



U.S. Department of Energy  
**Office of River Protection**

P.O. Box 450, MSIN H6-60  
Richland, Washington 99352

07-TED-043

OCT 25 2007

Mr. John C. Fulton, President  
and Chief Executive Officer  
CH2M HILL Hanford Group, Inc.  
2440 Stevens Center Place  
Richland, Washington 99354

Dear Mr. Fulton:

CONTRACT NO. DE-AC27-99RL14047 – THE U.S. DEPARTMENT OF ENERGY (DOE),  
OFFICE OF RIVER PROTECTION (ORP) ASSESSMENT REPORT “TANK FARM  
CONTRACTOR PROJECT W-314 AN EXHAUSTER SKID SAFETY SYSTEM OVERSIGHT  
(SSO) ASSESSMENT,” A-07-ASTM-TANKFARM-003

This letter transmits the results of ORP’s assessment of the Project W-314 AN Exhauster Skid.  
The SSO assessment was completed September 14, 2007.

The SSO assessment resulted in three findings and nine observations. The assessment team  
concluded that there are several weaknesses in key aspects of the testing verification and  
planning processes. These weaknesses must be corrected before the operability of the W-314  
AN exhauster can be verified.

Within 30 days of receipt of this letter you should respond to the assessment findings. The  
response should include:

- The causes of the findings;
- The corrective actions that have been taken to control or remove any adverse impact from the noncompliant conditions and the results achieved;
- The corrective actions that will be taken to identify the extent of condition, correct the causes, and prevent further findings; and
- The date when all corrective actions will be completed, verified, and compliance to applicable requirements achieved.

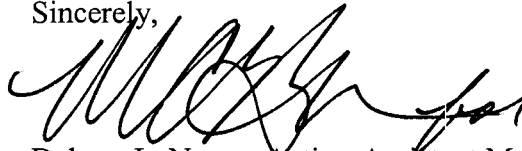
Mr. John C. Fulton  
07-TED-043

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OCT 25 2007

If you have any questions, please contact me, or your staff may contact Mr. Dennis H. Irby, Tank Farm Engineering Division, Assessment Team Lead, (509)376-5652.

Sincerely,



Delmar L. Noyes, Acting Assistant Manager  
For Tank Farms Project

TED:DHI

Attachment

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**U.S. Department of Energy  
Office of River Protection**

**Tank Farm Contractor  
Project W-314 AN Exhauster Skid  
Safety System Oversight Assessment**

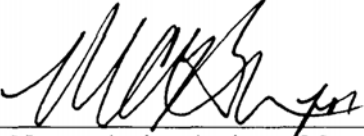


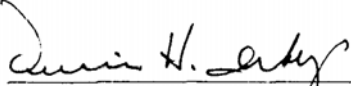
**Final Report  
A-07-AMTF-TANKFARM-003**

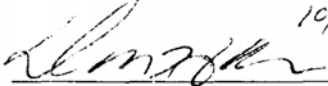
**October 2007**


Dennis H. Irby  
Team Leader

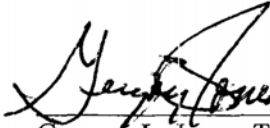
**Report Approval**

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## EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE), Office of River Protection (ORP) conducted an assessment of Tank Farm Contractor (TFC) Project W-314 AN Exhauster (W-314) status from September 10 through 14, 2007. The objectives of the assessment were to:

- Identify the current status of cold Operational Acceptance Test (OAT) and results;
- Determine if ongoing 241-AN Farm new exhaust system skid readiness activities are in accordance with programs, policies and procedures to support cold/hot OATs and transition to operation;
- Determine if the 241-AN Farm new exhauster skid ongoing field work will support hot OAT actions required for startup and is consistent with program requirements and are identified and;
- Determine the 241-AN Farm new exhauster skid hot OAT actions required for startup and are consistent with program/safety requirements and are identified.

### Conclusion

The assessment team concluded that there are several weaknesses in key aspects of the testing verification (e.g., lack of documented justification for non-conforming issues, pre-OAT open issue justification for proceeding) and planning processes (e.g., verifying that all necessary design features will be tested, ensuring all necessary actions are identified, scheduled and staffed to achieve hot OAT and ultimate operation). These weaknesses must be corrected before the operability of the W-314 AN exhauster can be verified. The TFC began the cold OAT in June 2007. Currently a few items remain to be performed in the cold OAT with the hot OAT scheduled for December 2007.

The assessment team also concluded that the TFC test program was not correctly resolving test deficiencies because the procedure, TFC-PRJ-SUT-C-03, Conduct of Testing incorrectly implemented the requirements of TFC-PLN-02, *Quality Assurance Program Description* (QAPD) for evaluation and correction of nonconformances. The QAPD provides the TFC's implementation of the requirements of 10 CFR 830, Subpart A.

This assessment resulted in three findings and nine observations:

### FINDINGS

**Finding A-07-AMTF-TANKFARM-003-F01:** The TFC failed to implement the requirements specified in TFC-PLN-02, *QAPD*, for documenting, classifying, and correcting nonconforming conditions in TFC-PRJ-SUT-C-03, *Conduct of Testing*.

**Finding A-07-AMTF-TANKFARM-003-F02:** W-314-OAT-1.4.1, *241-AN Ventilation Tank Primary System, W-314 Phase 2 OAT-Cold* does not test design requirements of RPP-12722, *Software Requirements Specification (SRS) for Heating Ventilation Air Conditioning (HVAC)*.

**Finding A-07-AMTF-TANKFARM-003-F03:** The draft Operational Readiness Checklist (ORC) was not developed in accordance with TFC-PRJ-PM-C-06, *Operational Readiness Process*, Revision B.

### **Observations**

**Observation A-07-AMTF-TANKFARMS-003-O01** - The TFC did not implement the requirement to verify air conditioning unit operation on the AN Exhauster skid in accordance with “interim care and custody” requirements identified during ORP A-06-AMTF-TANKFARMS-005 assessment conducted in July 2006.

**Observation A-07-AMTF-TANKFARM-003-O02:** The test engineering organization’s understanding of how the TFC implements the quality improvement requirements is weak. The test engineering organization should consider conducting indoctrination or training to improve their understanding of how the TFC implements the quality improvement requirements of 10 CFR 830, Subpart A.

**Observation A-07-AMTF-TANKFARM-003-O03:** TFC-PRJ-PM-C-02, *Project Management for DOE Order 413.3A Projects*, TFC-PLN-26, *Testing Program Plan*, and TFC-PRJ-SUT-C-03, *Conduct of Testing* could clarify the primary responsibilities/interfaces for the actual performance of OAT’s.

**Observation A-07-AMTF-TANKFARM-003-O04:** TFC-PRJ-SUT-C-03, *Conduct of Testing* should require sufficient justification be provided as part of the pre-OAT, OAT, the Test Deficiency Report (TDR) or Test Change Request (TCR) to document basis for decisions.

**Observation A-07-AMTF-TANKFARM-003-O05:** Labels should be permanently affixed in accordance with TFC-ENG-STD-12 prior to any continued testing.

**Observation A-07-AMTF-TANKFARM-003-O06:** The link between TFC-PRJ-PM-C-25 on the procedures web page and the generic Operational Readiness Checklist (ORC) did not reflect the most current ORC. During the assessment the TFC corrected the hyperlink and this observation is considered closed.

**Observation A-07-AMTF-TANKFARM-003-O07:** The TFC did not update the AN Farm Primary Ventilation System Piping and Instrumentation Diagram (P&ID) in a timely fashion after field changes to the existing ventilation system were complete.

**Observation A-07-AMTF-TANKFARM-003-O08:** The scheduling of the revision to the System Design Document and the Safety Equipment List separate from the Safety Basis Amendment may impact the schedule of the start of the hot OAT.

**Observation A-07-AMTF-TANKFARM-003-O09:** The thermal hydraulic analysis that supports the installation of the new exhauster in AN Farm is still draft even though the cold OAT is underway, potentially affecting the efficacy of the cold OAT.

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**ACRONYMS**

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## **1.0 INTRODUCTION**

The U.S. Department of Energy (DOE) Office of River Protection (ORP) performed an assessment of the Tank Farm Contractor (TFC) Project W-314 AN Exhauster (W-314) status from September 10 through 14, 2007. The cold Operational Acceptance Test (OAT) had not yet been completed during the period of the assessment.

## **2.0 PURPOSE AND SCOPE**

The purpose of this assessment is to evaluate the closure of items identified in A-06-AMTF-TANKFARM-005 issued under ORP letter 06-TED-047, dated July 27, 2006; identify the current status of W-314 AN Ventilation Tank Primary System cold OAT readiness to conduct hot OAT; status of field work required to support both cold and hot OAT; and determine if the OAT's adequately assure compliance with the proposed Safety Basis (SB) amendment.

The objectives of the assessment are to:

- Identify the current status of cold OAT and results,
- Determine if ongoing 241-AN Farm new exhaust system skid readiness activities are in accordance with programs, policies and procedures to support cold/hot OATs and transition to operation,
- Determine if the 241-AN Farm new exhauster skid ongoing field work will support hot OAT actions required for startup and is consistent with program requirements and are identified,
- Determine the 241-AN Farm new exhauster skid hot OAT actions required for startup and verify they are consistent with program/safety requirements and are identified.

## **3.0 APPROACH AND DELIVERABLES**

The assessment team performed the review consistent with ORP M 220.1, "Integrated Assessment Program (DOE 2006)."

Major assessment activities consisted of:

- Preparation of the Criteria Review and Approach Documents (CRAD);
- Selection of the assessment team;
- Pre-review activities;
- Entrance Meeting with the TFC;
- Fieldwork activities;
- Development of the assessment results;
- Exit Meeting with the TFC and;
- Development of a final report, including a factual accuracy review by the TFC.

The assessment team developed the CRADs from the *Model Assessment Criteria and Guidelines for Performing Phase II Assessments of Safety Systems at Defense Nuclear Facilities* (DOE 2001) and TFC procedures. Appendix A provides the CRADs for this assessment.

ORP selected the assessment team based on technical expertise and experience. Appendix B provides the biographical summaries for each of the team members.

The assessment team conducted the entrance briefing on September 10, 2007. The assessment team performed fieldwork between September 10 through 14, 2007. Fieldwork consisted of TFC staff interviews and an inspection of the new AN exhauster. Team members discussed assessment activities and results periodically and communicated the issues to the TFC point-of-contact. Communication of program strengths, weaknesses, and TFC feedback related to requested information or resolution of issues occurred in real time. The assessment team held the exit briefing on September 17, 2007.

#### **4.0 ASSESSMENT RESULTS**

A summary of the results of the assessment, including observations, by assessment performance objective is provided below. Appendix A provides detailed discussions, references, personnel interviewed, and additional considerations.

#### 4.1 Assessment A-06-AMTF-TANKFARMS-005 Resolution of Issues

This objective required evaluating the TFC closure actions to ensure issues from the July 2006, assessment have been adequately resolved. The assessment resulted in no findings and there were six observations. The following provides the observations, TFC Problem Evaluation Request (PER) and associated status. The observations were:

- **A-06-AMTF-TANKFARM-005-O01** – Existing equipment degradation or potential degradation requires evaluation prior to system testing. TFC PER, CH2M-PER-2006-1756 was closed on November 6, 2006, to address this issue. The TFC concluded that the exiting procedure TFC-PRJ-SUT-C-03, Conduct of Testing addressed this concern and the assessment team agrees with this conclusion.
- **A-06-AMTF-TANKFARM-005-O02** – When Project W-314 was delayed, the Project Turnover process did not address turnover of the new AN/AW exhauster skids for Interim Care and Custody. TFC PER, CH2M-PER-2006-1745 was closed on October 19, 2006. TFC procedures were revised to clarify the cope of “Interim Care and Custody” including project baseline, funding and potential suspension/cancellation. The assessment team agrees with this conclusion and verified procedure changes.
- **A-06-AMTF-TANKFARM-005-O03**–Electrical panel board schedules were not issued as facility status drawings and physically installed in the AW (AN was not verified) electrical panels in accordance with TFC-ENG-FAC SUP-C-09, Control of Electrical Panel Board Schedules. TFC-PER, CH2M-PER-2006-1757 is currently “In Process/Work.” Actions were identified to update panelboard schedules and update them in the field. For AN farm the completion date was identified as January 15, 2008. As this date was after currently scheduled hot OAT and turnover to operations the status and justification for the date was questioned. Based on the assessment being performed starting September 10, 2007, Waste Feed Operations (WFO) Maintenance Engineering accelerated the AN farm tasks and completed the Engineering Change Notice (ECN) and updating the field panelboards on September 11, 2007. The assessment team agrees the correct panelboard schedules are in the field, but was concerned about the timeliness of the actions (greater than one year after observation in July 2006).
- **A-06-AMTF-TANKFARM-005-O04**– No objective evidence was provided to support the Seal Pots were drained and purged. TFC PER, CH2M-PER-2006-1758 was closed on December 7, 2006. The TFC concluded that based on facility manager knowledge and freeze protection program reasonable assurance existed regarding the draining of the seal pots. The assessment team agrees with the TFC conclusion.
- **A-06-AMTF-TANKFARM-005-O05** – The Winterization Program is not effectively implemented for the AN/AW new ventilation skids. TFC PER, CH2M-PER-2006-

1762 was closed on December 7, 2006. The TFC identified that from a “winterization program” perspective, there are no critical components during interim care and custody. The assessment team agrees with the TFC conclusion for interim care and custody.

- **A-06-AMTF-TANKFARM-005-O06** – The surveillance program for the AN/AW new ventilation skids is not comprehensively and effectively implemented. TFC PER, CH2M-PER-2006-1762 was closed on May 2, 2007. The TFC resolution added verifying the air conditioning unit was on when ambient temperatures exceeded 80 degrees Fahrenheit on the weekly rounds TF-OR-ER1-01-W. However, the “interim care and custody” critical criteria would require a daily check. The assessment team contacted the facility manager and the TFC initiated a change to TF-OR-ER1-01-D, East Routines Daily Rounds to include the verification. As the TFC closure did not meet the requirements identified to ORP during the 2006 assessment an observation is written to address this issue.

### Observations

**A-07-AMTF-TANKFARMS-003-O01** - The TFC did not implement the requirement to verify air conditioning unit operation on the AN Exhauster skid in accordance with “interim care and custody” requirements identified during ORP A-06-AMTF-TANKFARMS-005 assessment conducted in July 2006.

## **4.2 Performance Objective – Identify the Current Status of Cold OAT and Results.**

This objective required identifying the current status of cold OAT and any process issues associated with the cold OAT.

The performance criteria for evaluating this objective included:

1. Are the 241-AN Farm new exhauster skid OAT procedures implemented and documented to ensure applicable requirements are met?

### Assessment

There are two elements in assessing this criterion. Element A involved reviewing TFC procedures for OAT roles, responsibilities, and requirements. Element B involved reviewing project documentation for adequate computer software requirement implementation.

#### Element A

In general, the cold OAT complied with TFC-PRJ-SUT-C-02, TFC-PRJ-SUT-C-03, and TFC-PRJ-SUT-C-05. The procedures reviewed generally demonstrated consistency and

inter-relationships between testing, readiness and operations. However, the assessment team identified several areas for clarification of responsibilities and documentation of decisions. For example, there were several instances of poor to non-existent documentation of decision points. This includes pre-cold OAT decisions and those decisions made during the cold OAT to proceed given identified deficiencies. Also, TFC-PRJ-SUT-C-03 did not correctly implement the requirements of TFC-PLN-02, *Quality Assurance Program Description (QAPD)*, or the PER program for nonconforming items identified during testing. As a result, the TFC did not correctly resolve nonconformances identified during testing.

### Element B

Documents specified technical requirements for the software, quality assurance requirements, configuration management requirements, and test requirements, but there were inconsistencies between performance requirements and the tests. The TFC did not review the Software Requirements Specification and incorporate test requirements into the test plan and test procedure. As a result, at least two software design requirements were not tested in either the Acceptance Test Procedure (ATP) or the cold OAT.

2. Are the cold OAT Results complete, open items identified and being worked, lessons learned documented and being considered for hot OAT? If cold OAT is not complete, observe cold OAT and provide performance assessment.

### Assessment

At the time of this assessment the cold OAT was not complete and there was no testing being performed during this assessment. Table 1 (in Appendix A of this report) provides the “open” work orders against the 241-AN exhauster skid as of August 30, 2007. The table provides the work package number, title, flow status, current planner, driver (i.e., whether the package was issued prior to cold OAT initiation), and if the work was not completed prior to cold OAT initiation the justification for not affecting cold OAT completion. The justification for not affecting cold OAT was not found in OAT documentation, but rather justified by the TFC as part of this assessment.

3. Is the field equipment appropriately marked and tagged for the intended use and drawings current?

### Assessment

The labeling was found to be good and typically used solid plastic labels that were securely attached (see pictures below). All components were found to be properly labeled with the following exceptions:

- AN241-VTP-V-153, associated with the B Train de-entrainer, missing its label.

- Four different levers, two on each train, between the High Efficiency Particulate Air filters that appeared to be attached to dampers. Each had two positions, “test position” and “operate position.” The damper should be labeled.
- One label from AN241-VTP-EF-010 was found lying on the ground.
- Raychem switches associated with the seal pot and de-entrainers on each train were missing labels.

#### Findings and Observations

There are two findings and four observations. They are:

**Finding A-07-AMTF-TANKFARM-003-F01:** The TFC failed to implement the requirements specified in TFC-PLN-02, *QAPD*, for documenting, classifying, and correcting nonconforming conditions in TFC-PRJ-SUT-C-03, *Conduct of Testing*.

#### **Requirements**

- TFC-PLN-02, *QAPD*, Section 15.2.4 states, “Further processing, delivery, installation, or use of a nonconforming item shall be controlled pending the evaluation and an approved disposition by authorized personnel.”
- TFC-PLN-02, *QAPD*, Section 15.2.7 states, “The disposition of use-as-is, reject, repair, or rework, for nonconforming items shall be identified and documented.”
- TFC-PLN-02, *QAPD*, Section 15.2.3 states, “Personnel performing evaluations to determine a disposition shall have demonstrated competence in the specific area they are evaluating, have adequate understanding of the requirements, and have access to pertinent background information.”
- TFC-ESHQ-Q\_C-C-01, *PER*, Section 4.1 states, “A PER shall be initiated for conditions that require resolution, trending, cause determination, or identification and tracking of corrective actions.”
- TFC-ESHQ-Q\_ADM-C-02, *Nonconforming Item Reporting and Control*, Section 1.0 states, “This procedure implements the requirements of TFC-PLN-02, *QAPD* for control of nonconforming items; it establishes the process for documenting, evaluating, and dispositioning nonconforming items. This procedure does not apply to items that fail during operation.”

- TFC-ESHQ-Q\_ADM-C-02, *Nonconforming Item Reporting and Control*, Section 3.0 states, “CH2M HILL employees and subcontractors who become aware of a nonconforming condition have the responsibility to initiate an NCR or notify their managers or responsible Quality Assurance (QA) representatives about the condition for initiation of an NCR.”

## Assessment

Contrary to these requirements, the process used by the testing organization to resolve testing deficiencies did not assure the correct technical authority would specify the technically appropriate corrective action. It also did not specify application of the nonconformance report process, nor did it require consistent use of the problem evaluation report process as specified in TFC procedures. The assessment team based its conclusions on the following:

- Conduct of testing procedures do not require classifying test deficiencies as “use-as-is,” “reject,” “repair,” or “rework,” and specifying corrective actions accordingly. (TFC-PLN-02 section 15.2.7)
- For some situations, TFC test procedures allow Test Directors to specify technical resolutions to test deficiencies without explicit, documented concurrence of System Engineers. Test Engineers are not qualified as technical authorities on systems. (TFC-PLN-02 section 15.2.3)
- Conduct of testing procedures do not require all test deficiencies to be documented with PERs. (TFC-PLN-02 Table 1, item 16 and TFC-ESHQ-Q\_C-C-01, *Problem Evaluation Request*, section 4.1)
- Conduct of testing procedures do not require all non-conformances identified during testing to be documented with NCRs. (TFC-PLN-02 section 15.2.1 and TFC-ESHQ-Q\_ADM-C-02, *Nonconforming Item Reporting and Control*, section 1.0)

**Finding A-07-AMTF-TANKFARM-003-F02:** W-314-OAT-1.4.1, *241-AN Ventilation Tank Primary System, W-314 Phase 2 Operational Acceptance Test-Cold* does not test design requirements of RPP-12722, *Software Requirements Specification (SRS) for HVAC*:

## Requirements

- RPP-12722, *Software Requirements Specification (SRS) for HVAC* Section 3.2.9.2 states, “Valve alarms are inhibited during sequenced startup and shutdown of the PVS or if the valves are being manually controlled.”
- SRS Section 3.2.9.2 states, “Skid Valve(s) Failure Alarm: The system shall provide an alarm when the skid valves do not reach the commanded position after a preset time.”



- TFC-PLN-02, *Quality Assurance Program Description*, Section 11.2.2, states, “Test requirements and acceptance criteria shall be provided or approved by the responsible design organization... Test requirements and acceptance criteria shall be based upon specified requirements contained in applicable design documents or other pertinent technical documents that provide approved requirements.”

## Assessment

Contrary to the above requirements, some design requirements identified in the SRS were not tested in either the acceptance test procedure or the cold OAT. This occurred because the SRS was not reviewed for attributes requiring testing.

- There was no test for section 3.2.9.2, “Valve alarms are inhibited during sequenced startup and shutdown of the PVS or if the valves are being manually controlled.”
- There was no test for section 3.2.9.2, “Skid Valve(s) Failure Alarm: The system shall provide an alarm when the skid valves do not reach the commanded position after a preset time.”
- In interviews, cognizant TFC personnel stated they had not reviewed the Software Requirements Specification to identify software design requirements requiring testing.

**Observation A-07-AMTF-TANKFARM-003-O02:** The test engineering organization’s understanding of how the TFC implements the quality improvement requirements is weak. The test engineering organization should consider conducting indoctrination or training to improve their understanding of how the TFC implements the quality improvement requirements of 10 CFR 830, Subpart A.

**Observation A-07-AMTF-TANKFARM-003-O03:** TFC-PRJ-PM-C-02, *Project Management for DOE Order 413.3A Projects*, TFC-PLN-26, *Testing Program Plan*, and TFC-PRJ-SUT-C-03, *Conduct of Testing* could clarify the overall responsibility for the actual performance of OAT’s.

**Observation A-07-AMTF-TANKFARM-003-O04:** TFC-PRJ-SUT-C-03, *Conduct of Testing* should require sufficient justification be provided as part of the pre-OAT, OAT, the TDR or TCR to document bases for decisions.

**Observation A-07-AMTF-TANKFARM-003-O05:** Ensure all labels are permanently affixed in accordance with TFC-ENG-STD-12 prior to any continued testing.

**4.3 Performance Objective – Determine if ongoing 241-AN Farm new exhaust system skid readiness activities are in accordance with programs, policies and procedures to support cold/hot Operational Acceptance Tests and transition to operation.**

The purpose of the performance objective is to determine if readiness activities are following established policies, programs and procedures.

The performance criteria for evaluating this objective included:

1. Are the 241-AN Farm new exhauster skid readiness activities being performed in accordance with applicable program, policy and procedure requirements?

Assessment

The activity description for the startup of the new primary exhausters, AD-W314AN-01, *Activity Description for Project W-314 Phase II 241-AN And 241-AW Tank Farms Primary Ventilation System Upgrades* was found to be in compliance with TFC-PRJ-PM-C-04, *Startup Notification Report*. The activity is basically the startup and operation of another ventilation system which has similar and, in most cases (except for higher flow rates), identical characteristics to other ventilation systems already in operation in the tank farms. Operation of Double-Shell Tank ventilation systems has been determined by the contractor as one of a number of activities that is considered to be routine per their latest quarterly approved routine activities list. Operation of this new DST ventilation system will not differ appreciably. Therefore, the decision to not conduct a Readiness Assessment and to follow an activity-specific Operational Readiness Checklist (ORC) using TFC procedures is valid and complies with DOE Order 425.1C, *Startup and Restart of Nuclear Facilities*, and ORP M 425.1, *Startup and Restart of Tank Farm Contractor Nuclear Facilities* requirements.

2. Are the 241-AN Farm new exhauster skid readiness activities defined sufficient to support hot OAT and operations?

Assessment

The development of the activity-specific ORC generally complied with the contractor's internal procedure mandating this activity, with certain exceptions. The ORC was reviewed and approved by numerous departmental managers as required. Attachment A, of the activity-specific ORC, contained the list of generic line-item deliverables considered to be not applicable to the startup of the new exhaust system. However, twelve of the line item deliverables from Revision 7 of the generic ORC were missing from the activity-specific ORC and no justification for excluding them was included in Attachment A of the activity-specific ORC, as required by TFC-PRJ-PM-C-06, *Operational Readiness Process*.

As a result of this and other identified discrepancies (discussed in Appendix A), the TFC elected to rewrite portions of the activity-specific ORC for the startup of the new primary ventilation system in AN Farm. Specifically, they are (1) accounting for all the line item deliverables in the generic ORC either in the body of the activity-specific ORC or in Attachment A to the activity-specific ORC, (2) correcting two deliverables (discussed in Appendix A) that are contained in both the ORC and Attachment A, (3) providing brief justifications as applicable for those line item deliverables that have been determined to be not applicable, (4) adding to the ORC those line item deliverables that were erroneously determined to be not applicable and (5) updating the activity-specific ORC to the current revision of the generic ORC (Revision 9). The TFC had completed the draft of Revision 1 of the activity-specific ORC during the assessment and was routing it around to various department managers as applicable for approvals. The assessment team review of the draft activity specific ORC Revision 1 found it to be acceptable.

3. Are applicable safety/operational requirements identified, linked to acceptance criteria, being tested and verified as part of cold and hot OAT?

#### Assessment

The Tank Farm Technical Safety Requirements (TSR) provides for maintaining flammable gas concentrations <25% of the lower flammability limit (LFL) by requiring an OPERABLE Double Shell Tank (DST) Primary Ventilation System. To ensure the DST primary ventilation system is OPERABLE, a surveillance requirement (SR) specific to AN farm was established. That is SR 3.2.1.1 which states, "Tank inlet HEPA filter differential pressure shall be VERIFIED to be > 0 in. w.g. for each tank in the 241-AN Tank Farm every 10 days. VERIFICATION of inlet HEPA filter differential pressure (dP) provides an indication that airflow is maintained into the tank headspace."

The cold OAT, W-314-OAT-1.4.1, *241-AN Ventilation Tank Primary System, W-314 Phase 2 Operational Acceptance Test-Cold*, steps 8.7 and 8.8 verify operability of the dP interlock and alarm for Train A and steps 8.17 and 8.18 verify Train B dP interlock and alarm operability.

#### Findings and Observations

**Finding A-07-AMTF-TANKFARM-003-F03:** The activity-specific ORC was not developed in accordance with TFC-PRJ-PM-C-06, *Operational Readiness Process*, Revision B.

#### **Requirement**

DOE O 425.1C, *Startup and Restart of Nuclear Facilities*, Section 4.a (2) states, in part, "If a Readiness Assessment is not to be performed, the contractor's standard operating procedures for startup or restart will be used."

TFC-PRJ-PM-C-06, *Operational Readiness Process*. Section 4.2 Development of the Operational Readiness Checklist states “Provide written justification for all generic ORC deliverables that are determined to not be within the activity-specific ORC scope.”

#### **Assessment**

Twelve of the line item deliverables from Revision 7 of the generic ORC were missing from the activity-specific ORC and no justification for excluding them was included in Attachment A of the generic ORC, as required by TFC-PRJ-PM-C-06, *Operational Readiness Process*.

**Observation A-07-AMTF-TANKFARM-003-O06:** The link between TFC-PRJ-PM-C-25 on the procedures web page and the generic ORC did not reflect the most current ORC. During the assessment the TFC corrected the hyperlink and this observation is considered closed.

#### **4.4 Performance Objective – Determine if the 241-AN Farm new exhauster skid ongoing field work will support hot Operational Acceptance Test (OAT) actions required for startup and is consistent with program requirements and are identified.**

The purpose of this performance objective is to determine if ongoing field activities resulting from any identified deficiencies are being managed to support actions and schedule for hot OAT.

The performance criteria for evaluating this objective included:

1. Are the 241-AN Farm new exhauster skid field actions required for startup identified and reviewed for programmatic changes?

#### Assessment

A review of the work orders, drawings and ECNs was conducted to verify that changes to the ventilation system(s), both existing and new, were under configuration control. It was found that the two new vacuum relief valves were installed on the inlet stations at tanks 241-AN-101& AN-102 during April 2007. The ECN against the Piping and Instrumentation Diagram (P&ID) (H-14-020101, sheet 1, rev 6) was not signed complete until August 2007. Although the ECN was not signed off until August 2007, the actual “field work complete” was done in April 2007, prior to initiating the cold OAT.

The review also verified that an important assumption underlying the evaluation calculations of the vacuum relief valves was included in the project planning. The calculations assume that two exhaust line valves in ventilation instrument pits 1 & 2 are administratively controlled in the open position. Work Order WFO-WO-07-0863, *Verify Outlet Valves Open*, accomplishes this important task.

2. Are the 241-AN Farm new exhauster skid field activities necessary for transition from OAT to operations identified and managed?

#### Assessment

A review of the work orders, drawings and ECNs was conducted to verify that required field activities are identified and being managed. Two important work orders have been drafted to cover the assumptions underlying the thermal hydraulic calculations and the final tie-in to the exhaust ducting. These two work orders, WFO-WO-07-0863, *Verify Outlet Valves Open*, and 2E-03-01772, *W-314-241-AN-PH2 Final Connection Primary Exhauster System* were reviewed in draft. The fact that they have been formally entered into the work planning process gives confidence they will be carried out.

#### Findings and Observations

There were no findings for this performance objective and one observation.

**Observation A-07-AMTF-TANKFARM-003-O07:** The TFC did not update the AN Farm Primary Ventilation System P&ID in a timely fashion after field changes to the existing ventilation system were complete.

#### **4.5 Performance Objective - Determine the 241-AN Farm new exhauster skid hot Operational Acceptance Test (OAT) actions required for startup and are consistent with program/safety requirements and are identified.**

The purpose of this performance objective is to ensure hot OAT actions are consistent with program/safety requirements, all acceptance criteria have been met to assure successful turnover for operation.

The performance criteria for evaluating this objective included:

1. Are the 241-AN Farm new exhauster skid actions required for startup identified and reviewed for hot OAT implications?

#### Assessment

The scheduling of the development and submission for approval of the Safety Basis (SB) Amendment Package to ORP for approval did not include the time required to update the

System Design Description (SDD) and the Safety Equipment List (SEL). ORP letter 03-TED-109, *Approval of the Revised Documented Safety Analysis (DSA), Technical Safety Requirements (TSR), And Supporting Documents for Tank Farms Safety Basis for Implementation*, dated October 17, 2003, identified the SDD and SEL as SB documents.

The draft Thermal Hydraulics Analysis (THA) which is now in review does identify that AN Farm has seven tanks instead of only six as in AW Farm. It also recognizes and analyzes the inlet station at 241-AN-107 which has a 4 inch riser instead of the standard 12 inch riser in the other six AN Farm tanks. The development of the hot OAT procedure by way of the Sub-Test Plan (W-314-STP-1.4/1.6) incorporates two test areas that invoke results of the THA. Test section item 1 (verify fan flow rate) and test section item 37 (verify flow rate of 500 cubic feet per minute (cfm) or greater is achieved for the 241-AN and 241-AW tanks) both call for the placing administrative testing limits based on the results of the THA. It is probable that the new THA will not change the results for the operation of the new exhauster under normal (non-mixing) conditions; however, there is some inherent risk in proceeding until the draft THA is reviewed and approved. Discussions with the Project Engineer and the vendor that owns the GOTH code gives confidence that the final version will have all the required configuration control documentation.

2. Are the 241-AN Farm new exhauster skid activities necessary for hot OAT identified and managed?

#### Assessment

The hot OAT scoping matrix was reviewed against the sub-test plan (W-314-STP-1.4/1.6, *Sub-Test Plan for 241-AN and AW Farms Ventilation Tank Primary Systems*, Rev 1A, May 8, 2007) and found that all elements in the sub-test plan identified as requiring testing during the hot OAT were included in the hot OAT scoping matrix.

#### Findings and Observations

There are no findings associated with this performance objective and two observations.

**Observation A-07-AMTF-TANKFARM-003-O08:** The scheduling of the revision to the System Design Document and the Safety Equipment List separate from the Safety Basis Amendment may impact the schedule of the start of the hot OAT.

**Observation A-07-AMTF-TANKFARM-003-O09:** The thermal hydraulic analysis that supports the installation of the new exhauster in AN Farm is still draft even though the cold OAT is underway, potentially affecting the efficacy of the cold OAT.

## 5.0 CONCLUSIONS

The assessment team concluded that there are several weaknesses in key aspects of the testing verification and planning processes. These weaknesses are demonstrated by a lack of documented justification for non-conforming items, pre-OAT open issue justification for proceeding and verifying all necessary design features are tested to achieve hot OAT and ultimate operation. These weaknesses must be corrected before the operability of the W-314 AN exhauster can be verified. The cold OAT commenced in June 2007. Currently a few items remain to be performed in the cold OAT with the hot OAT scheduled for December 2007.

## 6.0 REFERENCES

DOE 2006 - ORP M 220.1, *Integrated Assessment Program*, Revision 4, January 2006, U. S. Department of Energy Office of River Protection, Richland, Washington.

DOE 2001 – Memorandum from S. V. Cary (DOE) to DOE Environmental Management, *Model Assessment Criteria and Guidelines for Performing Phase II Assessments of Safety Systems at Defense Nuclear Facilities*, November 2001, U. S. Department of Energy, Washington, D. C.

Specific references and personnel contacted for each assessment performance objective are listed in Appendix A.

**APPENDIX A - 241-AN NEW EXHAUSTER SKID ASSESSMENT CRITERIA REVIEW  
AND APPROACH DOCUMENTS**



**Status of Observations from the U.S. Department of Energy, Office of River Protection (ORP) Assessment of the CH2M HILL Hanford Group, Inc. (CH2M HILL) New Exhauster Skids in 241-AN AND 241-AW FARMS, letter, 06-TED-038 dated July 2006.**

During the month of June 2006, ORP will conduct an assessment of CH2M HILL new exhauster skids located in 241-AN and 241-AW Farms.

The objectives of the assessment are to:

- Identify current exhauster skid status since the W-314 ramp down;
- Identify and verify ongoing maintenance activities that prevents system degradation prior to use;
- Verify availability and actions required for exhauster skid tie-in; and
- Perform oversight of CH2M HILL Double-Shell Tank Primary Ventilation System Assessment to be performed in June 2006.

The assessment resulted in no findings and there were 6 observations. The following provides the observations, CH2M HILL Hanford Group, Inc. (CH2M) Problem Evaluation Request (PER) and associated status. The observations were:

- **A-06-AMTF-TANKFARM-005-O01** – Existing equipment degradation or potential degradation requires evaluation prior to system testing.
  - CH2M-PER-2006-1756 was closed on November 6, 2006. The description of the concern or problem accurately reflects the ORP identified issue. It was assigned a PER significance of “PIE/CIM” which is a process improvement code. The TFC evaluation concluded that “The Startup and Testing, Conduct of Testing procedure reviews changes in the facility or equipment status prior to the restart or start of testing. This is covered in TFC-PRJ-SUT-C-03, *Conduct of Testing*, Section 4.0. Also, the test documentation drives the equipment to be evaluated for functionality prior to start of Operational Acceptance Testing (OAT). This is performed by verifying all the instrumentation on the exhauster skid has been calibrated before performance of the OAT. No further action required.”

Assessment

This testing had already been planned and accomplished by the performance of the cold OAT and closure of the PER is acceptable.

- **A-06-AMTF-TANKFARM-005-O02** – When Project W-314 was delayed, the Project Turnover process did not address turnover of the new AN/AW exhauster skids for Interim Care and Custody.

CH2M-PER-2006-1745 was closed on October 19, 2006. The description of the concern or problem accurately reflects the ORP identified issue. It was assigned a PER significance of “PIE/CIM” which is a process improvement code. The TFC evaluation recommended to, “Revise the PM procedures noted above to ensure funding is available to execute the project turnover to operations and project turnover for "Interim Care and Custody" processes. Revise the Project Turnover procedure noted above to clarify the scope of "Interim Care and Custody." Reviews were performed on procedures TFC-PRJ-PM-C-02 and TFC-PRJ-PM-C-11 to add the statements that when the project baseline is developed, funding to support closeout, and or early suspension/cancellation shall be included. The conclusion was that these revisions needed to be made. These changes were made and the revised procedures (listed above) were issued on October 19, 2006.

#### Assessment

This action was acceptable and the procedures were reviewed and found acceptable.

- **A-06-AMTF-TANKFARM-005-O03**—Electrical panel board schedules were not issued as facility status drawings and physically installed in the AW (AN was not verified) electrical panels in accordance with TFC-ENG-FAC SUP-C-09, Control of Electrical Panel Board Schedules.

CH2M-PER-2006-1757 is currently “In Process/Work.” The description of concern or problem accurately reflects the ORP identified issue. It has been assigned a PER significance of “Track Until Fixed (TUF)” to the DST Project and Maintenance Engineering Manager. There are 4 actions identified:

- Prepare/release an ECN to support updating the panelboard schedule drawings for the W-314 exhauster at 241-AN Farm." Action due date 12/04/07.
- Prepare/release an ECN to support updating the panelboard schedule drawings for the W-314 exhauster at 241-AW Farm." Action due date 9/18/2007.
- Update the panelboard schedule drawings for the W-314 exhauster at 241-AN Farm, per Engineering direction (ECN)." Action due date 1/15/2008.
- Update the panelboard schedule drawings for the W-314 exhauster at 241-AW Farm, per Engineering direction (ECN)." Action due date 9/23/2007.

#### Assessment

During the assessment performed in 2006, the AN/AW W-314 electrical distribution panels did not have “panelboard schedules” installed. As a result of this observation, the TFC

identified “one-line” (essential) diagrams as the “panelboard schedules” and installed them in the field (June 2006). In accordance with TFC-ENG-DESIGN-C-09, the following rules apply to essential drawings

- Essential drawing - Revise within 30 calendar days of ECN work completion date.

The TFC wrote a PER to identify actions to ensure the current panelboard schedules are installed in the field. The first week of September 2007, preparing for this assessment, it was determined the PER was still open and “in-process/work.” A status of the actions identified above resulted in PER closure documentation where on September 9, 2007, “panelboard schedules” were installed in the AN/AW electrical distribution panels replacing the electrical one-line diagrams. In accordance with TFC-ENG-FAC SUP-C-09, Attachment C, electrical panelboard schedules are “support drawings.” In accordance with TFC-ENG-DESIGN-C-09, the following rules apply to support drawings

- Support drawing with AutoCAD file - Revise within 60 calendar days from the date of the third work-completed ECN.
- Support drawing without AutoCAD File - Revise within 90 calendar days from the date of the sixth work-completed ECN.

In further discussions, it was identified that in actuality, an electrical panelboard schedule, dated September 2004 existed and part of the closure of PER 2006-1757 resulted in the 2004 panelboard schedule replacing the 2006 electrical one-line diagrams. In an unrelated event dealing with the AN variable frequency drive (VFD), the following actions were taken by the TFC:

- On June 4, 2007, initiated troubleshooting activities (verbal authorization only) on AN241-VTP-SIC-009 and SIC-010 (variable frequency drives) at AN Farm utilizing H-14-030101 sheet 1 thru 6. Note: EDT 820909 issued September 4, 2004, which included H-14-030101 sheet 5 & 6: panelboard schedules for distribution panels on the AN Exhauster Skids panel board schedules. The 2004 panelboard schedules were verified against the one-line diagrams during troubleshooting activities but not documented verified.
- On September 6, 2007, ECN 725007 R0 written to generate the prints and install in the field for AW Farm and panelboard schedule AW Exhauster distribution panels. Note: The panelboard schedule installed in AW farm was marked “Essential” instead of “Support.”
- On September 10, 2007, ECN 725007 R1 written for both AN and AW Farm to remove "Essential Print" from the panelboard schedule for both AW and AN Exhauster distribution panels.

- On September 11, 2007, ECN 7254007 R1 installed in the field in both AN and AW

Therefore, on September 11, 2007, the actions of the PER were completed one year after initiation. Note: During this time the electrical one-line diagrams were in place during the cold OAT. These actions are deemed acceptable although not timely.

- **A-06-AMTF-TANKFARM-005-O04**– No objective evidence was provided to support the Seal Pots were drained and purged.

CH2M-PER-2006-1758 was closed on December 7, 2006. The description of concern or problem accurately reflects the ORP identified issue. It has been assigned a PER significance of “PIE/CIM” which is a process improvement code. The TFC evaluation resulted in the following statement, “Discussions with the Facility Manager (Parnell) reveal that he has personnel knowledge that the seal pots were drained at the completion of testing and system lineups and lock outs were performed that provide reasonable assurance that the seal pots are currently drained and will not be filled back up... The current lack of objective evidence to support the believe that the seal pots are drained does represent some risk, the personal knowledge of the facility manager combined with the freeze protection process (heat trace) on the ventilation system provides reasonable assurance that the seal pots are adequately protected from inclement weather conditions. No further actions are warranted to address this observation.”

#### Assessment

The conclusion of this PER is acceptable.

- **A-06-AMTF-TANKFARM-005-O05** – The Winterization Program is not effectively implemented for the AN/AW new ventilation skids.

CH2M-PER-2006-1762 was closed on December 7, 2006. The description of concern or problem accurately reflects the ORP identified issue. It has been assigned a PER significance of “PIE/CIM” which is a process improvement code. The TFC evaluation resulted in the following statement, “WFO has evaluated items inspected on the weekly winterization PM and identified which components are critical. Critical components found out of service will be repaired immediately for temporary heaters/blankets/heat trace will be installed until permanent repairs can be made. Components deemed non-critical found out of service will have a work package initiated and will be worked as priorities and resources allow. There are no critical components identified on the new exhausters.

### Assessment

The TFC review and response is acceptable.

- **A-06-AMTF-TANKFARM-005-O06** – The surveillance program for the AN/AW new ventilation skids is not comprehensively and effectively implemented.

CH2M-PER-2006-1762 was closed on May 2, 2007. The description of concern or problem accurately reflects the ORP identified issue. It has been assigned a PER significance of “PIE/CIM” which is a process improvement code. The TFC evaluation resulted in the following statement, “Although the de-winterization checklist verifies that the air conditioning units are functional (in the Spring), there are no checks to see if the a/c units are actually running and keeping the units cool when hot weather conditions exist. Recommend adding a period check to the round sheets during hot weather conditions to verify temperature conditions are appropriate. Operating round revised to verify A/C operating if temperatures are above 80 degrees Fahrenheit.”

### Assessment

Review of the daily operator rounds could not produce objective evidence for closing the PER. The TFC Facility Manager for AN farm was contacted to obtain the objective evidence. The requirement to verify Air Conditioning Unit is operating when ambient temperatures are greater than 80 degrees Fahrenheit was found in the “Weekly” round, TF-OR-ER1-01-W. Discussed that weekly was not acceptable given the TFC contractor defining AN241-VTP-ENCL-110 and 111 as critical during care and custody. The TFC Facility Manager indicated a change to the daily rounds would be accomplished. Therefore, closure of this PER by the TFC is deemed not acceptable at this time.

### Observation

**A-07-AMTF-TANKFARMS-003-O01** - The TFC did not implement the requirement to verify air conditioning unit operation on the AN Exhauster skid in accordance with “interim care and custody” requirements identified during ORP A-06-AMTF-TANKFARMS-005 assessment conducted in July 2006.

**Criteria and Review Approach Document  
241-AN Farm New Exhauster Skid Assessment 2007**

Functional Area: Double-Shell Tank (DST) Primary Ventilation	Assessment Element: 241-AN New Exhauster Skid Current Status	Facility or Process: Tank Farms	Date: September 10-14, 2007	CRITERIA MET YES: _____ NO: <u>  X  </u>
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Objective: Identify the current status of cold Operational Acceptance Test (OAT) and results.

Performance Criteria:

1. Are the 241-AN Farm new exhauster skid OAT procedures implemented and documented to ensure applicable requirements are met?
2. Are the cold Operational Acceptance Test Results complete, open items identified and being worked, lessons learned documented and being considered for hot OAT? If cold OAT is not complete, observe cold OAT and provide performance assessment.
3. Is the field equipment appropriately marked and tagged for the intended use and drawings current?

Approach:

- Interview responsible organization (Engineering and Operations) to identify requirements.
- Develop Lines of Inquiry based on identification of requirements.
- Review Tank Farm Contractor (TFC) cold OAT and supporting documents.

Records Reviewed:

- 6-PCD-686, *Anderson Greenwood – Set Pressure Verification and Adjustment for Pilot Operated Vacuum Relief Valve*, Rev A-0, December 22, 2006.
- Engineering Change Notice 721922, *AN Vacuum Relief Valve Addition*, Rev 0, August 12, 2004.
- Engineering Change Notice 721922, *AN Vacuum Relief Valve Addition*, Rev 1, August 9, 2007.
- Engineering Change Notice 721922, *Project W-314: AN Inlet Station Modifications*, August 12, 2004 – Rev 0 – 5, May 3, 2007.
- Engineering Change Notice 724063, *Operating Specifications For The Double-Shell Storage Tanks*, OSD-T-151-00007, Rev K, Rev 0, August 24, 2006.
- Engineering Data Transmittal, EDT-821371, *Vendor Information for 241-AN Vacuum Relief Valve 9209V 12SS V-A-G*, November 10, 2004.

- H-14-020101, *Ventilation Tank Primary System (VTP) O&M System P&ID*, Sheet 1, Rev 8, August 29, 2007.
- H-14-104368-1, *Drawing List Vicinity Map 241-AN Tank Farm Upgrades*, Rev2, May 4, 2005.
- H-14-104475-2, *Instrument List AN Farm Exhauster System*, Rev 2, May 4, 2005.
- HNF-6779, *Project Development Specification for HVAC, Project W-314 Tank Farm Restoration and Safe Operation*, Rev 1, December 2, 2003.
- HNF-SD-WM-TRD-007, *System Specification for the Double-Shell Tank System*, Rev 4, June 29, 2005.
- JMI-040301, *Evaluation of the Proposed Vacuum Relief System for the 241-AW Tank Farm*, Rev 1, July 27, 2004.
- JMI-NB-040301, *AN and AW Farm Vacuum Relief system Evaluation Engineering Notebook*, Rev 2, DRAFT August 17, 2007.
- JMI-NB-050201, *AN-Farm Primary Ventilation System Thermal Hydraulic Evaluation Engineering Notebook*, Rev2 August 16, 2007.
- OSD-T-151-00007, *Operating Specifications For The Double-Shell Storage Tanks*, Rev L, March 2007.
- PTI-W314-SEL-001, *Safety Equipment List for AN241 Exhauster Units (A and B Skids)*, Rev 1, January 23, 2004.
- RPP-11413, *Technical Basis for the Ventilation Requirements Contained in the Tank Farms Operating Specifications Documents*, Rev 2, September 25, 2003.
- RPP-13198, *Project W-314 Specific Test and Evaluation Plan 241-AN Tank Farm HVAC Upgrades Phase 2*, Rev 1, July 8, 2004.
- RPP-15034, *Project W-314 Primary Ventilation System Setpoint Determination*, Rev 0, March 30, 2004.
- RPP-16922, *Environmental Specifications Requirements*, Rev 15, April, 2007.
- RPP-16977, *Project W-314 DST Primary Exhaust System Supporting Calculations*, Rev 0, March 28, 2005.
- RPP-6066, *Project Design Concept – Primary Ventilations(sic) System*, Rev 1, May 7, 2002.
- RPP-7171, *Thermal Hydraulic Evaluation For 241-AN Tank Farm Primary Ventilation System*, Rev 1, DRAFT August 17, 2007.
- RPP-7553, *Primary Ventilation System Ductwork Evaluation for 241-AN Farms*, Rev 0, February 21, 2001.
- RPP-7881, *Specification for a Primary Exhauster System for Waste Tank Ventilation*, Rev 1, July 8, 2004.
- RPP-CALC-27954, *Determination of Maximum Flow Rate For Variable Speed Driven Primary Tank Ventilation Systems on Double-Shell Tanks*, Rev 1, January 12, 2006.
- RPP-CALC-28557, *Determination of Adequacy of 241-AN and 241-AW Vacuum Relief Valves During W-314 Exhauster Fan Over-speed Condition*, Rev 0, January 12, 2006.
- TFC-ENG-DESIGN-C-09, *Engineering Drawings*, Rev C-3, June 20, 2007.
- TFC-PLN-02, *Quality Assurance Program Description*, Rev D, April 25, 2007.
- TFC-PRJ-PM-C-06, *Operational Readiness Process*, Rev B, February 2, 2006.
- TFC-PRJ-SUT-C-02, *Operational Acceptance Test Preparation*, Rev D-2, August 3, 2006.

- TO-060-106, *Operate AN Tank Farm Primary Ventilation system (VTP)*, Rev A-0, DRAFT.
- W-314-OAT-1.4.1, *241-AN Ventilation Tank Primary System, W-314 Phase 2 Operational Acceptance Test-Cold*, Rev 1, May 8, 2007.
- W-314-STP-1.4/ 1.6, *Sub-Test Plan for 241-AN and AW Farms Ventilation Tank Primary Systems*, Rev 1A, May 8, 2007.
- WHC-SD-WM-DB-032, *Design Basis for Tank Inlet Air Control Stations in The 241-AN Tank Farm*, Rev 0, January 30, 1996.
- Work Order: WFO-WO-07-0274, *241-AN-New Exh Seal Pot Lvl Indication MOD*, January 26, 2007.
- RPP-12722, *Software Requirements Specification (SRS) for HVAC*, Rev. 1.
- RPP-10291, *Software Design Plan for HVAC*, Rev. 0.
- RPP-14903, *Qualification Test Report for AN Farm HVAC System*, Rev. 0.
- RPP-12716, *Software Verification and Validation Plan for HVAC*, Rev. 0.
- RPP-6764, *Software Quality Assurance Plan for Monitoring and Control System*, Rev. 1 & Rev. 3.
- RPP-21625, *Software Verification and Validation Report for HVAC – Project W-314*, Rev. 0.
- ECN 724570, *W-314 MCS Citect Software Upgrade*, Rev. 0.
- ECN 724616, *W-314 Software Modifications*, Rev. 0.
- W-314-C13, *Construction Specification*, Rev. 1.
- TFC-PLN-02, *Quality Assurance Program Description*, Rev. D.
- TFC-ENG-DESIGN-P-12, *Process Control Software Procedure*, Rev. B-2.
- TFC-BSM-IRM\_HS-C-01, *Software Development, Implementation, and Management*, Rev. B.
- TFC-ESHQ-Q\_ADM-C-02, *Nonconforming Item Reporting and Control*, Rev. A-6.
- TFC-ESHQ-Q\_C-C-01, *Problem Evaluation Request*, Rev. D-3.

Interviews Conducted:

- Manager, Project Facility and Turnover;
- Manager, Testing;
- W-314 AN Exhauster Test Director;
- Double Shell Tank Ventilation System Engineer;
- Project Manager, AN/AW W-314 Exhausters; and
- WFO/Projects Construction Engineer

Observations and Discussion of Results:

**Performance Criterion 1** - Are the 241-AN Farm new exhauster skid OAT procedures implemented and documented to ensure applicable requirements are met?



## Assessment

There are two elements in assessing this criterion. Element A involved reviewing TFC procedures for Operational Acceptance Test (OAT) roles, responsibilities, and requirements. Element B involved reviewing project documentation for adequate computer software requirement implementation.

### **Element A**

In assessing the first element, the following procedures were reviewed for “Operational Acceptance Test” statements to be verified as part of this assessment.

- TFC-PRJ-PM-C-02, *Project Management for DOE O 413.3A Projects*, Section 4.
- TFC-PRJ-SUT-C-05, *Startup Plan – Development And Implementation*, Section 4.
- TFC-PRJ-PM-C-04, *Startup Notification Report (SNR)*, Section 1 and 4.
- TFC-PLN-26, *Testing Program Plan*, Sections 1.2.3, 4.2, 4.3.
- TFC-PRJ-SUT-C-02, *Operational Acceptance Test Preparation*, entire procedure.
- TFC-PRJ-SUT-C-03, *Conduct of Testing*, entire procedure.
- TFC-PRJ-SUT-C-04, *Test Results Report Preparation*, entire procedure.

### **Assessment**

The statement in TFC-PRJ-PM-C-02, Section 4.1.7 regarding custody for OAT could be more clearly defined. TFC-PLN-26, *Testing Program Plan* and TFC-PRJ-SUT-C-03. TFC-PLN-26 which states that the Testing Manager “Directs field activities and provides field work status to the Startup and Testing director...Verifies the resolution of test changes and deficiencies.” See Section 3.6 for operations responsibilities. TFC-PRJ-SUT-C-03, Section 4.2 has the senior test director/test director ensuring testing is conducted in a safe manner.

Document W-314-OAT-1.4.1, Rev. 1 dated March 27, 2007, page 2 has the Preliminary RADCON Risk Screening as “LOW” and page 3 has the Final as “Low” also. NOTE 1: The radiological control representative performing low risk work planning must have completed the “Low Risk Radiological Work Planner” qualification card #350190 or have a radiological control representative who has completed the qualifications review and co-sign the applicable documentation. The RADCON signature is currently qualified as of August 3, 2005, with no re-qualification required.

TFC-PRJ-SUT-C-02, REV D-2, Operational Acceptance Test Preparation, Section 3.3, Project

Manager - Ensures construction and assembly of structures, systems, and components (SSCs) are completed to support testing. Section 6.5, Project Release of Equipment, of the cold OAT record copy, only has one “exception.” Reviewing open work orders, PERs, etc., there were numerous “open items” prior to the start of the cold OAT. Discussions with the Project Manager and test director, no objective evidence could be produced to document the decision to proceed into cold OAT based on release of equipment.

A Test Deficiency Report (TDR) is used to identify, evaluate, characterize, and document corrective actions of deficient conditions encountered during the testing. Additionally, a PER is required to be generated prior to the time of OAT completion when the OAT, or a portion of the OAT, failed acceptance criteria. Test Change Requests (TCR) requires changes to an OAT fall into one of two categories, “intent” or “non-intent” changes. The determination of the “intent” or “non-intent” change is the responsibility of the senior test director/test director. Review of the TDR/TCR, the justification for “intent or non-intent” is not documented.

Acceptance Criterion 2 below also identifies “open” work orders, some before cold OAT, that were not formally dispositioned/justified as “no” impact to cold OAT prior to cold OAT initiation.

### **Nonconforming Condition Resolution Requirements Not Implemented**

The assessment team reviewed of sample of test exception and TDRs contained in the cold OAT. TFC-PRJ-SUT-C-03 required Test Directors to initiate TDRs for test deficiencies. The procedure also required them to initiate a PER if the test deficiency involved a test acceptance criterion, but this was not required until the time of completion of the OAT. If a PER was required, it was not necessary to initiate the PER until after the resolution had been specified, implemented, and tested.

If a test deficiency involved a test criterion, TFC-PRJ-SUT-C-03 stated that a PER was not required. However, section 4.1 of TFC-ESHQ-Q\_C-C-01, *Problem Evaluation Request*, stated, “A PER shall be initiated for conditions that require resolution, trending, cause determination, or identification and tracking of corrective actions.” This statement and other portions of TFC-ESHQ-Q\_C-C-01 provide no opportunity for exemption from the requirement to issue a PER for all test deficiencies requiring a resolution, trending, cause determination, or identification and tracking of corrective actions.

The administrative procedure TFC-PRJ-SUT-C-03 was incorrect in not requiring PERs for software and other test deficiencies before initiating a resolution. As currently written, the PER procedure requires PERs be initiated for all deficiencies requiring resolution, so that the exemption taken by the testing procedures did not comply with TFC quality improvement requirements. One purpose of the PER is to assure the correct technical authority authorizes the technical resolution.

TFC-PRJ-SUT-C-03 did not require or reference the procedure for initiating a nonconformance report (NCR), although it did not explicitly exempt the Test Directors from NCR documentation requirements. TFC-ESHQ-Q\_ADM-C-02, *Nonconforming Item Reporting and Control*, specified the process for documenting nonconforming conditions. It stated, "This procedure implements the requirements of TFC-PLN-02, *Quality Assurance Program Description (QAPD)* for control of nonconforming items; it establishes the process for documenting, evaluating, and dispositioning nonconforming items. This procedure does not apply to ... Items that fail during operation." Therefore, while the procedure did not apply to items failing during operation, it did apply to items failing during testing.

The administrative procedure TFC-PRJ-SUT-C-03 was incorrect in not identifying when an NCR was required to document deficiencies. By not addressing NCRs for testing deficiencies, the procedure implied that Test Directors were authorized an exemption from the requirement to initiate an NCR for a deficiency similar to the incorrect exemption TFC-PRJ-SUT-C-03 sometimes allowed for PERs. After interviewing the Test Director and Testing Manager, the assessment team concluded the testing organization had an incorrectly narrow view of when an NCR was required and did not understand the role of the test deficiency report in meeting TFC quality improvement requirements in the QAPD. While NCRs are not required to document items that fail during operation, testing occurs before systems are considered to be operational. As written, TFC-ESHQ-Q\_ADM-C-02 required NCRs to be initiated for items found not to conform to requirements during testing.

The TDR form, required by TFC-PRJ-SUT-C-03, provided a space for the Test Director to specify a technical resolution to a deficiency, and required approval by the Operations first line manager and the Facility Manager. There was no place for the System Engineer to sign the form, and there was no discussion in the conduct of testing procedure describing the role of the System Engineer in specifying the resolution. The System Engineer was qualified on the system and held technical authority for it. During an interview, the Testing Manager stated that System Engineers were within the Facility Manager's organization, implying that the Facility Manager's signature reflected the System Engineer's participation in the resolution. However, this was not explicit in TFC-PRJ-SUT-C-03. In an interview, the Test Director stated that he would usually contact the System Engineer by telephone or e-mail when formulating resolutions. The assessment team concluded TFC-PRJ-SUT-C-03 lacked a process for involving the correct technical authority in specifying technical resolutions for test deficiencies.

Because TFC-PRJ-SUT-C-03 did not state if or when an NCR was required in accordance with TFC-ESHQ-Q\_ADM-C-02, procedural controls did not exist to assure the requirements of QAPD, section 15.2.3, "Personnel," and section 15.2.7, "Disposition," were satisfied. Section 15.2.3 required personnel performing evaluations to disposition NCRs "have adequate understanding of the requirements." The TFC establishes understanding of technical requirements for facility systems through its System Engineer training and qualification process. Section 15.2.7 required that dispositions be classified as "use-as-is," "reject," "repair," or "rework," and requirements for dispositioning items will vary based on this classification. The

TDR form lacked provisions for classifying deficiencies within these categories. Deficiencies would only be properly classified in the event that an NCR was issued.

TFC-PRJ-SUT-C-03 stated that configuration changes required an Engineering Change Notice (ECN), and the ECN process required Engineering approval. Therefore, when a corrective action was specified that involved a configuration change, Engineering would have appropriately specified technical resolutions.

The assessment team reviewed Test Deficiency Report 007 for W-314-OAT-1.4.1 and found that it documented an apparent deficiency with the software logic. However, the Test Director had contacted the System Engineer and learned informally that the test procedure was in error, not the software logic. The System Engineer told the Test Director that the reported condition was expected, so the Test Director recorded a resolution to correct the test procedure. There was no record as to whether this was a “use-as-is,” “reject,” “repair,” or “rework” resolution. Also, the information on system behavior was obtained informally from the System Engineer and was recorded by the Test Director in his own words. There was no objective evidence of System Engineer participation in formulation or approval of the resolution.

In some cases, the lack of either a PER or an NCR could bypass the System Engineer who might not see that a resolution was inadequate until corrective actions had been executed and the entire test was essentially complete. Also, deficiencies that require technical corrective action but do not involve an explicit test criterion may never be documented on a PER or NCR. However, it is reasonable to conclude that Test Directors recognize when a resolution involves a configuration change and would call for an ECN. Corrective actions involving configuration changes would therefore normally be formally approved by Engineering.

The conduct of testing procedure, TFC-PRJ-SUT-C-03, does not implement TFC-PLN-02, section 15.2.3 with respect to nonconforming items which states, “Personnel performing evaluations to determine a disposition shall have demonstrated competence in the specific area they are evaluating, have adequate understanding of the requirements, and have access to pertinent background information.” It is the System Engineer, rather than the Test Director, who is qualified and has authority for technical resolution to system deficiencies.

The conduct of testing procedure, TFC-PRJ-SUT-C-03, does not implement TFC-PLN-02, section 15.2.7 with respect to nonconforming items which states, “The disposition of use-as-is, reject, repair, or re-work for nonconforming items shall be identified and documented.”

Some specific examples where TFC-PRJ-SUT-C-03 does not fully implement TFC-PLN-02 and other TFC requirements are:

- Conduct of testing procedures do not require classifying test deficiencies as “use-as-is,” “reject,” “repair,” or “rework” and specifying corrective actions accordingly. (TFC-PLN-02 section 15.2.7).

- For some situations, TFC test procedures allow Test Directors to specify corrective actions without explicit, documented concurrence of System Engineers. Test Engineers are not qualified as technical authorities on systems. (TFC-PLN-02 section 15.2.3).
- Conduct of testing procedure does not require all test deficiencies to be documented with PERs. (TFC-PLN-02 Table 1, item 16 and TFC-ESHQ-Q\_C-C-01, *Problem Evaluation Request*, section 4.1).
- Conduct of testing procedure does not require all non-conformances identified during testing to be documented with NCRs. (TFC-PLN-02 section 15.2.1 and TFC-ESHQ-Q\_ADM-C-02, *Nonconforming Item Reporting and Control*, section 1.0).

## **Element B**

The assessment team reviewed all procedures listed under records reviewed for computer software requirements and found there was an appropriate set of specifications, plans, and procedures. Documents specified technical requirements for the software, quality assurance requirements, configuration management requirements, and test requirements. However, the Software Requirements Specification was not reviewed for testing requirements, and as a result some software requirements were not tested.

Documents specified technical requirements for the software, quality assurance requirements, configuration management requirements, and test requirements. However, there were inconsistencies between performance requirements and the tests.

### **Software Requirements from the Test Plan Tested**

The assessment team reviewed a random sample of eight test requirements from W-314-STP-1.4/1.6, *Sub-Test Plan for 241-AN and 241-AW Farms Ventilation Tank Primary Systems*, and checked for evidence the tests were implemented in the test procedure. All eight requirements were addressed by the cold Operational Acceptance Test (OAT).

### **Software Requirements from the Software Requirements Specification Not Tested**

The assessment team found that the TFC had an appropriate set of specifications, plans, and procedures. Documents specified technical requirements for the software, quality assurance requirements, configuration management requirements, and test requirements. However, the test procedures (both the ATP and cold OAT) did not implement all test requirements from the software requirements specification as follows:

- Software Requirements Specification (SRS) Section 3.2.9.2, “Valve alarms are inhibited during sequenced startup and shutdown of the PVS or if the valves are being manually controlled.”

- SRS Section 3.2.9.2, “Skid Valve(s) Failure Alarm: The system shall provide an alarm when the skid valves do not reach the commanded position after a preset time.”

TFC management said the SRS was issued after the test plan, ATP, and cold OAT documents were issued, but the SRS design requirements were never reviewed for inclusion of new test requirements in the test documents.

Section 11.2.2 of TFC-PLN-02, states, “Test requirements and acceptance criteria shall be provided or approved by the responsible design organization... Test requirements and acceptance criteria shall be based upon specified requirements contained in applicable design documents or other pertinent technical documents that provide approved requirements.” This is the TFC implementation of 10 CFR 830.122, (h)(1) which specifies, “[T]est specified items, services, and processes using established acceptance and performance criteria.”

## Conclusion

In general, the cold OAT complied with TFC-PRJ-SUT-C-02, TFC-PRJ-SUT-C-03, and TFC-PRJ-SUT-C-05. The procedures reviewed generally demonstrated consistency and inter-relationships between testing, readiness and operations. Areas have been identified for clarification of responsibilities and documentation of decisions. There are several instances of poor to non-existence documentation of decision points. This includes pre-cold OAT decisions to those decisions made during the cold OAT to proceed given identified deficiencies.

TFC-PRJ-SUT-C-03 does not implement the requirements of the TFC QAPD, NQA-1, and 10 CFR 830 Subpart A for control of nonconforming items. As a result, some test deficiencies lacked evidence of proper technical resolution.

When the SRS was issued, the test organization did not review it for new test requirements. As are result, the previously issued test plan, ATP, and cold OAT procedure were not updated to test some software design features.

**Performance Criterion 2** - Are the cold OAT Results complete, open items identified and being worked, lessons learned documented and being considered for hot OAT? If cold OAT is not complete, observe cold OAT and provide performance assessment.

## Assessment

At the time of this assessment the cold OAT is not complete. There was no testing being performed during this assessment. Table 1 provides the “open” work orders against the 241-AN exhauster skid as of 8/30/07. The table provides the work package number, title, flow status, current planner, driver (i.e., whether the package was issued prior to cold OAT initiation), and if the work was not completed prior to cold OAT initiation the justification for not affecting cold OAT completion. The justification for not affecting cold OAT was not found in OAT documentation but rather justified by the TFC as part of this assessment.

**Table 1 - AN HVAC Open Packages As of August 30, 2007**

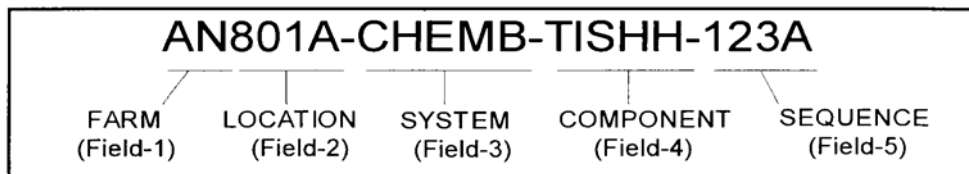
		Related to Cold OAT			
		Open and need justification for why not pre-OAT			
		Field Work Complete			
		Could not find in CHAMPS			
WP Number	Title	Flow Status	Current Planner	Driver	Not Done Prior to OAT Justification
2E-04-01844	241-AN Primary Ventillation System Vacuum Relief	Field Work Complete	Iceberg, DW	Issue prior to test	Not related to Cold OAT; exhauster system not hooked up to inlets
WFO-WO-07-0274	241-AN New Exh Seal Pot Lvl indication MOD	Field Work Complete	Iceberg, DW	Issue prior to test	Not tested in OAT until after mod complete; new instrument interfaces with control system same as old instrument, i.e., 4-20 mA, so no effect on testing approach
WFO-WO-07-0496	241-AN New VTP Exhausters Modify Fieldbus	Working	Iceberg, DW	Issue prior to test	See section 5.5.5 of OAT; in reality, upgrade has turned out to be incremental, so final portion of SMAR test has not yet been performed in OAT
WFO-WO-07-1028	241-AN & AW New Exh Rmve Ext Voltage Plug	ECN Required	Iceberg, DW	Issue prior to test	Work completed for AN prior to OAT; ECN covers AN & AW, so awaiting AW resolution.
WFO-WO-07-1045	241-AN, Install New VTP Exh. Sample Test Ports	Field Work Complete but no date in CHAMPS	Iceberg, DW	Issue prior to test	No effect on testing; simple piping change
WFO-WO-07-1154	241-AN PERFORM SOFTWARE MODS FOR NEW EXHAUSTER	Field Work Complete	Iceberg, DW	Issue prior to test	ECN implemented prior to testing; package is FWC.
WFO-WO-07-1155	W314 MCS WATCH DOG TIMER INSTALLATION	In Planning	Iceberg, DW	Issue prior to test	Related to MCS, not exhausters

Table 1 - AN HVAC Open Packages As of August 30, 2007 Continued					
WP Number	Title	Flow Status	Current Planner	Driver	Not Done Prior to OAT Justification
WFO-WO-07-1808	241-AN B Train Glycol Level Transmitter	Closed	N/A	Related to test	Testing identified failed transmitter; replaced and retested successfully
WFO-WO-07-1897	241-AN NEW EXHAUSTER REPLACE CAM ALARM HORN	Working	Iceberg, DW	Related to test	Testing identified failed buzzer; being replaced, and will be retested
WFO-WO-07-1898	241-AN NEW EXH REMOVE/REPL CAM'S FOR UL INSP	Working	Iceberg, DW	Issue prior to test	No effect on test; CAM simply removed for inspection, then replaced; CAM functional test will be final section of OAT, not yet performed.
N/A	Replace terminal block, related to temp probes	Requested by Deford, DK (Test Director)	Iceberg, DW	Related to test	Testing identified erratic behavior of two temp indicators (although no test criteria were failed); requested repair, then will recheck performance

**Performance Criteria 3** - Is the field equipment appropriately marked and tagged for the intended use and drawings current? A field inspection of the W-314 AN exhauster was conducted on September 12, 2007.

Assessment

TFC-ENG-STD-12, Tank Farm Equipment Identification Numbering and Labeling Standard, Section 3.2 has the following standard:





The labeling was found to be good and typically used solid plastic labels that were securely attached (see pictures below). All components were found to be properly labeled with the following exceptions:

- AN241-VTP-V-153, associated with the B Train de-entrainer, missing its label.
- Four different levers, two on each train, between the HEPA filters that appeared to be attached to dampers. Each had two positions, “test position” and “operate position”. The damper should be labeled.
- One label from AN241-VTP-EF-010 was found lying on the ground
- Raychem switches associated with the seal pot and de-entrainers on each train were missing labels.



Example of Good Labeling



AN241-VTP-EF-010 Label on Ground



Conclusion:

Compliance with TFC procedures is generally good. Performance Criteria 2 and 3 were met with one observation. Performance Criteria 1 resulted in two findings and three observations identified below involving the following deficiencies or weaknesses:

- While the TFC had an appropriate set of technical, quality assurance, and configuration management documents, some design requirements were not tested. Some of the omissions apparently occurred when the SRS was released after the ATP and cold OAT were issued.
- TFC-PRJ-SUT-C-03 and practices do not implement several requirements of the TFC-PLN-02 for control of nonconforming items.
- TFC-PRJ-SUT-C-03 and practices do not comply with the requirement to initiate a PER for all deficiencies requiring corrective action.
- Testing Organization personnel do not understand the role of the test deficiency report in complying with TFC-PLN-02 requirements for control of nonconforming items

Issue(s):

There are two findings and four observations. They are:

**Finding A-07-AMTF-TANKFARM-003-F01:** The TFC failed to implement the requirements specified in TFC-PLN-02, *Quality Assurance Program Description*, for documenting, classifying, and correcting nonconforming conditions in TFC-PRJ-SUT-C-03, *Conduct of Testing*.

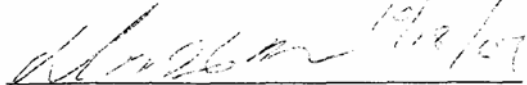
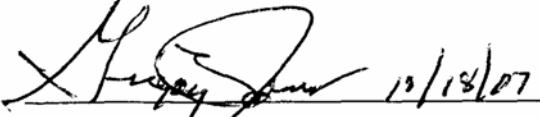
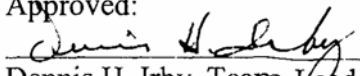
**Finding A-07-AMTF-TANKFARM-003-F02:** W-314-OAT-1.4.1, *241-AN Ventilation Tank Primary System, W-314 Phase 2 Operational Acceptance Test-Cold* does not test design requirements of RPP-12722, *Software Requirements Specification (SRS) for HVAC*.

**Observation A-07-AMTF-TANKFARM-003-O02:** The test engineering organization's understanding of how the TFC implements the quality improvement requirements is weak. The test engineering organization should consider conducting indoctrination or training to improve their understanding of how the TFC implements the quality improvement requirements of 10 CFR 830, Subpart A.

**Observation A-07-AMTF-TANKFARM-003-O03:** TFC-PRJ-PM-C-02, *Project Management for DOE Order 413.3A Projects*, TFC-PLN-26, *Testing Program Plan*, and TFC-PRJ-SUT-C-03, *Conduct of Testing* could clarify the overall responsibility for the actual performance of OAT's.

**Observation A-07-AMTF-TANKFARM-003-O04:** TFC-PRJ-SUT-C-03, *Conduct of Testing* should require sufficient justification be provided as part of the pre-OAT, OAT, the TDR or TCR to document bases for decisions.

**Observation A-07-AMTF-TANKFARM-003-O05:** Ensure all labels are permanently affixed in accordance with TFC-ENG-STD-12 prior to any continued testing.

<p>Assessor:</p> <p> 10/18/07</p> <p>David H. Brown</p> <p> 10/18/07</p> <p>Gregory L. Jones</p>	<p>Approved:</p> <p></p> <p>Dennis H. Irby, Team Lead</p>
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**Criteria and Review Approach Document  
241-AN Farm New Exhauster Skid Assessment 2007**

Functional Area: Double-Shell Tank Primary Ventilation	Assessment Element: 241-AN New Exhauster Skid Readiness Activities	Facility or Process: Tank Farms	Date: September 10-14, 2007	CRITERIA MET YES: ____ NO: <u>  X  </u>
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Objective: Determine if ongoing 241-AN Farm new exhaust system skid readiness activities are in accordance with programs, policies and procedures to support cold/hot Operational Acceptance Tests and transition to operation.

Performance Criteria:

1. Are the 241-AN Farm new exhauster skid readiness activities being performed in accordance with applicable program, policy and procedure requirements?
2. Are the 241-AN Farm new exhauster skid readiness activities defined sufficient to support hot OAT and operations?
3. Are applicable safety/operational requirements identified, linked to acceptance criteria, being tested and verified as part of cold and hot OAT?

Approach:

- Verify by observation and interviews, that 241-AN Farm new exhauster skid readiness activities are being performed in accordance with applicable program, policy and procedure requirements. In addition, verification of the startup notification report will be verified.
- Verify by document reviews and interviews, that 241-AN Farms new exhauster skid readiness activities have incorporated lessons learned and open items sufficiently to support hot OAT operations.
- Verify by document reviews and observation, that applicable safety/operational requirements are identified, linked to acceptance criteria and are being verified as part of cold/hot OAT.

Documentation and Records Reviewed:

- AD-W314AN-01, *Activity Description Project W-314 Phase II 241-AN and 241-AW Tank Farms Primary Ventilation System Upgrades*, Rev. 1.

- ORC-241AN HVAC-01, *Operational Readiness Checklist for 241-AN Tank Farm Primary Ventilation System Upgrades*, Revision 0.
- ORC-241AN HVAC-01, *Operational Readiness Checklist for 241-AN Tank Farm Primary Ventilation System Upgrades*, Draft Revision 1.
- TFC-PRJ-PM-C-06, *Operational Readiness Process*, Revision B.
- TFC-PRJ-PM-C-04, *Startup Notification Report*, Revision A-8.
- TFC-PRJ-PM-C-25, *Readiness Verification Checklists*, Revision A-2.
- TFC-PRJ-PM-C-07, *Startup Management Self-Assessment*, Revision B.
- TFC-PLN-16, *Operational Readiness Program Plan*, Revision C.
- W314-PTSD-011, *W-314 AN Farm Phase II Ventilation Tank Primary System Project Turnover Scoping Document*, Revision 0.
- Memorandum dated July 3, 2007, *Approved Routine Activities*, Revision 7.
- Operational Readiness Checklist, Generic Table Version, Revision 7, December 28, 2006.
- Operational Readiness Checklist, Generic Table Version, Revision 9, June 25, 2007.
- Tank Farm Contractor Startup Notification Report for Fourth Quarter Fiscal Year 2007.
- W-314-OAT-1.4.1, *241-AN Ventilation Tank Primary System, W-314 Phase 2 Operational Acceptance Test-Cold*, Rev 1, May 8, 2007.

Interviews Conducted:

- Operational Readiness Manager; and
- Senior Readiness Assistant.

Observations and Discussion of Results:

A review of the documents was conducted in conjunction with interviews for each of the performance criteria cited below.

**Performance Criteria 1** - Are the 241-AN Farm new exhauster skid readiness activities being performed in accordance with applicable program, policy and procedure requirements?

Assessment

The activity description for the startup of the new primary exhausters, AD-W314AN-01, *Activity Description For Project W-314 Phase II 241-AN And 241-AW Tank Farms Primary Ventilation System Upgrades* was found to be in compliance with TFC-PRJ-PM-C-04, *Startup Notification Report*. The activity is basically the startup and operation of another ventilation system which has similar and, in most cases (except for higher flow rates), identical characteristics to other ventilation systems already in operation in the tank farms. This one uses PLC based controls which currently exist at 702-AZ and virtually identical valving, HEPA filters, de-entrainers, heaters, etc. which also currently exist in other ventilation systems. Further, operation of DST ventilation systems has been determined by the contractor as one of a number of activities that is considered to be routine per their latest quarterly approved routine activities list. Operation of

this new DST ventilation system will not differ appreciably. Therefore, the decision to not conduct a Readiness Assessment and to follow the activity-specific Operational Readiness Checklist (ORC) using TFC procedures is valid and complies with DOE Order 425.1C, *Startup and Restart of Nuclear Facilities*, and ORP M 425.1, *Startup and Restart of Tank Farm Contractor Nuclear Facilities* requirements.

**Performance Criteria 2** - Are the 241-AN Farm new exhauster skid readiness activities defined sufficient to support hot OAT and operations?

#### Assessment

The development of the activity-specific ORC generally complied with the contractor's internal procedure mandating this activity, with certain exceptions discussed below. The ORC was reviewed and approved by numerous departmental managers as required. Attachment A, of the activity-specific ORC, contained the list of generic line-item deliverables considered to be not applicable to the startup of the new exhaust system. However, twelve of the line item deliverables from Revision 7 of the generic ORC were missing from the activity-specific ORC and no justification for excluding them was included in Attachment A of the activity-specific ORC, as required by TFC-PRJ-PM-C-06, *Operational Readiness Process*. In addition, two of the line item deliverables from the generic checklist were included in the activity-specific ORC and the list of deliverables in Appendix A that were considered to be not applicable. Furthermore, the line item deliverables from the generic ORC considered to be not applicable (contained in Attachment A to the activity-specific ORC) were grouped into two groups, one where the startup involved no impact to programmatic deliverables and one where there was no impact on activity-specific deliverables. While this is allowed by language in the generic checklist, the same language also specifies that the grouping is to be as appropriate, and also specifies that for each line item deliverable determined to be not applicable to the scope of the activity-specific ORC, a brief justification should be provided. This was not done. Consequently, Appendix A provided insufficient justifications as to why individual deliverables were considered to be not applicable, as required by the generic ORC. Furthermore, six different line item deliverables contained in Appendix A were questioned by the team as to why they were considered to be not applicable. After discussions with the Senior Readiness Assistant and the Operational Readiness Manager, it was determined that three of the items were contained in either W314-PTSD-011, *W-314, AN Farm Phase II Ventilation Tank Primary System Project Turnover Scoping Document*, or other line item deliverables in the activity-specific ORC. The other three line items, DOE issuance of the Safety Evaluation Report, DOE approval of the Safety Equipment List revision, and a System Walkdown by Operations prior to system turnover, should have been properly captured in the activity-specific ORC. A review of W314-PTSD-011 confirmed that it did indeed contain the three items referred to above. All of these discrepancies taken together constitute a finding due to lack of compliance with certain sections of TFC-PRJ-PM-C-06 and the generic ORC.

As a result of the above identified discrepancies, the TFC elected to rewrite portions of the activity-specific ORC for the startup of the new primary ventilation system in AN Farm.

Specifically, they are (1) accounting for all the line item deliverables in the generic ORC either in the body of the activity-specific ORC or in Attachment A to the activity-specific ORC, (2) correcting the two deliverables discussed above that are contained in both the ORC and Attachment A, (3) providing brief justifications as applicable for those line item deliverables that have been determined to be not applicable, (4) adding to the ORC those line item deliverables that were erroneously determined to be not applicable and (5) updating the activity-specific ORC to the current revision of the generic ORC (Revision 9). The TFC had completed the draft of Revision 1 of the activity-specific ORC during the assessment and was routing it around to various department managers as applicable for approvals. Review of the draft activity specific ORC Revision 1 found it to be acceptable.

Finally, a comparison was made between Revision 7 of the generic ORC dated December 28, 2006, which is the version that the activity-specific ORC was developed to, and Revision 9, dated June 25, 2007, which is the current revision, to determine what changes had been made and if they were significant enough to be considered in the activity-specific ORC. Most of the changes were relatively minor. It was also observed during this assessment that the link between TFC-PRJ-PM-C-25 on the TFC procedures web page and the generic ORC actually linked to Revision 3 of the generic ORC and not the current revision (Revision 9) as required. This was corrected by the TFC prior to the end of the assessment. Revision 10 of the Generic Operational Readiness Checklist was issued as this assessment report was being drafted. The new revision contains a revised table with a space to justify which elements are not applicable to the activity under review. This revision answers item (3) in the paragraph above.

**Performance Criteria 3** - Are applicable safety/operational requirements identified, linked to acceptance criteria, being tested and verified as part of cold and hot OAT?

#### Assessment

The Tank Farm Technical Safety Requirements (TSR) provides for maintaining flammable gas concentrations <25% of the lower flammability limit (LFL) by requiring an OPERABLE Double Shell Tank (DST) Primary Ventilation System. To ensure the DST primary ventilation system is OPERABLE, a surveillance requirement (SR) specific to AN farm was established. That is SR 3.2.1.1 which states, "Tank inlet HEPA filter differential pressure shall be VERIFIED to be > 0 in. w.g. for each tank in the 241-AN Tank Farm every 10 days. VERIFICATION of inlet HEPA filter differential pressure (DP) provides an indication that airflow is maintained into the tank headspace." The bases states, "Airflow through the inlet air control station results in a differential pressure across the HEPA filter because the filter provides a restriction to the airflow. Measurement of a differential pressure > 0 in. w.g. across the HEPA filter is an indication that airflow is maintained into the tank headspace. VERIFICATION of this measurement also ensures that the exhaust valves are correctly aligned and open and that a contiguous pathway from the tank headspace to the exhaust fan is provided." The cold OAT, W-314-OAT-1.4.1, *241-AN Ventilation Tank Primary System, W-314 Phase 2 Operational Acceptance Test-Cold*, steps 8.7 and 8.8 verify operability of the DP interlock and alarm for Train A and steps 8.17 and 8.18 verify Train B DP interlock and alarm operability.



Conclusion:

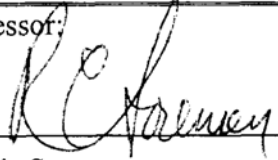
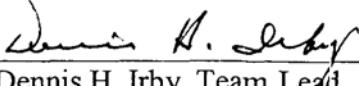
The TFC was largely in compliance with their startup program, policies and procedure requirements, with the exception of the finding discussed above. The exhauster readiness activities have been sufficiently defined to support hot OAT and operations. Performance Criteria 1 and 3 were met.

Issue(s):

Performance Criterion 2 resulted in one finding and one observation.

**Finding A-07-AMTF-TANKFARM-003-F03:** The activity-specific ORC was not developed in accordance with TFC-PRJ-PM-C-06, *Operational Readiness Process*, Revision B.

**Observation A-07-AMTF-TANKFARM-003-O06:** The link between TFC-PRJ-PM-C-25 on the procedures web page and the generic ORC did not reflect the most current ORC. During the assessment the TFC corrected the hyperlink and this observation is considered closed.

<p>Assessor:</p>  <hr/> <p>Chris Sorensen</p>	<p>Approved:</p>  <hr/> <p>Dennis H. Irby, Team Lead</p>
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**Criteria and Review Approach Document  
241-AN Farm New Exhauster Skid Assessment 2007**

Functional Area: Double-Shell Tank Primary Ventilation System	Assessment Element: 241-AN New Field Work to Support Hot Operational Acceptance Test	Facility or Process: Tank Farms	Date: September 10-14, 2007	CRITERIA MET YES: <u>  X  </u> NO: <u>      </u>
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Objective: Determine if the 241-AN Farm new exhauster skid ongoing field work will support hot Operational Acceptance Test (OAT) actions required for startup and is consistent with program requirements and are identified.

Performance Criteria:

1. Are the 241-AN Farm new exhauster skid field actions required for startup identified and reviewed for programmatic changes?
2. Are the 241-AN Farm new exhauster skid field activities necessary for transition from OAT to operations identified and managed?

Approach:

- Review the surveillance, maintenance, availability, and open actions from the cold OAT required for startup documentation.
- Develop Lines of Inquiry.
- Verify by observation and interviews that the actions required to support hot OAT and transition to operations are identified and managed.

Documentation and Records Reviewed:

- TFC-ENG-DESIGN-C-09, *Engineering Drawings*, Rev C-3, June 20, 2007.
- H-14-020101, *Ventilation Tank Primary System (VTP) O&M System P&ID*, Sheet 1, Rev 8, August 29, 2007.
- W-314-OAT-1.4.1, *241-AN Ventilation Tank Primary System, W-314 Phase 2 Operational Acceptance Test-Cold*, Rev 1, May 8, 2007.
- H-14-020101, *Ventilation Tank Primary System (VTP) O&M System P&ID*, Sheet 1, Rev 8, August 29, 2007.
- Work Order: WFO-WO-07-0863, *241-AN-101 & 102 Verify Outlet Valves Open*, DRAFT, March 16, 2007.

- Work Order: 2E-03-01772, *W-314-241-AN-PH2 Final Connection Pri Exh Sys*, DRAFT, November 4, 2004.
- Work Order: WFO-WO-07-0799, *241-AN 101 & 102 Vac Relief Funcs*, March 20, 2007.
- Work Order: WFO-WO-07-0800, *241-AN 101 & 102 Vac Relief Funcs*, March 20, 2007.
- Work Order: WFO-WO-07-1177, *241-AN 101 & 102 Vac Relief Funcs*, April 24, 2007.
- Work Order: WFO-WO-07-1178, *241-AN 101 & 102 Vac Relief Funcs*, April 24, 2007.

Interviews Conducted:

- Project Manager;
- Project Engineer;
- Senior Test Engineer; and
- Double-Shell Tank Ventilation System Engineer

Observations and Discussion of Results:

**Performance Criteria 1** - Are the 241-AN Farm new exhauster skid field actions required for startup identified and reviewed for programmatic changes?

Assessment

TFC-ENG-DESIGN-C-09, *Engineering Drawings*, Section 3.1 states that the Engineering Standards organization is to “Ensure Facility Engineering Change Notices (ECNs) that are work completed are incorporated into drawings using the following criteria:

- Essential drawing - Revise within 30 calendar days of ECN work completion date
- Support drawing with AutoCAD file - Revise within 60 calendar days from the date of the third work-completed ECN.
- Support drawing without AutoCAD File - Revise within 90 calendar days from the date of the sixth work-completed ECN.
- Reference drawing – These drawings are not kept current.”

Attachment C of TFC-ENG-DESIGN-C-09, states that Piping and Instrumentation Diagrams (P&ID) are to be considered “essential drawings.”

A review of the work orders, drawings and ECNs was conducted to verify that changes to the ventilation system(s), both existing and new, were under configuration control. It was found that the two new vacuum relief valves were installed on the inlet stations at tanks 241-AN-101& AN-102 during April 2007. The ECN against the P&ID (H-14-020101, sheet 1, rev 6) was not signed complete until August 2007. Although the ECN was not signed off until August 2007, the actual “field work complete” was done in April 2007 prior to initiating the cold OAT. The

P&ID was updated and released within the allowable time frame after the ECN was signed complete (block 15 on the ECN). However, the signing of the ECN complete and the field work complete was not timely and potentially could have impacted the cold OAT.

The review also verified that an important assumption underlying the evaluation calculations of the vacuum relief valves was included in the project planning. The calculations assume that two exhaust line valves in ventilation instrument pits 1 & 2 are administratively controlled in the open position. Work Order WFO-WO-07-0863, *Verify Outlet Valves Open*, accomplishes this important task.

**Performance Criteria 2** - Are the 241-AN Farm new exhauster skid field activities necessary for transition from OAT to operations identified and managed?

Assessment

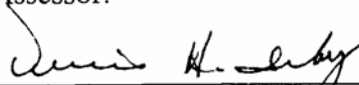
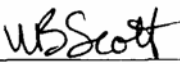
A review of the work orders, drawings and ECNs was conducted to verify that required field activities are identified and being managed.

Conclusion:

Two important work orders have been drafted to cover the assumptions underlying the thermal hydraulic calculations and the final tie-in to the exhaust ducting. These two work orders, WFO-WO-07-0863, *Verify Outlet Valves Open*, and 2E-03-01772, *W-314-241-AN-PH2 Final Connection Primary Exhauster System* were reviewed in draft. The fact that they have been formally entered into the work planning process gives confidence they will be carried out. Given the current status of the cold OAT, and the observations of the identified activities, the preparations for the transition from OAT to operations are deemed to be on course for completion.

Issue(s):

**Observation A-07-AMTF-TANKFARM-003-O07:** The TFC did not update the AN Farm Primary Ventilation System P&ID in a timely fashion after field changes to the existing ventilation system were complete.

Assessor:  Dennis H. Irby, Team Lead	Approved:  Walter B. Scott, TF Engineering Division
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**Criteria and Review Approach Document  
241-AN Farm New Exhauster Skid Assessment 2007**

Functional Area: Double-Shell Tank Primary Ventilation System	Assessment Element: 241-AN New Status of Hot Operational Acceptance Test	Facility or Process: Tank Farms	Date: September 10-14, 2007	CRITERIA MET YES: <u>  X  </u> NO: <u>      </u>
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**Objective:** Determine the 241-AN Farm new exhauster skid hot Operational Acceptance Test (OAT) actions required for startup and are consistent with program/safety requirements and are identified.

Performance Criteria:

1. Are the 241-AN Farm new exhauster skid actions required for startup identified and reviewed for hot OAT implications?
2. Are the 241-AN Farm new exhauster skid activities necessary for hot OAT identified and managed?

Approach:

- Review the surveillance, maintenance, availability, safety requirements, and open actions from the cold OAT required for startup documentation.
- Develop Lines of Inquiry.
- Verify by observation and interviews that the actions required to support hot OAT are identified and managed.

Documentation and Records Reviewed:

- W-314-STP-1.4/ 1.6, *Sub-Test Plan for 241-AN and AW Farms Ventilation Tank Primary Systems*, Rev 1A, May 8, 2007.
- HNF-SD-WM-TSR-006, *Technical Safety Requirements*, Rev 2, 3.2.1 DST Primary Ventilation Systems.
- TO-060-106, *Operate AN Tank Farm Primary Ventilation system (VTP)*, Rev A-0, DRAFT.
- ANGMC-0251-US, *Pilot Operated Pressure Relief Valves*, Tyco Flow Control.
- RPP-7171, *Thermal Hydraulic Evaluation For 241-AN Tank Farm Primary Ventilation System*, Rev 1, DRAFT August 17, 2007.
- RPP-7171, *Thermal Hydraulic Evaluation For 241-AN Tank Farm Primary Ventilation System*, Rev 0, March 6, 2001.

Interviews Conducted:

- Senior Test Director; and
- Project Manger.

Observations and Discussion of Results:

At the time of this assessment the cold OAT has not been completed to a point of identifying lessons learned, open items, etc. The TFC Testing Director provided a DRAFT matrix of the scope the hot OAT would entail and relationship to the sub-test plan testing requirements/acceptance criteria. In addition, the Level 1 schedule for activities necessary to complete testing and transition to operation was reviewed

**Performance Criteria** - Are the 241-AN Farm new exhauster skid actions required for startup identified and reviewed for hot OAT implications?

Assessment

The scheduling of the development and submission for approval of the Safety Basis (SB) Amendment Package to ORP for approval did not include the time required to update the System Design Description (SDD) and the Safety Equipment List (SEL). ORP letter 03-TED-109, *Approval of the Revised Documented Safety Analysis (DSA), Technical Safety Requirements (TSR), And Supporting Documents for Tank Farms Safety Basis for Implementation*, dated October 17, 2003, identified the SDD and SEL as SB documents. Specifically it states, "In summary, this SER Update supplements the July 31, 2003, SER and together with that SER, constitutes the approval basis for the Tank Farms DSA (RPP-13033, Revision 0), TSR (HNF-SD-WM-TSR-006, Revision 3), supporting documents (as identified in the enclosure to this SER Update), the JCO for the 241-C-106 Oxalic Acid Dissolution (Revision 0-B), the JCO for the Double Contained Receiver Tanks 244-BX, 244-S, and 244-TX (Revision 0-A), and the onetime transfer authorization for Plutonium Finishing Plant waste that exceeds the tank farms fissile material concentration limit. The approved documents shall be kept current in accordance with the 10 CFR 830 requirements and the ORP approved Unreviewed Safety Question Procedure." As the SDD and SEL are SB documents identified in 03-TED-109, these documents need to be included with the proposed changes to the Documented Safety Analysis, Technical Safety Requirements, and other Safety Basis Documents that need to be updated to support the SB amendment. The absence of these two documents in the SB amendment submission will delay the approval of the whole package by ORP and may impact the start of the hot OAT.

The update to the thermal hydraulic analysis (THA) that supports the installation of the new exhauster in AN Farm is still draft even though the cold OAT has been underway for some months. In the earlier versions of the THA, it stated that it was based on the implementation of the new exhauster in AW Farm. Since there are distinct differences between AW and AN Farms (e.g., more tanks in AN Farm, different inlet sizes, etc.), it was asked how those differences

would be reconciled. The TFC will update RPP-7171 to Revision 1 which will address those points. The draft THA now in review does identify that AN Farm has seven tanks instead of only six as in AW Farm. It also recognizes and analyzes the inlet station at 241-AN-107 which has a 4 inch riser instead of the standard 12 inch riser in the other six AN Farm tanks. The development of the hot OAT procedure by way of the Sub-Test Plan (W-314-STP-1.4/ 1.6) incorporates two test areas that invoke results of the THA. Test section #1 (Verify Fan Flow Rate) and test section #37 (Verify flow rate of 500 cubic feet per minute (cfm) or greater is achieved for the 241-AN and 241-AW tanks) both call for the placing administrative testing limits based on the results of the THA. It is probable that the new THA will not change the results for the operation of the new exhauster under normal (non-mixing) conditions; however there is some inherent risk in proceeding until the draft THA is reviewed and approved. Discussions with the Project Engineer and the vendor that owns the GOTH code gives confidence that the final version will have all the required configuration control documentation.

**Performance Criteria** - Are the 241-AN Farm new exhauster skid activities necessary for hot OAT identified and managed?

#### Assessment

The hot OAT scoping matrix which is used to prepare the hot OAT procedure was reviewed. The hot OAT scoping matrix was reviewed against the sub-test plan (W-314-STP-1.4/ 1.6, *Sub-Test Plan for 241-AN and AW Farms Ventilation Tank Primary Systems*, Rev 1A, May 8, 2007) and found that all elements in the sub-test plan identified as requiring testing during the hot OAT were included in the hot OAT scoping matrix.

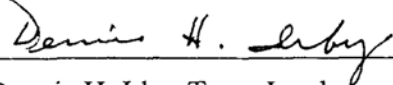

#### Conclusion:

At the time of this assessment the cold OAT has not been completed to a point of identifying lessons learned, open items, etc. The TFC Testing Director provided a DRAFT matrix of the scope the hot OAT would entail and relationship to the sub-test plan testing requirements/acceptance criteria. In addition, the Level 1 schedule for activities necessary to complete testing and transition to operation was reviewed. Given the current status of the cold OAT, and the observations of the identified activities, the preparations for the hot OAT are deemed to be on course for completion.

#### Issue(s):

**Observation A-07-AMTF-TANKFARM-003-O08:** The scheduling of the revision to the System Design Document and the Safety Equipment List separate from the Safety Basis Amendment may impact the schedule of the start of the hot OAT.

**Observation A-07-AMTF-TANKFARM-003-O09:** The thermal hydraulic analysis that supports the installation of the new exhauster in AN Farm is still draft even though the cold OAT is underway, potentially affecting the efficacy of the cold OAT.

<p>Assessor:  Dennis H. Irby, Team Lead</p>	<p>Approved:  Walter B. Scott, TF Engineering Division</p>
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**APPENDIX B - TEAM MEMBER BIOGRAPHIES**

### **Team Member Qualification Summary**

**Team Member Name:** Dennis H. Irby, Assessment Team Leader

**Title and Organization:** Authorization Basis Engineer  
Tank Farm Engineering Division  
Office of Assistant Manager Tank Farms Project  
Office of River Protection

#### **Summary of Education and Technical Qualifications and Experience:**

- Bachelor of Science in Mining Engineering, South Dakota School of Mines & Technology; and
- Master of Science in Mining Engineering, South Dakota School of Mines & Technology.

#### **Summary of Experience:**

- Over 30 years of experience in the areas of: nuclear safety authorization basis management, nuclear waste safety issue resolution, technology development, radioactive solid waste management, management of design of nuclear waste repository facilities, construction of high security facilities (including structures, utilities, and safety support systems), project management, manufacturing and marketing of remotely actuated machinery, and conducting field and laboratory research programs related to worker health and safety in mines with flammable gas and respirable dust issues.
- Experience and training in:
  - Conducting audits, assessments and surveillances related to the DOE Nuclear Safety and Waste Management Orders and the DOE Safety Management System Policy; and
  - Application of Management Oversight Risk Tree analysis techniques and DOE Accident Investigation techniques.
- Provided oversight of the resolution of the four priority one safety issues related to tank waste.
- Provided oversight of over 120 Authorization Basis actions, over 40 of which have been completed since the approval of the DSA.
- Has completed qualifications for Waste Management, Mechanical Systems, and Safety System Oversight Qualifications for Double-Shell Tank Primary Ventilation Systems and Double Contained Receiver Tank Purge Air Systems.

### **Team Member Qualification Summary**

**Team Member Name:** Gregory L. Jones

**Title and Organization:** Senior Engineer  
YAHSGS, LLC.

#### **Summary of Education and Technical Qualifications and Experience:**

- Bachelor of Science in Nuclear Engineering Technology, Oregon State University, 1976;
- Qualified Unreviewed Safety Question Evaluator; and
- Professional Member, American Society of Safety Engineers

#### **Summary of Experience:**

- Over 29 years experience in the commercial and government environment, safety and health industry;
- Over 26 years experience at Hanford, over 20 in tank farms;
- Safety Basis Compliance Activities in accordance with 10 CFR 830, Nuclear Safety Rule;
- Provided the lead in implementing over 25 safety basis amendments at the Hanford Tank Farms;
- Developed and assisted in preparing a strategy for implementing the Tank Farms DSA in accordance with 10 CFR 830;
- Development of Safety Management Program assessment guidance, and performing assessments to ensure compliance with DSA in accordance with 10 CFR 830 requirements and 29 CFR 1910 and 1926, OSHA for worker safety protection features;
- Developed assessment plan and coordinated approval of ORP contractor 10 CFR 851, Worker Safety and Health Program; and
- Technical Safety and QA Appraisals at the PANTEX Plant and the Analytical Laboratory and Savannah River Technology Center at the Savannah River Site for DOE Headquarters.

### Team Member Qualification Summary

**Team Member Name:** Chris Sorensen

**Title and Organization:** Facility Representative, Tank Farm Operations Division, ORP

#### Summary of Education and Technical Qualifications:

- Bachelor of Science in Engineering, University of Washington, 1979;
- Qualified Nuclear Shift Test Engineer on S5W Reactor Plants, Puget Sound Naval Shipyard;
- Qualified as NRC Resident Inspector and Senior Resident Inspector;
- Qualified in Nuclear Safety Systems, Technical Qualification Program for DOE Technical Personnel;
- 1
- Qualified as DOE Facility Representative at the Hanford Tank Farms;
- Twenty eight years experience in various naval, commercial, and DOE nuclear facilities.

#### Summary of Experience:

- ORP Facility Representative at the Hanford Tank Farms.
- Team Lead for Engineering Team in the Tank Farms Engineering Division, ORP. Responsible for conducting or leading assessments of various engineering or operational topics of the Tank Farm Contractor such as Hose-in-Hose Transfer Lines, Master Pump Shutdown System, Corrective Action Management, etc.
- Acting Division Director for the Safety and Health Division for ORP. Responsible for the Safety Basis, Nuclear Safety, Occupational Safety, Fire Protection, etc. for the Hanford Tank Farms.
- Responsible for Startup/Restart Program and ISMS for the DOE Office of River Protection overseeing the Tank Farm Contractor.
- Site Safety Representative at Hanford for DOE-HQ (EH). Conducted numerous assessments of activities in DOE nuclear facilities to ensure compliance with DOE requirements.
- DOE Project Engineer for FFTF. Also dealt with legacy sodium issues around the site.

- NRC Senior Resident Inspector at Columbia Generating Station, dealing with inspection and enforcement of the facility license and design basis. Supervised the activities of one resident inspector.
- NRC Resident Inspector at Columbia Generating Station. Conducted numerous inspections of licensee activities to ensure compliance with NRC requirements.
- NRC Project Inspector for Palo Verde Nuclear Generating Station.
- Nuclear Shift Test Engineer for Naval reactor plants on various submarines at Puget Sound Naval Shipyard. Provided work isolation for all aspects of maintenance and modifications on submarine reactor plants through the tagout process. Conducted extensive testing of all aspects of a submarine reactor plant during and after overhaul. Supervised the activities of two assistants.
- Assistant Shift Test Engineer for Naval reactor plants on various submarines at Puget Sound Naval Shipyard.

### **Team Member Qualification Summary**

**Team Member Name:** David H. Brown

**Title and Organization:** Engineering Consultant, Project Assistance Corp.  
Office of Environmental Safety and Quality, Office of River  
Protection

#### **Summary of Education and Technical Qualifications and Experience:**

- Bachelor of Science (Marine Nuclear) State University of New York Maritime College, 1971

#### **Summary of Experience:**

- Over 35 years experience in the nuclear field. Currently consulting to the Office of River Protection on quality assurance with a specialty in software quality assurance
- Co-author of DOE implementation guides DOE G 414.1-1 (assessment) and DOE G 414.1-2 (implementation of the quality assurance rule and quality assurance order)
- Eighteen years as a general engineer and nuclear engineer for the U.S. Department of Energy Richland Operations Office and Office of River Protection, leading various assessments and operational readiness reviews, and chairing Type B accident investigations.
- Fifteen years as Nuclear Test Engineer, Chief Test Engineer and Project Engineer at Pearl Harbor Naval Shipyard.
- Experience and training in:
  - Conducting audits, assessments and surveillances related to the DOE Nuclear Safety and Waste Management Orders and the DOE Safety Management System Policy; and
  - Application of Management Oversight Risk Tree analysis techniques and DOE Accident Investigation techniques.