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

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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**

memorandum

Idaho Operations Office

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 I Results for the AMWTP – PHD-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 I 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
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AMWTP Document Control

- 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		**Date:** 3/8/07
Review: Pat A. Young		**Date:** 3/12/07
Printed Name:	Allan Exley	
Printed Title:	Facility Evaluation Team Site Lead	
Signature:		**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		

Table of Contents:

List of Figures
List of Tables
Definitions
Abbreviations/Acronyms
Executive Summary
1. Introduction
   1.1. Facility Overview
   1.2. Ventilation Strategy
2. Functional Classification Assessment
   2.1. Existing Classification
   2.2. Evaluation
   2.3. Summary
3. System Evaluation
   3.1. Identification of Gaps
   3.2. Gap Evaluation
   3.3. Modifications and Upgrades
4. Conclusion
References
Attachments

List of Figures:

1. Figure 1.1 - Ventilation Strategy Overview

List of Tables:

1. Data Collection Table (Table 4.3 as submitted to DOE for DNFSB 2004-2)
2. Comparison Of The AMWTP Ventilation System To Performance Criteria – WMF-676/634 (Table 5.1 as submitted to DOE for DNFSB 2004-2)

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.

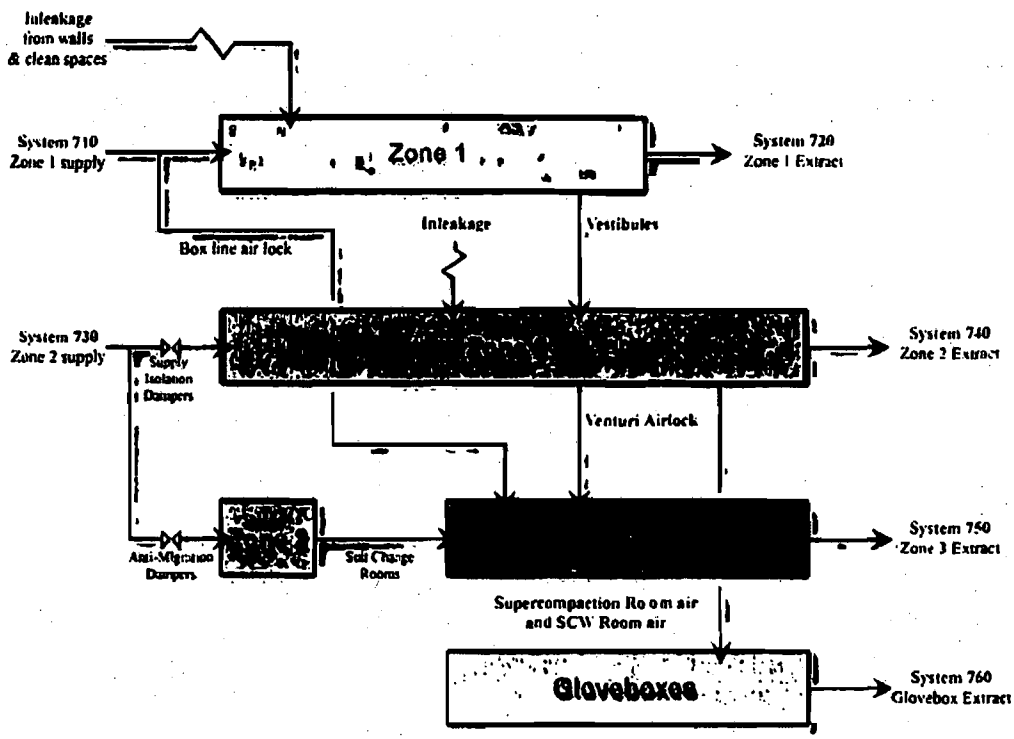

Figure 1.1 - Ventilation Strategy Overview

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	Maximum ST CLW – 60 rem SB – 7.3 rem Average ST 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	Maximum ST CLW – 18 rem SB – 0.052 rem Average ST 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-K0105C-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.