



## Department of Energy

Washington, DC 20585

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MEMORANDUM FOR DAVID A. BROCKMAN  
MANAGER  
RICHLAND OPERATIONS OFFICE

FROM: DR. STEVEN L. KRAHN *SK*  
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<sup>®</sup> 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 <sup>90</sup>Sr and <sup>137</sup>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.