated against the safety significant criteria associated with the established DNFSB 2004-2 evaluation guidelines with a single gap identified with respect to the lack of backup power. Closure of the gap is not recommended by the FET due to the high cost and moderate benefit. Loss of electrical power requires Limited Condition of Operation action to place the facility gloveboxes into a standby condition until electrical power is restored.

- For the Waste Encapsulation and Storage Facility the review concluded that the ventilation systems were not appropriately evaluated against the safety significant criteria associated with the established DNFSB 2004-2 evaluation guidelines since this is a Category 2 facility. The TAB instructed that the field team should re-perform the evaluation against safety-significant criteria instead of defense-in-depth. The re-evaluation will be evaluated when received, please provide a schedule for timely completion of this re-evaluation.

If you have any further questions, please call me at (202) 586-5151.

Attachment

cc:
D. Chung, EM-2
F. Marcinowski, EM-3
M. Gilbertson, EM-50

Independent Review

of

Richland Operations
Waste Stabilization and Disposition
Project Facilities
Ventilation System Evaluation Report

November 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Richland Operations (RL) Waste Stabilization and Disposition Project Facilities Ventilation System Evaluation Report utilizing the process and criteria outlined in the Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The RL Waste Stabilization and Disposition Project Facilities are Hazard Category 2 facilities and consist of three individual evaluated facilities. These include the Waste Encapsulation and Storage Facility (WESF), T Plant Complex (221-T Canyon, 2706-T, 2706-TA) and the Waste Receiving and Packaging (WRAP) facility. The T-Plant Complex and WRAP are managed under a single comprehensive master Documented Safety Analysis (MDSA) while WESF is covered under its own DSA. The RL facility evaluation team (FET) performing the ventilation system review appropriately evaluated the individual systems functional requirements and determined their classification. Furthermore, the FET evaluated the ventilation systems against the 2004-2 Ventilation System Evaluation Guide performance criteria. Gaps were identified in each of the systems.

The IRP concludes that the WRAP and T Plant Complex Ventilation Systems Evaluation were performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide. The IRP concludes that the WESF Ventilation Systems Evaluation was performed correctly in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide for a defense in depth system, the IRP was unable to evaluate whether the system would meet the criteria established for the Safety Significant level..

Results of Independent Review Panel's Review of the Richland Operations Waste Stabilization and Disposition Project Facilities Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Richland Operations (RL) Waste Stabilization and Disposition Project Facilities Ventilation System Evaluation Report utilizing the process and criteria outlined in the Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the RL Waste Stabilization and Disposition Project Facilities Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

WRAP

The WRAP facility was constructed in the mid-90's and began operation in 1996. WRAP has a tiered confinement ventilation system (CVS) to allow processing of Transuranic (TRU) waste in process glovebox lines. The WRAP mission is to process and package TRU waste for shipment and disposal at the Waste Isolation Pilot Plant (WIPP) in New Mexico. Due to the amount of material at risk (MAR), WRAP is a Hazard Category 2 facility. This CVS is credited in the DSA in numerous accidents and is classified as safety significant.

The WRAP facility utilizes a tiered confinement ventilation system in the Process Area to maintain control of radioactive material. The CVS was part of the original construction and has not been modified. The DSA takes credit for both the active and passive

confinement systems for accident mitigation. Processing of TRU waste is accomplished inside large glovebox lines with entry and exit ports for transitioning of the containerized waste into and out of the glovebox. A redundant exhaust fan system with HEPA filtration provides suction on the glovebox line to maintain a negative differential pressure between the interior of the glovebox and the process area. Room air is supplied to the gloveboxes through filtered infiltration. The process area has redundant supply and exhaust fans that are coordinated to provide a negative differential pressure between the process area and both atmosphere and the surrounding rooms. Two stages of HEPA filters are provided for each exhaust fan. Interlocks prevent operation of the supply fan if the exhaust fan fails. Operation of the heating, ventilation and air conditioning (HVAC) system is controlled by a Distributed Control System that is monitored by the Real Time Application Platform system in the dispatch room. Alarms provide notification of abnormal system operation.

221-T Canyon (T Plant Complex)

The 221-T canyon building was constructed in the 1940's and is one of the original Hanford canyon facilities. The T-Plant Complex also processes TRU waste for shipment to WIPP. In addition, the T Plant Complex stores radioactive sludge, decontaminates equipment and is being considered for major modifications to allow processing of remote handled TRU waste. The 221-T Canyon was recently modified to allow processing of contact handled TRU waste. Perma-Con® enclosures were installed to process containers using a bag out system, and a floor level entry was made from the head end area to the canyon deck for movement of containers. The T Plant Complex is classified as Hazard Category 2. Numerous changes have been made to the facility over the years including new high-Efficiency Particulate Air (HEPS) filter banks in 1991, new backup exhaust fan in 1994 and a new primary fan in 2003.

2706-T and 2706-TA (T Plant Complex)

The 2706-T facility was constructed in the late 1950's specifically for low level decontamination activities. The 2706-TA building and the filtered confinement ventilation systems for both buildings were added in the 1950's. Since the two standard construction metal buildings are attached, they are generally treated as one facility for this evaluation. A HEPA filtered exhaust fan system provides a negative differential pressure between the interior of the buildings and the atmosphere during operations. The CVS for 2706-T and 2706-TA is secured when the building is not in operation. As part of the T Plant Complex, 2706-T and 2706-TA are classified as Hazard Category 2.

WESF

WESF was designed and constructed in 1974 to process, encapsulate, and store ^{90}Sr and ^{137}Cs separated from wastes generated during the chemical processing of defense fuel on the Hanford Site. Cesium and strontium processing have been shut down; however, WESF continues to store the Hanford Site's inventory of cesium and strontium capsules in the pool cells. Only F and G cells remain active hot cells, used to maintain the capsules as needed. WESF remains a Hazard Category 2 facility based on gross inventory. This evaluation includes the active ventilation system in WESF, which is not

credited as an active confinement ventilation system. Instead it provides a preventive defense in depth control to reduce hydrogen concentration during accident conditions.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

WRAP

The active confinement ventilation system in the WRAP facility is functionally classified Performance Category (PC) 2 and Uniform Building Code Zone 2B, designed to withstand a free field horizontal seismic acceleration of 0.12g. The building was qualitatively evaluated and judged to withstand a PC-2 NPH event and not fail in a manner that would initiate a spill event. The process area glovebox enclosures and confinement ventilation boundaries were qualitatively evaluated and determined to be capable of containing releases of radiological materials sufficiently to satisfy the postulated event scenarios documented in the SWOC MDSA. The WRAP active CVS is designated as safety significant.

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

221-T Canyon (T Plant Complex)

The active confinement ventilation systems for the T Plant Complex are functionally classified as safety significant. The 221-T canyon has been analyzed to meet PC-2 design criteria. None of the active T Plant Complex ventilation systems have been credited during the bounding NPH accident.

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

2706-T and 2706-TA (T Plant Complex)

The active confinement ventilation systems for the T Plant Complex are functionally classified as safety significant. The 2706-T and 2706-TA have been analyzed to not meet PC-2 design criteria. The 2706-T and 2706-TA structures are assumed to collapse during the NPH event. None of the active T Plant Complex ventilation systems have been credited during the bounding NPH accident.

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

WESF

The active confinement ventilation systems for the WESF are functionally classified as defense in depth. None of the WESF ventilation systems have been credited in the DSA for accident mitigation or during the bounding NPH accident.

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

WRAP

A single gap was identified: backup electrical power shall be provided to all critical instruments and equipment required to operate and monitor the confinement ventilation system. The WRAP Process Area and Glovebox HEPA CVS have no backup electrical power.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

221-T Canyon (T Plant Complex)

There were four gaps identified for 221-T canyon relating to: pressure differential should be maintained between zones and atmosphere, exhaust system should withstand anticipated normal, abnormal and accident system conditions and maintain confinement integrity, provide system status instrumentation and/or alarms, and backup electrical power shall be provided to all critical instruments and equipment required to operate and monitor the confinement ventilation system.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

2706-T and 2706-TA (T Plant Complex)

There were four gaps identified for 2706-T and 2706-TA relating to: pressure differential should be maintained between zones and atmosphere, provide system status instrumentation and/or alarms, confinement ventilation systems should not propagate spread of fire (2706-T only), and backup electrical power shall be provided to all critical instruments and equipment required to operated and monitor the confinement ventilation system.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

WESF

No gaps were identified for the WESF facility against Defense in Depth Criteria. The FET stated however that due to the preventive nature of the active ventilation system function during accident conditions, evaluation of the DSA identified safety functions and functional criteria, the stated criteria was not easily applied.

The IRP concludes that although the ventilation systems evaluation was performed correctly in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide for a defense in depth system, the IRP was unable to evaluate whether the system would meet the criteria established for the Safety Significant level.

3.3 Evaluation of physical modifications to enhance safety performance

WRAP

The FET evaluated the addition of backup power to the facility. The result of their evaluation demonstrated a high cost for the upgrade (~$5 M) with only moderate benefit. Backup electrical power would allow the facility to operate during electrical outage, however, the active confinement ventilation is not considered a vital function since loss of power would require transition of activities to a standby mode, in accordance with established LCO required actions, until power is reestablished. The FET recommended that the gap not be closed.

The IRP concluded that RL evaluation of the physical modifications was appropriately performed in accordance with the 2004-2 Ventilation System Evaluation Guide.

221-T Canyon (T Plant Complex)

The FET evaluated the closure of the four identified gaps. The result of their evaluation demonstrated a high cost (between $1 M and $25 M) with only moderate benefit. The FET recommended that no modifications be made at this time. If modifications to the T Plant Complex are made for future TRU missions, the CVS will need to be revisited at that time.

The IRP concluded that RL evaluation of the physical modifications was appropriately performed in accordance with the 2004-2 Ventilation System Evaluation Guide.

2706-T and 2706-TA (T Plant Complex)

The FET evaluated the closure of the four identified gaps. The result of their evaluation demonstrated a high cost (between $1 M and $25 M) with only moderate benefit. The FET recommended that no modifications be made at this time. If modifications to the T Plant Complex are made for future TRU missions, the CVS will need to be revisited at that time.

The IRP concluded that RL evaluation of the physical modifications was appropriately performed in accordance with the 2004-2 Ventilation System Evaluation Guide.

4. CONCLUSIONS

IRP concludes that the RL Waste Stabilization and Disposition Project Facilities Ventilation System Evaluation was performed in accordance with criteria in the DNFSB 2004-2 Ventilation Systems Evaluation Guide. However, the WESF evaluation was performed against Defense in Depth criteria and not the required Safety Significant criteria.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the RL Waste Stabilization and Disposition Project Facilities Ventilation System Evaluation Report.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman
Robert Nelson, IRP Member EM

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the WTP evaluation, a detailed-full IRP team review was not determined to be necessary.

SEPARATION

PAGE

Department of Energy
Washington, DC 20585

DEC 29 2009

MEMORANDUM FOR JEFFREY M. ALLISON
MANAGER
SAVANNAH RIVER OPERATIONS OFFICE

FROM: DR. STEVEN L. KRAHN
ACTING DEPUTY ASSISTANT SECRETARY FOR
SAFETY AND SECURITY PROGRAM
ENVIRONMENTAL MANAGEMENT

SUBJECT: Evaluation of Savannah River Site Facility Ventilation Systems in Response to Defense Nuclear Facilities Safety Board Recommendations 2004-2, Final Reports

Based on review of the information included in the subject reports, evaluation by the Defense Nuclear Facilities Safety Board (DNFSB) 2004-2 Independent Review Panel, the Environmental Management Technical Advisory Board, and input from the Chief of Nuclear Safety Office, the reports are approved with the following considerations:

- For the Tank Farm Waste Tank and Transfer Facility, an equivalent process to that required by DNFSB Recommendation 2004-2 was conducted during the Documented Safety Analysis (DSA) upgrade process for the Tank Farm Waste Tank and Transfer Facility. Vulnerabilities identified equivalent to gaps are identified and prioritized in the DSA. These vulnerabilities are required to be updated annually and tracked for execution as funding becomes available.

- For the Defense Waste Processing Facility, the ventilation systems were appropriately evaluated against the safety significant criteria associated with the established DNFSB 2004-2 evaluation guidelines, with a gap associated with the lack of a continuous on-line monitoring system. The Facility Evaluation Team (FET) analyzed the cost benefit analysis of physical modifications to close the gap, and concluded gap closure was not warranted. Periodic sampling of the Zone 2 system is made via grab samples versus continuous online monitoring.

- For the Savannah River Site (SRS) Evaporator Facilities, the ventilation systems were appropriately evaluated against the safety significant criteria associated with the established DNFSB 2004-2 evaluation guidelines, with gaps identified with respect to the safety-significant criteria. These being: (1) Three gaps associated with no installed post-accident monitoring capability for the three evaporators, (2) Lack of 242-25H Primary Ventilation System reliability during normal operations. The FET recommends that no action be taken to add post accident monitoring capability to the evaporators' ventilation systems due to the

limited, if any, overall dose reduction and cost. However, the FET does recommend that the previous action to review the 242-25H design for possible improvements should be given a higher priority, and that modifications be made to improve its reliability during normal operations.

- For the Defense Waste Processing Facility Low Point Process Pit, the ventilation systems were appropriately evaluated against the safety significant criteria associated with the established DNFSB 2004-2 evaluation guidelines, with three gaps identified with respect to the safety-significant criteria. These being: (1) effluent from the stack is not continuously monitored, (2) backup power is not supplied to the exhaust fan, and (3) no direct differential pressure (DP) measurement between environment and the Maintenance and Service area. The FET recommended that due to the low risk associated with the gaps, no gaps needed to be closed. DP measurement is not required since exhaust flow indication exists, and supply is infiltration from outside.

- For the H-Canyon and HB-Line Facilities, the ventilation systems were appropriately evaluated against the safety class criteria associated with the established DNFSB 2004-2 evaluation guidelines, with three performance gaps identified with respect to the safety class criteria. These being: (1) failure of the stack liner in a seismic event, (2) failure of the stack and stack liner in a tornado/wind event, and (3) temporary release of unfiltered air from HB-Line during a fire event. The FET recommends that upgrades to these systems be evaluated during the H-Canyon and HB-Line Safety Basis upgrade. The safety basis document is under final review by DOE-SR. The TAB requests a briefing on the results of the Safety Basis Upgrade upon approval, and a presentation on the DOE-SR conclusions on ventilation system upgrades in light of current and future missions of H-Canyon and HB-Line.

- For the Savannah River National Laboratory (SRNL) Building, the ventilation systems were appropriately evaluated against the safety class criteria associated with the established DNFSB 2004-2 evaluation guidelines, with fifty-eight gaps identified with respect to the 15 active ventilation systems. No gaps were found to involve a discrepancy between the DSA and design. The FET recommended closure (contingent upon funding) of 24 of the 58 gaps over a period of 4 to 6 years at an estimated cost of $23M to $33M, to improve reliability and effectiveness of an integrated active confinement ventilation for facility worker protection. The TAB recommends that DOE-SR review the potential for unfiltered and unmonitored releases from "tertiary" clean areas of the SRNL Building and determine if closure of identified gaps for the tertiary area ventilation is warranted.

- For the SRS F&H Area Analytical Laboratories, the ventilation systems were appropriately evaluated against the safety significant criteria associated with the

established DNFSB 2004-2 evaluation guidelines, with eight performance gaps identified with respect to the safety-significant criteria. These being: (1) building layout does not provide confinement zone separation, (2) some primary filter housings do not provide a robust seal, (3) the relay cabinet is not environmentally qualified, (4) the supply and exhaust interlock is not SS qualified, (5) control system interlocks are not SS qualified, (6) control system components are not fail safe, (7) the design does not permit in-place leak testing, and (8) backup power cables being subject to identified accidents. No gaps were found to involve a discrepancy between the DSA and design. FET recommends closure of gaps 1, 4, 6, and 8 to improve system reliability. The TAB recommends that SR review the potential for unfiltered and unmonitored releases from "tertiary" clean areas of the F&H Area Laboratories and determine if closure of identified gaps for the tertiary area ventilation is warranted.

- For the SRS Outside Facilities-H, no evaluation was made against established guidelines since these facilities are outside, without confinement and existing active ventilation systems.

- For the SRS L-Area Material Storage Facility (MSF), there is no current confinement ventilation system for the Disassembly Basin section of the facility. Historically, the ventilation system was used for personnel comfort and functionally classified as General Service, but is currently inoperable. The L Area MSF Documented Safety Analysis credits other safety class and safety significant controls for preventing and mitigating accidents. The FET evaluated the cost and safety benefit of modifying the facility to have an active confinement ventilation system and concluded that the cost of modifying the facility was not warranted because there is very little safety benefit to be gained, given that accidents are prevented or mitigated by other safety controls.

- For the SRS Solid Waste Management Facilities, the ventilation systems were appropriately evaluated against the defense in depth criteria associated with the established DNFSB 2004-2 evaluation guidelines as Hazard Category 3 facilities, without active ventilation systems. These facilities have no ventilation systems. Options were evaluated for equipping the buildings with ventilation systems, or building new facilities along with current operation. The FET recommended the continued use of the facilities as they exist due to the low risk of these existing facilities.

If you have any further questions, please call me at (202) 586-5151.

Attachments

cc:
D. Chung, EM-2
F. Marcinowski, EM-3
M. Gilbertson, EM-50

INDEPENDENT REVIEW

OF

Savannah River Site
Defense Waste Processing Facility
(DWPF) Low Point Pump Pit (LPPP)
Process Vessel
Ventilation System Evaluation Report

June 2009

Executive Summary

The DNFSB Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) Defense Waste Processing Facility (DWPF) Low Point Pump Pit (LPPP) Process Vessel Ventilation (PVV) System Evaluation Report utilizing the process and criteria outlined in DOE's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The LPPP is a Hazard Category 2 nuclear facility. The evaluation report covered the LPPP PVV System and the LPPP Building Maintenance and Service Area active ventilation systems. The LPPP Process Vessel System and the Building Maintenance and Service Area Ventilation System are both functionally classified as Production Support due to the low consequences to both onsite and off-site receptors from postulated events and the use of other safety related components to prevent or mitigate an event. They are not credited nor required to perform an active confinement function during design basis accidents. SRS reviewed the system function classification as part of the ventilation evaluation in accordance with the 2004-2 Ventilation System Evaluation Guide to ensure it was appropriately classified.

Although the ventilation systems were classified below the Safety Significant levels, SRS evaluated the ventilation systems for the LPP Building against the Safety Significant performance criteria (because the 2004-2 Ventilation System Evaluation Guide specified that ventilation systems for Hazard Category 2 facilities will be evaluated, as a minimum, against the Safety Significant criteria). SRS identified three performance gaps, i.e., no continuous online monitoring system for the LPPP effluent, no indication of differential pressure between the atmosphere and the Maintenance and Service Area, and no supply emergency power to the Maintenance and Service Area fan. In accordance with the 2004-2 Ventilation System Evaluation Guide, SRS performed a cost benefit analysis to determine whether modifications were warranted to close the performance gaps and concluded that modifications were not cost beneficial.

The IRP concludes that the ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Savannah River Site Defense Waste Processing Facility (DWPF) Low Point Pump Pit (LPPP) Process Vessel Ventilation System Evaluation Report

1. INTRODUCTION

The DNFSB Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) Defense Waste Processing Facility (DWPF) Low Point Pump Pit (LPPP) Process Vessel Ventilation System Evaluation Report utilizing the process and criteria outlined in DOE's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the SRS DWPF LPPP Process Vessel Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps (between the existing ventilation system and applicable performance criteria); and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

This evaluation included the LPPP PVV System and the LPPP Building Maintenance and Service Area active ventilation systems. Underground inter-area pipelines are used to transfer High Level Waste slurries between H-Area and DWPF. Similarly, a separate underground line is used to transfer aqueous radioactive waste generated in DWPF to the H-Area Tank Farm via the LPPP Recycle Waste Tank (RWT). The design of the LPPP Building incorporates multiple confinement levels to minimize releases of radioactivity to the environment and to minimize transport of radioactive contaminants within the facility. The primary confinement for the radioactive material at LPPP consists of the process vessels and piping, process cells and cell covers, and process vessel vent system.

The PVV system is provided at the LPPP to limit the release of radioactive materials, to control the atmosphere within the process tanks, and to limit radioactive particulate escape in the event of over-pressurization. Ventilation of the LPPP Building Maintenance and Service Area is provided to filter radioactive contamination (if present) from the air before discharge to the environment, to provide assistance with cell

ventilation when cell covers are removed, and to maintain the Maintenance and Service Area at a slight negative pressure with respect to atmospheric pressure.

The LPPP Process Vessel System and the Building Maintenance and Service Area Ventilation System are both functionally classified as Production Support due to the low consequences to both onsite and off-site receptors from postulated events and the use of other safety related components to prevent or mitigate an event.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The DWPF LPPP PVV System Evaluation Report appropriately followed the process outlined in the 2004-2 Ventilation System Evaluation Guide in developing the Data Collection Table used to identify accidents, their unmitigated consequences, and the confinement strategy. The hazard analysis for the LPPP facility did not identify accidents that could lead to consequences challenging the offsite Evaluation Guidelines (EGs); however, accidents that could challenge the onsite EG were identified. These accidents include explosions in the process vessels, spill and leaks, seismic and tornado/high winds. The bounding event, seismic impact on the LPPP Building, yielded an unmitigated dose of 0.86 rem for the offsite receptor and 400.6 rem for the collocated workers. The seismic related explosion events are prevented with Performance Category (PC)-2 seismically qualified Safety Significant nitrogen purge. The LPPP superstructure, crane, vaults, cell covers, jumpers, above the purge jumpers, sludge pump tank and precipitate pump tank are also PC-2 seismically qualified.

The recycle waste tank and strip effluent jumper in the sludge pump tank cell are not credited to survive a PC-2 seismic event and are therefore assumed to fall, resulting in a spill of their contents. This results in a mitigated onsite dose of 10.05 rem, with the majority of the dose due to the spill of the recycle waste tank contents (10 rem). Neither the PVV nor the Building Maintenance or Service Area Ventilation systems are credited for any Design Basis Accidents. A spill of 15,000 gallons of sludge during an Inter-Area transfer results in an onsite dose of 17.8 rem. The LPPP cell vaults and cell covers are credited with providing mitigation for these events.

Based upon this evaluation, SRS determined that the LPPP Process Vessel System and the Building Maintenance and Service Area Ventilation System are both appropriately functionally classified as Production Support.

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

Although the ventilation systems were classified below the Safety Significant level, SRS evaluated the ventilation systems for the LPP Building against the Safety Significant performance criteria (because the 2004-2 Ventilation System Evaluation Guide specified

that ventilation systems for Hazard Category 2 facilities will be evaluated, as a minimum, against the Safety Significant criteria).

The SRS DWPF LPPP PVV System Evaluation Report included a brief description of how the ventilation systems met the criteria and specified reference documents used as part of the review.

The SRS DWPF LPPP PVV System Evaluation Report identified three gaps with respect to the DNFSB 2004-2 Evaluation Guidance. The first gap was found with both systems in that effluent from the LPPP Stack is not continuously monitored as DNFSB Tech 34 suggests. The second gap identified in the LPPP Building Maintenance and Service Area Ventilation is that emergency power is not provided to the exhaust fan. The final gap with the LPPP Building Maintenance and Service Area Ventilation is that there is no direct DP measurement between the environment and the Maintenance and Service Area.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

3.3 Evaluation of physical modifications to enhance safety performance

WSRC-IM-2002-000014, SRS Air Emissions Monitoring Graded Approach, identified the LPPP as a potential impact category IV source (potential effective dose equivalence of $\leq$ 0.00002 mrem/year). Monitoring requirements were changed from continuous to an annual grab sample. Due to the cost associated with maintaining the system, the need to replace obsolete equipment, and the change in regulatory drivers, the continuous air monitoring system was removed by J-DCP-S-03017. It is estimated that the project cost to reinstall a continuous online monitoring system would be $3,460,000 ($2,422,000 to $5,190,000) with an additional cost of $1,200,000 ($840,000 to $1,800,000) for upgrading the system to being PC-2 NPH qualified. This is a Class 5 estimate prepared by SRS Site Estimating. This does not include the cost associated with qualifying the PVV System to function during and after a PC-2 NPH event. The FSAR does not credit PVV System for providing any mitigation for design basis accidents as the cell vaults and shield covers provide adequate mitigation. Both the LPPP PVV and Building and Service Area discharge through a common stack.

The LPPP Building Maintenance and Service Area Ventilation System does not have a direct measurement of differential pressure between the atmosphere and the Maintenance and Service Area. The Service and Maintenance Area is separated form the outside by sheet metal that is attached to the LPPP superstructure. Air is pulled into this area via six wall mounted counterweighted louvers. The louvers start to open at 0.05 inches water column and each is rated for 2,020 standard cubic feet per minute. There is a low flow alarm for the system. The system is not cascaded and thus flow provides an adequate measure of system performance. The fan is controlled via flow. It is estimated that the cost to install a differential pressure monitor is $60,000 ($60,000 to $90,000). This estimate was provided by SRS design engineering.

The LPPP Building Maintenance and Service Area Ventilation System does not have emergency power supplied to its fan. It is estimated that project cost to connect the fan to

INDEPENDENT REVIEW

OF

Savannah River Site
Evaporator Facilities
Ventilation System Evaluation Report

October 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) 242-16F, 242-16H and 242-25H Evaporator Facilities Ventilation System Evaluation Report utilizing the process and criteria outlined in Department of Energy's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The three SRS evaporator facilities are Hazard Category 2 facilities. 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. SRS reviewed the system functional classification as part of the ventilation evaluation in accordance with the 2004-2 Ventilation System Evaluation Guide and determined it was appropriate.

Although the ventilation systems were classified below the Safety Significant level, SRS evaluated the ventilation systems for the three evaporator facilities against the Safety Significant performance criteria in the 2004-2 Ventilation System Evaluation Guide (because the 2004-2 Ventilation System Evaluation Guide specified that ventilation systems for Hazard Category 2 facilities will be evaluated, as a minimum, against the Safety Significant criteria). SRS identified performance gaps between the Safety Significant 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. In accordance with the 2004-2 Ventilation System Evaluation Guide, SRS performed a cost benefit analysis to determine whether modifications were warranted to close the performance gaps and concluded that modifications were not cost beneficial.

The IRP concludes that the ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Savannah River Site Evaporator Facilities Ventilation System Evaluation Report

1. INTRODUCTION

The DNFSB Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) Evaporator Facilities Ventilation System Evaluation report utilizing the process and criteria outlined in DOE's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the SRS Evaporator Facilities Ventilation System Evaluation report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps (between the existing ventilation system and applicable performance criteria); and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM 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 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.

The evaporator cell ventilation systems are similar in their design and operation, however, the 242-25H evaporator is newer than the other evaporators and subsequently its cell ventilation system has been designed to more current codes and standards. 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. 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 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 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.

Although the SRS Evaporator Facilities are properly designated as Hazard Category 2, the 242-16H Mercury Removal System Ventilation System portion was treated as a Hazard Category 3 facility segment for the purposes of performing DNFSB 2004-2 evaluations due to the low consequence potential.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

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. 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 DSA to operate during or following any DBA events, including NPH events.

The DSA dose calculations did not identify any evaporator events that challenge the 25 rem Evaluation Guideline from DOE-STD-3009 for the public or the 100 rem Co-located Worker criteria per Washington Savannah River Company Procedure E7 2.25, Functional Classification 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 as appropriately classified as PS.

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation systems as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

Although the ventilation systems were classified below the Safety Significant level, SRS evaluated the ventilation systems for the SRS Evaporator Facilities against the Safety Significant performance criteria (because the 2004-2 Ventilation System Evaluation Guide specified that ventilation systems for Hazard Category 2 facilities will be evaluated as a minimum, against the Safety Significant criteria).

The SRS Evaporator Facilities Evaluation Report included a brief description of how the ventilation systems met the criteria and specified reference documents used as part of the review.

The SRS Evaporator Facilities Evaluation Report identified four gaps with respect to the DNFSB 2004-2 Evaluation Guidance. The first three gaps are associated with the 242-16F, 242-16H and 242-25H Evaporator Cell Ventilation Systems and the 242-25H Evaporator Secondary Ventilation System having no installed post-accident monitoring capability. 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 last gap is associated with improving the 242-25H Primary Ventilation System (PVS) reliability during normal operations. 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 IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

3.3 Evaluation of physical modifications to enhance safety performance

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 <u>each</u> 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. 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.

INDEPENDENT REVIEW

OF

Savannah River Site (SRS)
F & H Area Analytical Laboratory
Ventilation System Evaluation Report

July 2009

Executive Summary

The Defense Nuclear Facility Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) F & H Area Analytical Laboratory Ventilation System Evaluation report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The SRS F& H Area Analytical Laboratory is a Hazard Category 2 nuclear facility. The primary function of the building and associated system is to support the handling of nuclear materials and chemicals in limited bench-scale quantities for analysis. These operations are performed inside the gloveboxes, radiohoods, radiobenches and shielded cells (containment units) contained within the lab modules. Eight gaps were identified between the safety significant criteria and the 772-F and 772-4F designs.

The IRP concludes that the ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Savannah River Site (SRS) F & H Area Analytical Laboratory Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facility Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) F & H Area Analytical Laboratory Ventilation System Evaluation report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the SRS F & H Area Analytical Laboratory Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The primary mission of the F/H Labs over the last 50+ years has been to support the chemical separations processing activities at Buildings 221-F and 221-H. Samples received from the canyo0ns and other site areas are subjected to the required radiological and chemical quality control/analyses. Results from these analyses are used to effectively and safely operate the canyon facilities. The mission of the F/H Lab has changed very little over the last 40 years of operation. The projected future use of the facility is to continue its mission to support the separations processes and to provide support for the increasing waste management, waste characterization, waste stabilization, and environmental remediation activities at SRS. F/H Labs will also support the tank farm operations, reactor area programs, the Liquid Waste Disposition Unit, to a limited extent the Defense Waste Processing Facility, and site waste characterization efforts.

The function of the Off Gas Exhaust (OGE) system is to exhaust and filter air from the Gloveboxes. Air from within the laboratory area is drawn through the glovebox

containment enclosure and filtered to minimize the potential for release during normal operation and low energy accident conditions. The HEPA filters installed at the inlet and outlet of each glovebox are non-leak testable type filters. In addition, the air from the glovebox is exhausted into the main header which directs the air flow to the central OGE filtration in Shielded Area B. The 3 central OGE HEPA filter housings in Shielded Area B each consists of two in-place testable HEPA filters in series. After the air if filtered, the air passes through the OGE fans in the fan room and then into the Main Exhaust System concrete trench before entering the ductwork to 772-4F where it passes through another two stages of HEPA filtration.

The function of the main exhaust system is to exhaust all building areas to the outside environment while minimizing the potential of radioactive releases and subsequent onsite and offsite exposure during normal operation and abnormal conditions. The main exhaust system filters air from all radiological areas, radiohoods and radiobenches, gloveboxes, waste handling systems, and the retrospective air sampling and stack monitoring systems.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The Consolidated Hazard Analysis did not identify any design basis accidents to be included in the DSA that challenge the public Evaluation Guideline from DOE-STD-3009. One accident in the DSA does exceed the 100 REM Co-Located Worker Criteria in SRS procedure E7 2.25, Functional Classification and DOE Ventilation System Evaluation Guidance document. The Detonation Event in the DSA, yields unmitigated offsite dose consequences of approximately 0.5 REM and 137 REM for co-located workers.

There are no active SS or SC functions for the existing active confinement ventilation systems associated with the 772-F Confinement boundary, however the system provides a SS passive boundary. The 772-F and 772-4F active confinement ventilation systems are not credited by the FHLAB DSA to operate during or following any DBA or NPH events. The SRS FET concluded that the SS functional classification of the existing 772-F Building passive confinement ventilation system and GS functional classification of the 772-F Main Exhaust active confinement ventilation System components is appropriate.

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The 772-F confinement ventilation systems, structures, and components were evaluated against SS, PC-2 & PC-3 criteria. In evaluating the 772-F active confinement ventilation against the SS criteria, the events from the DSA as shown in Table 4.3 and system classification boundaries for each confinement ventilation system played an important

role in determine whether any of the identified gaps and related closure recommendations would be considered discretionary in nature. While the unmitigated consequences for the detonation event were the only accident consequences that drove the 772-F evaluation to SS criteria, a few other credible events for the DSA were considered in the development of Table 5.1.

The SRS FET evaluation identified eight discretionary gaps.

1. The building layout does not provide confinement zone separation. Pressure instrumentation to monitor pressure differential between building interior and outside environment is not available. The 772-F CVS is designed to maintain the required pressure differential during normal operations. It is not credited in the DSA to operate during or following any DBS event, including NPH events.
2. The majority of the Main Exhaust filter housings in the 772-F are 1950's vintage and are constructed with a tape-in-place seal at the inlet and discharge of the HEPA filter frame. These filters do not have a positive seating mechanism that provides a robust seal that is independent of human performance during filter installation.
3. Relay cabinet, CRP-1, located in 772-4F is sensitive to vibration, radiofrequency interference, and/or pressure pulses and is not Safety Significant (SS) or credited as functioning in the DSA. The result of a CRP-1 failure would range from the ventilation system going into a process upset condition (safe mode failure) to a complete shutdown of the ventilation system resulting form the loss of system controls.
4. The exhaust fan interlocks are not SS and are not credited as functioning during or after DBA events.
5. The control system interlocks are not SS and are not required or credited to function during or after DBA events.
6. The controls are not SS and are not required or credited to function during or after DBA events.
7. The installed design for most of the inlet and discharge HEPA filters of the gloveboxes in 772-F does not permit In-Place Leak Testing.
8. Electrical cables are run in open cable trays from 772-4F over the middle of the 772-F roof to the 254-9F diesel generator located on the west side of 772-F. A detonation event could potentially damage these cables and standby power capability (GS) to the 772-4F ventilation system could be lost.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

3.3 Evaluation of physical modifications to enhance safety performance

2004-2 Ventilation System Evaluation Guide specifies that an evaluation of physical modifications that may be appropriate to enhance the ventilation system in the areas where the current confinement ventilation system does not meet the 2004-2 evaluation criteria should be performed. The SRS FET proposed closure actions, identified costs and recommendation for the eight identified gaps were:

1. Enclose laboratory corridors with doors, install a secondary set of doors at exterior exit on west side of 772-F main floor, and provide zone differential monitoring capabilities. The total ROM cost estimated for closure is $832,000 to $1,664,000. The modification associated with the closure moves the facility closer to meeting current code and standard definition of Zone boundaries and aids in adding a minor ability to minimize the spread of contamination between internal zones but does not mitigate the consequences of the detonation event. There is no discernible benefit or significant risk reduction associated with this gap resolution for any of the bounding accidents in the DSA. The SRS FET does not recommend implementing this gap closure for the mitigation of an event, but does recommend implementation of this gap closure for the perceived benefit in increased system reliability.
2. The closure of this gap would require the replacement of the existing ductwork, clean and dirty plenums, and 26 filter housings with a more current design that contains an engineered installation air, boundary around filter shell, and In-Place Leak Testing of filters. The total ROM cost estimated for this gap closure is $6,200,000 to $12,400,000. The ventilation upgrade primarily brings the immediate laboratory module filtration units up to more current codes and standards but does not improve facility worker protection. The SRS FET does not recommend implementation of this modification for the mitigation of the Detonation event consequences.

3-6. Replace existing CRP-1 Relay Cabinet with a PLC bus system as well as perform upgrade of existing system controls. The total ROM cost estimated for this gap closure is $2,500,000 to $5,000,000. While the implementation of this gap closure, with respect to Gaps 4 and 6, does ensure more rigor is put into maintaining the reliability of the interlocks between the Supply and Exhaust, it does not provide a means of mitigation for the consequences of the Detonation event. There is no discernible benefit or significant risk reduction associated with this gap resolution for any of the bounding accidents in the DSA. The FET does not recommend implementing this gap closure for the mitigation of an event but does recommend implementation of this gap closure for the perceived benefit in increased system reliability.

7. Due to the small diameter welded pipe duct design and limited space available with the existing glovebox installations (except Lab 175) in 772-F Laboratory modules, it is not possible to modify the existing gloveboxes. Therefore in order to close this gap, all glovebox units that are needed for active Analytical Sample analysis will need to be replaced with new glovebox containment units along with lab utilities renovation work as well. The RIM cost estimated for this gap closure is $200,000 to $1,000,000 per glovebox. The total modification ROM ($9,000,000 to $45,000,000) for this gap closure is dependent on the number of gloveboxes needed to support the mission of the lab, the lab currently has and maintains 47 glo9veboxes. The SRS FET does not recommend implementation of this modification for the mitigation of the Detonation event consequences.
8. Replace and relocate cables and cable trays for both Normal Electrical Power and Standby Electrical Power with new cables in environmentally shielded, seismically qualified cable trays. The total ROM cost estimated for this gap closure is $400,000 to $800,000. The FET does not recommend implementing this gap closure for the mitigation of an event but does recommend

implementation of this gap closure for the perceived benefit in increased system reliability.

The IRP concluded that SRS evaluation of the physical modifications was appropriately performed in accordance with the 2004-2 Ventilation System Evaluation Guide.

4. CONCLUSIONS

IRP concludes that the SRS F & H Area Laboratory Ventilation Systems Evaluation Report was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the SRS F & H Area Laboratory Ventilation System Evaluation Report.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman
Robert Nelson, IRP Member EM

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the SRS F & H Area Laboratory ventilation system evaluation, a detailed-full IRP team review was not determined to be necessary.

INDEPENDENT REVIEW

OF

Savannah River Site
H-Canyon and HB-Line Facilities
Ventilation System Evaluation Report

October 2009

Executive Summary

The DNFSB Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) H-Canyon and HB-Line Facilities Ventilation System Evaluation Report utilizing the process and criteria outlined in DOE's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The H-Canyon and HB-Line Facilities are Hazard Category 2 nuclear facilities. The evaluation report covered the "H-Canyon Ventilation System," which provides confinement for both H-Canyon and HB-Line Facilities. The portions of the ventilation systems are functionally classified as Safety Class. This functional classification is based upon the high radiological dose consequences to both on-site and off-site receptors from postulated events as evaluated in the Safety Analysis Report (SAR) for each facility. SRS reviewed the functional classification of the ventilation systems as part of the ventilation evaluation in accordance with the 2004-2 Ventilation System Evaluation Guide and concluded that they were appropriately classified.

The Facility Evaluation Team (FET) performing the ventilation system review also evaluated the ventilation systems for the H-Canyon and HB-Line Ventilation System against the Safety Class performance criteria specified in the 2004-2 Ventilation System Evaluation Guide. SRS identified three performance gaps, i.e., failure of the stack liner in a seismic event, failure of the stack and stack liner in a tornado/wind event, and temporary release of unfiltered air from HB-Line during a fire event. The FET recommends that upgrades to these systems be evaluated during the H-Canyon and HB-Line Safety Basis upgrade to a 10 CFR 830 compliant Documented Safety Analysis (DSA) which is currently underway. Any gap resolution will be considered during the DSA review/approval process. Conceptual studies have placed the total system upgrades to be between $7,000,000 and $16,000,000.

The IRP concludes that the ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Savannah River Site H-Canyon and HB-Line Facilities Ventilation System Evaluation Report

1. INTRODUCTION

The DNFSB Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) H-Canyon and HB-Line Facilities Ventilation System Evaluation Report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the SRS H-Canyon and HB-Line Facilities Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

This evaluation included the H-Canyon and HB-Line Facilities systems. The H-Canyon and related support facilities were constructed in the 1950s. The original mission of these facilities was to process irradiated/unirradiated uranium target assemblies to recover plutonium for national defense purposes. The facilities were later modified to process enriched uranium fuels and neptunium targets. H-Canyon and its support facilities are classified as Hazard Category 2 based upon uranium and plutonium radiological inventories. The process equipment is located in two parallel canyons – a "Hot" and a "Warm" Canyon, separated by a central operating and service section that is divided into four levels. The more highly radioactive processing operations are performed in the Hot Canyon.

The HB-Line facility is classified as Hazard Category 2 and is comprised of a hardened structure located on the Fifth and Sixth Levels of the H-Canyon, a one-story office building appendage located on the Fifth Level of the H-Canyon, and a segregated area (outside the hot and warm canyons) in the southwest corner of the H-Canyon Third and Fourth Levels. The hardened structure and the office building are commonly referred to

as the new HB-Line. The segregated area on the Third and Fourth Levels of H-Canyon is commonly referred to as the old HB-Line. The HB-Line is a large radiochemical processing facility that processes solid scrap material; conducts receipt, storage, unpackaging and repackaging of uranium material in scrap recovery; and processes radioactive solutions containing neptunium, plutonium and/or uranium.

The H-Canyon Exhaust Ventilation System is considered as the final confinement barrier for airborne contamination for the Hot and Warm Canyons. The functional requirement of the active confinement ventilation system is to provide a filtered ventilation pathway to mitigate radioactive releases. It is credited with limiting the spread of contamination from the Canyons, providing a high degree of filtration of the Canyon Exhaust, providing an elevated release point for the exhaust, and protecting facility workers during abnormal and normal events. The Safety Class (SC) designated Canyon Ventilation System controls the spread of contamination in the Hot and Warm Canyons by ensuring that air flows from lesser contaminated areas to more contaminated areas and by filtering this air through sand filters before exhausting it to the atmosphere.

The HB-Line ventilation system directs air from radiological clean areas to areas with increased potential of radiological contamination. The HB-Line ventilation systems interface with the process vessels, process cabinets, and facility structure to control airborne radioactivity and other hazardous materials. The ventilation system features a once-through airflow. All exhaust air from HB-Line is passed through the H-Canyon exhaust system. The final level of confinement is the H-Canyon Sand Filter and the building itself, which constitute the confinement barrier between the general public and the nuclear material. The HB-Line Building Structure (outside walls, exterior security doors, roofs, exterior ventilation tunnel and Sixth Level Floor), and the Ventilation Interlock (Building Vacuum) are classified as SC Structure, Systems and Components (SSCs).

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The SRS H-Canyon and HB-Line Ventilation System Evaluation Report appropriately followed the process outlined in the 2004-2 Ventilation System Evaluation Guide in developing the Data Collection Table used to identify accidents, their unmitigated consequences, and the confinement strategy. Functional classification was performed in accordance with Procedure 2.25 of WSRC Procedure Manual E7, which meets the requirements of the DOE-STD-3009-94.

The H-Canyon active CVS is functionally classified as SC. The only Safety Significant (SS) portion of the ventilation system is the 291-H Stack and Stack Liner. All structural components are functionally classified as Performance Category (PC-3). The Stack is classified as PC-2. The H-Canyon confinement supply and exhaust systems, sand filter, and the passive confinement in both facilities are credited as SC to protect the public and control releases that may exceed or challenge the 25-rem Evaluation Guideline (EG) specified in DOE-STD-3009. These SC SSCs also provide an SS function to protect the

Co-located Worker and control releases that may exceed or challenge the 100-rem evaluation criteria. Unique and bounding accident scenarios for which the H-Canyon SC CVS is credited to mitigate are evaluated in the H-Canyon SAR and the HB-Line SAR. The Facility Evaluation Team (FET) performing the ventiliation system review concluded that the ventilation systems are appropriately classified as SC.

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The FET evaluated the ventilation systems performance capabilities against the SC criteria specified in the 2004-2 Evaluation Guide The SRS H-Canyon and HB-Line Ventilation System Evaluation Report included a brief description of how the ventilation systems met the criteria and specified reference documents used as part of the review. As part of the evaluation, the ventilation and support systems were walked down and documentation was reviewed to confirm system configuration. The systems were then evaluated against the criteria and gaps were identified and documented.

The H-Canyon and HB-Line Ventilation System Evaluation Report identified three gaps with respect to the DNFSB 2004-2 Evaluation Guidance affecting four of the H-Canyon evaluation criteria and five of the HB-Line evaluation criteria. The first gap is that although H Canyon 291 H Stack will withstand the PC-3 seismic loads, the brick stack liner will collapse and partially or completely block airflow through the stack. The canyon building remains intact with minor cracks in the walls. The 243-19H Diesel Generators will provide power for the exhaust system after an earthquake. The safety analysis assumes that any one of four fans can be returned to operation within 48 hours, thereby pulling a minimum vacuum on the canyon.

The second gap is that the H-Canyon stack will fail in a Design Basis Tornado (DBT) or wind event. The Canyon and HBL structures will withstand a DBT or wind event, so there are no releases inside the structure and no accident event recognized in the SAR. High winds or tornado events causing failure of the 291-H stack would not simultaneously cause accidents inside the canyon, nor would there be credible accident scenarios whereby events inside the canyon would occur immediately after collapse of the stack.

The third gap is that some temporary release of unfiltered air is anticipated during fire events in HB-Line due to release of large volumes of Halon and abrupt expansion of air due to heat input. However, passive confinement features keep consequences well below EG. For fire events on 5th and 6th levels, the non-credited room exhaust fans, which discharge into the canyon exhaust tunnel, are conservatively assumed to fail. Although the canyon exhaust system continues to draw some air from HB-Line, it is not sufficient to avoid some release of unfiltered air through expansion joints and open doors. For fire events on the 3rd and 4th levels, non-credited air supply fans are conservatively assumed to continue to operate while the non-credited exhaust fans, which discharge into the warm canyon are conservatively assumed to fail.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

3.3 Evaluation of physical modifications to enhance safety performance

Options were identified for modification or replacement of the stack/stack liner. An evaluation was completed to provide Alternative Study Estimates for the Modification of the 291-H Stack to determine the most cost-effective path forward to modify the stack to meet PC-3 seismic and wind requirements. Options vary in cost, between $2,000,000 and $6,000,000. Another alternative to be evaluated is whether sufficient air can pass through the stack liner or stack rubble to maintain minimum facility vacuum. Of the four options explored, installing additional reinforcement is favored technically. Upgrades are currently included in the multi-year plan for facility infrastructure upgrades. The H-Canyon SAR is currently being revised to a 10 CFR 830 compliant Documented Safety Analysis (DSA) per current Office of Environmental Management guidance. The revision will consider revising the earthquake accident analysis to reduce/eliminate the assumed time that the active ventilation system is unavailable after an earthquake.

A pre-conceptual estimate for the HB-Line upgrades to close the third gap is $5,000,000 to $10,000,000 million. The HB-Line DSA is scheduled to be updated to improve alignment with DOE-STD-3009-94 requirements. The current accident analyses include many very conservative assumptions, and reanalysis will focus on which assumptions are warranted. The HB-Line mission is changing. There are no remaining plutonium solutions in H-Canyon, and neptunium processing was scheduled to be completed by the end of CY 2007. Further, new security restrictions will significantly lower allowable radioactive material inventory if plutonium oxide is declared Attractiveness Category 1 rather than 2. The DSA analysis has been completed since the completion of this report and is currently in review by DOE.

The SRS FET recommends that the H-Canyon Safety Basis upgrade, currently underway, identify if system upgrades are warranted to resolve the two gaps dealing with the stack/stack liner. The FET also concurs with the prudent H-Canyon decision to include the stack/stack liner upgrades in the list of upgrades that require funding to support new missions. Conceptual studies have been done that evaluate several upgrade options that cost between $2,000,000 and $6,000,000. For the third gap, the FET recommends that the HB-Line Safety Basis upgrade identify if systems upgrades are warranted to resolve the gaps. Any gap resolution will be considered during the DSA review/approval process. A pre-conceptual estimate for the HB-Line upgrades is $5,000,000 to $10,000,000.

The IRP concluded that SRS evaluation of the physical modifications was appropriately performed in accordance with the 2004-2 Ventilation System Evaluation Guide.

4. CONCLUSIONS

IRP concludes that the H-Canyon and HB-Line Facilities Evaluation Report was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman
Robert Nelson, IRP Member EM

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For this ventilation system evaluation review, a detailed-full IRP team review was not determined to be necessary.

INDEPENDENT REVIEW

OF

L Material Storage Facility Disassembly Basin Section Ventilation System Evaluation Report

August 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) L Material Storage Facility (MSF) Disassembly Basin Section Ventilation System Evaluation Report utilizing the process and criteria outlined in Department of Energy's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The L Area MSF is a Hazard Category 2 facility used for underwater and dry storage of spent nuclear fuel (in the Disassembly Basin [DB] section of the facility). There is no confinement ventilation system for DB section. Historically, the DB ventilation system was used for personnel comfort and functionally classified as General Service but is currently inoperable. The L Area MSF Documented Safety Analysis credits other safety class and safety significant controls for preventing and mitigating accidents.

The Facility Evaluation Team (FET) performing the ventilation system review evaluated the ventilation system functional classification and determined it to be appropriately classified as General Service. The FET evaluated the cost and safety benefit of modifying the facility to have an active confinement ventilation system and concluded that the cost of modifying the facility (estimated $20 million cost) was not warranted because there was very little safety benefit to be gained given that accidents were prevented or mitigated by other safety controls.

The IRP concludes that the ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the L Material Storage Facility Disassembly Basin Section Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) L Material Storage Facility Disassembly Basin Section Ventilation System Evaluation Report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the SRS L Material Storage Facility Disassembly Basin Section Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The L Area MSF was originally known as L Reactor Facility. The facility began operation as a production reactor in the early 1950s, and operated until it was shut down in 1968, when its production capacity was not needed. The L Reactor was restarted in 1985 and again shutdown in 1988. In 1990, the decision was made to use the L Reactor Facility as a backup source of tritium production. In 1993, DOE directed WSRC to place the L Reactor in a shut-down condition with no capability for restart. In the mid 1990s, the L Facility MSF was directed to begin the receipt and storage of Foreign Research Reactor Fuel and domestic Research Reactor Fuel in the Disassembly Basin (DB) section of the facility. By laying up equipment not associated with the ongoing storage and handling operations, potential hazards associated with the MSF were reduced.

The DB section has been modified and now primarily serves as a storage location for spent nuclear fuel. SRS plans to continue receiving spent nuclear fuel from research reactors and other miscellaneous nuclear material and storing it in the DB section until

alternative interim storage facilities are available or final disposition of the material can be accomplished.

The majority of the fuel stored in the DB section is stored underwater. A small quantity of fuel is stored dry in the Dry Fuel Storage Area (DFSA) and in the Dry Cave. The DFSA is a totally enclosed, isolated area within the DB section for the dry storage of fuel. The DFSA was designed as a critically safe and environmentally sound location for the dry storage of special nuclear material. The DFSA provides an effective four hour fire rated barrier wall.

There is no confinement ventilation system for the DB section of the L Area MSF. The primary ventilation fan for the DB section is out of service and inoperable. The DB section ventilation system is used for personnel comfort and is functionally classified as General Service.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The L Area MSF has been identified as a Hazard Category 2 facility. The Facility Evaluation Team (FET) performing the ventilation system review evaluated the ventilation system functional classification to determine whether it was appropriately classified as General Service or should be classified at a higher classification level (e.g., safety significant or safety class). The FET found that with current credited controls in place, radiological doses to the worker and to the public are significantly below minimum Evaluation Guides (EGs) required to establish additional safety significant or safety class controls per WSRC E7 Manual, Procedure 2.25, *Functional Classification.* Based on this, the FET concluded that the current General Service classification was appropriate.

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Ventilation System Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

Because no confinement ventilation system existed for the DB section, the FET did not perform a formal evaluation of the system against the 2004-2 Ventilation System Evaluation Guide to evaluate specific system performance gaps but rather performed an evaluation of the cost and benefit of installing a complete confinement ventilation system.

The IRP concluded that the evaluation was not necessary to indicate the complete absence of a ventilation system.

3.3 Evaluation of physical modifications to enhance safety performance

The cost range of a confinement ventilation system for the DB section using an estimate prepared by Site Estimating was $20,000,000. The FET recommended no facility modifications be made because:

- With current credited controls in place, radiological doses to the worker and to the public are significantly below minimum Evaluation Guides (EGs) required to establish additional safety significant or safety class controls per WSRC E7 Manual, Procedure 2.25, Functional Classification,
- The significant cost of providing a confinement structure and confinement ventilation system for the DB, and
- Additional controls could be developed to reduce the consequences to the facility (onsite) worker in a criticality accident.

The IRP concluded that SRS evaluation of the physical modifications was appropriately performed in accordance with the 2004-2 Ventilation System Evaluation Guide.

4. CONCLUSIONS

IRP concludes that the SRS L MSF DB Section Ventilation System Evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman, Office of Health, Safety and Security
Robert Nelson, IRP Member, Office of Environmental Management

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For this evaluation, a detailed-full IRP team review was not determined to be necessary.

INDEPENDENT REVIEW

OF

Savannah River Site (SRS)
Outside Facilities – H
Ventilation System Evaluation Report

July 2009

Executive Summary

The DNFSB Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) Outside Facilities – H Ventilation System Evaluation Report utilizing the process and criteria outlined in DOE's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The SRS Outside Facilities - H are Hazard Category 2 facilities located in the 200-H Separations Area of the SRS. Operations conducted in the Outside Facilities – H include general support for H canyon activities, principally for processing of irradiated and unirradiated fuels and targets.

The Documented Safety Analysis (DSA) for the Outside Facilities - H does not credit any active or passive confinement ventilation systems for mitigation of accidents since these facilities exist outside the H Canyon facility with no physical structure surrounding them. There is a non-credited recycle vessel vent active confinement system that draws a slight vacuum on each vessel and discharges to a sand filter. The radioactive source term contained in the vessels is low. The offsite Evaluation Guidelines and onsite evaluation criteria are not challenged for any of the bounding accidents analyzed in the DSA.

For the Outside Facilities – H there are no credited building structures and no credited confinement ventilation systems to evaluate.

The IRP concludes that the ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Savannah River Site Outside Facilities – H Ventilation System Evaluation Report

1. INTRODUCTION

The DNFSB Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) Outside Facilities – H Ventilation System Evaluation Report utilizing the process and criteria outlined in DOE's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the SRS Outside Facilities – H Ventilation System Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The SRS Outside Facilities - H are Hazard Category 2 facilities located in the 200-H Separations Area of the SRS. Operations conducted in the Outside Facilities – H include general support for H canyon activities, principally for processing of irradiated and unirradiated fuels and targets.

The term "Outside Facilities" is used to describe a wide variety of processes and utilities that are ancillary to the primary 200-H Area operations. The Outside Facilities – H processes include A-Line, General Purpose Evaporation, Segregated Solvent facilities, and Enriched Uranium Storage (EUS) Tank which exist outside of H-Canyon without any supporting physical structure around them. Low Level Waste containers (e.g., Sealands, B-25s, B-12s, roll pans, and pot boxes) are also temporarily stored or staged at Outside Facilities – H in support of H-Canyon activities.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The Facility Evaluation Team (FET) performing the ventilation evaluation reviewed the Facility hazard analysis and safety analysis. For all of the accident consequences identified in the SAR for the Hazard Category 2 Outside Facilities – H, all of the unmitigated radiological consequences are below the DOE Standard 3009 evaluation guidelines for the maximum exposed offsite individual (i.e., 25 rem) and the on site criteria for exposure to a collocated worker (i.e., 100 rem). Additionally, the unmitigated radiological consequences do not exceed the minimum evaluation guidelines required to establish safety significant defense-in-depth controls to protect the collocated worker and offsite public as defined in WSRC E7 Manual, Procedure 2.25. The accident analysis does not require a confinement ventilation system as a mitigator for any of the facility Design Basis Accidents since the unmitigated doses do not challenge the current control selection evaluation guidelines.

The IRP concluded that the FET appropriately reviewed the safety classification of the facility and the requirement for a confinement ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

For the Outside Facilities – H, there are no credited building structures and no credited confinement ventilation systems to evaluate. There is a non-credited vent system that draws a slight vacuum on each vessel and discharges to the H-Canyon sand filter and exhaust stack. The Outside Facilities – H are located out of doors because the source term contained in the vessels is low. Due to low unmitigated radiological doses, the Outside Facilities – H operate without a credited confinement structure and without a credited confinement ventilation system.

The IRP concluded that no ventilation system existed for these facilities for evaluation against the 2004-2 Ventilation System Evaluation performance criteria.

3.3 Evaluation of physical modifications to enhance safety performance

The FET concluded that, based upon the low radiological doses to the public and workers from postulated design basis accidents and the high cost of constructing a confinement structure and confinement ventilation system for multiple facilities (A-Line Facility, General Purpose Evaporator Facility, and the Segregated Solvent Facility), no modifications should be made to the Outside Facilities – H at this time. However, the Safety Basis upgrade, that is currently underway, may conclude that additional Safety Basis controls (including perhaps ventilation controls) are warranted.

4. CONCLUSIONS

IRP concludes that the SRS Outside Facilities - H Ventilation Systems Evaluation Report was performed in accordance with the criteria in DNFSB 2004-2 Ventilation System Evaluation Guide.

5. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman
Robert Nelson, IRP Member EM

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For this evaluation, a detailed-full IRP team review was not determined to be necessary.

INDEPENDENT REVIEW

OF

Savannah River Site (SRS)
Solid Waste Management Facilities
Hazardous and Mixed Waste Storage
Ventilation System Evaluation Report

October, 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) Solid Waste Management Facilities Hazardous and Mixed Waste Storage Buildings Ventilation System Evaluation report utilizing the process and criteria outlined in Department of Energy's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

Three N Area Hazardous Waste Management Storage Buildings, 645-N, 645-2N and 645-4N are addressed in this evaluation. The facilities collectively comprise a Hazard Category 3 segment. None of these buildings possess an active or passive airborne release confinement system.

In accordance with the 2004-2 Ventilation System Evaluation Guide, the facilities were evaluated against Defense in Depth criteria to determine if there is a need for active confinement ventilation systems. The review concluded that there was not a need for an active confinement ventilation system because consequences from analyzed events would not warrant either a safety significant or a safety class ventilation system and the cost associated with modifications to install a defense in depth system were not cost beneficial.

The IRP concludes that the ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Savannah River Site (SRS) Solid Waste Facilities Hazardous and Mixed Waste Storage Buildings Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River Site (SRS) Solid Waste Facilities Hazardous and Mixed Waste Storage Buildings Ventilation System Evaluation Report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the SRS Solid Waste Facilities Hazardous and Mixed Waste Storage Buildings Ventilation System Evaluation report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The three Hazardous Waste Management Storage Buildings (545-N, 645-2N, and 645-4N) are located within the plant northwest quadrant of N-Area. Each building has been permitted by the South Carolina Department of Health and Environmental Control to provide interim storage of containerized Mixed Waste and/or Hazardous Waste, Low Level Waste, RCRA empty containers, TSCA waste, and non-hazardous waste. The inventories in the buildings are maintained as Hazard Category 3. Buildings 645-N, 645-2N, and 645-4N are segregated into one or more cells (or bays) and are used to provide interim storage of waste in containers as specified in the current Resource Conservation and Recovery Act permit. These vented metal buildings provide weather shelter for the waste containers. The containers are stored on concrete pads that have surface liquid containment curbs around each side.

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

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

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The SRS Solid Waste Facilities Hazardous and Mixed Waste Storage Buildings ventilation evaluation appropriately followed the process outlined in the 2004-2 Ventilation System Evaluation Guide in developing the Data Collection Table used to identify accidents, their unmitigated consequences, and the confinement strategy based upon the existing DSA and draft DSA Upgrade for Buildings 645.N, 645-2N, and 645-4N. The draft DSA Upgrade analysis bounds that in the current DOE-approved and implemented DSA.

The draft DSA Upgrade analyzed a bounding combustible organic liquid fire in Hazard Category 3 facilities including the subject buildings. The unmitigated event resulted in a dose to the 100-meter worker of 269 rem and an offsite dose to the Maximally Exposed Offsite Individual of 0.14 rem. Both the offsite and onsite (100-meter) doses were calculated using 95th percentile meteorology. The MOI consequence did not challenge the offsite Evaluation Guide so no Safety Class preventative or mitigative controls were specified. The onsite worker dose, which exceeded the worker evaluation criteria, is mitigated to approximately 77 rem by a Technical Safety Requirement inventory limit, which serves a Safety Significant function. Since the Technical Safety Requirements inventory limit reduced the worker consequence to less than the evaluation criteria, additional Safety Significant controls, such as a CVS, were not specified by the DSA accident analysis. Additional conservatisms that would further reduce the expected dose include the fact that individual waste containers stored in these buildings normally have a very low radiological content compared to the full Hazard Category 3 inventory

authorized for these buildings cumulatively. In fact, since the waste in these buildings is typically bulk contaminated combustible liquid, the DSA Upgrade will limit these buildings to no more than 16 Plutonium Equivalent Curies (PEC) each. Additionally, the DSA Upgrade will limit individual containers that could be opened within 645-N, -2N, and -4N to no more than 4 PEC. Thus, the 100-meter worker hazard from a fire involving one of these containers would be much less than the mitigated dose of 77 rem (approximately 20 rem). Dose mitigation would be further enhanced by SRS fire fighting and emergency response actions that would be initiated upon a fire.

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

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The SRS Solid Waste Facilities Hazardous and Mixed Waste Storage Buildings ventilation report evaluated the building confinement ventilation systems utilizing the Defense in Depth (DID) criteria from the 2004-2 Ventilation Evaluation Guide. Since the SRS Solid Waste Facilities Hazardous and Mixed Waste Storage Buildings do not contain an installed CVS, the result was a Table 5.1 containing gaps for all of the criteria. Two options were further evaluated, both of which are designed and estimated to close all of the gaps. Option 1 included the design and installation of CVSs in each of the three buildings. Option 1 includes the design and installation of a structure with primary and secondary confinements inside one of the buildings.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

3.3 Evaluation of physical modifications to enhance safety performance

For Option 1, each building has its own CVS designed to ensure the system and facility meet the DNFSB 2004-2 criteria in accordance with all applicable requirements. A Rough-Order-of-Magnitude estimate to install a CVS in the three buildings is $11,200,000 ($7,800,000 to $16,800,000). This CVS is not required by the Evaluation Guidance to meet the criterion for withstanding credible fire events. However, the analyzed accident scenario is a full facility fire. Since the building serves as the primary confinement zone for this option, it must be protected. According to the DOE-HDBK-1169, Section 10 Fire Protection, a suppression system should be installed for each building to mitigate building and ductwork damage. In addition, the HEPA filters should be made of noncombustible materials with water sprays as required and a fire detection system installed in filter housings. Installing a fire suppression system in each of the

buildings could increase the cost by as much as three times depending on the choice of suppression technology.

Option 2 includes the design and installation of a structure inside one of the N area buildings with primary and secondary confinements. The design and estimate is based on the Mixed Waste Processing Facility (MWPF) which is currently installed on TRU Pad 6 in E-Area. The MWPF TEC was estimated in 2001 at $1,500,000. This estimate adjusted for escalation to 2007 dollars and TPC is $2,500,000. Using this as the basis for Option 2, a Rough-Order-of Magnitude estimate to close all the gaps is $1,800,000 to $3,800,000.

The third option evaluated, Option 3, was the current operation. Operations to open containers are performed in a temporary radiological containment system, e.g., a ventilated plastic hut that meets WSRC 5Q requirements. Container opening operations are typical only infrequently performed within the buildings. Additionally, the DSA upgrade will limit individual containers that could be opened within the buildings to no more than 4 PEC. Thus, the 100-meter worker hazard form a fire involving one of these containers would be much less than the mitigated dose of 77 rem (approximately 20 rem). Dose mitigation would be further enhanced by SRS fire fighting and emergency response actions that would be initiated upon a fire.

The SRS Facility Evaluation Team (FET) recommends the use of Option 3. The FET believes the low operational risk normally involved with open container processing does not justify the expense of either Options 1 or 2 and the low risk is appropriately managed by Option 3.

The IRP concluded that SRS evaluation of the physical modifications was appropriately performed in accordance with the 2004-2 Ventilation System Evaluation Guide.

4. CONCLUSIONS

IRP concludes that the SRS Solid Waste Facilities Hazardous and Mixed Waste Storage Buildings evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the SRS Solid Waste Facilities Hazardous and Mixed Waste Storage Buildings Ventilation System Evaluation.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman, Office of Health, Safety and Security
Robert Nelson, IRP Member, Office of Environmental Management

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the SRS Solid Waste Facilities Hazardous and Mixed Waste Storage Buildings evaluation, a detailed-full IRP team review was not determined to be necessary.

INDEPENDENT REVIEW

OF

Savannah River National Laboratory
Active Confinement
Evaluation Report

November 2009

Executive Summary

The Defense Nuclear Facility Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River National Laboratory (SRNL) Active Confinement Evaluation Report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

Savannah River National Laboratory (SRNL), Department of Energy (DOE) Environmental Management's Corporate Laboratory, provides R&D, analytical, process support and enabling technologies in support of DOE Environmental Management (waste operations, environmental restoration, decontamination and decommissioning, site cleanup and closure), National Nuclear Security Administration (tritium, plutonium disposition, and homeland security), DOE Energy Production and Conservation (hydrogen economy), and other government agencies and commercial customers. SRNL receives and uses limited quantities of radiological and hazardous chemicals as described in the Documented Safety Analysis (DSA) and supporting program documentation in order to provide the requisite services.

Based on SRS Evaluation Criteria, the FET identified six events that exceeded the 1 rem criteria for the Maximally Exposed Offsite Individual (MOI). No events were identified that exceed the 100 rem criteria for the Co-located Worker (CS). Subsequent application of guidance from the 2004-2 Ventilation System Evaluation Guide screening criteria along with DOE guidance to exclude Natural Phenomena Hazard (NPH) and full facility fire events resulted in the elimination of all but one event (glovebox over-pressurization). However, to develop a more complete understanding of the hazards that can be mitigated by an active confinement ventilation system as part of the assessment, the FET elected to include four additional process events. The FET performed a functional review of the 15 active ventilation systems using the Safety Class (SC) criteria per the DOE evaluation guidance.

The FET evaluation resulted in the identification of 58 gaps for further evaluation. All gaps were determined to not constitute a discrepancy between the DSA and field conditions. The FET determined that closure of all 58 gaps would require funding in the range of $37 M to $107 M over a period of 6 to 10 years depending upon gap closure methods selected. Based on the number and significance of the gaps as well as the estimated cost to close all the gaps, the FET recommends closing 24 of the 58 gaps at an estimated cost of $23 M to $33 M over a period of 4 to 6 years, contingent on funding. Closure of the gaps would provide a discernable improvement in the reliability and effectiveness of the existing integrated active confinement ventilation system for protection of the facility worker and provide a system that could be credited in the future for protection of the co-located worker, and in turn enhanced protection of the public.

The IRP concludes that the SRNL Active Confinement Evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Savannah River National Laboratory Active Confinement Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facility Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Savannah River National Laboratory (SRNL) Active Confinement Evaluation Report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the SRNL Active Confinement Evaluation Report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps, if any, between the existing ventilation system and applicable performance criteria; and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The main laboratory of the SRNL, is a nominal 250,000 square foot Hazard Category 2 Nuclear facility. It is divided into six sections or wings (Sections A through F). Each section has a minimum of two levels – the main floor and the service floor.

- Section A is an administrative portion of the facility and has no radionuclide or chemical inventory with the exception of exempt sealed sources (used by the Radiological Protection Department to source test equipment). This section has a third floor consisting of office space.
- Sections B and C consist of radiochemical laboratories and office space on the main floor and radiochemical labs, two Intermediate Level Cells, administrative spaces, and mechanical and electrical support equipment on the service floor. A sub-basement in each Service Floor contains the majority of the confinement ventilation system exhaust fans.
- Section D consists of offices, maintenance shops, chemical and laboratory supply and storage areas, robotics laboratory, glass shop and high bay experimental area.

- Section E contains two High Level Cell Blocks A and B as well as the associated support areas necessary to support operations of the cells.
- Section F contains operating laboratories, shielded cell facilities, several "retired" process areas waiting D&D and a high bay experimental area.
- The majority of the air exhausted from Sections E and F and a portion of the air exhausted form Sections B and C discharge to the SRNL Sand Filter for additional filtration before release to the environment.

The Central Hood Exhaust (CHEX) systems are two independent systems serving Sections B and C with about 30 lab modules in each section. Separate single stage HEPA filter banks serve individual or groups of lab modules. Three of four exhaust fans on-line is the normal operating configuration. Air is discharged to a 75 ft stack for each section of the building. In the event of a loss of power, the system reduces to one exhaust fan provided with standby power. In the event of a significant stack release, the normal exhaust fans can be shutdown and a booster fan (with standby) can be started to "divert" reduced airflow to the SRNL Sand Filter. The booster "diversion" fans are provided with standby power.

The Process Hood Exhaust (PHEX) systems are three independent systems serving Sections B, C, and F. Each system serves various enclosures, rooms or cells in the respective section of the building. The Section B and C systems have single or double stage HEPA filtration, and redundant exhaust fans. The Section F system has single, double or triple stage HEPA filtration and normally operates two of three exhaust fans. All three systems discharge to the SRNL Sand Filter. All the fans are provided with standby power.

The Off-Gas Exhaust (OGE) system serves approximately 75 gloveboxes and other special process enclosures equipped with inlet and outlet HEPA filters. Two interconnected OGE sub-systems service Sections B, C, and F. Each sub-system has redundant standby two stage HEPA filter housings, redundant exhaust fans and discharges to the SRNL Sand Filter. All the fans are provided with standby power.

The B and C Shielded Area Exhaust (RREX) systems exhaust the B and C CHEX and PHEX HEPA filter rooms. There are two independent systems with single stage HEPA filtration and single exhaust fans that discharge to the 75 ft stack located at each section of the building. The fans are not provided with standby power.

The B and C Equipment Room Exhaust (RREX) systems exhaust the sub-basement equipment rooms where the CHEX, OGE and RREX fans are installed. There are two independent systems with single stage HEPA filtration and single exhaust fans that discharge to the 75 ft stack located at each section of the building. The fans are not provided with standby power.

The B and C HVAC Systems provide conditioned air to the offices and corridors (tertiary confinement zone) as well as directly into the labs. The system operates at 1/3 capacity on a loss of normal power or in CHEX Diversion mode (supply air to tertiary confinement zone only). The combined systems consist of thirty 100% outside air units.

The B and C Change/Restroom (HV) exhaust systems are two independent low volume exhaust systems that serve the Men's and Ladies' change rooms. Neither system is HEPA FILTERED. No standby fans are provided and the fans are not connected to standby power. Each fan discharges to its own stack.

The Cell Exhaust (CE) systems are two independent systems serving the Section E Shielded Cells. Each system has three stages of HEPA filtration, redundant exhaust fans and discharges to the SRNL Sand Filter. All the fans are provided with standby power.

The E Miscellaneous Ventilation Systems, Regulated Room Exhaust – RREX and Local Hood Exhaust – LHEX, consist of six independent exhaust systems that exhaust various rooms in the secondary confinement zone used for loading and unloading cells, surveying samples, storing contaminated equipment and decontaminating equipment removed from the cells. Each system is provided with a single stage of HEPA filtration before discharging to the SRNL Sand Filter. Four systems are equipped with redundant exhaust fans. The other two systems have a normal fan only. One system is connected to standby power.

The Section E HVAC System consists of two 100% outside air units (serving zones 1 and 3 respectively), one mixed air (partial return) system (serving zones 1 and 2) and two 100% recirculating systems (serving zone 4). None of the systems have redundant fans or standby power.

The E Change/Restroom (HV) exhaust systems are two independent low volume exhaust systems. The Men's change room system is provided with HEPA filtration. No standby fans are provided and the fans are not connected to standby power. Each fan discharges to its own stack.

Section F LHEX System exhausts two chemical labs in the tertiary confinement zone. The system is provided with HEPA filtration and redundant fans connected to standby power. The system discharges to its own stack.

Section F HVAC System consists of two 100% outside air units that are supplied with standby power. Air is supplied to the secondary and tertiary confinement zones. Interlocks between the supply and exhaust systems are provided.

The Sand Filter (FHSF) system provides an additional stage of filtration before air is discharged to the environment. All primary confinement zone systems in Sections B, C, E and F discharge continuously or can be "diverted" (Section B and C CHEX system) to the Sand Filter. All secondary confinement zone systems in Sections E and F discharge to the Sand Filter. The Sand Filter is equipped with redundant exhaust frans and standby power.

Stack Monitors and Sampling systems are provided for the threee primary stachs from 773-A (B Stack, C Stack and Sand Filter Stack). Each stack has both an isokinetic sampling system used for environmental monitoring and a stack monitoring stystem with on-line alpha and beta/gamma monitors that report to the control room.

Standby Power is provided by two diesel generators (D/Gs). The 773-A D/G provides standby power to Sections B, C, E and F. The Sand Filter D/G provides standby power to Sections B, C, and F.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The confinement ventilation systems for the Hazard Category 2 SRNL Building 773-A are not credited in the design basis accident analyses for providing radiological dose reduction for the offsite and onsite receptors. Therefore, the mitigated and unmitigated dose to the Maximally Exposed Offsite Individual (MOI) and Co-located Worker (CW) are the same. However, some of the confinement ventilation systems for Building 773-A are functionally classified as Safety Significant to protect in-facility workers form potential radiological hazards from explosion events involving accumulation of process or distributed flammable gas. The balance of the ventilation and support systems are functionally classified as General Service. The Facility Evaluation Team (FET) concluded that the SS functional classification of several confinement ventilation systems for protection of the facility worker and GS functional classification of the balance of the confinement ventilation systems are appropriate.

Using the 2004-2 Evaluation Guide criteria, six events were identified that exceed the SRS 1 rem criteria for the MOI. Of those six events, five involve an NPH initiator or a full facility fire which were excluded. However, to develop a more complete understanding of the hazards that can be mitigated by an active confinement ventilation system, the FET elected to include four additional events from the original hazards analysis.

The IRP concluded that the FET appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Ventilation System Evaluation Guide.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

The FET conservatively utilized the Safety Class (SC) performance criteria in the evaluation guidance to perform a functional review of the 15 ventilation systems serving the four sections of Building 773-A. Since the SC performance criteria are used, the evaluation and identification of any associated gaps would not change if meteorological conditions were changed from 50% to 95% for the CW.

A multiple page cross-cut matrix of the 58 identified gaps by system and criteria was provided in the evaluation report with the basis provided in the work sheets attached to the report. The FET grouped and split the gaps across systems and criteria based on the following considerations.

In some cases, gaps have been combined across system boundaries where closure of the same criteria for multiple systems would need to be executed together to have the desired outcome. In other cases, the same gap across multiple system boundaries has been evaluated separately since the priority for closing a gap may be different based on the consequence and likelihood of a specific event in a specific location.

The IRP concluded that evaluation of the ventilation systems were conservatively performed against the 2004-2 Ventilation System Evaluation performance criteria.

3.3 Evaluation of physical modifications to enhance safety performance

Since 773-A is provided with General Services active confinement ventilation systems that would provide some mitigation for the evaluated process events, the FET considered the following criteria when evaluation the 58 identified gaps for closure:

- Does the gap identify a discrepancy between the DSA and field conditions?
- Is the gap associated with a primary, secondary or tertiary confinement system?
- Could closing the gap decrease the probability of an event form occurring?
- Could closing the gap provide the ability to mitigate an event form Low to Negligible consequence level?
- Would closing an alternative gap provide the same or better mitigation of an event at a lower cost?
- In the process in the primary confinement zone active or shutdown?
- The number of active process areas affected by the gap.

The recommendation and priority to close individual gaps is summarized in Table 3 of the Evaluation Report and high/low cost estimates are presented in Table 4 of the Evaluation Report. A cross-walk of gaps recommended for closure which reduce the potential or mitigate the consequence of the five evaluated process events is provided in an attachment to the Evaluation Report. A summary of Table 3 of the Evaluation Report is as follows:

- Overall 24 of 58 gaps are recommended to be closed.
- No gaps are identified that constituted a discrepancy between the DSA and field conditions.
- 23 gaps are related to a primary confinement zone. Of these gaps, 15 are recommended to be closed.
- 25 gaps are related to a secondary confinement zone. Of these gaps, 14 are recommended to be closed.
- 31 gaps are related to a tertiary confinement zone. Of these gaps, we are recommended to be closed.
- 8 gaps could decrease the probability (prevent) of the Low consequence events to Negligible. Of these gaps, 7 are recommended to be closed.
- 9 gaps could decrease the probability (prevent) of a Negligible consequence event. Of these gaps, all 9 are recommended to be closed.
- 8 gaps could increase the ability of the existing system to mitigate of a Low consequence event to Negligible. Of these gaps, 7 are recommended to be closed.

- 36 gaps could increase the ability of the existing system to mitigate a Negligible consequence event. Of these gaps, 18 are recommended to be closed.
- 16 gaps are not recommended for closure based upon the FET's evaluation that closure of an alternative gap would also mitigate this gap.
- 3 of the gaps identified dealt with inactive facilities. None of these gaps are recommended to be closed.

The duration to close all the gaps is estimated to be between 8 and 10 years. The duration to close the recommended gaps is estimated to be between 4 and 6 years, contingent upon funding. Closure of individual gaps varies in duration from 2 months to 4 years. Total duration is driven by the need to maintain laboratory operations, i.e. certain gap closure activities can not be performed concurrently without placing the overall facility confinement strategy/air balance at risk.

The cost range to close all the gaps is between $37 M and $107 M depending upon the gap closure method selected. The cost range to close the recommended gaps using the method recommended is between $23 M and $33 M.

The IRP concluded that SRS evaluation of the physical modifications was appropriately performed in accordance with the 2004-2 Ventilation System Evaluation Guide.

4. CONCLUSIONS

IRP concludes that the SRNL Active Confinement Evaluation Report was performed in accordance with the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. RECOMMENDATIONS

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the SRNL Active Confinement Evaluation Report.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman
Robert Nelson, IRP Member EM

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the SRNL evaluation, a detailed-full IRP team review was not determined to be necessary.

SEPARATION

PAGE

Department of Energy
Washington, DC 20585

DEC 30 2009

MEMORANDUM FOR RICHARD B. PROVENCHER
DEPUTY MANAGER
IDAHO CLEANUP PROJECT

FROM: DR. STEVEN L. KRAHN
ACTING DEPUTY ASSISTANT SECRETARY FOR
SAFETY AND SECURITY PROGRAM
ENVIRONMENTAL MANAGEMENT

SUBJECT: Evaluation of Advanced Mixed Waste Treatment Facility Ventilation Systems in Response to Defense Nuclear Facilities Safety Board Recommendations 2004-2

The Advanced Mixed Waste Treatment Facility (AMWTP) was evaluated as a high priority facility under Defense Nuclear Facility Safety Board (DNFSB) 2004-2. This evaluation concluded that no gaps existed between the AMWTP and the DNFSB 2004-2 evaluation criteria. Based on evaluation by the DNFSB 2004-2 Independent Review Panel, the Environmental Management Technical Advisory Board, and input from the Chief of Nuclear Safety Office, the report is approved.

If you have any further questions, please call me at (202) 586-5151.

Attachments

INDEPENDENT REVIEW

OF

Idaho Operations Office
Advanced Mixed Waste Treatment Plant
Ventilation System Evaluation Report

December 2009

Executive Summary

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Advanced Mixed Waste Treatment Plant (AMWTP) Ventilation System Evaluation report utilizing the process and criteria outlined in Department of Energy (DOE) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

The AMWTP is a Hazard Category 2 nuclear facility designed with a combination of passive structures and ventilation systems for contamination control and worker protection. .The facility utilizes "zoned" ventilation systems which ensures that airflows from areas of low potential contamination (zone 1) to areas of higher potential contamination (Zone 3) are maintained. The process was designed to allow large items (i.e., boxes and drums) to be transferred from clean to highly contaminated areas quickly and efficiently to support the required production rates.

The facility Documented Safety Analysis (DSA) does not credit active ventilation systems for mitigation of analyzed hazard release events and therefore does not classify the system as safety significant or safety class. The boundary of the Zone 3 cells are identified as safety significant passive confinement boundaries in the DSA to ensure that in the event of an accident or abnormal condition resulting in shutdown of the ventilation system the passive confinement boundary will allow sufficient time to allow workers to evacuate the area.

The Facility Evaluation Team performing the ventilation review evaluated the DSA accidents to identify the ventilation performance requirements and potential impacts of potential accidents on the public and workers. The review confirmed that no potential unmitigated releases exceeded DOE's evaluation guidelines for the public and that accidents that could result in releases impacting workers were appropriately controlled.

Although the active ventilation system is not relied on to mitigate accidents, in accordance with the 2004-2 Ventilation System Evaluation Guide for Hazard Category 2 facilities, the performance criteria for safety significant ventilation systems were used to evaluate the ventilation system. The conclusion of the evaluation was that the design features of the facility ventilation system meet the performance criteria for safety significant ventilation systems, as specified in Table 5.3 of the 2004-2 Ventilation System Evaluation Guide.

The IRP concludes that the AMWTP ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

Results of Independent Review Panel's Review of the Idaho Operations Office Advanced Mixed Waste Treatment Plant Ventilation System Evaluation Report

1. INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Advanced Mixed Waste Treatment Plant (AMWTP) Ventilation System Evaluation report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation is to:

- Verify that appropriate performance criteria are derived for ventilation systems
- Verify that these systems can meet the performance criteria, if applicable, and
- Determine if any physical modifications are necessary to enhance safety performance.

The IRP team reviewed the AMWTP Ventilation System Evaluation report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide; evaluate the appropriateness of the evaluation results and methods proposed for eliminating identified gaps (between the existing ventilation system and applicable performance criteria); and provide any additional input considered appropriate to the responsible program and site offices.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The AMWTP is designed to contain processes for processing and packaging TRU waste. The AMWTP has been categorized as a Hazard Category 2 nuclear facility and a Documented Safety Analysis (DSA) has been developed for the facility which analyzes potential accidents and identifies hazard controls.

The main treatment facility for the AMWTP (WMF-676) is divided into three air confinement zones where Zone 3 has the highest potential contamination and Zone 1 has the lowest potential contamination. Dedicated supply air systems have been provided to serve Zone 1 and Zone 2 areas within the facility. The exhaust air systems serving Zone 1, Zone 2, Zone 3 and glovebox containment areas have been designed to collect and remove radioactive materials and to maintain area containment to prevent the spread of contaminated air into potentially less contaminated areas.

WMF-634 (characterization facility for the AWMTF) is also managed through the use of a "zoned" ventilation system. The system utilizes both differential pressure and flow to

ensure airflows from areas of low potential contamination (Zone 1) to areas of higher potential contamination (Zone 3) are maintained. There are no Zone 3 cells within building 634 and the Zone 3 areas are gloveboxes or parts of gloveboxes, this makes the ventilation system simpler than WMF-676 with respect to control and monitoring requirements.

The facility DSA does not credit active ventilation systems for mitigation of analyzed hazard release events and therefore does not classify the system as safety significant or safety class. The boundary of the Zone 3 cells in WMF-676 are identified as safety significant passive confinement boundaries in the DSA to ensure that in the event of an accident or abnormal condition resulting in shutdown of the ventilation system the passive confinement boundary will allow sufficient time to allow workers to evacuate the area.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The AMWTP ventilation evaluation appropriately followed the process outlined in the 2004-2 Ventilation System Evaluation Guide in developing the Data Collection Table used to identify accidents, their unmitigated consequences, and the confinement strategy based upon the DSA for the facility. Furthermore, the Data Collection Table included the performance expectation for the ventilation systems.

The Facility Evaluation Team performing the ventilation review evaluated the DSA accidents to identify the ventilation performance requirements and potential impacts of potential accidents on the public and workers. The review confirmed that no potential unmitigated releases exceeded DOE's evaluation guidelines for the public and that accidents that could result in releases impacting workers were appropriately controlled.

3.2 Evaluation of Ventilation System Against the Selected Performance Criteria

Although the active ventilation system is not relied on to mitigate accidents, in accordance with the 2004-2 Ventilation System Evaluation Guide for Hazard Category 2 facilities, the performance criteria for safety significant ventilation systems were used to evaluate the ventilation system.

The AMWTP Ventilation System Evaluation Report includes a systematic evaluation of the ventilation system against the safety significant performance criteria identified in the 2004-2 Ventilation System Evaluation Guide. The conclusion of the evaluation was that the design features of the facility ventilation system meet the performance criteria for safety significant ventilation systems, as specified in the 2004-2 Ventilation System Evaluation Guide. No gaps were identified.

4. CONCLUSIONS

IRP concludes that the AMWTP ventilation system evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide.

5. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman
Robert Nelson, IRP Member EM

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria) and (2) was performed and documented with an appropriate the level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the AMWTP evaluation, a detailed-full IRP team review was not determined to be necessary.

United States Government **Department of Energy**

Idaho Operations Office

memorandum

Date: March 20, 2007

Subject: Transmittal of Advanced Mixed Waste Treatment Facility Ventilation System Evaluation to Deputy Assistant Secretary for Safety Management and Operations (OS-QSD-07-032)

To: Dae Y. Chung, Deputy Assistant Secretary
for Management and Operations
DOE-HQ, EM-60/FORS

Reference: (1) Report: Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2004-2 – Active Confinement Systems, Revision 1, dated June 2006

(2) Memo, I. Triay to Distribution, Subject: Office of Environmental Management Expectations for Implementation of Commitment 8.6 under the Department of Energy Implementation Plan Responding to Defense Nuclear Facility Safety Board Recommendation 2004-2, dated June 9, 2006

Attached is the final evaluation report for the Advanced Mixed Waste Treatment Facility (AMWTF) Ventilation System Evaluation. The attachment is part of the interim milestones identified in Reference 2 to show completion of the evaluations required by the DOE 2004-2 implementation plan.

If you have questions or comments regarding this transmittal, please contact Ken Whitham 208-526-4151 or Isabelle Wheeler 208-526-9226

Richard B. Provencher, Deputy Manager
Idaho Cleanup Project

Attachment

AMWTP
Advanced Mixed Waste Treatment Project

Bechtel BWXT Idaho, LLC

March 15, 2007 CN 07-30164

Mr. Richard B. Provencher, Deputy Manager
Idaho Cleanup Project
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue
Idaho Falls, ID 83415-1220

Subject: Contract No. DE-AC07-99ID13727, Advanced Mixed Waste Treatment Project (AMWTP). Transmittal of the Active Confinement System Evaluation Summary Report, Phase 1 Results for the AMWTP – PID-40-07

References:
(1) Active Confinement Ventilation System Evaluations at the Advanced Mixed Waste Treatment Project in Accordance with DOE Implementation Plan for DNFSB Recommendation 2004-2 (OS-QSD-06-121)
(2) Memo, Dr. Ines Triay to Distribution, Office of Environmental Management Expectations for Implementation of Commitment 8.6 under the Department of Energy Implementation Plan Responding to Defense Nuclear Facilities Safety Board Recommendation 2004-2, June 9, 2006
(3) Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System, dated January 2006

Dear Mr. Provencher:

As requested per reference (1), the final Active Confinement System Evaluation, Phase 1 Results is attached for the Advanced Mixed Waste Treatment Project (AMWTP). Specifically, the attached summary report, including the previously submitted Table 4.3 and Table 5.1, directed by reference (2) is transmitted to you as part of completing a Defense Nuclear Facilities Safety Board Recommendation 2004-2 action. The AMWTP facilities addressed in the summary report were evaluated using Safety Significant Performance Criteria stated in reference (3). The deliverable was reviewed by the Facility Evaluation Team including DOE-ID team members with all comments resolved.

If you have any questions regarding this matter, please contact Kraig Wendt at 557-7279 or myself at 557-6555.

Sincerely,

Paul H. Divjak, P.E.
President and General Manager
Bechtel BWXT Idaho, LLC
Advanced Mixed Waste Treatment Project

KMW:jh

Attachment – Active Confinement System Evaluation Summary Report, Phase I Results for the AMWTP

cc: John Brooks, BBWI
Craig Enos, DOE-ID
Allan Exley, BBWI
William McQuiston, DOE-ID
Phillip Mills, BBWI
Jeff Mousseau, BBWI
Leonard Sygitowicz, BBWI
Scott Van Camp, DOE-ID
Kraig Wendt, BBWI
Isabelle Wheeler, DOE-ID
Ken Whitham, DOE-ID
Edward Ziemianski, DOE-ID
AMWTP Document Control

AMWTP
Advanced Mixed Waste Treatment Project

- Idaho National Laboratory -
Advanced Mixed Waste Treatment Project

Ventilation System Evaluation

Active Confinement System Evaluation Summary Report, Phase I Results for the AMWTP, Revision 0

A submittal to DOE-ID in support of deliverables as required by DNFSB Recommendation 2004-2.

Review and Approval:

Originators: Kraig M. Wendt, John R. Godak	K. Wendt J. Godak	**Date:** 3/8/07
Review: Pat A. Young	Peter A. Young	**Date:** 3/12/07
Printed Name:	Allan Exley	
Printed Title:	Facility Evaluation Team Site Lead	
Signature:	A. Exley	**Date:** 3/8/07
Printed Name:	Ken R. Whitham	
Printed Title:	Facility Evaluation Team DOE Field Manager	
Signature		**Date:** 3/15/07
Printed Name:	Richard B. Provencher	
Printed Title:	Deputy Manager, Idaho Cleanup Project	
Signature:		**Date:** 3/19/07
Distribution List: Ken Whitham, Isabelle Wheeler, Allan Exley, Pat Young, Kraig Wendt, Richard Provencher		

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Definitions:

None

Abbreviations and Acronyms:

AMWTP	Advanced Mixed Waste Treatment Project
CLW	Co-located Worker
DID	Defense in Depth
DOE-ID U.S.	Department of Energy, Idaho Operations Office
DNFSB	Defense Nuclear Facilities Safety Board
DSA	Documented Safety Analysis
ERPG	Emergency Response Planning Guidelines
HEPA	High-Efficiency Particulate Air (filter)
HMI	Human Machine Interface
HVAC	Heating, Ventilating, and Air Conditioning
ICS	Integrated Control System
INL	Idaho National Laboratory
IW	Involved Worker
SB	Site Boundary
SC	Safety Class
SMP	Safety Management Program
SS	Safety Significant
ST	Source Term
TSR	Technical Safety Requirement
WMF	Waste Management Facility

Executive Summary:

In the effort to evaluate the ventilation systems in WMF-676 and WMF-634 of the INL-AMWTP with regard to the criteria set forth as part of DNFSB Recommendation 2004-2, the following results are noted:

The ventilation systems in both WMF-676 and WMF-634 are not required to operate for any postulated accident scenario within the DSA, and therefore are not credited therein. The WMF-676 confinement boundary is the only mandated confinement barrier which is safety significant. There are no findings, gaps, or planned modifications to report regarding the evaluated confinement systems in these facilities. The ventilation systems evaluated meet the intent to which they are deployed insomuch that they provide a function with regard to containment only, as opposed to a dedicated safety confinement function.

1. Introduction:

1.1. Facility Overview

WMF-676:

As described in the Documented Safety Analysis (DSA), one of the intended functions of the AMWTP is to "perform waste treatment operations, including the sorting of box contents into drums, handling of special case waste, and size reduction." The primary function of WMF-676 is to perform these tasks.

WMF-634:

Other key functions performed at the AMWTP as described in the DSA are to "Characterize the retrieved waste" and "Safely and compliantly store waste awaiting treatment or shipment". These two functions are performed primarily in WMF-634.

The hazard category of the AMWTP is clearly stated in the DSA as well, and reads as follows:

> *"On the basis of the waste inventory and associated radionuclide inventory, the preliminary hazard classification, issued July 14, 1997, determined that the AMWTP facilities are Hazard Category 2 (has the potential for significant onsite consequences). The hazard and accident analyses presented in the DSA are consistent with the preliminary hazard classification of the AMWTP facilities*

as Hazard Category 2."

1.2. Ventilation Strategy

WMF-676:

Containment is managed through the use of a "zoned" ventilation system. Normal operational control of the ventilation system is automatically controlled via an integrated control system (ICS); however, operators monitor and make adjustments routinely via a human machine interface (HMI). The control system utilizes both differential pressure and flow to ensure airflows from areas of low potential contamination (zone 1) to areas of higher potential contamination (Zone 3) are maintained. Figure 1 below shows a general overview of the airflow paths through this "zoned" philosophy.

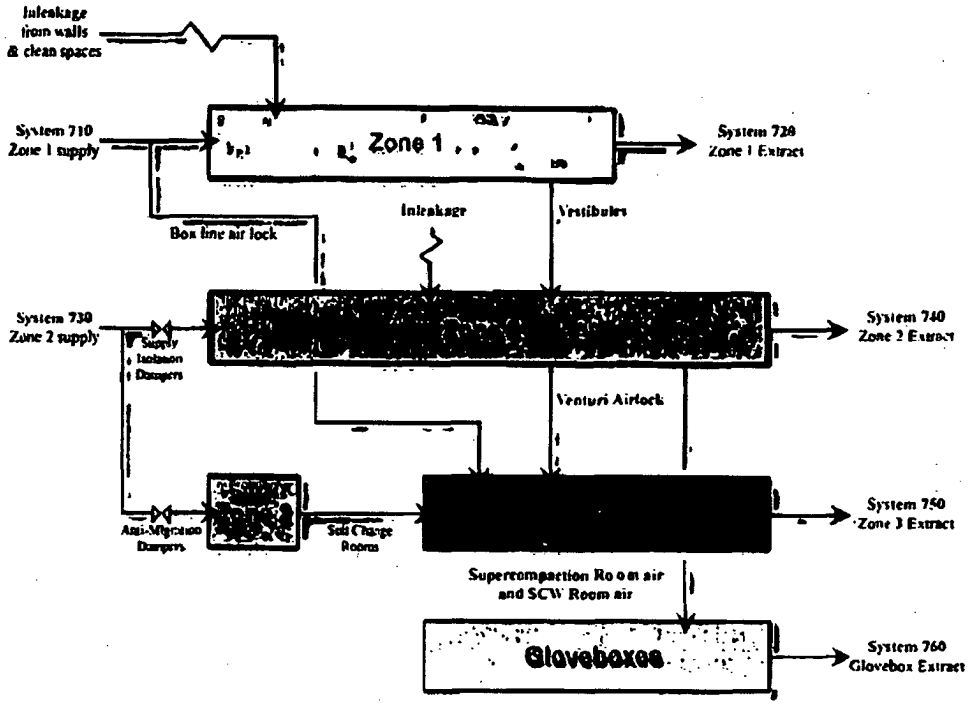

Figure 1.1 - Ventilation Strategy Overview

The overall process was designed to allow large items (i.e., boxes and drums) to be transferred from clean to highly contaminated areas quickly and efficiently to support the required production rates. To achieve this high volumes of air (in the order of 30000 CFM) are simultaneously supplied and extracted from the zone 3 cells and transfer gloveboxes. Pressures and flows are therefore monitored using hard-wired and software interlocks which shut down the ventilation system in the event of an abnormal condition to ensure pressure differentials are not

compromised. For this reason the boundary of the zone 3 cells are identified as safety significant (SS) passive confinement boundaries in the DSA to ensure that in the event of an accident or abnormal condition resulting in co-incident shutdown of the ventilation system the passive confinement boundary will allow sufficient time to allow co-located workers to evacuate the area.

WMF-634:

Containment is again managed through the use of a "zoned" ventilation system. This system also utilizes both differential pressure and flow to ensure airflows from areas of low potential contamination (zone 1) to areas of higher potential contamination (Zone 3) are maintained.

There are no zone 3 cells within building 634 and the zone 3 areas are gloveboxes or parts of gloveboxes, this makes the ventilation system simpler than WMF 676 with respect to control and monitoring requirements. The ventilation system is not required to operate for any postulated accident scenario within the DSA and is therefore not credited. Pressures are monitored using hard wired and software interlocks to ensure pressure differentials are not compromised.

2. Functional Classification Assessment

The classification of facility systems described above, namely the ventilation and/or confinement systems in WMF-634 (Characterization Processes) and WMF-676 (Treatment Facility), is respectively identified in attached Table 4.3. The classification was based on the level of defense in the AMWTP Safety Basis which those systems provide (i.e., DSA credit for hazard mitigation).

2.1 Existing Classification

The systems and classification per attached Table 4.3 for DNFSB Recommendation 2004-2 applicability at the AMWTP by facility are:

WMF-634 (the only applicable systems are gloveboxes)

- Primary drum vent system – [Safety Management Program (SMP)]
- Drum coring glovebox – [SMP]

WMF-676 (the applicable systems are gloveboxes and the Boxline with associated rooms providing the SS "confinement boundary")

- Boxline and ancillary rooms – [SMP except for confinement boundary as SS]
- Supercompactor glovebox – [SMP]
- Special case waste area (including gloveboxes and drum opening enclosure) – [SMP]

2.2 Evaluation

The WMF-676 confinement boundary credited in the DSA as a SS design feature is based on reducing the exposure from radiological and chemical contaminants (e.g., for mitigation of hazards) to the facility worker during a boxline or box opening gantry room fire. The same credit for hazard mitigation is attributed to this SS confinement boundary for the seismic event as well. This classification is for a passive control; however, because of the need for assuring this control is maintained, an active surveillance is performed for this SS confinement boundary as follows:

A specific administrative control (SAC) [Technical Safety Requirement (TSR) level control] is implemented for the Treatment Facility WMF-676 SS confinement boundary to ensure the boundary remains as credited in the Safety Basis (i.e., a design feature providing a SS function). The level of protection provided by this boundary must provide a minimum protection factor of 100 for at least 10 minutes to allow the facility worker adequate time to evacuate during the postulated fire or earthquake events. The boundary provides this required level of protection independent of the ventilation system because the ventilation system cannot reasonably be expected to operate in ***all*** postulated accident scenarios. Note that the SS function is only necessary to protect the facility worker as doses to a co-located worker are below evaluation guidelines.

Layers of defense with respect to safety controls are common within operational processes (e.g., for the Criticality Safety Program [an SMP], criticality working requirement values which are operating values are lower than nuclear material safety limit values - note that these nuclear material safety limits are equivalent to a TSR if such is required). Pertaining to the other Section 2.1 systems noted for WMF-634 and WMF-676, the classification for these systems are designated as SMP as shown in Table 4.3. This follows the same layer-of-defense evaluative methodology since these ventilation systems provide a measure of protection but are not relied upon to provide defense at the safety significance level. Therefore the SMP classification is designated for these ventilation systems; the ventilation system is not relied upon to function in the event of an accident (e.g., if fire dampers close to isolate an area as a result of a fire, the ventilation system will safely shutdown to prevent overdepression of the structure)

It should be noted that WMF-636, the Temporary Storage Area – Retrieval Enclosure (TSA-RE), was previously identified as a building with a system(s) which was categorized as being Recommendation 2004-2 applicable. The drum venting enclosure in this building only provides an energy absorption function and not a confinement function during a deflagration event. In addition the building ventilation system is not used with respect to any safety function [roll up doors are commonly left open]; these WMF-636 ventilation systems do not

follow strategic "zone" philosophy as demonstrated by active confinement systems. Lastly, no credit is taken for the building/system during a design basis accident. Therefore, this building/system should be removed from the Recommendation 2004-2 list and be designated as "excluded."

With respect to the same arguments above, WMF-615 (Primary drum vent system) and WMF-635 (Liquid absorption tent) are not and should not be designated as Recommendation 2004-2 applicable. Note that WMF-615 (a system inside WMF-635) vents directly into the WMF-635 operating area.

2.3 Summary

Only the confinement boundary for WMF-676 is classified as safety significant. All other confinement systems in WMF-676 and WMF-634 discussed above are classified at the Safety Management Program level.

3. System Evaluation

The confinement system evaluation was performed per the prescribed performance criteria for the WMF-676 and WMF-634 confinement systems previously noted. This evaluation is captured in the attached Table 5.1. Based on this evaluation there are no findings or gaps with respect to the performance of the discussed confinement systems. Therefore, there are no modifications required as well as there are currently no planned non-required modifications to these confinement systems. Table 5.1 notes the few criteria which do not apply and the justification for being not applicable.

4. Conclusion

This evaluation finalizes the documentation requirements for Recommendation 2004-2. The AMWTP Treatment Facility WMF-676 confinement boundary is designated as safety significant and a TSR level control (i.e., SAC) is stipulated to monitor this passive barrier. The remaining confinement barriers evaluated in WMF-676 (i.e., Supercompactor glovebox and special case waste area) and those in the characterization building WMF-634 (i.e., primary venting and drum coring glovebox) are designated and managed as Safety Management Programs.

The retrieval facility WMF-636, the Module 1 storage facility WMF-635 and WMF-615 (the facility for venting drums within WMF-635) were previously designated as Recommendation 2004-2 applicable. Based on further evaluation of associated confinement systems within these three facilities, it was determined that Recommendation 2004-2 is not applicable.

References (none)

Attachments (none)

Table 4.3 Data Collection Table

Confinement Documented Safety Analysis Information											
Facility	WMF-634		Hazard Category 2					Performance Expectations			
Bounding Accidents	Type Confinement		Doses Bounding unmitigated/ mitigated	Confinement Classification				Function	Functional Requirements	Performance Criteria	Compensatory Measures
	Active	Passive		SS	SC	DID	SMP				
Explosion/ deflagration during characterization		X	Maximum ST CLW – 16 rem SB – 0.94 rem Average ST IW – 11 rem CLW – 0.35 rem SB – 0.021 rem				X	Containment	Provide some level of containment after accident and to mitigate the pressure front	Reduce contamination spread	Emergency response processes and other SMP functions such as Radiation Protection Program and Training
Design basis earthquake		X	Maximum ST CLW – 38 rem SB – 11 rem Average ST * IW – 590 rem CLW – 1.5 rem SB – 0.63 rem HCl, Phosgene > ERPG				X	Containment	Provide some level of containment after accident	Reduce contamination spread	Emergency response processes and other SMP functions such as Radiation Protection Program and Training

* 590 rem for earthquake is bounding for all of the AMWTP and specifically applies to WMF-676 for requiring a control at a safety significance level; the SMP control is sufficient for WMF-634

Table 4.3 Data Collection Table

Confinement Documented Safety Analysis Information											
Facility	WMF-676		Hazard Category 2					Performance Expectations			
Bounding Accidents	Type Confinement		Doses Bounding unmitigated/ mitigated	Confinement Classification				Function	Functional Requirements	Performance Criteria	Compensatory Measures
	Active	Passive		SS	SC	DID	SMP				
Explosion/ deflagration during characterization		X	Maximum ST CLW – 16 rem SB – 0.94 rem Average ST IW – 11 rem CLW – 0.35 rem SB – 0.021 rem				X	Containment	Provide some level of containment after accident and to mitigate the pressure front	Reduce contamination spread	Emergency response processes and other SMP functions such as Radiation Protection Program and Training
Design basis earthquake		X	Maximum ST CLW – 38 rem SB – 11 rem Average ST IW – 590 rem CLW – 1.5 rem SB – 0.63 rem HCl > ERPG Phosgene > ERPG	X				Building and confinement boundary	Provide confinement after accident	Reduce contamination spread by 100 reduction factor for at least 10 minutes	Emergency response processes and other SMP functions such as Radiation Protection Program, Configuration Management, and Training
Fire in the AMWTF box opening gantry room		X	Maximum ST CLW – 6 rem SB – 0.36 rem Average ST IW – 78 rem CLW – 0.11 rem SB – 0.0066 rem HCl, Phosgene, Ethylene dichloride > ERPG	X				Building and confinement boundary	Provide confinement after accident	Reduce contamination spread by 100 reduction factor for at least 10 minutes	Emergency response processes and other SMP functions such as Radiation Protection Program, Configuration Management, and Training

Table 4.3 Data Collection Table

Fire in the AMWTF boxline		X	<u>Maximum ST</u> CLW – 60 rem SB – 7.3 rem <u>Average ST</u> IW – 1200 rem CLW – 6.4 rem SB – 0.77 rem HCl, Phosgene, Ethylene dichloride > ERPG	X				Building and confinement boundary	Provide confinement after accident	Reduce contamination spread by 100 reduction factor for at least 10 minutes	Emergency response processes and other SMP functions such as Radiation Protection Program, Configuration Management, and Training
Nuclear criticality in AMWTF		X	CLW – 0.13 rem SB – 0.021 rem				X	Building Structure	Provide shielding after accident	Reduce neutron exposure	Emergency response processes and other SMP functions such as Radiation Protection Program and Training
Loss of electrical power grid and failure of backup power		X	<u>Maximum ST</u> CLW – 18 rem SB – 0.052 rem <u>Average ST</u> IW – 0.11rem CLW – 0.095 rem SB – 2.8×10^{-4} rem				X	Building, glovebox and confinement boundary	Provide some level of containment after accident	Reduce contamination spread	Emergency response processes and other SMP functions such as Radiation Protection Program and Training

Legend Table 4.3:

CLW – co-located worker
DID – defense in depth
ERPG – emergency response planning guidelines
IW – involved worker
SB – site boundary
SC – safety class
SMP – safety management program
SS – safety significant
ST – source term

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-676

Evaluation Criteria	Criteria Explanation and Comparison	Reference
	Ventilation Criteria - General Criteria	
Pressure differential should be maintained between zone and atm.	Containment is managed through the use of a "zoned" ventilation system. Normal operational control of the ventilation system is automatically controlled via an integrated control system (ICS); however, operators monitor and make adjustments routinely via a human machine interface (HMI). The control system utilizes both differential pressure and flow to ensure air flows from areas of low potential contamination (zone 1) to areas of higher potential contamination (Zone 3) are maintained. The overall process was designed to allow large items (i.e. boxes and drums) to be transferred from clean to highly contaminated areas quickly and efficiently. To achieve this high volumes of air (in the order of 30000 cfm) are simultaneously supplied and extracted from the zone 3 cells and transfer gloveboxes. Pressures and flows are therefore monitored using hard wired and software interlocks which shut down the ventilation system in the event of an abnormal condition to ensure pressure differentials are not compromised. For these circumstances, in general, the boundary of the zone 3 cells are identified as safety significant passive confinement boundaries in the Documented Safety Analysis (DSA) to ensure that in the event of an accident or abnormal condition resulting in co-incident shutdown of the ventilation system, the passive confinement boundary will allow sufficient time to allow co-located workers to evacuate the area. The ventilation system is not required to operate for any postulated accident scenario within the DSA and is therefore not credited.	DD-K010SC-SYST-00070 Schedule of Process System Interlocks BNFL-5232-PDC-01 Project Design Criteria AMWTP-RPT-DSA-02 Documented Safety Analysis

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-676

Materials of construction should be appropriate for normal. abnormal and accident conditions	Ventilation system components are supported seismically as Performance Category 2 (PC2) per Advanced Mixed Waste Treatment Project (AMWTP) Project Design Criteria. Materials used for construction are fire resistant.	System 700 duct const. specs. DD-K0105C-SYST-00038 Glovebox spec. BNFL-5232-PDC-01 Project Design Criteria BNFL-5232-EDF-070 Seismic Design Approach
Exhaust system should withstand anticipated normal, abnormal and accident system conditions and maintain confinement integrity	Passive safe shut-down is employed for abnormal and accident scenarios. Ventilation system components are supported seismically as minimum performance Category 2 (PC2) per AMWTP Project Design Criteria. All process exhaust streams are filtered by means of High Efficiency Particulate Air (HEPA) filtration prior to return to atmosphere.	53-5188 Overall Vent. Schematic System 700 duct const. Specs. DD-K0105C-SYST-00038 Glovebox spec. BNFL-5232-PDC-01 Project Design Criteria BNFL-5232-EDF-070 Seismic Design Approach
Confinement ventilation systems (CVS) shall have appropriate filtration to minimize release	All process exhaust streams are filtered by means of HEPA filtration prior to return to atmosphere; zone 3 has three stages of filtration, zone 2 has two stages of filtration, and zone 1 has one stage of filtration.	53-5188 Overall Vent. Schematic Process HVAC VFDs

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-676

Ventilation System - Instrumentation and Control		
Provide system status instrumentation and/or alarms	Ventilation system is fully controlled and monitored continuously by the Facility ICS.	DD-K0105C-SYST-00070 Schedule of Process System Interlocks Process HVAC VFDs
Interlock supply and exhaust fans to prevent positive pressure differential	Hardware and software interlocks exist to ensure passive safe shutdown in order to prevent positive pressure differential.	DD-K0105C-SYST-00070 Schedule of Process System Interlocks
Post accident indication of filter break-through	Passive safe shut-down is employed for abnormal and accident scenarios. If vent remains operable, indications of filter break-through are available via ICS.	Process HVAC VFDs
Reliability of control system to maintain confinement function under normal, abnormal and accident conditions	Passive safe shut-down is employed for abnormal and accident scenarios.	DD-K0105C-SYST-00070 Schedule of Process System Interlocks
Control components should fail safe	Dampers are actuated either electrically or pneumatically, and failure mode is consistent with the ventilation philosophy.	BNFL-HVAC-DS-0004-01 Damper Sched.

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-676

Resistance to Internal Events – Fire		
Confinement ventilation systems should withstand credible fire events and be available to operate and maintain confinement	Passive safe shutdown of heating, ventilation. and air conditioning (HVAC) equipment is initiated following detection of fire. Protection of final stage HEPAs relies upon water based fire depression system in HVAC air stream on detection of fire in ventilation ducts. Gloveboxes are equipped with an automatic fire detection and suppression system. Lastly. materials used for construction are fire resistant.	53-5188 Overall Vent. Schematic BNFL-5232-RPT-ESH-012 Trtmt Fcty FHA Spec. 15333 Auto. Sprinkler Systems Spec. 16721 Fire Detection and Alarm
Confinement ventilation systems should not propagate spread of fire	Passive safe shutdown of HVAC equipment is initiated following detection of fire. Protection of final stage HEPAs relies upon water based fire depression system in HVAC air stream on detection of fire in ventilation ducts. Gloveboxes are equipped with an automatic fire detection and suppression system. Materials used for construction are fire resistant. Lastly, fire dampers will act independent of ventilation system in accordance with National Fire Protection Agency (NFPA) codes to prevent spread of fire.	53-5188 Overall Vent. Schem. SP_K0105C_SYST_00033 AMWTP Fire Damper Control

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-676

Resistance to Internal Events - Natural Phenomena – Seismic		
Confinement ventilation systems should safely withstand earthquakes	Passive safe shut-down is employed for abnormal and accident scenarios. Confinement vent system components are braced seismically as a minimum PC2 per AMWTP Project Design Criteria.	(A56842 series), Amber-Booth Seismic dwgs. BNFL-5232-PDC-01 Project Design Criteria BNFL-5232-EDF-070 Seismic Design Approach
Resistance to Internal Events - Natural Phenomena – Tornado/Wind		
Confinement ventilation system should safely withstand tornado depressurization	Tornado pressures are not addressed in the design documentation for this facility as the DSA states that the calculated probability for a tornado at the Idaho National Laboratory (INL) is "extremely remote". In the case of loss of pressure control, passive safe shutdown is employed; zone 2 ductwork designed for –16" w.c., Zone 3 ductwork designed for –32" w.c..	AMWTP-RPT-DSA-02 Documented Safety Analysis 15889 Process Area Duct Construction Standards
Confinement ventilation system should withstand design wind effects on system performance	Passive safe shut-down is employed for abnormal and accident scenarios. Hardware and software interlocks ensure passive safe shutdown is implemented to prevent reversal of differential pressures. Confinement ventilation systems are enclosed in building envelope and are not affected by wind effects. No credit is taken in design basis for any benefit to ventilation system due to wind effects; zone 2 ductwork designed for –16" w.c., zone 3 ductwork designed for –32" w.c..	DD-K0105C-SYST-00070 Schedule of Process System Interlocks 15889 Process Area Duct Construction Standards

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-676

Other NP Events (e.g., flooding, precipitation)		
Confinement ventilation system should withstand other NPH events considered credible in the DSA where the confinement ventilation system is credited	N/A – Ventilation system is not credited in the DSA.	AMWTP-RPT-DSA-02 Documented Safety Analysis
Range Fires/Dust Storms		
Administrative controls should be established to protect confinement ventilation systems from barrier threatening events	Passive safe shutdown is initiated as appropriate in case of range fire.	MP-EC&P-12.8 Range Fire Response
Testability		
Design supports the periodic inspection and testing of filters and housing. Tests and inspections are conducted periodically	HEPA filters are subject ,as a minimum, to an aerosol challenge test on an 18 month cycle. Filter differential pressure monitoring provides early indication of filter breakthrough or plugging. In-duct and stack alpha monitors provide early indication of elevated alpha contamination levels after HEPA filtration. Redundant fans and filters banks are provided to facilitate testing and to improve overall reliability.	AMWTF Air Permit ASME-N510 Maximo PMs
Instrumentation required to support system operability is calibrated	Instrumentation to support system operability is calibrated routinely in accordance with the instrumentation test program. HEPA filters are not allowed to operate at a differential pressure of >5" w.c..	AMWTP-MP-CMNT-10.14 Instr. Test Prgm

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-676

Integrated system performance testing is specified and performed	Routine monitoring of ventilation operation via ICS.	FOI-02 Facility Process HVAC Operation Form 1547 Facility HVAC round sheet
	Maintenance	
Filter service life program should be established	HEPA filters are subject, as a minimum, to an aerosol challenge test on an 18 month cycle. Filter differential pressure monitoring provides early indication of filter breakthrough or plugging. Shelf life of HEPA filters is controlled. HEPA filters are not used when the differential pressure exceeds 5" w.c..	AMWTF Air Permit ASME-N510 Maximo PMs MP-EC&P-7.4.1 HEPA Filter Test Proc.
	Single Failure	
Failure of one component (equipment or control)shall not affect continuous operation	See footnote; N/A due to DOE evaluation guideline criteria.	Ventilation System Evaluation Guidance for Safety Related and Non-Safety Related Systems (DNFSB 2004-2 deliverables 8.5.4 and 8.7.)
Automatic backup electrical power shall be provided to all critical instruments and equipment required to operate and monitor the confinement ventilation system	See footnote; N/A due to DOE evaluation guideline criteria.	Ventilation System Evaluation Guidance for Safety Related and Non-Safety Related Systems (DNFSB 2004-2 deliverables 8.5.4 and 8.7.)

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-676

Backup electrical power shall be provided to all critical instruments and equipment required to operate and monitor the confinement ventilation system	Passive safe shut-down is employed for abnormal and accident scenarios. However, limited ventilation capability is available using backup generators and uninterrupted power supply (UPS) systems for selected control functions.	54-0012 WMF 676 Single Line Diagram
Other Credited Functional Requirements		
Address any specific functional requirements for the confinement ventilation system (beyond the scope of those above) credited in the DSA	N/A – Ventilation system is not credited in the DSA.	AMWTP-RPT-DSA-02 Documented Safety Analysis

Note: This evaluation is based on Safety Significant performance criteria per *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related Systems*, section 5.1 (see Ventilation System Evaluation Guidance for Safety Related and Non-Safety Related Systems (DNFSB 2004-2 deliverables 8.5.4 and 8.7.)). The ventilation system is not credited in the documented safety analysis as either safety significant or defense in depth to meet the evaluation guide lines for any of the postulated bounding design basis accident scenarios.

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-634

Evaluation Criteria	Criteria Explanation and Comparison	Reference
	Ventilation Criteria - General Criteria	
Pressure differential should be maintained between zone and atmosphere	Containment is managed through the use of a "zoned" ventilation system. This system utilizes both differential pressure and flow to ensure air flows from areas of low potential contamination (zone 1) to areas of higher potential contamination (Zone 3) are maintained. There are no zone 3 cells within building 634 and the zone 3 areas are gloveboxes or parts of gloveboxes; this makes the ventilation system simpler than WMF 676 with respect to control and monitoring requirements. The ventilation system is not required to operate for any postulated accident scenario within the DSA and is therefore not credited. Pressures are monitored using hard wired and software interlocks to ensure pressure differentials are not reversed.	53-1916, 53-1915, 51-1914 Mech. P&IDs BNFL-5232-PDC-01 Project Design Criteria
Materials of construction should be appropriate for normal, abnormal and accident conditions	Ventilation system components are supported seismically as PC2 per AMWTP Project Design Criteria. The drum ventilation system is designed to withstand postulated pressures due to a deflagration event as per specification. Materials used for construction are fire resistant.	Spec. 11527 Drum Vent System Spec. 15010 General equipment Duct Seismic Bracing Spec.

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-634

Exhaust system should withstand anticipated normal, abnormal and accident system conditions and maintain confinement integrity	Passive safe shut-down is employed for abnormal and accident scenarios. Ventilation system components are supported seismically as PC2 per AMWTP Project Design Criteria. Drum vent system is designed to withstand postulated pressures due to deflagration event as per specification. Materials used for construction are fire resistant. Zone 2 and 3 process exhaust streams are filtered by means of HEPA filtration prior to return to atmosphere.	Spec. 11527 Drum Vent System Spec. 15010 General equipment Duct Seismic Bracing Spec. 53-1916, 53-1915, 51-1914 Mech. P&IDs BNFL-5232-PDC-01 Project Design Criteria BNFL-5232-EDF-070 Seismic Design Approach
Confinement ventilation systems (CVS) shall have appropriate filtration to minimize release	Zone 2 and 3 process exhaust streams are filtered by means of HEPA filtration prior to return to atmosphere; zone 3 ventilation has three stages of HEPA filtration, zone 2 has two stages.	53-1916, 53-1915, 51-1914 Mech. P&IDs
Ventilation System - Instrumentation and Control		
Provide system status instrumentation and/or alarms	Ventilation system includes instrumentation to monitor and log system status and alarms.	INST-OI-33 Characterization Facility HVAC Sys. Operations Form 1602 WMF 634 round sheets

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-634

Interlock supply and exhaust fans to prevent positive pressure differential	Hardware and software interlocks exist to ensure passive safe shutdown in order to prevent positive pressure differential.	54-0815, 54-0816 WMF 636 control schematics INST-OI-33 Characterization Facility HVAC Sys. Operations
Post accident indication of filter break-through	Passive safe shut-down is employed for abnormal and accident scenarios. If vent remains operable, indications of filter break-through are available via ICS.	53-10020, 53-1914, 53-1915, 53-1916 Mech P&IDs
Reliability of control system to maintain confinement function under normal, abnormal and accident conditions	Hardware and software interlocks exist to initiate passive safe shutdown in abnormal and accident scenarios.	54-0815, 54-0816 WMF 636 control schematics INST-OI-33 Characterization Facility HVAC Sys. Operations
Control components should fail safe	Dampers are actuated either electrically or pneumatically, and failure mode is consistent with the ventilation philosophy.	54-0815, 54-0816 WMF 636 control schematics

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-634

Resistance to Internal Events – Fire		
Confinement ventilation systems should withstand credible fire events and be available to operate and maintain confinement	Passive safe shutdown of HVAC equipment is initiated following detection of fire. Protection of final stage HEPAs relies upon water based fire depression system in HVAC air stream on detection of fire in ventilation ducts. Gloveboxes are equipped with an automatic fire detection and suppression system. Lastly, materials used for construction are fire resistant.	53-1916, 53-1915 51-1914 Mech. P&IDs AMWTP-RPT-ESH-01 Non-Trtmt Fcty FHA Spec. 15333 Auto. Sprinkler Systems Spec. 16721 Fire Detection and Alarm MP-ISIH-2.49 Fire Protection Program
Confinement ventilation systems should not propagate spread of fire	Passive safe shutdown of HVAC equipment is initiated on detection of fire. Protection of final stage HEPAs relies upon water based fire depression system in HVAC air stream on detection of fire in ventilation ducts.	53-1916, 53-1915 51-1914 Mech. P&IDs
Resistance to Internal Events - Natural Phenomena - Seismic		
Confinement ventilation systems should safely withstand earthquakes	Passive safe shut-down is employed for abnormal and accident scenarios. Confinement vent system components are braced seismically as PC2 per AMWTP Project Design Criteria.	Spec. 11527 Drum Vent System BNFL-5232-PDC-01 Project Design Criteria BNFL-5232-EDF-070 Seismic Design Approach

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-634

Resistance to Internal Events - Natural Phenomena – Tornado/Wind		
Confinement ventilation system should safely withstand tornado depressurization	Tornado pressures are not addressed in the design documentation for this facility as the DSA states that the calculated chance for a tornado at the INL is "extremely remote". In the case of loss of pressure control, zone 2 ductwork designed for –24" w.c., zone 3 ductwork designed for –80" w.c..	Spec.15889 WMF 634 Duct System AMWTP-RPT-DSA-02 Documented Safety Analysis
Confinement ventilation system should withstand design wind effects on system performance	Passive safe shut-down is employed for abnormal and accident scenarios. Hardware and software interlocks ensure passive safe shutdown is implemented to prevent reversal of differential pressures. Confinement ventilation systems are enclosed in building envelope and are not affected by wind effects. Hardware and software interlocks ensure passive safe shutdown is implemented to prevent reversal of differential pressures. No credit is taken in design basis for any benefit to ventilation system due to wind effects.	AMWTP-RPT-DSA-02 Documented Safety Analysis INST-OI-33 Characterization Facility HVAC Sys. Operations 54-0815, 54-0816 WMF 636 control schematics
Other NP Events (e.g., flooding, precipitation)		
Confinement ventilation system should withstand other NPH events considered credible in the DSA where the confinement ventilation system is credited	N/A – Ventilation system is not credited in the DSA.	AMWTP-RPT-DSA-02 Documented Safety Analysis
Range Fires/Dust Storms		
Administrative controls should be established to protect confinement ventilation systems from barrier threatening events	Passive safe shutdown is initiated as appropriate in case of range fire.	MP-EC&P-12.8 Range Fire Response

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-634

Testability		
Design supports the periodic inspection and testing of filters and housing. Tests and inspections are conducted periodically	HEPA filters are subject, as a minimum, to an aerosol challenge test on an 18 month cycle. Filter differential pressure monitoring provides early indication of filter breakthrough or plugging. Redundant fans and filters banks are provided to facilitate testing and to improve overall reliability. HEPA filters are not allowed to operate at a differential pressure of >5" w.c..	CRR-5232-AM-BN-L-5294 Permit to Construct Exemption ASME-N510 Maximo PMs
Instrumentation required to support system operability is calibrated	Instrumentation to support system operability is calibrated routinely in accordance with the instrumentation test program. HEPA filters are not allowed to operate at a differential pressure of >5" w.c..	AMWTP-MP-CMNT-10.14 Instr. Test Prgm
Integrated system performance testing is specified and performed	Perform routine operational system monitoring.	INST-OI-33 Characterization Facility HVAC Sys. Operations Form 1602 WMF 634 round sheets
Maintenance		
Filter service life program should be established	HEPA filters are subject, as a minimum, to an aerosol challenge test on an 18 month cycle. Filter differential pressure monitoring provides early indication of filter breakthrough or plugging. HEPA filters are not allowed to operate at a differential pressure of >5" w.c.. Shelf life of HEPA filters is controlled.	CRR-5232-AM-BN-L-5294 Permit to Construct Exemption ASME-N510 MP-EC&P-7.4.1 HEPA Filter Test Proc.

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-634

Single Failure		
Failure of one component (equipment or control)shall not affect continuous operation	See footnote, N/A due to DOE evaluation guideline criteria.	Ventilation System Evaluation Guidance for Safety Related and Non-Safety Related Systems (DNFSB 2004-2 deliverables 8.5.4 and 8.7.)
Automatic backup electrical power shall be provided to all critical instruments and equipment required to operate and monitor the confinement ventilation system	See footnote, N/A due to DOE evaluation guideline criteria.	Ventilation System Evaluation Guidance for Safety Related and Non-Safety Related Systems (DNFSB 2004-2 deliverables 8.5.4 and 8.7.)
Backup electrical power shall be provided to all critical instruments and equipment required to operate and monitor the confinement ventilation system	Passive safe shut-down is employed for abnormal and accident scenarios. However, limited ventilation capability is available using backup generators.	54-0801 WMF 634 Single Line diagram

Table 5.1. Comparison Of The AMWTP Ventilation System To Performance Criteria - WMF-634

Other Credited Functional Requirements		
Address any specific functional requirements for the confinement ventilation system (beyond the scope of those above) credited in the DSA	N/A – Ventilation system is not credited in the DSA.	AMWTP-RPT-DSA-02 Documented Safety Analysis

Note: This evaluation is based on Safety Significant performance criteria per *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related Systems*, section 5.1 (see Ventilation System Evaluation Guidance for Safety Related and Non-Safety Related Systems (DNFSB 2004-2 deliverables 8.5.4 and 8.7.)). The ventilation system is not credited in the documented safety analysis as either safety significant or defense in depth to meet the evaluation guide lines for any of the postulated bounding design basis accident scenarios.

SEPARATION

PAGE

Department of Energy
Washington, DC 20585

JUL 09 2009

MEMORANDUM FOR SHIRLEY OLINGER
MANAGER
OFFICE OF RIVER PROTECTION

FROM: DAE Y. CHUNG
ACTING PRINCIPAL DEPUTY ASSISTANT SECRETARY
FOR ENVIRONMENTAL MANAGEMENT

SUBJECT: Approval of Supplemental System Evaluation and Associated Gaps for Active Confinement Ventilation Systems in the Waste Treatment and Immobilization Plant Pretreatment and High-Level Waste Facilities in Response to Defense Nuclear Facilities Safety Board Recommendation 2004-2

The purpose of this memorandum is to provide my endorsement of the Defense Nuclear Facilities Safety Board (DNFSB) 2004-2 supplement system evaluation and acceptance of the identified gaps forwarded by you on July 7, 2009. My endorsement and acceptance are based on an evaluation by the DNFSB 2004-2 Independent Review Panel (attached), review by the Office of Environmental Management (EM) Fire Protection subject matter expert, and input from the Office of the Chief of Nuclear Safety.

The gap identified by the Waste Treatment and Immobilization Plant (WTP) during its initial evaluation for compliance with DNFSB 2004-2 is accepted through the identified alternate approach for specific requirements of Section 14 of DOE-STD-1066. The alternate approach as defined in the supplemental ventilation system evaluation accounts for the unique configuration of the WTP and demonstrates a comparable level of safety for the specific criteria in DOE-STD-1066 supporting EM's acceptance of the gap.

I expect as the WTP ventilation design is finalized and construction is completed WTP will continue to ensure that compliance with the implementation strategy for DNFSB 2004-2 is maintained.

If you have any further questions, please contact me at (202) 586-7709.

Attachment

cc:
I. Triay, EM-1
J. Owendoff, EM-3
S. Krahn, EM-60

REVISED
INDEPENDENT REVIEW

OF

Office of River Protection
Waste Treatment Plant
High-Level Waste and
Pretreatment Facilities
Ventilation System Evaluation Report

July 2009

Executive Summary

In September 2007 the Department of Energy's (DOE) Independent Review Panel (IRP) for Defense Nuclear Facilities Safety Board (DNFSB)Recommendation 2004-2, *Active Confinement Systems*, reviewed the Waste Treatment Plant (WTP) High-Level Waste (HLW) and Pretreatment (PT) facilities Ventilation System Evaluation report utilizing the process and criteria outlined in the DOE's *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

WTP is a Hazard Category 2 nuclear facility under final design and construction. Preliminary Safety Analyses have been completed for the HLW and PT facilities which have shown that there are several unmitigated bounding accidents that have significant offsite consequences (exceeding 100 rem to the maximum exposed offsite individual).

As of June 2009 the confinement strategy for both the HLW and PT facilities is to utilize active safety class and safety significant confinement ventilation systems in accordance with the criteria established in DOE-STD-3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses.* If a refined accident analysis determines that accident consequences fall below DOE evaluation guidelines, these classifications may be reduced. However, active ventilation systems will continue to be used at these facilities and will be, at a minimum, designed and reviewed against safety significant requirements established in the DNFSB 2004-2 Evaluation Guide.

In the initial September 2007 review, the IRP concluded that the WTP HLW and PT ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide with one exception. The exception being that the WTP evaluation did not include a cost analysis or alternatives for resolution of the one gap that was identified, i.e., a lack of fire suppression for the High Efficiency Particulate Air (HEPA) filter housing. At that time, the IRP recommended that the Program Secretarial Office and Central Technical Authority accept the WTP HLW and PT Ventilation System Evaluation with a condition that future approval of a resolution that addresses fire safety requirements for HEPA filter housings is required.

In 2009, the Office of River Protection (ORP) with the support of the Office of Environmental Management has evaluated an alternative approach to satisfy the requirements of DOE-STD-1066, *Fire Protection Design Criteria*, which includes limits on combustibles, use of fire barriers, and considers unique features of the WTP facilities. The ORP evaluation team concluded that this approach will provide an appropriate level of safety and mitigates the identified gap.

The IRP concludes that ORP has taken appropriate action to evaluate and mitigate the identified gap in accordance with the 2004-2 Ventilation System Evaluation Guide and that the WTP ventilation system evaluation complies with the 2004-2 Ventilation System Evaluation Guide.

Results of the Revised Independent Review Panel's Review of the Waste Treatment Plant Ventilation System Evaluation Report

1. INTRODUCTION

In September 2007, the Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-2 Independent Review Panel (IRP) reviewed the Waste Treatment Plant (WTP) High-Level Waste (HLW) and Pretreatment (PT) facilities Ventilation System Evaluation report utilizing the process and criteria outlined in Department of Energy's (DOE's) *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related System* (2004-2 Ventilation System Evaluation Guide).

As stated in Revision 1 of the DNFSB Recommendation 2004-2 Implementation Plan, the focus of the ventilation system evaluation was to:

- Verify that appropriate performance criteria are derived for ventilation systems;
- Verify that these systems can meet the performance criteria, if applicable; and
- Determine if any physical modifications are necessary to enhance safety performance.

During the original evaluation, the IRP team reviewed the WTP HLW and PT Ventilation System Evaluation report to determine whether it was performed in accordance with the 2004-2 Ventilation System Evaluation Guide. The IRP evaluated the appropriateness of the evaluation results and methods proposed for eliminating identified gaps (between the existing ventilation system and applicable performance criteria). One gap was identified, that is, fire suppression features have not been provided inside High Efficiency Particulate Air (HEPA) filter housing as recommended by DOE-STD-1066, *Fire Protection Design Criteria*. DOE-STD-1066 was designated a contract requirement of the WTP by its inclusion in the project Safety Requirements Document (SRD). Section 1.0 of DOE-STD-1066 specifies that "Nothing in this Standard is intended to limit the application of other fire protection methods when unique situations or hazards warrant an alternate approach. The alternate approach should provide a comparable level of safety to that achieved by conformance with this Standard." The project has adopted the alternative approach to meeting the fire suppression criteria of DOE-STD-1066. This revised IRP review has considered the alternate approach justification provided by WTP to satisfy the criteria of DOE-STD-1066 and that are proposed to provide an appropriate level of safety for the WTP facilities.

2. FACILITY AND VENTILATION SYSTEM OVERVIEW

The PT facility is designed to contain processes for pretreatment of waste transferred from the Hanford Site underground storage tanks before it is immobilized at the Low-Activity Waste and HLW Facilities. The HLW facility is designed to immobilize pretreated waste and entrained solids in a manner that will meet waste acceptance requirements for ultimate disposal in a geologic repository by blending the waste with the appropriate glass formers.

WTP is a Hazard Category 2 nuclear facility under final design and construction. Preliminary Safety Analyses have been completed for the HLW and PT facilities which show that there are several unmitigated bounding accidents that have significant offsite consequences (exceeding 100 rem to the maximum exposed offsite individual).

As of June 2009 the confinement strategy for both the HLW and PT facilities is to utilize active safety class and safety significant confinement ventilation systems in accordance with the criteria established in DOE-STD-3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses.* If a refined accident analysis determines that accident consequences fall below DOE evaluation guidelines, these classifications may be reduced, however, active ventilation systems will continue to be used at these facilities and will be, at a minimum, designed and reviewed against safety significant requirements established in the DNFSB 2004-2 evaluation guide.

3.0 REVIEW RESULTS

3.1 Derivation of Ventilation System Performance Criteria and Confinement Strategy

The HLW and PT ventilation evaluation appropriately followed the process outlined in the 2004-2 Ventilation System Evaluation Guide in developing the Data Collection Table used to identify accidents, their unmitigated consequences, and the confinement strategy based upon the Preliminary Safety Analysis Reports for the PT and HLW facilities. Furthermore, the Data Collection Table specifies the performance expectation for the ventilation systems.

For the PT facility, the main building ventilation system is designated as active safety class while several other process or area-specific ventilation systems include passive safety class and/or safety significant features. Similarly for the HLW facility, the main building ventilation system is designated as active safety class while several other process and area-specific ventilation systems include passive safety class and/or safety significant features.

The IRP concluded that the evaluation team appropriately reviewed the safety classification of the ventilation system as specified in the 2004-2 Evaluation Guide.

3.2.1 Evaluation of Ventilation System Against the Selected Performance Criteria

The WTP HLW and PT ventilation report evaluated the HLW and PT facilities building confinement ventilation systems utilizing the safety class and safety significant criteria from the 2004-2 Ventilation Evaluation Guide. The WTP HLW and PT Ventilation

System Evaluation Report provides a systematic evaluation of the ventilation systems against the 2004-2 performance criteria to identify any gaps.

One gap was identified, that is, fire suppression features have not been provided inside HEPA filter housing as recommended by Chapter 14 of DOE-STD-1066, *Fire Protection Design Criteria*. DOE-STD-1066 was designated a contract requirement of the WTP by its inclusion in the project Safety Requirements Document (SRD). The revised ventilation report provides rationale and justification for an alternate approach to satisfying the criteria of Chapter 14 of DOE-STD-1066 and recommends that the Program Secretarial Officer utilize this rationale and justification to accept the gap originally identified.

The IRP concluded that evaluation of the ventilation systems against the 2004-2 Ventilation System Evaluation performance criteria was appropriately performed.

3.3 Evaluation of Physical Modifications to Enhance Safety Performance

DOE-STD-1066 states in its scope paragraph, "Nothing in this Standard is intended to limit the application of other fire protection methods when unique situations or hazards warrant an alternate approach. The alternate approach *should* provide a comparable level of safety of that achieved by conformance with this Standard."

This revised review has considered an alternative approach to satisfy the criteria of DOE-STD-1066, presented as part of a recent Authorization Basis Amendment Request submitted to the Office of River Protection to mitigate impacts from the gap identified in the initial review report. The alternative approach is characterized by providing fire control capabilities at the source of incipient plant fires by the installation of automatic fire suppression throughout the majority of the WTP facilities (with exception of low combustibility and non accessible high radiation areas specifically identified in the WTP Safety Requirements Document, Appendix K), and in all areas where combustible material could potentially be a fire hazard (e.g., filter cave cranes), such that heat, embers, and soot will not threaten final plant HEPA filters. Other features include location of HEPA filters in separate fire areas protected by NFPA-compliant fire barriers with protection of openings and penetrations from the rest of the plant, installation of fire screens upstream from all safe-change filter housings, and in-bleed dampers to retard smoke and fire movement from threatening the filters. In addition WTP will invoke a robust combustible control program during operation.

The Office of River Protection with the support of fire protection engineers from the Office of Environmental Management evaluated the alternative approach to satisfy the requirements of DOE-STD-1066, *Fire Protection Design Criteria*, and concludes that this approach will provide an appropriate level of safety and adequately mitigates impacts from the identified gap. The IRP concludes that Office of River Protection has taken appropriate action to evaluate and resolve the identified gap in accordance with the 2004-2 Ventilation System Evaluation Guide. With these actions, the IRP finds that the WTP complies with the evaluation guidelines established for DNFSB 2004-2.

4. CONCLUSIONS

In the initial September 2007 review, the IRP concluded that the WTP HLW and PT ventilation systems evaluation was performed in accordance with the criteria in the DNFSB 2004-2 Ventilation System Evaluation Guide with one exception. The exception being that the WTP evaluation did not include a cost analysis or alternatives for resolution of the one gap that was identified, i.e., compliance with Chapter 14 of DOE-STD-1066. At that time, the IRP recommended that the Program Secretarial Office and Central Technical Authority accept the WTP HLW and PT Ventilation System Evaluation with a condition that future approval of a resolution that addresses fire safety requirements for HEPA filter housings is required.

The revised DNFSB 2004-2 evaluation and review considered an alternative approach to satisfy the criteria of DOE-STD-1066 and allow the PSO to accept the gap identified in the initial review report. With this identification of an alternate approach to satisfy the requirements of DOE-STD-1066, the IRP finds that the WTP complies with the evaluation guidelines established for DNFSB 2004-2.

5. RECOMMENDATION

The IRP recommends that the Program Secretarial Office and Central Technical Authority accept the WTP HLW and PT Ventilation System Evaluation as compliant with the evaluation guidelines established for DNFSB 2004-2.

6. REVIEW TEAM MEMBERS

James O'Brien, IRP Chairman
Robert Nelson, IRP Member EM

Note: The IRP has established a review process that includes an initial review by two members of the IRP to determine whether the evaluation: (1) is consistent with the implementation plan methodology and expectations (including choice of evaluation criteria); and (2) was performed and documented with an appropriate level of detail and rigor.

A detailed-full IRP team review will be performed if the ventilation evaluation report is not consistent with the implementation plan, was not performed with an appropriate level of detail or rigor (after consultation with the report developers), or has unique ventilation strategies, gap analysis, or corrective actions that warrant full IRP review.

For the WTP evaluation, a detailed-full IRP team review was not determined to be necessary; however, the team coordinated its review with a Fire Protection Professional.