



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

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

DEC 15 2005

05-TED-090

Mr. Mark Spears
Chief Operating Officer
CH2M HILL Hanford Group, Inc.
Richland, Washington 99352

Dear Mr. Spears:

CONTRACT NO. DE-AC27-99RL14047 -- ASSESSMENT REPORT A-06-AMTF-TANKFARM-001, ASSESSMENT OF THE CH2M HILL HANFORD GROUP, INC. (CH2M HILL) FIRE PROTECTION SAFETY MANAGEMENT PROGRAM

This letter transmits the results of the U.S. Department of Energy (DOE), Office of River Protection (ORP) assessment of the CH2M HILL Fire Protection Safety Management Program. The assessment was completed on December 1, 2005.

The team evaluated compliance with the ORP Fire Protection Program Manual, ORP M 420.1-1, *ORP Fire Protection Program*, National Fire Protection Association Codes, DOE O 420.1A, *Facility Safety*, and DOE and national standards.

Based on this review, the ORP assessment team concluded the CH2M HILL Fire Protection Program is implemented, and with some exceptions, effective. The team identified six Findings and six Observations. Problem Evaluation Requests have been initiated by your staff to resolve those issues.

If you have any questions, please contact me, or your staff may contact Walter Scott, Tank Farms Engineering Division assessment team lead, on (509) 376-0756.

Sincerely,

A handwritten signature in black ink, appearing to read "T. Zack Smith".

T. Zack Smith, Assistant Manager
for Tank Farms Project

TED:WBS

Attachment

cc: See page 2

DEC 15 2005

Mr. Mark Spears
05-TED-090

-2-

cc: w/attach:

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

**Tank Farm Contractor
Fire Protection Program Assessment**

Final Report

A-06-AMTF-TANKFARM-001


December 2005



Office of River Protection

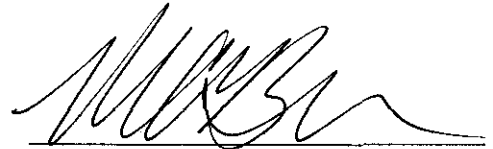
Walter B. Scott
Team Leader

Report Approval

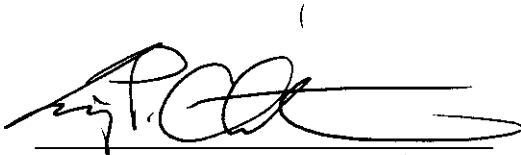
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EXECUTIVE SUMMARY

An assessment of the U.S. Department of Energy (DOE), Office of River Protection (ORP) Tank Farm Contractor (TFC) Fire Protection Safety Management Program (SMP) was performed by ORP from November 7, 2005, through November 30, 2005. The assessment evaluated the implementation and execution of the TFC Fire Protection Program as defined in ORP M 420.1-1, *ORP Fire Protection Program*. The scope of the assessment addressed programmatic and facility implementation elements.

A closeout meeting was conducted with the TFC on December 1, 2005. Following the meeting, the TFC provided additional information, clarification, and recommended changes to the assessment results. The feedback was evaluated and appropriate changes were made to the final assessment report.

Conclusion

The review team concluded that the TFC fire protection program is implemented, and with some exceptions, is effective. The team found that fire hazards analyses and safety basis documents are fully integrated. All fire protection program controls relied on in the safety analyses are incorporated into and implemented by the TFC fire protection program.

In a repeated finding from the previous ORP fire protection assessment, TFC assessments of fire protection, both the program assessments and facility inspections, were found to be deficient in fully meeting DOE requirements. The TFC oversight process failed to identify and correct these assessment deficiencies as part of the feedback and improvement element of the Integrated Safety Management Program (ISMP). As a result, ORP intends to conduct the next assessment of the TFC fire protection program within 2 years. The review team found deficiencies in some areas of the fire protection program, including the inspection and testing of fire protection features and equipment that are the responsibility of the TFC facility/building managers, the preparation and retention of written corrective action plans for prolonged fire protection system impairments and restrictions, and the inclusion of all fire protection engineering design criteria in engineering procedures as they apply to non-nuclear facilities that are not required to be protected by active fire protection systems.

This review resulted in 6 Findings and 6 Observations:

Findings

- Fire protection program and facility assessments do not meet all of the requirements of ORP and DOE directives, and CH2M HILL implementing procedures. (Finding FP.2-F-4)
- The periodic fire prevention inspection program was not consistently implemented and in some cases did not conform to the frequency requirements of National Fire Protection

Association 801, Standard for fire protection for Facilities Handling Radioactive Materials. (Finding FP.3-F-1)

- Some inspection and testing of fire protection features and equipment under the responsibility of CH2M HILL Building/Facility Management are not being conducted. The work control process in use does not ensure that non-active fire protection system inspections, tests, and maintenance are performed at the required frequency. (Finding FP.2-F-2)
- Accumulations of transient combustibles were identified in or adjacent to TF facilities. (Finding FP.3-F-2)
- CH2M HILL does not prepare corrective action plans to address fire protection system impairments or restrictions that are not repaired within 24 hours and 15 days, respectively. (Finding FP.2-F-1)
- Not all fire protection design requirements, including those fire protection features that are non-active system related (e.g., fire barriers, filter plenum requirements, flame spread ratings, roofing requirements, occupancy separations, etc.), are fully incorporated into CH2M HILL engineering design procedures that establish the design criteria for non-nuclear facilities. (Finding FP.2-F-3)

Observations

- Corrective action for externally identified fire protection program findings needs improvement. (Observation FP.2-O-3)
- Some fire protection systems maintenance and inspection tasks performed by Hanford Fire Department (HFD) Fire System Maintenance (FSM) have not been completed. (Observation FP.2-O-2)
- The TFC does not have a documented process or procedure for the approval of fire protection equivalencies or exemptions. (Observation FP.1-O-3)
- The TFC fire protection engineering resources are not adequate to account for contingencies, e.g., attrition, increased work load, etc. (Observation FP.2-O-1)
- A weakness was identified in the TFC S/RID for fire protection. (Observation FP.1-O-1)
- Weaknesses were identified in the TFC fire protection Program implementing procedures. (Observation FP.1-O-2)

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1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of River Protection (ORP) performed an assessment of Tank Farm Contractor (TFC) Fire Protection Safety Management Program (SMP) implementation from November 7, 2005, through November 30, 2005.

2.0 PURPOSE AND SCOPE

The purpose of this review was to conduct an ORP assessment of the TFC fire protection program. The team evaluated the improvements made to the structure and implementation of the fire protection program since the last review in 2002; reviewed the fire protection program to ensure it continues to be implemented in accordance with contractual requirements; assessed the integration of fire hazards analyses and controls with the safety basis documents; reviewed fire protection implementation in selected facilities; assessed the adequacy of the staffing levels, staff qualifications and training; reviewed the design, installation, and operability of fire protection systems; evaluated the fire protection system design process and requirements; assessed the effectiveness of the fire protection oversight assessment process; and reviewed the implementation of NFPA 101, *Life Safety Code*, requirements.

The objectives of the assessment were to:

- Verify that a comprehensive Fire Protection SMP is defined and implemented according to DOE Order and ORP requirements
- Verify that the DSA and TSR fire protection program commitments are fulfilled and protected by the Fire Protection SMP
- Verify that adequate numbers of technically competent, experienced, and fully qualified personnel are assigned to implement the Fire Protection SMP
- Verify that comprehensive elements are incorporated into the fire protection program that include fire safety training to employees, life safety provisions in facilities, and fire prevention methods to minimize facility fire risks and fire loss potential.

3.0 APPROACH AND DELIVERABLES

The review was performed consistent with ORP M 220.1, *Integrated Assessment Program*. Major elements of the review were developed from ORP M 420.1-1, *ORP Fire Protection Program*, previous fire protection program assessments, and guidance developed in support of DOE's Safety System Oversight Program.

Major elements of the review consisted of:

- Preparation of the Criteria Review and Approach Documents (CRAD)
- Selection of the review team
- Pre-review activities
- Entrance Meeting with the TFC
- Fieldwork activities

- Development of the assessment results
- Exit Meeting with the TFC
- Development of a final report, including a factual accuracy review by the TFC

The CRADs were developed from the fire protection program requirements in the ORP Fire Protection Program manual and are consistent with, and similar to, CRADs in development for the assessment of vital safety systems. The CRADs are included as part of the assessment forms in Appendix A.

The review team was selected from ORP staff based on technical expertise and experience. The team was comprised of senior ORP staff, including a Registered Fire Protection Engineer and experienced facility representatives. Biographical summaries for each of the team members are included as Appendix B.

Pre-review activities consisted of gathering and reviewing current TFC fire protection program plans, procedures, fire hazards analyses, DSA (including TSR), current DOE fire protection directives and standards, and industry standards.

The entrance briefing was conducted on November 3, 2005, and fieldwork began November 7, 2005, lasting until November 30, 2005. Fieldwork consisted of TFC staff interviews and facility inspections. Team meetings were held periodically to discuss strengths and weaknesses of the fire protection program discovered in the assessment. These were communicated to the TFC point of contact as they were identified. Feedback from the TFC regarding additional information and immediately corrected deficiencies was received in real time. The exit briefing was held on December 1, 2005, with senior TFC management and ORP line management.

4.0 ASSESSMENT RESULTS

A summary of the results of the assessment, including findings and observations, by assessment criterion is provided below. Detailed discussions, references, personnel interviewed and additional considerations for the TFC are provided in Appendix A.

4.1. Performance Objective FP.1

The performance objective and criteria for evaluating this objective are:

Fire Protection program commitments in each DSA, TSR, or Safety Analysis at each nuclear facility are addressed by basic program features of the Fire Protection SMP required by law or contractual requirements. Nuclear facility specific fire protection controls included in the specific TSRs are incorporated within the overall Fire Protection SMP or are identified as Specific Administrative Controls.

The criteria for this performance objective have been met. The fire hazard analyses (FHA) for the 242-A Evaporator, the 222-S Laboratory, and the Tank Farms (TF) were reviewed to ensure that the results were appropriately integrated into the safety bases. No

deficiencies were identified. The team found all assumptions and controls stated in the FHAs reviewed were appropriately included in the safety basis for each facility. Likewise, the Fire Protection SMP controls relied on in the safety analyses for all nuclear facilities were incorporated into, and implemented by, the TFC fire protection program. However, some improvement is needed. First, all the requirements for the fire protection program should be included in the program requirements documents, implemented in the program procedures and verified to be effective by an assessment process. In this regard, the team found one requirement from the ORP Fire Protection Manual not included in the fire protection S/RID document.

Second, the authorities for management and execution of the fire protection program should be correctly stated and implemented in the program plans, standards and procedures. Here, the team found that selection of fire analyses codes was to be approved by the DOE Richland Operations Office Authority Having Jurisdiction (AHJ) instead of the ORP AHJ.

Finally, the fire protection program must be designed and implemented so that personnel changes do not reduce the TFC ability to fully implement the requirements of the ORP fire protection manual. The team found that while current personnel are highly experienced and knowledgeable of the process, there is no written document that describes the process to be followed when an exemption or equivalency to fire protection requirements is sought. If the fire protection engineer (FPE) were to retire or leave the company, another qualified FPE could not easily identify the correct process to follow, including approvals and content of requests for exemptions or equivalencies. This weakness was corrected during the assessment. The implementation of compensatory measures or requirements associated with approved fire protection exemptions and equivalencies was not within the scope of this assessment. ORP plans to review the TFC implementation of exemption and equivalency conditions of approval in the first calendar quarter of 2006 through management walk throughs and surveillances.

Three Observations were identified in the review of this performance objective:

- Observation FP.1-O-1:** A weakness was identified in the TFC S/RID for fire protection.
- Observation FP.1-O-2:** Weaknesses were identified in the TFC fire protection Program implementing procedures.
- Observation FP.1-O-3:** The TFC does not have a documented process or procedure for the approval of fire protection equivalencies or exemptions.

4.2. Performance Objective FP.2

The performance objective and criteria for evaluating this objective are:

Fire Protection program commitments in each DSA, TSR, or Safety Analysis at each nuclear facility are implemented. Nuclear facility specific fire protection controls included in the specific TSRs are implemented. Adequate numbers of technically competent, experienced, and fully qualified personnel are assigned to the Fire Protection SMP at each nuclear facility to which the commitment to the Fire Protection SMP is a specified control.

The criteria for this performance objective were partially met.

The TFC fire protection engineering resources are not adequate to account for contingencies, e.g., attrition, increased work load, etc. The Fire Protection SMP is implemented. The HFD is completing the vast majority of the fire protection maintenance, testing and inspection that they do on behalf of the TFC. However, some SMP implementation problems exist with regard to the frequency and quality of fire protection program and facility assessments, and with the conduct of fire protection testing and inspection performed by CH2M HILL Building/Facilities Management. Also, two fire system restrictions associated with 272-AW have been open for over 485 days as of November 1, 2005 which is an excessively lengthy period of time to have these restrictions in place. The team confirmed that all major projects and modifications are being reviewed by the TFC FPE for compliance with fire protection requirements. However, not all fire protection design requirements are incorporated into CH2M HILL procedures for non-nuclear facilities. Findings from TFC internal fire protection assessments are tracked, corrected, and closed, but the corrective actions for some external assessments need improvement.

Four Findings and 3 Observations were identified in the review:

- Finding FP.2-F-1:** CH2M HILL does not prepare corrective action plans to address fire protection system impairments or restrictions that are not repaired within 24 hours and 15 days, respectively.
- Finding FP.2-F-2:** Some inspection and testing of fire protection features and equipment under the responsibility of CH2M HILL Building/Facility Management are not being conducted. The work control process (not CHAMPS) in use does not ensure that non-active fire protection system inspections, tests, and maintenance are performed at the required frequency.
- Finding FP.2-F-3:** Not all fire protection design requirements, including those fire protection features that are non-active system related (fire barriers, filter plenum requirements, flame spread ratings, roofing requirements, occupancy separations, etc.), are fully incorporated into CH2M HILL engineering design procedures that establish the design criteria for non-nuclear facilities.

- Finding FP.2-F-4:** fire protection program and facility assessments do not meet all of the requirements of ORP and DOE directives, and CH2M HILL implementing procedures.
- Observation FP.2-O-1:** The TFC fire protection engineering resources are not adequate to account for contingencies, e.g., attrition, increased work load, etc.
- Observation FP.2-O-2:** Some fire protection systems maintenance and inspection tasks performed by HFD Fire Systems Maintenance have not been completed.
- Observation FP.2-O-3:** Corrective action for externally identified fire protection program findings needs improvement.

4.3. Performance Objective FP.3

The performance objective and criteria for evaluating this objective are:

The Contractor has implemented comprehensive elements into the fire protection program that includes, fire safety training to employees, life safety provisions into facilities, and fire prevention methods to minimize facility fire risks and fire loss potential.

The criteria for this objective have been partially met.

The review team determined that the TFC has established fire protection program elements that include: fire safety training to employees, life safety provisions incorporated into facilities, and fire prevention methods established to minimize facility fire risks and fire loss potential. Some deficiencies were identified with the implementation effectiveness of some of the established programs, including deficiencies in Life Safety programs (discussed in Performance Objective FP.2 of this report) and the periodic fire prevention inspection program. Although programs and procedures were established for periodic fire prevention inspections, the review team determined that there was inconsistent implementation of inspection requirements. The team also observed instances of combustible material accumulation.

Two Findings were identified in the review of this Performance Objective:

- Finding FP.3-F-1** The periodic fire prevention inspection program was not consistently implemented and in some cases did not conform to the frequency requirements of National Fire Protection Association 801, Standard for Fire Protection for Facilities Handling Radioactive Materials.
- Finding FP.3-F-2** Accumulations of transient combustibles were identified in or adjacent to TF facilities.

5.0 CONCLUSIONS

The review team concluded that the TFC fire protection program is implemented, and with some exceptions, is effective. The team verified that FHAs and safety basis documents are fully integrated. Likewise, the Fire Protection SMP controls relied on in the safety analyses for all nuclear facilities were incorporated into, and implemented by, the TFC fire protection program. The team found a significant improvement from the 2002 ORP assessment in the reduction of the backlog of fire protection system maintenance, inspection, and testing provided to the TFC by the HFD Fire Systems Maintenance and Testing organization. Only a handful of tasks were overdue out of the hundreds of tasks that are completed each year. Further reduction of this backlog is encouraged by working with the HFD maintenance and testing organization to resolve facility access issues.

The assessments of fire protection, both the program assessments and facility inspections, were found to be deficient in fully meeting DOE requirements. Furthermore, it is evident that the TFC oversight process failed to identify and correct these assessment deficiencies as part of the feedback and improvement element of the ISMP. Had the oversight process been effectively implemented and discovered that the fire protection program assessments and facility inspections were deficient, the team believes all other deficiencies and weaknesses identified in this assessment could have been identified and corrected in a timely manner by the TFC. As a result of this finding, ORP intends to conduct the next assessment of the TFC fire protection program within 2 years.

The review team found deficiencies in some areas of the fire protection program, including the inspection and testing of fire protection features and equipment that are the responsibility of the TFC facility/building managers, the preparation and retention of written corrective action plans for fire protection system impairments and restrictions, and the inclusion of all fire protection engineering design criteria in engineering procedures as they apply to non-nuclear facilities that are not required to be protected by active fire protection systems. Weaknesses were identified in the areas of fire protection requirements identification, fire protection implementation procedures, and sufficiency of fire protection engineering staff to accommodate contingencies that could arise.

6.0 REFERENCES

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

APPENDIX A

CRITERIA REVIEW AND APPROACH DOCUMENTS

TITLE: FIRE PROTECTION SAFETY MANAGEMENT PROGRAM (SMP)

FUNCTIONAL AREA GOAL: A fully compliant Fire Protection SMP is implemented and maintained by the TFC.

TOPICAL AREA: Fire Protection SMP.

REQUIREMENTS:

- 10 CFR 830, Nuclear Safety Rule
- ORP M 420.1-1, *ORP Fire Protection Program*
- DOE O 420.1A, section 4.2; *Facility Safety*, fire protection
- Nuclear Facility FHA, DSA and TSR

GUIDANCE:

- DOE-STD-3009-94, Ch 2, Chapter 11; *Preparation guide for U.S. DOE Nonreactor nuclear facility Documented Safety Analyses*; Operational Safety
- DOE G-420.1B-0; *Implementation Guide for use with DOE Order 420.1 and 440.1 Fire Safety Program*

ELEMENTS:

To evaluate fire protection safety management and program implementation, DOE G-420.1B-0 and ORP M 420.1 specify fire related assessments to consider the following elements:

1. Programmatic:
 - Comprehensiveness of the fire protection program
 - Procedures for engineering design and review
 - Procedures for maintenance, testing, and inspection
 - FP engineering staff (number, qualifications, training)
 - Management support
 - Exemptions and documented equivalencies
2. Facility Implementation:
 - FP of safety class equipment
 - Life safety considerations
 - Fire protection of high value property
 - Fire suppression equipment
 - Completeness of fire hazards analyses
 - Fire barrier integrity

- Completeness of fire loss potential (MPFL/MCFL) determinations
- Fire safety training
- Inspection, testing, and maintenance reports
- Adequacy of facility assessments reports
- Administrative controls
- Temporary protection and compensatory measures
- Conformance with applicable Orders, codes and standards

*Note: To Evaluate Facility Implementation the Team will conduct graded physical tours of select facilities, including but not limited to 222-S, 242-A, 242-T, 242-S, and other TF facilities, to determine the effectiveness of the specific programmatic elements.

PROCESS:

Once the assessment commences, the team will investigate the various Performance Objectives, using evaluation of documentation and interviews with Contractor defined personnel as the primary methods of data gathering. The following documents are considered primary sources for information and investigation question development:

- Copy of Contractor Fire Protection Program (Site or Facility specific, as applicable)
- Fire Protection Organization Chart
- Fire protection personnel qualifications summary (i.e., education, experience, certifications, etc.) and training status
- Contractor Program and Facility Fire Prevention Procedures
- Listing and status of any fire protection upgrades or modification projects
- Current status report of approved and pending exemptions and equivalencies
- Current open issues report from contractor tracking system
- Current list of fire protection impairment(s) and dates initiated
- Current list of fire protection compensatory measures in-place and dates initiated
- Current Inspection, Testing, & Maintenance (ITM) status report of fire protection systems, Fire Hazards Analysis, DSA Reports, TSR, Facility Fire Protection Assessment, Vital Safety System Assessments related to fire protection, and Facility Representative Surveillance Reports as applicable to fire protection for the following facilities:

-222-S
-242-A
-242-T
-242-S
-Tank Farms

During all parts of the assessment, interviews with various personnel will be an important element. As a minimum, the following personnel will be interviewed:

- Fire Protection Manager and or person(s) responsible for the overall fire protection program, as delineated in the written program
- Project and facility Fire Protection Engineer(s)
- Facility or operations personnel who support the project or facility Fire Protection Program
- System Engineers Responsible for fire protection

PERFORMANCE OBJECTIVE FP.1

Fire protection program commitments in each DSA, TSR, or SA at each nuclear facility are addressed by basic program features of the Fire Protection SMP required by law or contractual requirements. Nuclear facility specific fire protection controls included in the specific TSRs are incorporated within the overall Fire Protection SMP or are identified as Specific Administrative Controls.

Criteria:

1. The TFC Fire Protection SMP is defined in accordance with contract requirements (DEAR, 10 CFR 830B).
2. Site contractor implementing mechanisms are compliant with DOE expectations for a nuclear Fire Protection SMP including (ORP M 420.1-1):
 - Policy statement confirms management commitment to the Fire Protection SMP complying with applicable requirements.
 - Comprehensive program description exists.
 - Robust, written Fire Safety Procedures and plans exist.
 - The SMP incorporates functions and principles of Site Integrated Safety Management System.
3. Fire Hazard Analyses (FHA) have been prepared for each nuclear facility and the results integrated into the Safety Analysis, the Documented Safety Analysis (DSA) and Technical Safety Requirements (TSR) as required. (ORP M 420.1-1, 6.7.2; DOE G-420.1/B-0)
4. Administrative controls and compensatory measures are adequately identified and meet the intent for which they are established and there is a formalized process for maintaining administrative controls and compensatory measures. (ORP M 420.1-1, Section 6.1)

Approach:

Record Review:

Site contract list A/B; Site Contractor Fire Protection SMP policy and implementing documentation; Nuclear facility FHA, DSA, and TSRs; Records of all fire safety equivalencies and exemptions.

Interviews:

TFC fire protection program managers, professional engineers, and fire protection system engineers. Line managers through whom Fire Protection SMP personnel report.

Observations:

Verify that the implementation are current compared to existing hazards and basis documents. Existing hazards for which the administrative controls or compensatory measures should be field verified.

PROCESS:

Records Reviewed:

- Contract DE-AC27-99RL14047, CH2M HILL Hanford Group, Inc., Section J, Appendix C, *DOE Directives*.
- Contract DE-AC27-99RL14047, CH2M HILL Hanford Group, Inc., Section I.108, *Laws, Regulations, and DOE Directives* (DEC 2000).
- TFC Standards/Requirements Identification Document (S/RID), HNF-SD-MP-SRID-001, *Fire Protection*, Rev 3a, 5/20/2002.
- ORP M 420.1-1, *ORP Fire Protection Program*, 3/11/2002.
- TFC-PLN-13, *Fire Protection Program*, Rev A-5, dated 7/7/05.
- DOE O 420.1A, *Facility Safety*, Contractor Requirements Document Section 4.2, *Fire Protection*, 5/20/2002.
- S/RID Phase 1 Assessment Table for fire protection from DOORS Database.
- S/RID Phase 2 Assessment Table for fire protection from DOORS Database.
- TFC-BSM-AD-C-07, Rev A-1, *Standards/Requirements Identification Document Process*, dated 8/22/05
- TFC-ESHQ-FP-STD-08, Rev A-2, *Fire Protection Discrepancies Management*, dated 2/24/05.
- RPP-13033, *Tank Farms Documented Safety Analysis*, Rev 1
- HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, Rev 4
- TFC-ESHQ-FP-STD-03, *Flammable/Combustible Liquids*, Rev B-1
- RPP-13261, Rev 1, *Analysis of Vehicle Fuel Releases Resulting in Waste Tank Fire*
- HNF-SD-WM-FHA-020, *Tank Farms Fire Hazards Analysis*, Rev 4
- TFC-PLN-32, *Tank Farm Contractor Safety Management Programs*, Rev B-5
- RPP-RPT-25891, *System Health Report for the 242A Evaporator Facility for 1st Quarter CY2005*

- RPP-20990, *Phase 2 Vital Safety Sys Assessment of the 242a Evaporator System & Design Features Management Assessment Report FY2004-ENG-S-0036*
- RPP-13261, *Analysis of Vehicle Fuel Release Resulting in Waste Tank Fire*

Personnel/ Positions Interviewed:

- CH2M HILL Fire Protection Engineer
- CH2M HILL Director, Industrial Safety
- CH2M HILL S/RID Coordinator
- 616 Building Manager
- 222-S Fire Protection Engineer
- IDF Construction Manager
- Facility Operations Managers
- ORP Facility Representatives

Evolutions/Operations/Shift Performance Observed:

The following facility tours to verify fire protection program implementation including:

- Integrated Disposal Facility
- 616 Hazardous Material Storage Facility
- 2704HV Administrative Support Office Building
- 2750E Administrative Office Building
- 242-A Evaporator
- 242-T Evaporator
- 242-S Evaporator
- 222-S Laboratory

RESULTS:

DISCUSSION OF RESULTS:

The review team determined that the TFC has established a fire protection program with elements that include the minimization of the potential for the occurrence of a fire or related perils; features to ensure a fire does not cause an unacceptable onsite or offsite release of hazardous material that will threaten the public health and safety or the environment; requirements consistent with the National Fire Protection Association (NFPA) 101, "Life Safety Code" that provide an acceptable degree of life safety to the TFC; provisions to ensure that vital U. S. Department of Energy (DOE) programs will not suffer unacceptable delays as a result of fire and related perils; controls to ensure that property damage from fire and related perils does not exceed DOE established levels; and elements to ensure that process control and safety systems are not damaged by fire or related perils. This determination was a result of document reviews, staff interviews, and field observations. Three improvements were noted in the area of fire protection program definition in accordance with contractual requirements. Details on these results follow.

Fire Protection Program Contract Requirements: The TF Contract Clause I.108, *Laws, Regulations, and DOE Directives*, allows the use of a Standards/Identification Requirements Document (S/RID) to tailor the applicability of DOE environment, safety and health orders. CH2M HILL has an implemented S/RID with a fire protection chapter that specifies the fire protection requirements that are applicable to the TFC. The fire protection S/RID implements all of the requirements of ORP M 420.1-1, *ORP Fire Protection Program*, except item 5.2.h., “Provide fire protection overview and assistance for subcontractor activities and facilities.” This requirement is similar to other requirements in ORP M 420.1-1 requiring fire protection oversight and assistance for subcontractor activities (e.g., 5.2.k) therefore the review team found the CH2M HILL program structured to require oversight of subcontractor activities. For completeness, however, the requirement should be cited in the S/RID. Inclusion of this requirement in the S/RID will cause the requirement implementation to be reviewed by CH2M HILL in their Phase 1 and Phase 2 assessments of requirement implementation. This omission can be corrected by CH2M HILL as an inconsequential correction of Section 12 of the S/RID without prior ORP approval.

The ORP manual requires the contractor to comply with the DOE fire protection order and standards. One editorial error was discovered in Section 12.2 of the S/RID. The reference citation, “Requirement Source: ORP M 420.1-1, 03-11-02; Section 6.5” should be corrected to read “Requirement Source: ORP M 420.1-1, 03-11-02; Section **5.2.**” This can be corrected by CH2M HILL as an inconsequential editorial revision to the Section 12 of the S/RID without prior ORP approval. **Observation FP.1-O-1.**

Fire Hazard Analyses Integrated into Safety Analyses: ORP M 420.1-1 requires the TFC to prepare Fire Hazards Analyses (FHA) for all nuclear facilities and for specific, significant new facilities. The review team determined that FHAs have been prepared in accordance with these requirements. The TFC standard (TFC-ESHQ-FP-STD-06, *Fire Hazard Analysis and Fire Protection Assessment Requirements*) that governs the preparation, review and approval of FHAs discusses the integration of FHAs into SA documents. The standard requires FHAs and safety analyses, for facilities required to have safety analyses, be jointly developed. The standard requires the joint development of the FHA and safety analyses to be prepared in accordance with the requirements of Standard 06 and the requirements of HNF-SD-GN-FHA-30001, *Integration of Fire Hazards Analysis and Safety Analysis Report Requirements*. The review team could not find the document as referenced; instead WHC-SD-GN-FHA-30001 was found. The document was issued in 1994, by the Westinghouse Hanford Company, an earlier TFC. The team found the general principles of the document to be sound, however, it has not been updated to current nuclear safety requirements (i.e., 10CFR830.120) or to current DOE design and fire protection orders.

Section 3.4.6, *Computer Models in Analysis* in TFC-ESHQ-FP-STD-06 states “[a]n acceptable tool that may be used in the development of a fire hazard analysis is a computer fire model as applied by qualified FPEs and approved by the RL authority having jurisdiction.” This reference should refer to the ORP Authority Having Jurisdiction. **Observation FP.1-O-2.**

The FHAs for the 242-Evaporator, the 222-S Laboratory, and the TFs were reviewed to ensure that the results were appropriately integrated into the safety bases. No deficiencies were

identified. The assumptions and controls stated in the FHAs reviewed were adequately included in the safety basis for each facility. Likewise, the fire protection program controls relied on the safety analyses for facility were adequately included in and implemented by the TFC fire protection program.

Administrative Controls and Compensatory Measures: ORP M 420.1-1 delineates the process the TFC is to follow for the approval of alternative fire protection methods that do not meet the requirements of the ORP manual. The process for requesting exemptions or equivalencies to fire protection requirements includes a submittal by the TFC addressing a number of specific issues. The ORP manual does not specifically require the preparation of a written TFC procedure or process for such requests. As a result, TFC-PLN-13, *Fire Protection Program*, states that requests for exemptions and equivalencies shall be submitted to the TFC FPE. Interviews with the FPE indicate satisfactory knowledge of the process and submittal requirements, however, there is no knowledgeable backup should the FPE be gone or leave the company. It is recommended that the Fire Protection Program include written instructions for processing and approving exemption and equivalency requests to be sent to ORP. **Observation FP.1-O-3.**

Conclusion:

The criteria for this objective have been met.

The FHAs for the 242-Evaporator, the 222-S Laboratory, and the TFs were reviewed to ensure that the results were appropriately integrated into the safety bases. No deficiencies were identified. The team found all assumptions and controls stated in the FHAs reviewed were appropriately included in the safety basis for each facility. Likewise, the fire protection program controls relied on the safety analyses for facility were incorporated into and implemented by the TFC fire protection program.

However, some improvement is needed. First, all the requirements for the fire protection program should be included in the program requirements documents, implemented in the program procedures and verified to be effective by an assessment process. In this regard, the team found one requirement from the ORP Fire Protection Manual not included in the fire protection S/RID document.

Second, the authorities for management and execution of the fire protection program should be correctly stated and implemented in the program plans, standards and procedures. Here, the team found that selection of fire analyses codes was to be approved by the DOE Richland Operations Office Authority Having Jurisdiction (AHJ) instead of the ORP AHJ.

Finally, the fire protection program must be designed and implemented so that personnel changes do not reduce the TFC ability to fully implement the requirements of the ORP fire protection manual. The team found that while current personnel are highly experienced and knowledgeable of the process, there is no written document that describes the process to be followed when an exemption or equivalency to fire protection requirements is sought. If the FPE were to retire or leave the company, another qualified FPE could not easily identify the correct process to follow,

including approvals and content of requests for exemptions or equivalencies. This deficiency was corrected during the assessment.

Findings

None.

Observations

Observation FP.1-O-1: A weakness was identified in the TFC S/RID for fire protection.

Observation FP.1-O-2: Weaknesses were identified in the TFC Fire Protection Program implementing procedures.

Observation FP.1-O-3: The TFC does not have a documented process or procedure for the approval of fire protection equivalencies or exemptions.

PERFORMANCE OBJECTIVE FP.2

Fire protection program commitments in each DSA, TSR, or SA at each nuclear facility are implemented. Nuclear facility specific fire protection controls included in the specific TSRs are implemented. Adequate numbers of technically competent, experienced, and fully qualified personnel are assigned to the Fire Protection SMP at each nuclear facility to which the commitment to the Fire Protection SMP is a specified control.

Criteria:

1. Site Fire Protection SMP is staffed with adequate numbers of technically competent, experienced, fully qualified personnel including FPEs, technicians, and fire fighting personnel. (DOE O 420.1A, 4.2.1, CRD).
2. The Fire Protection SMP is effectively implemented and maintained at each nuclear facility including facility specific controls or attributes to which the DSA/TSR commits. The Fire Protection SMP is effectively coordinated and maintained consistent with the applicable elements of the site-wide Fire Protection SMP (DOE O 420.1A; DOE-STD-3009-94 Ch 11).
3. Fire protection systems and equipment are designed, installed, and maintained to provide the level of protection, functionality, and the reliability specified in contract requirements. Procedures are in place for performing inspection, testing, and maintenance of fire protection systems and the Contractor has a schedule for performing inspection, testing, and maintenance of the fire protection systems. At individual nuclear facilities, the Fire Protection SMP meets all assumptions and requirements to which the FHA, DSA and TSRs commit. (DOE O 420.1A sec 4.2.2; DOE-STD-3009-94 CH 11, DSA/TSR).
4. Contractor engineering disciplines ensure that the requirements of the Fire Protection Program are incorporated into facility design and construction. This includes a documented review by a qualified FPE of plans, specifications, procedures, and acceptance tests. (DOE O 420.1A, Section 4.2.1.4).
5. TFC contractor assessments of the Fire Protection SMPs are sufficiently comprehensive and accomplished at the required periodicity. Assessments verify continued robust implementation of a compliant Fire Protection SMP that implements all fire protection commitments in individual nuclear facility FHAs, DSAs, and TSRs. Issues are identified, tracked and resolved in a manner to ensure satisfactory correction and prevent reoccurrence. (DOE O 420.1A sec 4.2.1, 10 CFR 830 A).
6. The Contractor performs periodic fire protection facility assessments at the required frequencies specified in ORP M 420.1-1 and a fire protection program self assessments at least every 3 years. (ORP M 420.1-1, Section 5.2 e & f).
7. Recommendations or findings from assessments or evaluations, both internal and external, are tracked and dispositioned in a formal manner (ORP M 420.1-1, Section 5.2 f 2).

Approach:

Record Review:

Selected contractor fire protection assessments and fire safety survey results; Nuclear facility FHAs, DSAs, and TSRs; TSR Surveillance records for Fire Protection SMP Systems, Structures, and Components (SSC); Maintenance records for fire protection SSCs with emphasis on SSCs that support nuclear facilities; Corrective action records for Fire Protection SMP related issues.

Interviews:

Contractor fire protection professional engineers, system engineers, and managers; Nuclear facility managers and selected operators; Maintenance personnel, including managers who work on Fire Protection SMP SSCs. Line managers through whom Fire Protection SMP personnel report.

Observations:

Fire protection SSC surveillances and preventive maintenance activities associated with selected nuclear facilities; Contractor fire protection self assessments if available; Fire emergency exercises associated with nuclear facilities if possible; Walk down selected facilities with emphasis on installation and operability of all elements of the Fire Protection SMP including physical systems and components and combustion control and storage programs.

PROCESS:

Records/Documents Reviewed:

- U.S. Department of Energy, Office of River Protection, ORP M 420.1-1, *ORP Fire Protection Program*, March 11, 2002.
- U.S. Department of Energy, DOE O 420.1A, *Contract Requirements Document*, Attachment 2, May 20, 2002
- U.S. Department of Energy, DOE G-420.1/B-0, *Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program*, September 30, 1995
- TFC, *Standards/Requirements Identification Document*, HNF-SD-MP-SRID-001 Rev 3a, *Fire Protection*, May 20, 2002
- TFC, Phase I & II Implementation Matrixes for Standards/Requirements Identification Document, Fire Protection
- CH2M HILL Requirements Matrix for HNF-IP-0842, July 7, 2003
- DOE-STD-1066-99, *DOE Standard Fire Protection Design Criteria*, July 1999
- DOE-STD-1088-95, *DOE Standard Fire Protection for Relocatable Structures*, June 1995
- U. S. Department of Energy, Richland Operations Office, A-05-SED-FH-025, *Report on the Assessment of Fluor Hanford, Inc. Fire Protection Program*, draft November 2005.
- TFC-PLN-13, Rev A-5, *Fire Protection Program*, July 7, 2005

- HNF-14755, *242-A Evaporator Documented Safety Analysis*, October 2005
- HNF-15279, *242-A Evaporator Technical Safety Requirements*, Rev. 0, November 14, 2003
- RPP-13033, *Tank Farms Documented Safety Analysis*, Section 11.4, *Fire Protection*, Revision 1
- HNF-SD-WM-FHA-020, *Tank Farms Fire Hazards Analysis*, Rev 4
- RPP-22461, Rev. 1, *Preliminary Fire Hazard Analysis for the Demonstration Bulk Vitrification System*, December 2004
- HNF-SD-WM-FHA-024, Rev. 1, *Fire Hazards Analysis for the 242-A Evaporator*, October 2003
- RPP-10342, Rev. 0, *Preliminary Fire Hazards Analysis for Cold Test, Training, and Mockup Facility*, June 2002
- RPP-23471, Rev. 0, *Preliminary Fire Hazards Analysis for Integrated Disposal Facility*, March 2005
- HNF-SD-CP-FHA-003, REV. 2, *222-S Laboratory Fire Hazards Analysis*, November 2004
- RPP-13978, *Technical Basis for the Transportation-Related Handling Accidents And Associated Representative Hazardous Conditions*, Revision 1, August 2003
- RPP-13354, *Technical Basis for the Release from Contaminated Facility Representative Accident and Associated Represented Hazardous Conditions*, Revision 2, MAY 2004
- RPP-13261, *Analysis of Vehicle Fuel Release Resulting in Waste Tank Fire*, Revision 2, October 2003
- RPP-24217, *Technical Basis Report for Large Fire Accidents Involving Aboveground Tanks/Vessels*, Revision 1, September 2005
- TFC-ESHQ-FP-STD-01, Rev B, *Combustible Materials Standard*, July 20, 2005
- TFC-ESHQ-FP-STD-02, REV A-1, *Fire Protection Design Criteria*, December 15, 2004
- TFC-ESHQ-FP-STD-03, Rev B-1, *Flammable/Combustible Liquid*, May 9, 2005
- TFC-ESHQ-FP-STD-04, REV A-3, *Fire Protection System Testing, Inspection, and Maintenance*, October 31, 2005
- TFC-ESHQ-FP-STD-06, REV A-1, *Fire Hazard Analysis and Fire Protection Assessment Requirements*, January 7, 2005
- TFC-ESHQ-FP-STD-12, REV A, *Hanford Fire Department Services*, August 5, 2004
- TFC-OPS-OPER-C-15, Rev. A-1, *Housekeeping*, September 27, 2005
- TFC-OPS-OPER-C-10, Rev B-5, *Vehicle and Dome Load Control in Tank Farm Facilities*, October 27, 2005
- TFC-ESHQ-Q_INSP-C-05, REV B-5, *Independent Review and Approval of Documents*, August 26, 2004
- CH2M HILL System Engineer Assignment List, Vital Safety System (VSS), October 6, 2005
- CH2M HILL System Engineer System Walkdown Log for 242A Evaporator, January 2005 through October 2005
- TFC-ENG-ADMIN-D-07, REV B-1, *Engineering Assessments*, October 19, 2004
- TFC-ESHQ-AP-C-01, REV C-2, *Management Assessment*, October 17, 2005

- RPP-20990, Rev. 0, *Phase 2 Vital Safety System Assessment of the 242A Evaporator System and Design Features Management Assessment Report FY2004-ENG-S-0036*, May 2004
- RPP-RPT-25891, Rev. 0, *System Health Report for the 242-A Evaporator Facility for First Quarter CY 2005*, April 2005
- HFD Fire System Impairment Tracking Report for October 2005
- 3-EMER-316, Rev C-0, *Inspection of Emergency Lights for Tank Farms*, March 22, 2005
- 5-EMER-089, Rev B-0, *Exit Light Inspection*, June 9, 2005
- 5-EMER-194, Rev D-0, *Fire Barrier Inspection*, August 31, 2005
- LO-040-101, *222-S Complex Building Inspection*, October 14, 2005
- LO-100-107, *Hot Cell Cubicle Housekeeping and Waste Management*, April 20, 2005
- ATS-310, Section 1.31, *Health and Safety Self-Inspection Program*, September 26, 2005
- ATS-310, Section 4.05, *Laboratory Complex Chemical Hygiene Plan*, September 26, 2005
- 6-ES-424, Rev D-0, *Functional Test/PM of Emergency Lights, 2101-HV/MO-850*, September 14, 2004
- LO-162-103, Rev H-0, *222-S Monthly Check of Fire Protection and Emergency Equipment*, September 28, 2005
- 2S22042, Rev 1-0, *222-S Emergency Lighting Inspection and Testing*, June 22, 2005
- North/South Area Fire Maintenance and Testing Weekly Schedule for November 7-11
- North/South Area Fire Maintenance and Testing Weekly Schedule for November 14-18
- CH2M HILL Hanford Group, Inc. Fire Protection Program Assessment, July 26, 2001
- Facility Fire Protection Assessment for 242-A dated 9/1/04
- Facility Fire Protection Assessment for 213-W dated June 2004
- Facility Fire Protection Assessment for 241-B Change Trailer dated March 2004
- Facility Fire Protection Assessment for 241-BX Tank Farm dated March 2004
- Facility Fire Protection Assessment for 241-BY Tank Farm dated March 2004
- Facility Fire Protection Assessment for 272-AW dated June 2004
- Facility Fire Protection Assessment for 272-WA dated June 2004
- Facility Fire Protection Assessment for 278-AW dated June 2004
- Facility Fire Protection Assessment for Bldg. 616 dated 9/16/04
- Facility Fire Protection Assessment for 2101-HV dated June 2004
- Facility Fire Protection Assessment for 2704-HV dated June 2004
- Facility Fire Protection Assessment for 2715-AW dated June 2004
- Facility Fire Protection Assessment for 2715-WA dated June 2004
- Facility Fire Protection Assessment for 2727WA dated June 2004
- Facility Fire Protection Assessment for the Big Top dated June 2004
- Facility Fire Protection Assessment for the Dean Dome dated June 2004
- Facility Fire Protection Assessment for the 222-S Laboratory Complex dated 9/2004
- TFC HGET Training Module for Fire Safety
- Problem Evaluation Requests (PER) 2004-5319, 2004-4246, 2004-4247, 2004-4248, 2004-4258, 2004-4251, 2004-4252, 2004-4253, 2004-4249, 2004-4250, 2004-4244, 2004-4259, 2004-4263, 2002-6625, 2002-6621, 2002-6620, 2004-4255, 2004-4256, 2004-5320, 2003-3832, 2002-6626, and 2002-6627

- Emergency Lighting Facility Rounds, Inspections for 616 Building, 2704HV, 2750E
- Fire Department MAXIMO recall print out of CH2M HILL required fire system maintenance packages
- Preventive Maintenance (PM) ET-05419, “Monthly Inspection of Emergency Lights for East Tank Farms”
- PM EE-02454, “Annual Inspection and Test of Emergency Egress Lights in East Tank Farms”
- PM WT-05955, “Monthly Inspection of Emergency Lights for West Tank Farms”
- PM ES-00502, “2101-HV Warehouse and MO-850 Emergency Lights Monthly Functional Test/PM”
- PM EE-02510, “242-A Fire Wall Inspection”
- PM WT-03269, “Inspection of Exit Lights at Bldg. 616”
- PM 2S-00942, “Perform Fire Barrier Inspection at 222-S”
- PM 2S-00473, “Monthly Inspection of Emergency Lights at 222-S”
- PM 2S-00955, “Inspection of 222-S Exit Signs”
- PM WT-03260, “Annual Inspection of Emergency Lights at West Tank Farms”
- PM ES-00503, “2101-HV Emergency Lights Yearly Functional Test”
- PM ES-00637, “MO-850 Emergency Lights Yearly Functional Test”
- PM 2S-00710, “222-S Monthly Inspection of Fire Protection and Emergency Equipment”
- Various work instructions that implement the above PMs
- Work Instruction (WI) WFO-WO-000280, WI WFO-WO-000285, WI WFO-WO-000503, WI WFO-WO-000750, WI WFO-WO-0001055, WI WFO-WO-001187, WI WFO-WO-001798, WI WFO-WO-002010, all “Monthly Inspection of Emergency Lights for East Tank Farms,” and all cancelled, no work completed due to lack of resources.

Personnel/Positions Interviewed:

- CH2M HILL Fire Protection Engineer
- Facility Manager for 242-A
- Facility Manager for AY/AZ Tank Farms
- Fire Protection Engineer for 222-S
- Assistant WFO Maintenance Manager
- WFO Operations Director
- 2704-HV Building Manager
- 242-A Shift Manager
- One Senior Shift Manager
- Two CO Shift Managers
- 242-A Operator
- IDF Construction Representative
- Nuclear Safety and Licensing Engineer
- Hanford Fire Marshal
- 2750 Building Administrator
- 616 Building Manager
- Hanford Fire Department Chief

- Hanford Fire Department Fire System Maintenance Manager
- Hanford Fire Department Fire System Testing Captain
- ORP Facility Representatives
- IDF Construction Manager

Evolutions/Operations/Shift Performance Observed:

The following facility walkdowns/tours were conducted to verify fire protection program implementation:

- Integrated Disposal Facility
- 616 Hazardous Material Storage Facility
- 2704HV Administrative Support Office Building
- 2750E Administrative Office Building
- 242-A Evaporator
- 242-T Evaporator
- 242-S Evaporator
- 222-S Laboratory

RESULTS:

DISCUSSION OF RESULTS:

CRAD FP.2.1 – Adequate numbers of competent, experienced, qualified personnel.

Per interviews with the CH2M HILL FPE, CH2M HILL currently only employs one qualified FPE, and also employs one on contract from Fluor Hanford who covers the 222-S lab about 15 hours per week. The CH2M HILL FPE indicated that while there have been others in the past, they are no longer employed by CH2M HILL. He is tasked with covering all of CH2M HILL's facilities with the exception of 222-S. When he needs engineering expertise to help with modifications or new projects, he recruits from the ranks of the electrical or mechanical engineers in CH2M HILL Engineering.

Maintenance and testing/inspection services for fire systems are provided by HFD. Testing/inspection of life safety equipment in individual facilities is the responsibility of the facility/building manager, not the HFD. As discussed below, some of these tests/inspections are not being done or are not being done consistently. Further, as discussed in the CRADs below, some facility fire protection assessments have not been completed or were inadequate. Finally, CH2M HILL does not have a backup for the one FPE and no apparent succession plans to address contingencies such as attrition, new facilities, or increased workload. (**Observation FP.2-O-1**).

CRAD FP.2.2 – Safety Management Program Effectively Implemented and Maintained Including Facility Specific Controls to which the DSA/TSR Commits.

The TSRs have no specific controls to which it commits from a fire protection standpoint, but merely refers to the Fire Protection SMP described in Section 11.4 of the DSA. The Fire Protection SMP commits to the following:

- Engineering design and review controls using qualified FPEs
- Administrative procedures encompassing controls for the use and storage of combustible, flammable, radioactive and hazardous materials
- A functioning self-assessment program
- Inspection, maintenance and testing of fire protection features
- Formal tracking and resolution process for identified program findings.

In addition, the Fire Protection SMP also commits to periodic surveillances by FPEs to ensure compliance with DOE O 420.1A and ORP M 420.1-1.

The team found that the SMP is being implemented, but there are some deficiencies as discussed in the CRADs below. For example, there are administrative procedures for the use and limitation of combustible and flammable materials. Facility fire protection assessments are being conducted for some facilities, but not for others, and the depth of some assessments is lacking. Inspection, testing and maintenance of fire protection features generally does take place, but the team identified examples where they had not been performed in several facilities, both by facilities' management and the HFD. Formal tracking and resolution of findings from fire protection assessments does take place via the PER system. Finally, periodic surveillances have been conducted to a limited degree by the CH2M HILL FPE.

CRAD FP.2.3: Inspection, Testing and Maintenance:

ORP M 420.1-1, Section 6.6 requires CH2M HILL to implement a program to ensure continued fire system performance and the operability of other fire features. The program must include the inspection and/or testing and maintenance of fire protection systems and features in accordance with National Fire Protection Association Standards. ORP also requires the contractors to implement a fire protection impairment program to minimize the duration and impact of fire protection system impairments and outages.

TFC-PLN-13 recognizes the ORP requirements outlined in ORP M 420.1-1 for inspection, testing, and maintenance of fire protection systems. The basic requirements for the program are outlined in TFC-ESHQ-FP-STD-04, which includes a table that specifies the required inspection, testing, and maintenance to be performed for each type of system, along with the required frequency. The table in TFC-ESHQ-FP-STD-04 identifies various National Fire Protection Association (NFPA) documents as the core requirement for the inspection, test, or maintenance items.

Within CH2M HILL, inspection, testing, and maintenance of fire protection systems is performed, primarily, by the HFD (operating under Fluor Hanford, Inc, by contract with the

DOE Richland Operations Office [RL]) as described in the HFD Services Procedure (TFC-ESHQ-FP-STD-12). By a combination of directive and contractual means, coupled with CH2M HILL's work control system, the HFD's Fire Protection System Testing and Logistics and Fire Protection Systems Maintenance organizations have the largest responsibility for implementation of the fire protection system operability portion of the Fire Protection Program. These organizations are responsible for rendering most inspection, testing, and maintenance services on the active fire protection systems (automatic sprinklers, detection systems, gaseous fire suppression systems, *etc.*) within CH2M HILL.

RL recently completed a similar review of the Fluor Hanford, Inc. Fire Protection Program, which included the HFD Fire System Testing and Maintenance Organization. RL determined that fire protection systems are being professionally inspected, tested, and maintained in accordance with a similar documented IT&M program by the HFD that is in compliance with NFPA standards and DOE expectations. The HFD Fire System Testing and Maintenance Organizations have procedures and personnel to inspect, test and maintain the fire protection systems and the fire department is making entry into CH2M HILL facilities to perform this work.

While this assessment team did not attempt to replicate the efforts of the RL team, this assessment saw facility evidence that required fire protection inspection, testing, and maintenance is being conducted in CH2M HILL operating facilities by the fact that fire sprinkler and fire alarm systems were operational and in service. With the exception of the 222-S facility (which had a trouble indication system restriction on the fire alarm control panel), all facility fire alarm control panels appeared to be in full operation without common, zone troubles or supervisory troubles. Sprinkler system Outside Stem and Yoke (OS&Y) valves and backflow preventer valves, including system post indicating valves, were also noted in the open position and sprinkler system risers were indicating the presences of pressures on their riser gages both below and above the alarm check valves in the various facilities visited by the assessment team.

In the review of CH2M HILL fire system inspection, testing, and maintenance, the assessment team noted some deficiencies in completing all work packages within the time frame and frequencies specified by DOE requirements as found in TFC-ESHQ-FP-STD-04. According to the fire department MAXIMO recall system reviewed during this assessment, there were approximately fourteen specific items requiring preventative maintenance and less than ten specific items that required fire system testing that were overdue past the required frequency (eight months or less). This may not be statistically significant since there are hundreds of fire system related components in CH2M HILL facilities requiring testing and maintenance. Prior to this assessment the situation was apparently worse and improvement in completing this work at the required frequency is continuing. However, sustained interface between CH2M HILL operational/facility units and the HFD is necessary to ensure that all fire protection system equipment is given the appropriate priority and attention for inspection, testing, and maintenance within the time frequency prescribed by DOE. **(Observation FP.2-O-2)**

1. During this assessment it was also determined that CH2M HILL has a number of long standing fire system restrictions greater than 15 days and some as high as 493 days (Building 272-AW three fire alarm chimes not working), 487 days (272-AW fire panel will not send alarms on battery power), 115 days (242-A Evaporator fire bell in load out room does not sound on test), 38 days (222-S sprinkler riser low air pressure switch will

not report to fire panel), and 23 days (222-SA sprinkler water flow bell not sounding on test). The reason for these long standing restrictions appears to be due to facility delays in preparing engineering and work package approvals necessary to repair the restrictions.

2. As required by ORP M 420.1-1, if a system restriction cannot be repaired within 15 days, contractor facility management must submit a corrective action plan within 48 hr to the Hanford Fire Marshal and the applicable FPE for review and approval. CH2M HILL procedure TFC-ESHQ-FP-STD-08 general states this but then indicates that a “work package” is synonymous with a corrective action plan. However, a work package would not necessarily address contingency plans with compensatory measures used to reduce the potential and consequences of a fire while the unplanned system restriction exists, but rather, a work package would address what it will take to repair the out of service fire related equipment. Furthermore, while contingency plans with compensatory measures for such restrictions may be established, no permanent record of them is maintained by the TFC. ORP expects the contractor to address the “what if a fire occurs” while this equipment is out of service and “how will the contractor minimize the fire consequences” while the equipment is out when a system restriction cannot be corrected within the required time frame. **(Finding FP.2-F-1)**

Those systems not inspected and tested by the HFD groups are the responsibility of individual facility owners. Generally all of the passive/non-active system fire protection systems (fire barriers, walls, doors, *etc.*), life safety devices (emergency lights, egress door mechanisms, exit signs, *etc.*) are inspected and tested by facility owners under the responsibility of the CH2M HILL Building/Facility Managers. Some of the active system inspections and tests (*e.g.*, monthly gauge readings on sprinkler systems, preaction sprinkler daily/monthly heating check during cold periods, and valve alignments on sprinkler systems) are also within the duty of facility owners.

During this assessment, the contractor was not able to provide evidence that inspection and tests of non-active system fire protection features were performed (*i.e.* documents showing evidence of completion were either not provided to the review team or were not sufficiently detailed to provide date or scope of the inspections). Furthermore, the assessment team observed some of the non-active system fire protection equipment was not inspected and maintained as required by ORP and CH2M HILL procedures. Some examples are provided in the following discussion.

Several examples of non-functioning emergency lighting were found during the facility portions of the review which failed to light when the test button was depressed: 242-S (hallway EL-71), Building 616 (Bay 2), and 222-S (emergency light 56). In addition the team noted some problems with functioning exit lighting in Building 616 (in Bay 2 and the flammable storage room had several exit lights that were not lit), 242A (AMU room exit sign was not lit), and most all of the tritium powered exit lights in 2704-HV had exceeded the manufacturer’s effective life of 10 years, and should have been replaced before September 2003 (according to manufacturer’s instructions on the exit sign units).

The Team also noted several fire doors in the 2750E Administration Building which had been modified or damaged and can no longer be considered fire doors. These included fire doors 9,

11, and 12 which had been cut and damaged on the door side length edge. This may indicate that fire barriers and fire doors are not being inspected in accordance with CH2M HILL procedures.

A review of the CH2M HILL CHAMPS facility maintenance records and other company records noted that some of the inspections required by DOE M 420.1-1, Section 6.6 and CH2M HILL procedures (TFC-ESHQ-FP-STD-04) have not been done for some time. Furthermore, some testing/inspections were closed out without work being conducted due to 'insufficient resources', others are not always being conducted in accordance with required frequencies, and other records for facility inspections lacked the required detail (date and exactly what was performed) necessary to validate if the CH2M HILL procedures for non-active fire system features inspections are even being conducted. Examples include:

- Monthly inspections of emergency lighting in east TF facilities were not conducted from January 2005 through August 2005.
- Monthly inspections of emergency lighting in west TF facilities were not conducted in April, May and September 2005.
- Records show no monthly inspections of exit lighting in the 616 Building have been conducted for at least the last year. It couldn't be determined from CHAMPS when the last time was that it had been completed. The preventive maintenance (PM) task itself was assigned an annual frequency in CHAMPS when it should have been monthly for electric lamped exit signs, per TFC-ESHQ-FP-STD-04.
- Records for conduct of annual inspections on tritium exit signs in 2704-HV could not be located. The Building Manager does not know who conducts these inspections for 2704-HV. Further, this facility does not use CHAMPS to track and complete their PMs. Most, if not all, TF facilities utilize CHAMPS to ensure that required PMs actually get accomplished on time and that a permanent record of performance is maintained.

It should be noted that all of these inspections are tied to Life Safety Code requirements. **(Finding FP.2-F-2)**

On a more positive note, the team also observed that, with regard to fire extinguisher monthly inspections, not one of them was overdue for its monthly inspection out of the dozens observed in various facilities.

CRAD FP.2.4: Design and Construction:

ORP M 420.1, Section 6.4 requires CH2M HILL to incorporate fire protection design requirements into new facility designs and existing facility modifications necessary to meet the fire protection objectives of DOE. Engineering designs are to incorporate the applicable requirements of National Fire Protection Association (NFPA) Codes and DOE Standards, including but not limited to, NFPA

101, *Life Safety Code*, DOE-STD-1066-99, *Fire Protection Design Requirements*, and DOE – STD-1088-95, *Fire Protection Relocatable Structures*. The fire protection engineering features required by DOE is dependent on the relevant facility or modification hazards, significance of the facility, property loss potential, and occupancy. Such fire protection features may include

automatic fire suppression depending on a number of factors, as specified in ORP M 420.1-1, Section 6.4, including, but not limited to, facilities having a loss potential greater than \$1 million, when required by an NFPA standard or as determined by the building code.

DOE O 420.1A, Section 4.2.1.4 recognizes the importance of incorporating fire protection features in all new facilities and for modifications to existing facilities by requiring that qualified FPEs perform and document reviews of design, specifications, and procedures.

Through interviews with the CH2M HILL FPE concerning current or near-term large-scale engineering projects (i.e., Demonstration Bulk Vitrification System, Contact Handled Transuranic Mixed Waste Packaging and Interim Storage Facilities, and Integrated Disposal Facility) and reviews of preliminary fire hazards analyses, the review team determined that the major projects are being reviewed by a qualified FPE, as required. The CH2M HILL Management Plan also requires facility designs and modifications to undergo review by a qualified FPE, however, the CH2M HILL procedures are somewhat weak regarding the specific applications where specific DOE fire protection requirements are required to be implemented.

For example, while the CH2M HILL fire protection design criteria procedure specifies how fire protection systems are to be installed, company procedures do not specify the precise applicability of these requirements so that fire protection systems are installed in all facilities or modifications, as specified in ORP M 420.1, Section 6.4. In addition, there are other fire protection features required by ORP M 420.1 that are non-active fire protection system related (e.g. fire barriers, filter plenum requirements, flame spread ratings, roofing requirements, occupancy separations, etc.). These fire protection features also delineated in DOE fire protection standards DOE-STD-1066-99 and DOE-STD-1088-95. While both of these standards are referenced in the contractor's fire protection design criteria procedure, the procedure is not applicable to facilities that do not require fire protection systems. Since these standards also require other fire protection features in addition to fire protection systems, these non-active fire protection system feature design requirements are not specifically required to be installed in facilities that are not required to have active fire systems by the contractor's internal procedures. This deficiency in the TFC fire protection design criteria procedure does not affect nuclear facilities; only those non-nuclear facilities that do not exceed the threshold for installing active fire protection systems. Fire hazard analyses are required for all nuclear facilities which assures that they are provided with all required fire protection systems and all required fire protection features that are non-active fire protection system related. ORP has reviewed each FHA and concluded that all required fire protection systems and features are installed in nuclear facilities. **(Finding FP.2-F-3)**

CRAD FP.2.5 & FP.2.6 (combined): Assessments:

ORP M 420.1, Section 5.2e requires CH2M HILL to perform facility and programmatic self assessments on a certain frequency based on the relative hazards and/or property values consistent with DOE O 420.1A and the associated DOE Guide. These assessments are required to contain a number of facility and programmatic elements that are also found in the ORP requirements.

ORP requires the facility assessments to be documented evaluations of the fire protection program implementation, including field walk downs of the contractor facilities by a qualified FPE. The programmatic assessment is also conducted to ascertain compliance with a number of program related elements not included in the specific facility assessments. A reference to the applicable fire hazard analysis or other assessment is considered adequate to satisfy those assessment elements to the extent that required elements for a facility assessment are adequately covered by either a facility fire hazard analysis or another assessment within the relative same time period.

ORP also requires fire protection assessments to include fire department emergency services. The ORP assessment of the CH2M HILL program recognized that another Hanford contractor provides the fire department emergency services to CH2M HILL. Since an assessment of the fire department emergency services was recently completed by the DOE Richland Operations Office (RL) this assessment did not evaluate the fire department area.

Overall, the Assessment Team determined that the contractor has a process (TFC-ESHQ-FP-STD-06) in place that documents the requirements for performing fire protection program and facility assessments in compliance with ORP M 420.1-1. The self-assessment program includes the elements (program and facility) of the fire protection elements in DOE G 420.1 that is reflected in the ORP Fire Protection Program requirements contained in ORP M 420.1-1.

Several facility assessments were reviewed during this assessment. A review of the most current assessments determined that the contractor's assessment scope adequately addressed most of the facility-related elements required by ORP M 420.1-1. However, one area of deficiency, determined by the ORP Assessment Team was in the contractor facility assessments. The ORP Assessment Team determined that the CH2M Hill assessments do not always evaluate the non-active fire system related inspection, testing and maintenance features and other inspection and testing of fire system components under facility responsibility as required by ORP M-420.1-1 and the contractor implementing procedures (TFC-ESHQ-FP-STD-06). Further indication that this area is not being assessed was found in the review of the inspection, testing and maintenance criterion area which found numerous facility related fire protection features (exit signs, emergency lighting, fire barriers, etc.) that have not been inspected and tested for long periods of time as required by ORP M 420.1-1, Section 6.6 and CH2M HILL procedures (TFC-ESHQ-FP-STD-04)

The contractor also has a process for performing programmatic self-assessments. However, the last formally documented program assessment was completed in July 2001, which exceeds the three year frequency established by ORP and DOE requirements (see ORP M 420.1-1, Section

5.2f). When the team interviewed the CH2M HILL FPE, it was explained that CH2M HILL took credit for a number of assessments in the 2003 TF fire hazard analysis update and the 2002 Phase II S/RIDs self assessment. However, utilizing this approach did not comply with the required process to assess all the fire protection elements every three years. Some fire program area elements have not been assessed since 2001 (e.g., comprehensiveness of the fire protection and prevention program, fire protection engineering design and review procedures, and procedures and personnel for fire equipment maintenance, test, and inspection, etc. [ORP M 420.1-1. 6.7.1.a]). **(Finding FP.2-F-4)**

The Team also reviewed the vital safety system (VSS) area to evaluate contractor oversight of any fire protection related VSS. A review of the CH2M HILL VSS list determined that CH2M HILL has only one identified fire protection system VSS at the 242-A Evaporator. Although CH2M HILL identifies this item as a 'vital safety system', the item is actually a combustible administrative control that is contained in the Evaporator TSR document.

A Phase II VSS assessment of the 242-A Evaporator was conducted in May 2004. The May assessment identified an observation that wooden scaffolding stored in the Evaporator Room has never been used since its initial application and should be reviewed for potential removal. PER-2004-3026 was written and it was concluded that the DSA analyzed twice the actual combustible loading in the Evaporator Room and found it to be an acceptable risk. PER-2004-3026 also concluded that administrative and procedural controls have been established as part of the TSR that control both personnel entry into the pump/evaporator rooms and limit the amount of additional combustible materials that can be placed in the Pump and Evaporator Rooms. Implementation of the TSR was evaluated by this assessment team under performance objective FP.1.

CRAD FP.2.7 – Findings from internal and external assessments are tracked and dispositioned in a formal manner.

A sample of 17 different internal CH2M HILL assessments were reviewed to determine if findings were identified and if the contractor tracked and resolved them. The assessments reviewed were conducted at various facilities ranging from nuclear facilities like 242-A and certain TFs, to non-nuclear office facilities such as 2704-HV and 272-AW. Findings were identified in 10 of them. In every case, the findings had been entered into the Problem Evaluation Request System (PER), corrected and closed out. The DOE team verified corrective actions for a random sample of findings from the contractor's internal assessment reports and noted that in every case they were complete.

Findings from an external assessment report were also examined to ensure that they had been entered into the PERS and properly dispositioned and corrected. The previous DOE Fire Protection Assessment Report from December 2002 was selected and reviewed. Three findings had been identified and all three had been entered into PERS. Corrective actions had been provided for all three and the PERS were closed. However some of the corrective actions are considered to be inadequate as discussed below **(Observation FP.2-O-3)**:

- Because of broad statements in Section 20 of the FHA in 2002 regarding assessment elements, the FHA did not satisfy DOE and TFC requirements for adequate coverage of some fire protection assessment elements. Instead of revising Section 20 of the FHA to provide these details, the revised FHA expanded the individual facility chapters. However, the fire protection assessment elements are still lacking such that programmatic assessment elements from
- DOE M 420.1-1 are still not included in the FHA and consequently, facility fire protection assessments are still considered inadequate in some cases. This is a repeat finding.
- There were no specific combustible controls in facility specific procedures to protect and maintain the assumptions of the FHA. There could be additional materials brought into CH2M HILL facilities which could result in larger and more severe fires than those analyzed in the FHA. The corrective action for this finding revised the TF Fire Protection Program Plan to require facility specific controls to prevent exceeding analyzed combustible limits. The corrective action also created a Combustible Materials Standard that mandates the control of combustible material in each facility to the quantity required for current needs and separation from ignition sources. Discussions with cognizant Nuclear Safety and Licensing personnel indicated that no specific combustible loadings were considered in accident analyses; fires of various sizes were assumed to occur and then the consequences were analyzed. Consequently there are no specific combustible loading limits in TF facilities with the exception of 242-A. The team reviewed several technical basis documents that support the DSA in the area of accident analyses for fires and verified this to be true.
- A portion of the automatic fire sprinkler system in 242-S was deactivated without obtaining DOE approval. Since an automatic fire suppression system is a NFPA requirement and a DOE requirement when the MPFL exceeds \$1 million, the contractor needed to obtain DOE concurrence in the form of an exemption or an equivalency. As corrective action for this finding, the contractor took the position that the sprinklers were not needed and elected to submit a Hanford Fire Marshal Interpretation Request to see if they agreed. The Fire Marshal's Office did agree and the finding was closed on this basis, apparently with the DOE originator's concurrence. This is not allowed in that the Hanford Fire Marshal cannot direct when NFPA and DOE requirements can be disregarded. This issue is still considered open, i.e. ORP still requires a fire equivalency for this condition.

Conclusion:

This performance objective was partially met.

The TFC fire protection engineering resources are not adequate to account for contingencies, e.g., attrition, increased work load, etc. The Fire Protection SMP is largely implemented. The HFD is completing the vast majority of the fire protection maintenance, testing and inspection that they do on behalf of the TFC. However, some SMP implementation problems exist with regard to the frequency and quality of fire protection program and facility assessments, and with the conduct of fire protection testing and inspection performed by Building/Facilities Management. Also, two fire system restrictions associated with 272-AW have been open for

over 485 days as of November 1, 2005 which is an excessively lengthy period of time to have these restrictions in place. The team confirmed that all major projects and modifications are being reviewed by the TFC FPE for compliance with fire protection requirements. However, not all fire protection design requirements are incorporated into CH2M HILL procedures. Findings from TFC internal fire protection assessments are tracked, corrected, and closed, but the corrective actions for some external assessments need improvement.

Findings:

FP.2-F-1: CH2M HILL does not prepare corrective action plans to address fire protection system impairments or restrictions that are not repaired within 24 hours and 15 days, respectively.

FP.2-F-2: Some inspection and testing of fire protection features and equipment under the responsibility of CH2M HILL Building/Facility Management are not being conducted. The work control process (not CHAMPS) in use does not ensure that non-active fire protection system inspections, tests, and maintenance are performed at the required frequency.

FP.2-F-3: Not all fire protection design requirements, including those fire protection features that are non-active system related (e.g., fire barriers, filter plenum requirements, flame spread ratings, roofing requirements, occupancy separations, etc.), are fully incorporated into CH2M HILL engineering design procedures that establish the design criteria for non-nuclear facilities.

FP.2-F-4: Fire protection program and facility assessments do not meet all of the requirements of ORP and DOE directives, and CH2M HILL implementing procedures.

Observations:

FP.2-O-1: The TFC fire protection engineering resources are not adequate to account for contingencies, e.g., attrition, increased work load, etc.

FP.2-O-2: Some fire protection systems maintenance and inspection tasks performed by HFD Fire Systems Maintenance have not been completed.

FP.2-O-3: Corrective action for externally identified fire protection program findings needs improvement.

PERFORMANCE OBJECTIVE FP.3

The Contractor has implemented comprehensive elements into the fire protection program that includes, fire safety training to employees, life safety provisions into facilities, and fire prevention methods to minimize facility fire risks and fire loss potential.

Criteria:

1. General fire safety training is provided to all personnel (ORP M 420.1-1, Section 6.8)
2. The Contractor requires implementation of NFPA 101, *Life Safety Code* in new facility projects and renovations and enforces NFPA 101 in existing buildings. (ORP M 420.1-1, Section 6.4 e)
3. Periodic fire prevention inspections are performed in facilities and procedures are being implemented to control combustible, flammable, radioactive, and hazardous materials to minimize the risk from fire. (ORP M 420.1-1, Section 6.8)
4. Property, including high value equipment, is protected in accordance with Department of Energy Orders, codes, and standards with the appropriate fire protection systems and methods. Fire loss potentials (MPFL/MCFL) determinations are complete and reasonable (ORP M 420.1-1, Section 5.2 and 6.4 g).

Approach:

Record Review:

1. Review the Contractor Site orientation and refresher training provided for all employees. Ensure that fire safety is discussed and is adequate.
2. Validate that the Contractor's Fire Protection Program and/or Engineering practices manual dictates the use of NFPA 101 is both new and existing facilities.
3. Validate that a procedure or formal methodology for performing periodic fire and life safety inspections on all Facilities and Areas exists. Review the procedure or other document to ensure that adequate instruction is provided to ensure that all buildings are inspected to appropriate criteria, as defined by the fire protection Program document.
4. Validate that the Contractor has a policy or programmatic statement that restricts smoking in areas of high fire concern (inside Facilities, wildland areas, near flammable liquids storage tanks, etc.).
5. Validate that the Contractor is performing hot work in accordance with a permitting system. Obtain and review the permitting process procedure to ensure that requisite standards – particularly NFPA 51 and 29 CFR 1910 – are being implemented.

Interviews:

1. Interview Contractor personnel to ensure that the principles taught in the initial and refresher training are retained by Contractor personnel.
2. Interview inspection personnel (like the FPE for the project) to determine the extent to which life safety infractions occur. Ensure that the number and frequency of infractions is low (as determined by the team lead) and that timely correction of the concerns is performed.

Observations:

Tour Facilities under contractual obligation to the Contractor (number and location as specified by the team lead) to field verify compliance conditions with NFPA 101, Life Safety Code. Particular attention should be paid to exit signs, emergency lighting, obstructions to egress, door swings and ease of opening, and violation of fire barriers defined for life safety (generally stairs, shafts, horizontal exits, etc.). Validate through observation if the fire prevention policy or programmatic statement is being implemented and the program implementation is mature to control combustible, flammable, radioactive, and hazardous materials to minimize the risk from fire. If possible, observe a permitted welding area and a field welding operation to determine if the hot work process is being followed.

Validate that adequate fire protection is specified via engineering design controls or is currently in place for the following conditions:

- Automatic suppression for all structures where the Maximum Possible Fire Loss exceeds \$1 Million.
- Redundant automatic suppression, including redundant water supplies, for all structures where the Maximum Possible Fire Loss exceeds \$50 Million.
- Redundant automatic suppression plus physical separation via 3 hour fire barriers for all structures where the Maximum Possible Fire Loss exceeds \$150 Million.
- Automatic suppression is provided in locations housing safety class equipment.
- Redundant automatic suppression in cases where no redundant capabilities to safety class equipment exist.
- Automatic suppression for locations housing high value property.

PROCESS:

Records Reviewed:

- Fire Protection Problem Evaluation Request (PER) Performance Indicators, dated November 1, 2005
- ORP M 420.1-1, *ORP Fire Protection Program*, March 11, 2002
- DOE O 420.1A, *Facility Safety*, April 20, 2002
- HNF-SD-MP-SRID-001, *TFC Standards/Requirements Identification Document*, Revision 3a, May 20, 2003
- HNF-SD-WM-FHA-024, *Fire Hazards Analysis for the 242-A Evaporator*, Revision 1, October 9, 2003
- TFC-ESHQ-FP-STD-01, *Combustible Materials Standard*, July 20, 2005
- WMP-242, Section 2.03, *Technical Safety Requirement Tracking*, January 19, 2004
- TF-OR-A-02, *242-A Evaporator Backside Rounds*, September 30, 2005
- HNF-SD-CP-FHA-003, *222-S Laboratory Fire Hazards Analysis*, Revision 2, November 22, 2004
- TF-OR-PWR-03, *242-A Evaporator Stationary Operating Engineer Rounds*, September 9, 2004
- RPP-22461, *Preliminary Fire Hazards Analysis for the Demonstration Bulk Vitrification Project*, Revision 1, DRAFT

- RPP-23471, *Preliminary Fire Hazards Analysis for the Integrated Disposal Facility*, Revision 0, DRAFT
- LO-040-101, *222-S Complex Building Inspection*, October 14, 2005
- Completed round sheets for LO-040-101, *222-S Complex Building Inspection*
- TFC-OPS-OPER-C-10, *Vehicle and Dome Load Control in Tank Farm Facilities*, October 27, 2005
- TFC-ESHQ-FP-STD-03, *Flammable/Combustible Liquids*, May 9, 2005
- TFC-OPS-OPER-C-08, *Shift Routines and Operating Practices*, August 31, 2005
- Form A-6003-578, *Housekeeping Inspection*, March 2004
- TFC-OPS-OPER-C-15, *Housekeeping*, September 27, 2005
- Web Excel form: Building Administrator Listing, last updated January 30, 2003 (//Ap012/nucopsdaily/housekeeping.xls)
- TFC-PLN-13, *Fire Protection Program*, July 7, 2005
- WFO EAPC/Operations Walkdown Housekeeping Schedule 1st Quarter FY 06
- TFC-BSM-HR_EP-C-02, *Employee Discipline*, April 15, 2005
- Various Problem Evaluation Requests
- Form A-6004-023, *Workplace Safety Observation Checklist*, October 1, 2005
- NFPA 101, *Life Safety Code*, 2003 Edition
- NFPA 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials*, 2003 Edition
- RPP-RPT-27759, Revision 0, Draft, Process Hazard and Operational Analysis for the Demonstration Bulk Vitrification System
- TFC-BSM-FPM_PR-CD-04, *Building Management*, September 28, 2005
- TFC-ESHQ-FP-STD-02, *Fire Protection Design Criteria*, December 15, 2004
- TFC-ESHQ-FP-STD-04, *Fire Protection System Testing, Inspection, and Maintenance*, October 31, 2005
- TFC-ESHQ-FP-STD-06, *Fire Hazard Analysis and Fire Protection Assessment Requirements*, January 7, 2005
- DOE-STD-1088-95, *Fire Protection for Relocatable Structures*, June 1995
- DOE-STD-1066-99, *Fire Protection Design Criteria*, July 1999

Personnel/ Positions Interviewed:

222-S Laboratory Acting Engineer for Fire Protection
222-S Facility Operations Management
222-S Chemical Technologist (2)
222-S Stationary Operating Engineer
FHI Fire Systems Representative for the 222-S Laboratory
Nuclear Chemical Operators (2)
TFC Waste Operations Manager
Fire Protection Engineer
WFO Facilities Director
WFO TF Facility Manager
242-A Manager
CO Facility Support Supervisor
WFO Employee Accident Prevention Council Co-Chair

Hanford Fire Marshal
2750 Building Administrator
HFD Chief

Evolutions/Operations/Shift Performance Observed:

Life Safety inspection of the following facilities: 242-A, 242-S, and 242-T Evaporators, 222-S Laboratory, 616 Building, Integrated Disposal Facility
Combustible, flammable, hazardous material inspection of the following facilities: 242-A, 242-S, and 242-T Evaporators, 222-S Laboratory, 616 Building, Integrated Disposal Facility, TFs (S, SX, SY, T, TX, TY, B, BX, BY, C, A, AX, AY, AZ, AN, AW), 2713-WB ("Greenhut"), 2727-WA, 244-A, 2704-HV, 2750E

RESULTS:

DISCUSSION OF RESULTS:

The review team determined that the TFC (TFC) has established fire protection program elements that include: fire safety training to employees, life safety provisions incorporated into facilities, and fire prevention methods established to minimize facility fire risks and fire loss potential. This determination was the result of document reviews, interviews, and field observation. Some deficiencies were identified with the implementation effectiveness of some of the established programs, including deficiencies in Life Safety programs and periodic fire prevention inspection program. The following details provide the results in each criterion.

Fire Safety Training: The fire safety training required by ORP M 420.1-1, Section 6.8 was provided to all employees through Hanford General Employee Training. The training materials were reviewed and the material covered all topical areas required by the ORP Manual. All personnel training records reviewed indicated that employees were properly trained. No deficiencies were identified.

Implementation of NFPA 101, Life Safety Code: The review team determined that NFPA 101 Life Safety requirements were generally applied and implemented in existing facilities in accordance to the requirements. Some deficiencies were identified in the inspection and maintenance of some Life Safety systems and equipment; these are detailed in Criteria Review and Approach Document FP.2 of this report.

The review team conducted tours of a number of CH2M HILL facilities to evaluate implementation of life safety provisions in the work spaces. Life safety elements observed during these facility tours included exit signs, emergency lighting, obstructions to egress, door swings and ease of opening, and violation of fire barriers necessary for life safety (stairs, shafts, horizontal exits, etc.).

Life safety provisions, such as obstructions to egress, door swings and ease of opening, are adequately addressed throughout the facilities. However, life safety provisions such as exit signs and emergency lighting was determined to be deficient. Although exit signs and emergency

lighting were generally installed throughout the facilities where required, the assessment team noted a number of non-functioning emergency lights, exit sign deficiencies, and fire door deficiencies. These deficiencies are detailed in CRAD FP.2 of this report.

Draft Preliminary Fire Hazard Analyses (PFHA) were reviewed for new facility projects and renovations. NFPA 101 requirements were appropriately applied to these new facilities as detailed in the PFHAs. Existing requirements outlined in the draft PFHA for the Demonstration Bulk Vitrification System (DBVS) appear adequate. The contractor is considering additional life safety requirements for DBVS based on the results provided in the draft report for the recently completed *Process Hazard and Operational Analysis for the Demonstration Bulk Vitrification System*.

Fire Prevention Inspections: The TFC implements various methods to conduct facility inspections to control combustible, flammable, radioactive, and hazardous materials to minimize the risk from fire. The methods employed (checklists, responsibilities) and the periodicities for the conduct of these inspections were not consistently applied, and in some cases did not meet the requirements of NFPA 801 (**Finding FP.3-F-1**). The review team found four different forms and three different procedures for conducting the required inspections. The following specific deficiencies were identified with existing procedures and practices (Observation FP.1-O-2 examples):

- OPER-C-15, *Housekeeping*, states that monthly inspections are required to be performed at all facilities North of the Wye Barricade, such that each facility is inspected at least once per quarter—this does not meet the requirements of NFPA 801, which requires documented facility inspections to be conducted at least monthly
- TFC procedure TFC-OPS-OPER-C-15, *Housekeeping*, was not being used
- Site form A-6004-023, *Workplace Safety Observation Checklist*, used by the WFO Employee Accident Prevention Council (EAPC) in conducting monthly inspections, did not have a requirement to check workplaces for combustible material accumulation (office spaces and areas outside *were* covered by the checklist; this form has since been modified by the contractor to include the requirements)
- Some contractor organizations were not conducting monthly fire prevention inspections as required by NFPA 801 (the review team did note that WFO and 222-S Laboratory were conducting inspections as required).
- Corrective actions for PER-2004-6255, which determined that TFC procedure TFC-OPS-OPER-C-15, *Housekeeping*, was not being followed, were ineffective (**Finding FP.3-F-1**)

In the course of this review, the team conducted walk downs of facilities to determine the effectiveness of contractor efforts to control combustible, flammable, radioactive, and hazardous materials to minimize the risk from fire. In general, contractor efforts have been successful in controlling combustible and flammable material accumulation. There were no areas identified that contained excessive accumulations of flammable liquids. However, the team did identify some instances where there was an excessive accumulation of combustible materials (**Finding FP.3-F-2**). These noted examples were contrary to contractor procedure TFC-ESHQ-FP-STD-01, *Combustible Materials Standard*. Specific examples were:

- West of the SX TF, near the carpenter's shop, a significant amount of combustible material and debris had accumulated (this was previously identified by an ORP Facility Representative on October 12, 2005)
- Southeast corner of SY TF there was a significant accumulation of wood consisting of wood planks and dunnage, resulting from construction activities in the farm
- 242-A Evaporator contained accumulations of scaffolding and wood planks in the Heating, Ventilation, and Air Conditioning (HVAC) Room, and in the upper area of the Condenser Room

Property Protection: The review team determined the TFC adequately protects property, including high value equipment, in accordance with Department of Energy Orders, codes, and standards with the appropriate fire protection systems and methods. Based on review of Fire Hazard Analyses, fire loss potentials (MPFL/MCFL) determinations are complete and reasonable.

ORP M 420.11-1, Section 6.4 requires automatic fire suppression systems under a number of conditions including, but not limited to, in structures having an maximum possible fire loss (MPFL) in excess of \$1 million and when required by an applicable National Fire Protection Association (NFPA) standard. As noted in assessment performance objective FP.2 Finding, all fire protection design requirements, when required by ORP M 420.1-1, Section 6.4, including those contained in DOE-STD-1066, DOE-STD-1088 and those that are non-active system related (fire barriers, filter plenum requirements, flame spread ratings, roofing requirements, occupancy separations, etc.) are not fully incorporated into CH2M Hill procedures. While the CH2M Hill fire protection design criteria procedure specifies *how* fire protection systems are to be installed, company procedures do not specify *when* these requirements are applicable and *when* such fire protection systems are required to be installed as directed in ORP M 420.1, Section 6.4.g.

Although the requirements when fire suppression is to be installed is not explicitly stated in CH2M Hill fire protection design procedure, the DOE criteria, to install fire protection suppression, is being evaluated in the fire hazard analysis and fire protection assessment areas. A review of a number of CH2M Hill fire hazard analyses and facility fire protection assessments determined that CH2M Hill focuses on facility hazards, fire protection systems, and loss potential determinations as required by DOE. Maximum Possible Fire Loss (MPFL) and Maximum Credible Fire Loss (MCFL) calculations contained in these documents provide the thought process used to arrive at these calculations and the documents discuss the required fire protection systems when applicable.

The Team also observed evidence of installed fire suppression systems in the facility walk downs including 242-A, 242-T, 2704HV, 222-S, and 2750E consistent with DOE requirements.

Conclusion:

The criteria for this objective have been partially met.

The review team determined that the TFC (TFC) has established fire protection program elements that include: fire safety training to employees, life safety provisions incorporated into facilities, and fire prevention methods established to minimize facility fire risks and fire loss potential. Some deficiencies were identified with the implementation effectiveness of some of the established programs, including deficiencies in Life Safety programs (discussed in Objective FP.2 of this report) and the periodic fire prevention inspection program. Although programs and procedures were established for periodic fire prevention inspections, the review team determined that there was inconsistent implementation of inspection requirements. The team also observed instances of combustible material accumulation.

Findings:

FP.3-F-1 The periodic fire prevention inspection program was not consistently implemented and in some cases did not conform to the frequency requirements of National Fire Protection Association 801, Standard for Fire Protection for Facilities Handling Radioactive Materials.

FP.3-F-2 Accumulations of transient combustibles were identified in or adjacent to TF facilities.

Observations:

None

APPENDIX B

TEAM MEMBER

BIOGRAPHIES

Team Member Qualification Summary

Team Member Name: Walter B. Scott, Assessment Team Leader

Title and Organization: Senior Technical Advisor
Tank Farms Engineering Division
Office of the Assistant Manager for Tank Farms Project
Office of River Protection

Areas Assigned: Safety System Oversight Program
Authorization Basis Reviews
DNFSB Technical Liaison
Fire Protection Safety Management Program

Summary of Education and Technical Qualifications and Experience:

- Thirty years experience in the nuclear and environmental restoration fields
- Registered Professional Mechanical Engineer (expired)
- BS in Mechanical Engineering, Brigham Young University

Summary of Experience:

- Canister Storage Building and Cold Vacuum Drying Facility Final Safety Analysis Review Team Lead
- Team member for Fermi Lab Tiger Team
- Investigation of Anticipated Transient without Scram incident at Salem Nuclear Generation Station
- Restart assessment of Rancho Seco Nuclear Power Plant
- NRC maintenance assessment of Trojan Nuclear Plant
- Consultant to DOE EH Site Representatives, Richland Operations Office
- Power Production Engineer, Maintenance, Diablo Canyon Nuclear Power Plant
- Construction Coordination Office Lead, Diablo Canyon Nuclear Power Plant
- Prototype Liquid Metal Fast Breeder Reactor Design and Analysis Team, General Electric Company, Fast Breeder Reactor Division

Team Member Qualification Summary

Team Member Name: Mark C. Brown

Title and Organization: Facility Representative
Tank Farms Operations Division
Office of the Assistant Manager for Tank Farms Project
Office of River Protection

Areas Assigned: 222-S Laboratory
Voluntary Protection Program
ISMS

Summary of Education and Technical Qualifications and Experience:

- Twenty years experience in the nuclear and environmental restoration fields
 - Nine years experience as a DOE Facility Representative
 - Eleven years experience as a Navy nuclear submarine officer
- BS in Mathematics, University of Texas

Summary of Experience:

- Facility Representative for the Office of River Protection for over nine years
- Numerous Operational Readiness Reviews, Readiness Assessments, safety program assessments, safety basis implementation reviews, and ISMS reviews
- NQA-1 certified lead auditor

Over 11 years as a naval nuclear submarine officer: qualified for and supervised the operations, maintenance, and overhaul of several naval reactor plants, including two years as the Lead Instructor in the operation of naval reactor and steam plants.

Team Member Qualification Summary

Team Member Name: Craig P. Christenson

Title and Organization: Fire Protection Engineer
Verification and Confirmation Team
Office of Environmental Safety and Quality
Office of River Protection

Areas Assigned: Fire Protection Engineering

Summary of Education and Technical Qualifications and Experience:

- Twenty years commercial and industrial fire protection experience
- BS, Fire Protection Engineering, University of Maryland, College Park, Maryland
- Registered Professional Engineering in WA and CA

Summary of Experience:

- Team Leader for Phase II DNFSB Assessments of Vital Safety Systems
- Team Member Operational Readiness Review of Analytical Chemistry Building (No. 559), Rocky Flats Area Office
- Committee Member of the National Fire Protection Association (NFPA) Technical Committee on Fire Protection for Nuclear Facilities
- Investigation of Glovebox Fire in Building 371, Rocky Flats Environmental Technology Site
- Committee Member of the Department of Energy's National Fire Safety Committee
- Investigation of 2000 Command 24 Wildland Fire Response, Hanford, Washington
- Technical evaluation and review of nuclear facility fire hazard analyses
- Team Leader for the development of the DOE Fire Protection Engineering Functional Area Qualification Standard, DOE-STD-1137-2000, of July 2000
- Author of the DOE nuclear confinement ventilation fire protection criteria, Section 14 in the DOE Fire Protection Design Criteria Standard, DOE-STD-1066-99, July 1999
- Team Member Operational Readiness Review Radioisotope Thermoelectric Generator Facility, Argonne West,
- White paper on the integration of fire hazard and nuclear SA which is contained in the DOE Handbook Integration of Multiple Hazard Analysis Requirements and Activities-DOE-HDBK-1163-2003.

Team Member Qualification Summary

Team Member Name: Chris Sorensen

Title and Organization: Facility Representative
Tank Farms Operations Division
Office of the Assistant Manager for Tank Farms Project
Office of River Protection

Areas Assigned: Tank Farm Construction Projects

Summary of Education and Technical Qualifications and Experience:

- 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
- Qualified as DOE Facility Representative at the Hanford TFs
- Twenty six years experience in various naval, commercial, and DOE nuclear facilities

Summary of Experience:

- ORP Facility Representative at the Hanford TFs.
- Team Lead for Engineering Team in the TFs Engineering Division, ORP. Responsible for conducting or leading assessments of various engineering or operational topics of the TFC 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 TFs.
- Responsible for Startup/Restart Program and ISMS for the DOE Office of River Protection overseeing the TFC.
- 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.