Department of Energy
Washington, DC 20585

March 28, 2002

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW
Suite 700
Washington, DC 20004

Dear Mr. Chairman:

Consistent with the Department of Energy's Implementation Plan for Defense Nuclear Facilities Board Recommendation 2000-2, *Configuration Management, Vital Safety Systems*, I am forwarding initial Phase II assessment reports from the Carlsbad Field Office and the Idaho National Engineering and Environmental Laboratory. Initial Phase II reports from the remaining Environmental Management sites will be forwarded as they are completed.

If you have any questions, please contact me at (202) 586-7709 or have your staff contact Mr. William Boyce at (202) 586-8856.

Sincerely,

Jessie Hill Roberson
Assistant Secretary for
Environmental Management

Enclosures

cc w/o Enclosures:
B. Cook, EH-1
S. Cary, EH-1
M. Whitaker, S-3.1
P. Bubar, EM-20
L. Smith, EM-23
E. Blackwood, EH-24
R. Scott, EM-40
C. Wu, CBFO
I. Triay, CBFO

DOE/ID-10961

Report on
Confinement Ventilation System Assessment
at the Idaho National Engineering and Environmental Laboratory
(INEEL)
New Waste Calcining Facility (NWCF)

January 2002

Team Members Approval

I, by signature here, acknowledge that I concur with the contents and conclusions of this report.

R. D. Boston DOE-ID	signature on file	January 14, 2002
N. E. Cole BBWI	signature on file	January 14, 2002
B. P. Conlon DOE-ID	signature on file	January 14, 2002
T. E. Fewell BBWI	signature on file	January 14, 2002
L. Harrison BBWI	Transferred to Hanford in November 2001	January 14, 2002
G. T. Paulson Deputy Team Leader BBWI	signature on file	January 14, 2002
C. R. Warren DOE-ID	signature on file	January 14, 2002
T. L. Wichmann, Team Leader DOE-ID	signature on file	January 14, 2002
R. W. Winslow DOE-ID	signature on file	January 14, 2002

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ACRONYMS

ALARA	as low as reasonably achievable
APS	Atmospheric Protection System
ASME	American Society of Mechanical Engineers
BBWI	Bechtel BWXT Idaho, LLC
CCR	competency commensurate with responsibility
CFR	Code of Federal Regulations
CMMS	Computerized Maintenance Management System
CRAD	Criteria Review and Approach Document
CSSF	Calcine Solids Storage Facility
CVS	Confinement Ventilation System
DBA	design basis accidents
DCS	Distributed Control System
DNFSB	Defense Nuclear Facilities Safety Board
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
DOP	detailed operating procedure
DR	Deficiency Report
EDE	effective dose equivalent
EGs	evaluation guideline
EM	Environmental Management
ERDA	Energy Research and Development Administration
FTF	Filter Test Facility
HV	heating and ventilating
HEPA	high-efficiency particulate air
HLLWE	high-level liquid waste evaporated
HLW	high-level waste
HVAC	heating, ventilating, and air conditioning
IFSF	Irradiated Fuel Storage Facility
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center (formerly ICPP)
IP	Implementation Plan
LCO	limiting condition for operation
M&O	management and operating
MCP	management control procedure
MEL	Master Equipment List
MIP	Master Implementation Plan
NEMA	National Electric Manufactures Association
NWCF	New Waste Calcining Facility
ORM	Operations Requirements Manual
OSD	Operational Safety Division
PAAA	Price-Anderson Amendments Act
PM	preventive maintenance
PO	purchase order
POG	process off-gas (system)

POC	point of contact
PPE	personal protective equipment
PSD	Plant Safety Document
QA	quality assurance
RAM	radiation area monitor
RSAC	Radiological Safety Analysis Computer
SAR	Safety Analysis Report
SPC	specification
SSCs	structures, systems, and components
SO	systems operability
TPR	technical procedure
TSR	technical safety requirement
USQ	unreviewed safety question

EXECUTIVE SUMMARY

This document provides a summary of the assessment team's conclusions concerning (1) the status of the current operability and reliability of the portion of the New Waste Calcining Facility (NWCF) Confinement Ventilation System (CVS) within the assessment scope of the review and (2) the confidence in continued long-term operability and reliability of the system over its expected service lifetime. The overall results of the assessment are presented in the "Assessment Results" section of this report, and detailed results are presented in Appendix A.

The assessment team performed detailed reviews in all areas addressed within the approved Assessment Criteria and Guidelines. Lessons learned from the CVS pilot assessments conducted at Savannah River Site H-Canyon and Lawrence Livermore Building 332 were incorporated into this assessment. This summary reflects the team's lead discussion of issues associated with the NWCF. The team's data and unedited assessment results are contained in Appendix A.

The NWCF began operation in 1982. Four processing runs on high-level liquid waste were completed by 1997, when all high-level waste had been transformed into calcine and transferred to large concrete-shielded bin-sets for storage. Since then, the NWCF has been used to evaporate and concentrate lower activity waste called sodium-bearing waste, per the Idaho Settlement Agreement. The NWCF would require regulatory upgrades and permitting under the Resource Conservation and Recovery Act and the Clean Air Act to continue calcining operations. The original ventilation system(s) high-efficiency particulate air (HEPA) filters have been installed since 1982. Calciner process off-gas HEPA filters are changed periodically because they are subjected to a more severe service life.

During the assessment several operability/reliability issues were identified that require attention. The maintenance and surveillance and testing Criteria, Review and Approach Documents (CRADs) including the performance objectives were not met. The team concluded that in the short term, these issues would not jeopardize the safety function of the NWCF CVS, but should be addressed by the U.S. Department of Energy Idaho Operations Office (DOE-ID) and the management and operating (M&O) contractor.

Areas that require attention include: (1) development and documentation of system description documents, (2) reevaluation of the current Safety Analysis Report (SAR) against the Idaho National Engineering and Environmental Laboratory (INEEL)-approved Evaluation Guidelines to accurately determine which NWCF systems are safety-class, safety-significant, or defense in-depth and inconsistencies between technical safety requirement (TSR) surveillances for these systems, (3) implementation of Defense Nuclear Facilities Safety Board (DNFSB) Technical Report 23 for testing and qualification of HEPA filters and determination of NWCF HEPA filter service life, (4) improvement in "walk-downs" of essential drawings by system engineers, and (5) implementation of predictive and preventive maintenance programs for the NWCF CVS systems. The M&O contractor is working to review how HEPA filters are used and tested on the INEEL, but nearly all HEPA filters on-site are for as low as reasonably achievable (ALARA) radiation protection and are not used as mitigation for processing upset conditions or accidents.

The team reviewed the results of the Phase I reports for the NWCF and noted that there were not any specific operability concerns identified, because mitigation measures and backup redundant systems were allowed in Phase I (i.e., system operability could still be determined as "green" with backup measures in place).

Some programs, such as the INEEL maintenance program intended to ensure long-term operability and reliability of equipment important to safety, have not been fully implemented. Qualified technical and management personnel are assigned to the NWCF at both the contractor and DOE levels. Significant progress has been made in establishing well-documented safety analysis and technical safety requirements, although improvements are required. To ensure continued long-term system reliability this program requires further maturing, including documentation of system descriptions. Maturation of the maintenance program as part of a long-term facility master plan integrated with facility condition assessments is important to ensure age-related degradation of safety systems, structures, and components does not compromise the future ability to accomplish the facility missions. The team notes that active management support is necessary to sustain and continue the progress being made to enhance the safety posture of the NWCF.

INTRODUCTION

In Recommendation 2000-02, "Configuration Management of Vital Safety Systems," the Defense Nuclear Facilities Safety Board (DNFSB) concluded that degradation of confinement ventilation system (CVS) reliability and operability may be approaching unacceptable levels. Their conclusion was based on a review of U.S. Department of Energy (DOE) Occurrence Reports. The DNFSB's recommendation and the associated DOE Implementation Plan discuss the need to survey operational records and assess the current condition of CVSs important to safety at defense nuclear facilities.

Commitment 10 of the Implementation Plan (IP) requires that the CVS Assessment Criteria and Guidelines be tested at two pilot facilities to determine their effectiveness. The pilot assessments are considered important because the Assessment Criteria and Guidelines are used by the field: (1) for assessing the condition of CVS at defense nuclear facilities in accordance with Commitment 11 of the IP: and (2) as the model from which to develop graded plans for performing Phase II assessments of vital safety systems, as described in Commitment 7 of the IP. The results and lessons learned from the pilot assessments conducted at H-Canyon facility at the Savannah River Site in June 2001, and Building 332 at Lawrence Livermore National Laboratory in July 2001, were used at the Idaho National Engineering and Environmental Laboratory (INEEL), where this CVS assessment was conducted in October 2001. These CVS assessments were conducted at the New Waste Calcining Facility (NWCF). The INEEL assessment teams are a joint DOE and contractor team of experienced personnel with the appropriate backgrounds as defined in the approved CVS Criteria, Review, and Approach Documents (CRADs). The INEEL team leader participated as a team member and conducted formal team familiarization briefings before the start of the NWCF assessment. None of the team members had direct line-management responsibility for the facility. DNFSB staff members and consultants observed all phases of the CVS assessment. The NWCF assessment did not involve re-evaluation of the underlying analysis that supported the approved facility authorization/safety basis. The NWCF has a Safety Analysis Report (SAR) and a DOE Safety Evaluation Report that meets the requirements of Title 10 Code of Federal Regulations (CFR) Part 830, "Nuclear Safety Rule."

Based on the assessment results and the judgment of team members, a qualitative assessment was made of the ability of the NWCF CVS to perform its safety function over the remaining anticipated service lifetime, through 2015.

SCOPE OF ASSESSMENT

The assessment included all structures, systems, and components (SSCs) that comprise the operational portions (the high-level liquid waste evaporator) of the New Waste Calcining Facility (NWCF) Confinement Ventilation System (CVS) and the associated high-efficiency particulate air (HEPA) filters that perform a safety function. Portions of interfacing support systems whose proper function is essential to accomplishment of the NWCF CVS safety function were included (see Figure 1).

The NWCF was reviewed using the *Assessment Criteria and Guidelines to Ascertain the Current Condition of Confinement Ventilation systems in Defense Nuclear Facilities*, August 2001, as required by Commitment 11 and in the DOE Implementation Plan.

The NWCF CVS is actually composed of seven different heating, ventilating, and air conditioning (HVAC) systems (see Figure 2). Three of these are considered in the Safety Analysis Report (SAR) as being important in the event of a major radiological release that has the potential to exceed the INEEL Evaluation Guidelines. These systems are the Calciner and Decon Area CVSs and the Process Off-gas (POG) System.

The Calciner CVS provides ventilation for both the Calciner and the high-level liquid waste evaporator (HLLWE). However, the calciner is in standby mode, with no expectation of restart in the foreseeable future. The procedures that implement the technical safety requirement (TSR) and SAR commitments for the operational or standby status of the facility have been carried out. The calciner portion of the Calciner cell CVS will not be assessed, with the exception that Calciner cell shield wall integrity will need to be reviewed. The cell shield walls are important to ensuring proper airflow of the CVS.

The portions of systems shown below were used as a guide. The formal system boundaries were determined on Monday, October 22, 2001, using system drawings.

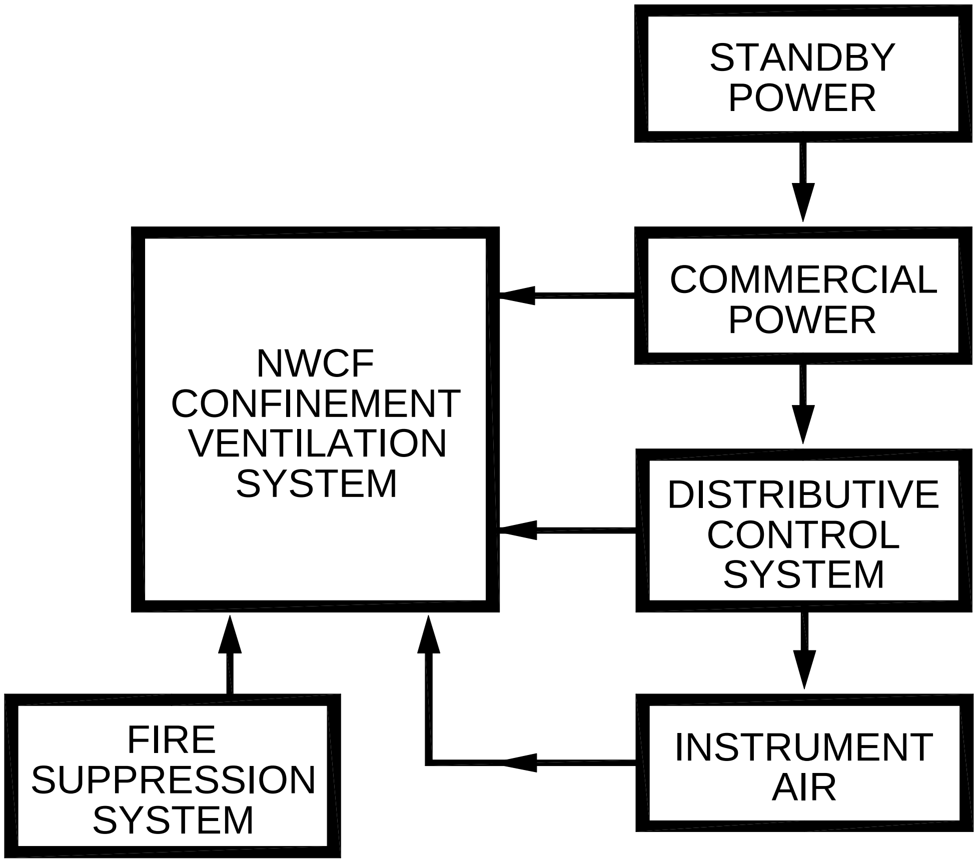
The portions of the Calciner CVS that serves the HLLWE assessed include:

1. HEPA filter banks
2. Blowers
3. Distributed control systems (DCSs) (including operations control software)
4. Instrumentation
5. Associated ductwork
6. Calciner cell shield wall integrity.

The portions of the POG assessed include:

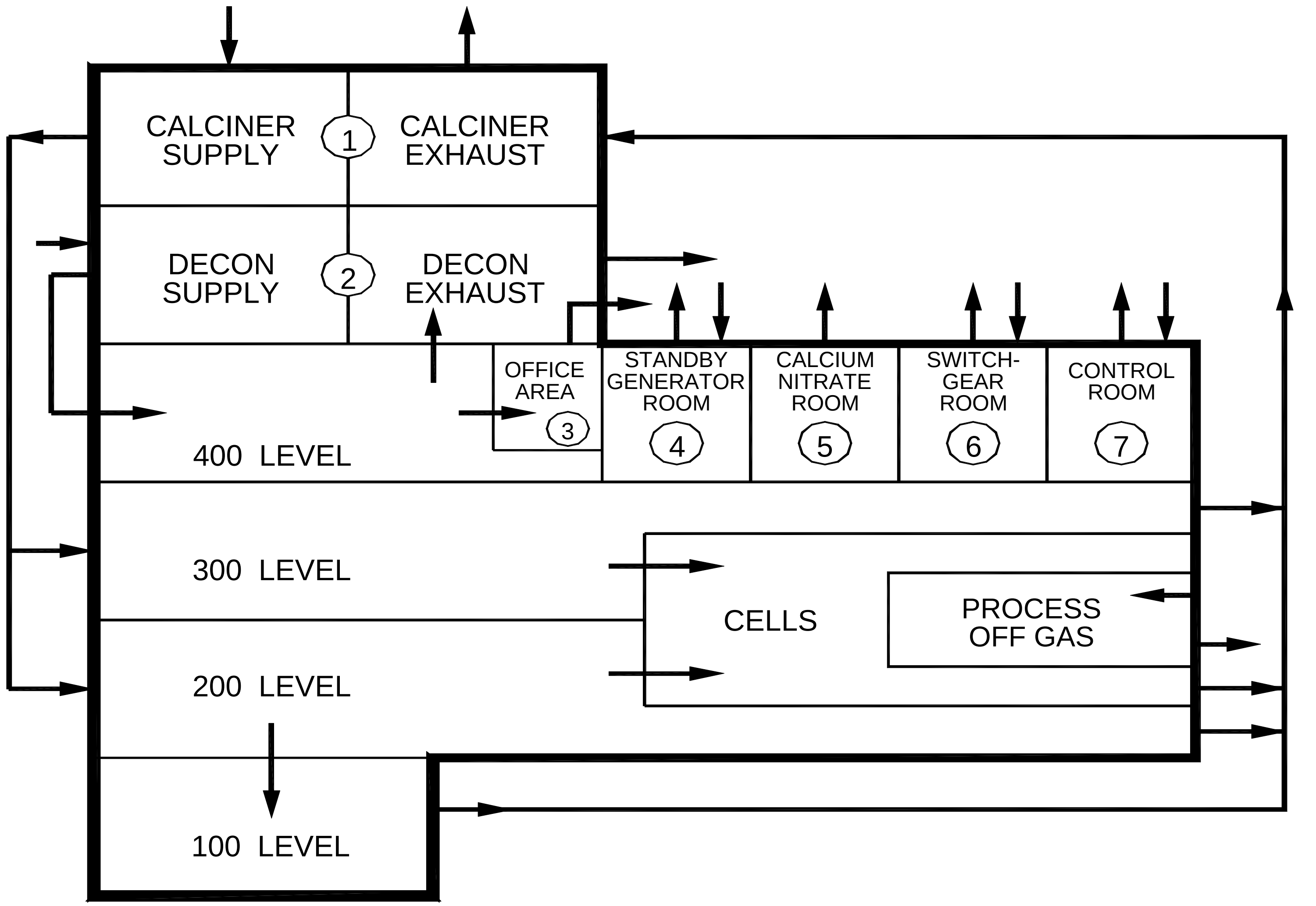
1. HEPA filter banks
2. Off-gas compressors
3. Distributed control systems (including operations control software)
4. Instrumentation
5. Associated piping.

NWCF CONFINEMENT VENTILATION SYSTEM SUPPORT SYSTEMS



NWCF confinement ventilation system support systems.

NWCF HVAC SYSTEM



NWCF HVAC system.

Decontamination Area CVS assessed include:

1. HEPA filter banks
2. Blowers
3. Distributed control systems (including operations control software)
4. Instrumentation
5. Associated ductwork.

Miscellaneous equipment that support these systems:

1. Plant air compressors (including the standby air receiver)
2. Uninterruptible power supply
3. Commercial power supply
4. Standby diesels (3) in CPP-1683.

Finally, the NWCF stack monitors were assessed.

The following portions of the NWCF were not included in the assessment, because the Calciner (NCC-105) is in standby. These supporting portions of the CVS should be assessed for operability if the decision is made to restart the Calciner.

1. Fluidizing air blowers
2. Fluidizing air preheaters
3. Auxiliary off-gas blower
4. Ventilation air cleanup cell
5. Calciner cell including vessel, cyclone, and off-gas scrub system
6. Off-gas cell
7. Adsorber cell (only those parts as required to support calciner operations)
8. Hot sump tanks cell (only those parts as required to support calciner operations).

Note that the approved safety analysis discusses NWCF standby power supplied by 2 diesel generators, 440-1 and 440-2. The functions of these diesels have been replaced by standby diesels (3) in CPP-1683. These diesels are under the control of Plant Projects and have not been turned over to INTEC Utility Operations. Additionally, the fire protection system at the NWCF was not assessed so that the team could directly focus on the CVSs and supporting systems.

Facility management was provided a DRAFT copy of this report to provide factual accuracy comments. In the case where the comment could not be resolved, the authors original text remains unchanged.

BACKGROUND

INEEL

The Idaho National Engineering and Environmental Laboratory (INEEL) was established in 1949, as the National Reactor Testing Station on land formerly used by the United States Navy as a weapons proving ground. The INEEL covers approximately 895 square miles on the Snake River Plain in southeastern Idaho. The INEEL's original mission was to build, test, and operate various nuclear reactors and associated facilities. The isolated location assured maximum public safety in the then unfamiliar area of nuclear research. Today the INEEL is a Department of Energy (DOE) multiprogram laboratory. The Environmental Management (EM) Program is currently the lead management program for the laboratory.

INTEC

One of the original missions of the INEEL was to reprocess spent nuclear fuel. This mission was accomplished at the Idaho Nuclear Technology and Engineering Center (INTEC), formerly known as the Idaho Chemical Processing Plant. INTEC is located approximately 42 miles west of Idaho Falls and 20 miles east of Arco, Idaho. The liquid radioactive waste generated from reprocessing spent nuclear fuel (raffinates) and decontamination operations was stored belowgrade in the INTEC Tank Farm.

Building CPP-659 (New Waste Calcining Facility)

The New Waste Calcining Facility (NWCF) (Building Number CPP-659) began hot operation in 1982. The NWCF uses a heated fluidized-bed calcination process to convert liquid radioactive waste into a dry granular product called calcine. The solid product from this process is pneumatically transported to the Calcine Solids Storage Facility (CSSF) for long-term storage. All of the high-level waste (HLW) was calcined by February 1998.

The NWCF is a concrete and steel structure approximately 250 feet long and 145 feet wide. It extends 57 feet belowgrade and 43 feet abovegrade. In general, NWCF design is based on a modular (functional isolation) concept to ensure the confinement of radioactivity. Traffic flow and ventilation within the plant are designed to prevent the spread of contamination from high- to low-concentration areas. The NWCF is designed to provide isolation and containment of radioactive material through multiple layers of confinement (primary, secondary, and tertiary confinement). The primary confinement is provided by process vessels and associated piping. This primary confinement provides isolation of radioactive materials during normal and abnormal operation. The secondary confinement barrier is the process cells and associated heating and ventilation (HV) systems, which together enclose the primary system. The building shell and the facility ventilation and filter system provide the tertiary confinement barrier.

Confinement/Ventilation System

Most NWCF HV systems are once-through air supply and exhaust systems that include air filters, air washers, heating and cooling coils, fans, dampers, ducts, and control instrumentation. The HV systems maintain confinement of radioactive materials through a multiple zone philosophy. Pressure differentials are maintained between the various building confinement zones and between the building and outside atmosphere. These pressure differentials ensure airflow is from zones of lesser contamination to zones of greater contamination. Normal exit for most of the ventilation air is through a prefilter and two stages of HEPA filters, and then out the NWCF ventilation exhaust stacks. Seven different HV systems serve the following locations in NWCF:

1. Calciner area
2. Decontamination area
3. Control room
4. Office area
5. Standby generator room
6. Calcium nitrate addition room
7. Switchgear room.

A brief description of these systems follows:

Calciner Area HV System – The HV system is designed to confine radioactive materials under normal and abnormal operating conditions. It is also designed to confine radioactive material to the lowest practicable level for protection of workers and the environment. The system is a once-through type and consists of two supply plenums, three supply blowers, two exhaust plenums, three exhaust blowers, and the associated ductwork and instrumentation. During normal operation, both supply plenums are operated at the same time. Each supply plenum is constructed with a HEPA filter to prevent release of activity if the system is pressurized in some manner. Each supply blower is rated at 50% of system capacity, so two supply blowers are normally run and are controlled from the control room. These blowers also have local controls. After the air supply leaves the blowers, it is supplied to the various contaminated cells through the ductwork. Each cell is provided with a manual and automatic damper. The automatic damper provides the necessary differential pressures and the manual damper is used for coarse adjustment of airflow. The exhaust ductwork leads to a scrubber system that removes corrosive vapors from the exhaust stream. After leaving the various cells and cubicles, the air goes to the calciner area HV system exhaust tunnels and then to the exhaust plenums. The exhaust ducts are stainless steel. All process cells exhaust ducts discharge to a common underground concrete duct that connects to the exhaust system plenums. Each of two exhaust plenums contains two banks of testable HEPA filters to protect against the release of radioactive contaminants. Three exhaust blowers are provided; two are normally run, while one is on standby. The exhaust discharges through the NWCF HV stack. Each exhaust plenum is provided with a radiation area monitor (RAM) and differential pressure detector. An isokinetic sampler diverts a small amount of airflow through a filter situated in front of a radiation detector for the system. The detector monitors for possible releases from the system and provides a warning when release limits are approached or exceeded.

Decontamination Area HV System – With the exception of those cells, cubicles, and equipment served by the calciner HV system, the decontamination area is served by the decontamination area HV systems. The main components of the system are a supply plenum and blower located inside the plenum; and two exhaust plenums and blowers with the associated ductwork and instruments. Supply air is pulled into the system through a louvered inlet. The supply blower is controlled from the control room. This blower also has local controls for starting and stopping the blower. After leaving the supply plenum, air is distributed to the decontamination areas. Manual and automatic dampers control airflow and differential pressure. Air then enters the decontamination area exhaust duct. The exhaust duct feeds into the two exhaust plenums, both of which are normally operated. Each plenum is equipped with a roughing filter and two HEPA filters in series. Instruments are provided across each stage of filtration to monitor pressure drop and each first stage HEPA filter is equipped with a RAM. The RAM alarms in the control room at a preset level of filter radioactivity. The two exhaust blowers supply exhaust air motive force. These blowers can also be controlled locally or from the control room. Normally, both plenums and blowers are operated together.

Control Room HV System – A separate HV system is provided for the control room to protect it from contamination and to maintain the proper temperature and humidity for the NWCF computer and control room electronics. The mechanical equipment for this system is located in a room adjacent to the control room. This system is normally run in the recirculation mode. Inlet air enters the system through an intake on the south side of the building. Two prefilters clean the incoming air. During normal operation, an air conditioning unit cools and dehumidifies the air. A blower integral to the unit provides the motive force. Air is exhausted to the outside through an outlet and an exhaust damper controls differential pressure. The control room is pressurized by this system, thus the possibility of contamination spread into the control room is small. A standby blower and air conditioning unit has been provided.

Office Area HV System – The offices and corridor in this section are ventilated and cooled by a once-through evaporative cooling system. The supply air for this system comes from the decontamination area supply plenum. After leaving the supply plenum, the air is supplied to the areas (divided into five zones) through the ductwork. After leaving the areas, the air is either recirculated or exhausted to the outside. A separate blower exhausts a constant air stream from the change room and toilet areas to outside atmosphere. Another blower provides motive force to recirculate or exhaust air from the remainder of the system. Manual dampers control airflow to the various areas.

Standby Generator Room HV System – A unique HV system is provided for the standby generator room to maintain the room free of contamination. The standby diesel generators in this room are no longer maintained to provide backup power to the NWCF.

Inlet air enters the room through an opening on the roof. This opening contains a filter to clean the incoming air. An inlet damper is throttled by a temperature indicator controller to maintain a preset range of room temperature. The inlet plenum houses a blower to provide the motive force. This blower is provided with both normal and standby power.

Calcium Nitrate Addition Room HV System – An electric-motor-driven exhaust blower mounted on the roof provides the calcium nitrate addition room HV. Two heater units with self-contained recirculation fans provide for movement of heated air when the room is in use and the roof mounted blower is controlled by local thermostat. Opening the roll-up door to the room provides inlet air.

Switchgear Room HV System – The switchgear room provides power to critical components and systems and the HV system protects the room from spread of contamination from other areas. The system provides for constant air changes to prevent the buildup of hydrogen and other battery off-gasses from the uninterruptible power supply located in the room. A filtered inlet on the roof of the building provides inlet air. The inlet has a normally closed damper, but bypass leakage is sufficient to make up for the air exhausted from the room. A temperature switch controls a normal and standby blower. These redundant blowers maintain the room below atmospheric pressure and provide for at least 200 standard cubic feet per minute (SCFM) air change. Only one blower is operated at a time.

An off-gas cleanup train that is backed up by the Atmospheric Protection System (APS) maintains process off-gas (POG) cleanup and confinement of the POG. The APS is beyond the scope of this assessment. The wet and dry NWCF process off-gas cleanup system is designed to collect entrained particulate and volatile ruthenium compounds from a gas stream flowing from the calciner vessel. Calciner off-gas passes from the wet portion of the scrubbing system to adsorber beds that collect unburned hydrocarbons and volatile ruthenium compounds. A mist eliminator downstream from the adsorbers provides for additional moisture control. The off-gas then passes through four parallel filter plenums, each containing one HEPA-grade prefilter and two HEPA filters in series. When loaded with solids, the filters are replaced remotely and transferred to the filter-handling cell. After passing through the final HEPA filters, the off-gas enters the off-gas blowers that maintain the necessary vacuum on the calciner system. The off-gas then travels underground to the APS and out the INTEC Main Stack.

Distributed Control System – Overall control of the NWCF is maintained from one control point, the control room, by means of a DCS. The DCS consists of several subsystems that operate simultaneously and independently to provide redundancy on critical systems.

The NWCF is controlled by a “MOD 300” DCS. The DCS is a microprocessor-based plant automation and information management system. The DCS is constructed of several individual subsystems (nodes). Each subsystem is a stand-alone computer, complete with one or more microprocessors, memory, power supply, etc. Critical subsystems have a backup microprocessor and multiple power supplies to provide redundancy in the event of a failure. By distributing control capabilities throughout several subsystems, the DCS is a masterless design where no single failure causes the entire system to fail.

ASSESSMENT RESULTS

The team came to the following conclusions concerning the NWCF CVS. The detailed results are contained in Appendix A. The results show that one of the maintenance CRAD and three of the surveillance and testing CRAD were not achieved. The implementation of the INEEL maintenance management program predictive and preventive maintenance programs and the need to provide accurate essential drawings for the NWCF are essential for long-term system operability. The surveillance and testing CRADs were not met because system operability tests of TSR-level controls have not been developed. Additionally, weaknesses were noted in the implementation of the HEPA filter testing program. The following is a summary of the assessment results in the four areas reviewed by the team.

SAFETY BASIS

Information concerning the safety functions of CVS SSCs relied on in the facility safety analysis for preventing/mitigating analyzed events are clearly documented. However, there are some questions regarding the necessity of some SSCs being classified as safety-significant SSCs. If the SAR and TSR are maintained in accordance with 10 CFR Part 830, Subpart B, the NWCF HVAC should be able to perform its intended function for the life of the facility (from the safety authorization basis perspective). Some deficiencies were noted during the assessment, but these are correctable and do not pose an immediate threat to the safety of workers, the public, or the environment.

CONFIGURATION MANAGEMENT

A review of the change control process being used, and a review of changes and work packages associated with recent NWCF HVAC upgrades showed that the changes were being adequately designed, reviewed, implemented, tested, and documented. Engineering design reviews are performed that are formal, technically substantive, and involve the appropriate technical disciplines. The unreviewed safety question (USQ) process is being used effectively to ensure changes are within the DOE-approved safety envelope for the facility, and that DOE review and approval are obtained when required. Applicable procedures appeared to be adequate and were being followed. This review confirmed general consistency among safety basis documentation, performance criteria, and surveillance requirements for HVAC components and subsystems. It was noted that essential drawings were not complete or walked-down. This effort was in progress, but requires significant attention.

In some cases, information necessary to document the technical basis or the design basis of components or subsystems of the existing NWCF configuration and installed safety systems, subsystems, and components are either not available or not readily retrievable.

MAINTENANCE

The Maintenance System portion of the assessment evaluated whether the NWCF CVS is maintained in a condition that ensures integrity, operability and reliability. Two Criteria were used for evaluation:

1. For the CVS, maintenance processes consistent with safety classification are in place for prescribed corrective, preventive, and predictive maintenance.

2. The system is periodically walked down in accordance with maintenance requirements to assess its material condition.

Criterion 1 was not met because a consistent preventive and predictive maintenance program is not in place at the NWCF that ensures long-term system operability. No facility master plan has been promulgated that will allow management to determine the type of maintenance program that will meet the yet undecided long-term mission assigned to the facility.

As discussed in the Phase I assessment, a system engineer is assigned to the NWCF HVAC system that understands the system and has been trained in accordance with the INEEL systems engineering documented program. The implementation of this training is not complete and further effort is required. In general, NWCF met the second maintenance criterion with noted opportunities for improvement.

SURVEILLANCE AND TESTING

The programmatic breakdowns resulting in failure to meet Criteria 2, 3, and 4 rendered the system surveillance and testing objective unattainable. Without TSR-level surveillances, operability of the NWCF confinement ventilation safety-significant SSCs could not be determined. Even if the surveillance-like requirements of the Operations Requirements Manual (ORM) were acceptable as controls for safety-significant SSCs, the breadth of the ORM was not sufficient to preserve the SAR-assumed performance levels for the NWCF confinement ventilation safety-significant SSCs. Furthermore, the technical directions and acceptance criteria for existing HEPA filter test procedures were determined to be less than adequate.

The DOE Idaho Operations Office did not aggressively document and resolve the HEPA filter service life issues elevated under DNFSB Technical Report 23. Mutually, the DOE-ID staff and contractor management knew the existence of the HEPA filter service life issue. Nevertheless, at least three DOE-ID and contractor assessments did not document the issue or provide technical justification for continued use of aging HEPA filters. Absent recognition of a HEPA filter service life issue and a documented technical resolution, no assurance of NWCF CVS performance could be credibly postulated.

The lack of TSR-level surveillances, the lack of adequate technical directions in test procedures, and the failure to recognize and resolve the HEPA filter service life issue of DNFSB Technical Report 23 caused the team to evaluate the surveillance and testing objective (as well as 3 of 5 of the criteria) as not met.

APPENDIX A: DETAILED DISCUSSION OF RESULTS

This appendix presents detailed discussion of the assessment and results for each objective.

Safety Function Definition

Objective:

Safety basis-related technical, functional, and performance requirements specific to the CVS (e.g., as discussed or cited in the facility safety analysis documents) are documented and maintained.

Criterion 1:

Safety/Authorization Basis documents identify and describe the CVS safety functions and the safety functions of any supporting systems.

Is the Criterion met?

Yes, with opportunities for improvement.

How the Review was Conducted:

The current Building NWCF SAR (SAR-103 Rev. 0), TSRs (TSR-103 Rev 0), and ORMs were reviewed. DNFSB Recommendation 2000-2 Phase I assessments prepared by INEEL and reviewed and approved by DOE-ID for subsystems comprising the CVS under review (see discussion of results below) were reviewed and used. Tours and walk-downs were conducted, and cognizant personnel were interviewed.

Interviews Conducted:

- NWCF Safety Analyst
- HVAC System Engineer
- DOE-ID INTEC High Level Waste Facility Engineer
- NWCF Shift Supervisor
- NWCF Facility Manager.

Documents Reviewed:

- Unreviewed safety questions:
    - NWCF Off-Gas Emissions Sampling Probe In-Situ Storage (01-USQ-SAR-103-002s)
    - NWCF HVAC Normal Operations INTEC-TPR-P8.2-B5 (01-USQ-SAR103-008s)

- MCP-1173 Package and Ship NWCF Off-Gas Emissions Samples for Analysis (00-USQ-SAR103-003s)
- TPR-5496 Sample NWCF Off-Gas for Emissions Characterization (00-USQ-SAR103-004s)
- NWCF Pre-filter Sample Transfer to RAL (00-USQ-SAR103-009s)
- NWCF [new flood analysis] (00-USQ-SAR103-010s).

- Ltr R. M. Stallman to R. N. Gurley "DOE Approval of Safety Documents for the NWCF and 6th CSSF" (OPE-CPP-96-07), August 1996
- Safety Evaluation Report NWCF, August 1996
- TSR-103 Rev 0, April 18, 2001
- INTEC General TSR Part 1 Rev 0, March 4, 1998
- Microfiche 98-0304-455, Plant Safety Document (PSD) 8.6 – Ltr R. M. Stallman to R. N. Gurley "DOE Approval of Stack Release Operational Requirements Manuals (ORM)," July 24, 1996
- Authorization Agreement INTEC NWCF, IAG-43, April 18, 2001
- ORMs 6.5.1.1-4, 6, 7 and 7.5.1.1-4
- Engineering Change File Index CPP-659 http://edms/edms/plsql/toto.ecf
- Ltr W. E. Jenson to R. N. Gurley to E. J. Ziemianski, "DOE Concurrence with LIMTCO ICPP ORM Format" (OPE-CPP-98-020)
- BBWI STD-1107 "Nuclear Safety Analysis Qualification Standard," Rev 1, June 2000
- SAR-103 Rev 0, April 18, 2001.

Discussion of Results:

For the two systems of concern at the NWCF, the following information is contained in the Building NWCF SAR (SAR-103 Rev. 0) and was used by INEEL in preparation of Phase I assessments. For these systems, the information is arranged as follows:

- System Name
- System Classification
- System Safety Function
- Accident Conditions and Assumptions under which system is to perform safety function
- System Functional Requirements and Performance Criteria.

System: Calciner and Decon Area HV System

System Classification: Safety-Significant

System Safety Function

The NWCF HV system removes radioactive particulate from the ventilation air under both normal and abnormal operating conditions.

Accident Conditions and Assumptions

The accident under which the Calciner and Decon Area HV systems must perform their safety function is the HVAC-Exhaust, HEPA-Filter Degradation.

Scenario Development – This scenario involves the accumulation of combustible material in the HVAC exhaust duct. An ignition source must be present to ignite the combustible material. The combustible material burns rapidly. The heat released from the fire is transferred through the HVAC exhaust duct, where the heat flows through the HEPA filters. The heat degrades the HVAC exhaust filter media, releasing the radionuclides.

Source-Term Analysis – Analyses of samples from the Tank Farm sodium waste from Tanks WM-180 and WM-181 were used as representative samples of future feed materials to the Calciner. An activity ratio was calculated using ^{137}Cs as a basis for the ratio, because sodium waste is the most representative of future campaign feed streams. The practice of using feed solutions to determine nuclide ratios on the filters has been used before. These ratios remain constant through the calcination process. The particulate nuclide ratio on the filters would be the same as for that in the Tank Farm. Volatile and gaseous effluent is released as it is produced and does not collect on the filters; thus, it was not included in the analysis. After the correct ratios were obtained, ^{137m}Ba (which occurs in equilibrium with ^{137}Cs) was used to estimate an approximate dose at the detector location. When this approximation appeared close, the activity of ^{137}Cs was determined, the ratios were applied, and the dose was calculated and adjusted to obtain the desired result of 150 mrem/h and 20 mrem/h. The dose rate was determined using the computer code, MicroShield. The filters are changed when a radiation reading from a RAM, which is permanently placed within the HEPA filter array, reads 150 mrem/h for the calciner side or 20 mrem/h for the decontamination side. The radiation limit for the decontamination side is lower because the buildup of radionuclides is very low. Because of the lower radiation limit, a stack monitor was not required for the decontamination side stack.

Dose calculations for decontamination side filters are enveloped by the Calciner area filters. The RAMs are located approximately even with the top of the filter arrays. These readings were used to calculate the activity present on the filters for the accident analysis. To exceed a dose of 0.5 rem at the site boundary from filter degradation, the filters would have to exceed 4.6 rem, which is an unacceptable operating condition (see the Opportunity For Improvement section below).

The first set of filters is prefilters arranged in an array approximately 366 cm (12 ft) in height, 10 cm (4 in.) in width, and 427 cm (14 ft) in length. The effluent from this set of filters passes through an array of two sets of final filters with the same dimensions as the first set.

The resolved curie loading from MicroShield analysis was then input into the Radiological Safety Analysis Computer (RSAC-5) code. Calculations were completed for various on-site locations and at the site boundary.

The on-site locations were analyzed for an effective dose equivalent (EDE) resulting from inhalation, cloud immersion, and exposure to ground surface contamination. Off-site locations included the EDE accrued from ingestion of radioactive materials in addition to the pathways listed above. The EDE for on-site locations was determined using the criteria from the DOE Radiological Control Manual. Doses were calculated according to an occupational exposure period. The EDE at the off-site location was determined using the criteria of DOE Order 5400.5.

System Functional Requirements and Performance Criteria

- **Functional Requirement.** RAMs shall be inspected for operability once per shift.

- **Performance Criteria.** The HV system exhaust filter radiation instruments (RAM-NCM-953-48, -55, -56, and -57) shall alarm at or below 150 mrem/h for the calciner area HV system and 20 mrem/h for the decontamination area HV system.

<u>Opportunities for Improvement:</u>

AB1 Facility Safety Evaluation Report (SER) was not transmitted to the contractor as required by DOE O 5480.23 7.b (2). This had not been the practice for this facility until recently.

AB2 Systems identified as safety-significant SSCs are not controlled at the TSR level as required by DOE O 5480.22. Several SSCs were identified in the NWCF SAR as safety-significant, even though there was no accident scenario that resulted in exceeding (or challenging) DOE-ID evaluation guidelines (EGs). The SSCs were in fact, elevated to the safety-significant SSCs level for defense in-depth of the facility. The resulting controls for these safety-significant SSCs are however, a “Safety Commitment.” Safety Commitments are maintained in a Contractor-approved “Operations Requirements Manual.” This is not identified as a major facility finding (requiring operations shutdown) for the following reason. It is clear from the accident analysis that those safety-significant SSCs were classified as such for defense-in-depth reasons and not because DOE-ID EGs were being challenged. Another look at these systems could result in their reclassification. (See S&T 2)

AB3 TSR or Safety Commitment controls cannot be used as mitigators in the Accident Analysis Section of the SAR. Section 3.4.2.2.2 is the source term analysis section for the HVAC Exhaust, HEPA-Filter Degradation Accident. This section states “The filters are changed when a radiation reading from a RAM, which is permanently placed within the HEPA filter array, reads 150 mrem/h for the calciner side or 20 mrem/h for the decontamination side.” This section then goes on to state, “To exceed a dose of 0.5 rem at the site boundary from filter degradation, the filters would have to exceed 4.6 rem, which is an unacceptable operating condition.” The implication here is that without a control, the off-site exposure could exceed the DOE/DOE-ID EGs. This is contrary to DOE-STD-3009. Again, this is not identified as a major facility finding (requiring operations shutdown) for the following reason. The last SAR statement above “To exceed a dose… which is an unacceptable operating condition” is a statement of conjecture and not a statement of fact. The facility needs to perform a USQ evaluation, per DOE O 5480.21, using an unmitigated analysis using concretive maximum <u>credible</u> HEPA filter loading. This may be more or less than the value currently quoted in the SAR.

Note: The knowledge of the system engineer, facility management, and facility Operations supervisors was exemplary. This was judged to be commendable, but not to rise to the level of a Noteworthy Practice.

<u>Noteworthy Practice:</u>

None.

There were no noteworthy practices in this area.

Configuration Management

Objective:

Changes to safety basis-related requirements and documents, system configuration and installed components are controlled.

Criterion 1:

Changes to CVS safety basis requirements, documents, and installed components are designed, reviewed, approved, implemented, tested, and documented in accordance with controlled procedures.

Is the Criterion Met?

Yes, with opportunities for improvement.

How Review Was Conducted:

The review was conducted via interviews with facility and program management, engineering, including system engineering, and maintenance personnel. A facility tour of NWCF Building CPP-659 CVS including: Calciner and decon supply and exhaust, the control room, the switch gear room and the standby generators, including the NWCF new power distribution switch-gear and associated gear, was conducted. This included a tour of the building and the control room that contains the three diesel generators that will provide the NWCF standby power.

The NWCF HVAC has 22 essential drawings. Two of these drawings have been walked down and as-built. The system engineer selected a third drawing (Air Flow Diagram Decon Area) for a formal walk-down by the configuration management team. A walk-down of the system was performed. The team did not climb up to inspect the overhead piping and ductwork nor did the team enter the filter plenum housing. The review consisted of looking at all ductwork, components, and instruments listed on the drawing. This included a review of the instruments located in control room. In addition, the availability and accuracy of NWCF drawings, used by facility operators in the control room, were assessed. The system engineer was present during the walk-down to answer questions.

Engineering change controls, USQ screenings, Engineering Change Form (ECF) packages, and facility work orders were reviewed.

A review of Phase I VSS-1.3, “Configuration Management and Maintenance programs effectively ensure operational availability of the system,” was performed to evaluate the results of Phase I to Phase II. Specifically, a review was performed of the system engineers and their training, knowledge and understanding of their roles and responsibilities.

Procedures and other documents reviewed:

- PRD-115, “Configuration Management,” Revision 3, October 31, 2000
- STD-107, “Configuration Management Program,” Revision 1, November 17, 2000
- MCP-557, “Managing Records,” Revision 6, July 5, 2001
- PRD-5074, “Design Control,” Revision 2, June 1, 2001
- PRD-113, “Unreviewed Safety Question,” Revision 4, October 1, 2001
- MCP-123, “Unreviewed Safety Question,” Revision 4, October 1, 2001
- MCP-538, “Control of Non-Conforming Items,” Revision 12, August 23, 2001
- MCP-540, “Documenting the Safety Category of Structures, Systems, and Components,” Revision 13, March 2001
- MCP-2374, “Engineering Analysis,” Revision 17, June 27, 2001
- MCP-2377, “Development, Assessment, and Maintenance of Drawings,” October 19, 2000
- MCP-2449, Nuclear Safety Analysis,” Revision 3, April 5, 2001
- MCP-2795, “Master Equipment List,” Revision 3, September 19, 2001
- MCP-2811, “Design Control,” Revision 7, June 18, 2001
- MCP-2869, “Construction Project Turnover and Acceptance,” Revision 9, December 4, 2000
- MCP-2987, Chapter XVIII, “Equipment and Piping Labeling,” August 24, 1999
- MCP-3056, “Test Control,” Revision 2, August 6, 2001
- MCP-3534, “Use of Professional Engineers,” Revision 2, September 10, 2001
- MCP-3572, “System Design Description,” June 6, 2001
- MCP-3573, “Vendor Data,” Revision 2, August 20, 2001
- MCP-3574, “Management of Data in the Configuration Management Database,” Revision 1, October 19, 2001
- MCP-3630, “Computer System Change Control,” Revision 3, August 6, 2001
- MCP-3772, “Dedication and Equivalency Evaluation of Commercial Grade Item,” Revision 4, August 9, 2001
- MCP-9185, “Technical and Functional Requirements,” Revision 0, June 18, 2001
- MCP-9217, “Design Verification,” Revision 0, June 18, 2001
- MCP-6402, “Master Equipment List and Maintenance History,” Revision 2, September 19, 2001
- MCP-2482, “Inspection for Conformance,” Revision 10, June 1, 2001
- SAR-100, “INEEL Standardized Safety Analysis Report (SAR) Chapters,” Revision 0, June 27, 2000
- SAR-103, “Safety Analysis Report New Waste Calcining Facility,” Revision 1, October 16, 2001
- TSR-103, “Technical Safety Requirements New Waste Calcining Facility,” Revision 0, April 18, 2001
- Drawing 13367, “Air Flow Diagram Calciner Area,” Revision 4
- Drawing 13368, “Air Flow Diagram Decon. Area,” Revision 5
- Drawing 13369, “Air Flow Diagram Decon. Area,” Revision 4
- Drawing 133172, “Air Flow Diagram Decon. Area,” Revision 5

- Drawing 133200, “Process and Instr. Diagram Decon. Exhaust Air System,” Rev. 18,
- IAG-43, “U. S. Department of Energy Idaho Operations Office and Bechtel BWXT, LLC Authorization Agreement for the INTEC New Waste Calcining Facility,” Revision 2, April 18, 2001
- LST-112, “Authorization Basis for INTEC New Waste Calcining Facility,” Revision 3, April 18, 2001
- LST-136, “INTEC Quality List,” Revision 0, February 1, 2000
- LST-164, “INTEC NWCF Essential Drawing,” May 3, 2000
- INEEL Systems Engineer Competency Commensurate with Responsibility (CCR)
- System Engineer Employee Position Description
- Component Engineer Employee Position Description
- Preventative Maintenance System – September 2000 Report
- Preventative Maintenance System – October 2000 Report
- Work Order Package No. Q04582701, Monthly PM on BIO-OGF-202, Completed August 7, 2001
- Work Order Package No. 00045572 01, Annual PM on BLO-NCD-287-2, Blank Work Package
- PLN-677, “INTEC Configuration Management and Design Recovery Plan,” Draft
- PLN-576, “INTEC Configuration Management Plan for the NWCF Control System DCS-NCC-901,” Rev 1, April 6, 2000
- The Phase I--Assessment of Operational Readiness of INTEC Vital Safety Systems

Tours and Walk-downs:

- Tour of NWCF, Building CPP-659
- Review of modification to Power Distribution Center including new and old distribution center and diesels
- Walk-down of the Process and Instrument Diagram Decon. Exhaust Air System, Drawing 133200, an essential drawing for the HVAC system.

Interviews:

- Chief Engineer
- NWCF System Engineer
- HVAC System Engineer
- PAAA/Compliance
- NWCF Engineering Data Configuration Management Tech Lead
- Configuration Management Subject Matter Expert
- Preventive Maintenance Manager
- Utility Operations Manager
- Utility Engineering Supervisor
- INTEC Power Operations Technical Lead
- Diesel Generator Operator
- DCS System Engineer
- DCS Subject Matter Expert

- Control Room Operators
- Competency Commensurate with Responsibility (CCR) INEEL System Engineer

Discussion of Results:

The NWCF Authorization Agreement documents IAG-43 and LST-118 provide a discussion of the basis for the facility operations. SAR-103 and TSR-103 provide the detailed analysis of the facility safety basis.

To control changes and modifications at the facility, “MCP-2811, Design Control,” is used for requesting, reviewing, approving, and conducting work activities at the INEEL, specifically, at NWCF. In addition, PRD-113, “Unreviewed Safety Questions,” and MCP-123, “Unreviewed Safety Questions,” provide guidance for evaluating proposed activities for potential USQs. These processes and guidance are in place to assure that work activities conducted in NWCF are properly requested, reviewed, and authorized before being performed and such work activities are performed in a formal and deliberate manner, with emphasis on safety.

Changes to the NWCF nuclear facility are controlled by MCP-2811 (Figure 1). The following steps are followed when making a change or modification to the NWCF:

- Determine if change is to a configuration-managed SSC
- If yes, obtain an ECF number from the ECF numbering and tracking system
- Determine if a registered professional engineer is required for the change
- Perform a technical risk screen of the change and determine if it is a “Low” or “Medium/High” risk
- Develop technical and functional requirements
- Perform USQ-NRC Screen
- Perform USQ-DOE Screen
- Determine if Environmental Check list is required
- Obtain Engineering manager approval of design input documents
- Identify and/or develop required documents
- Design engineering change
- Verify design and obtain Engineering manager and nuclear facility manager approval
- Procure equipment and fabricate
- Complete essential document prior to turnover to Operations
- Obtain nuclear facility manager approval of design
- Complete documentation and close out ECF with Engineering manager approval.

AND APPROVAL PROCESS FOR
ENGINEERING CHANGE CONTROL

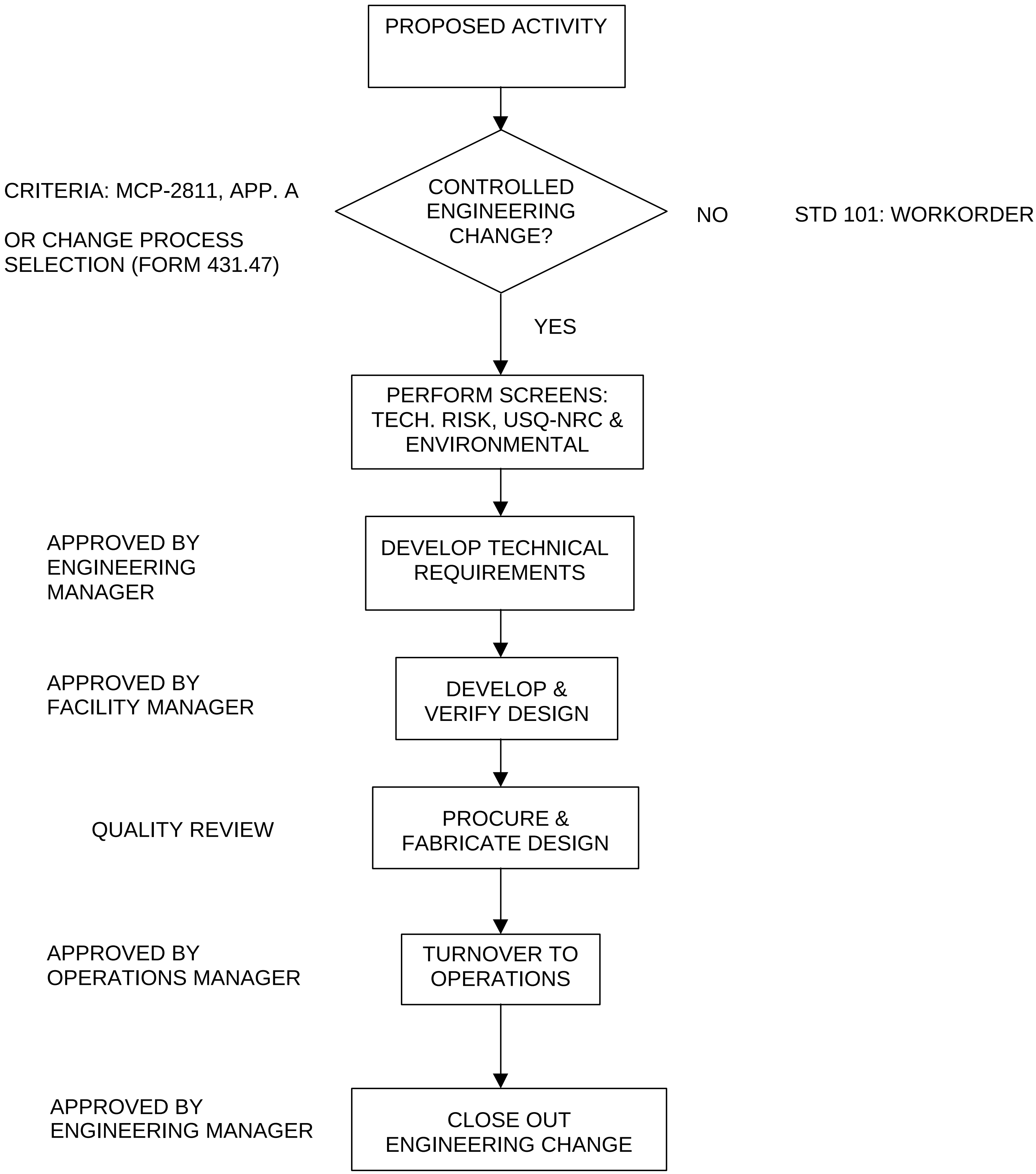


Figure 3. Flow chart of the review and approval process for engineering change control.

Interviews with cognizant personnel, review of work packages, and USQ screens indicate that NWCF HVAC modifications are being designed, reviewed, approved, implemented, tested, and documented in accordance with the INTEC and USQ procedures. Specific discussion of the approval process for the DCS is provided in Criterion 5. Interviews, documented reviews, and walk-downs indicate that the facility has formal programs in place to maintain the HVAC configuration management. Both Engineering and facility work packages are prepared and work is performed in accordance with company procedures.

Documentation of components from safety basis systems is required. Safety systems and components of those systems must be categorized and documented in a Q-List, as required by MCP-2449, "Nuclear Safety Analysis." MCP-6402, "Master Equipment List and Maintenance History," requires that a Master Equipment List (MEL) be maintained. MCP-540, "Documenting the Safety Category of Structures, Systems and Components," and MCP-3574, "Management of Data in the Configuration Management Database," require that safety SSCs be listed in the configuration management database.

NWCF HVAC equipment has not been maintained in the MEL. Currently, NWCF is entering this equipment information into the Passport system, a new maintenance management tool. Additionally, the facility has begun populating the Configuration Management database with several thousand system components. This information will have to be compared to the MEL as it is developed and to the Q-list as appropriate.

During testing of the new Electrical and Utility System Upgrade (EUSU) generators (GEN-WCS-002, -004, and -006 in CPP-1684) SUPS-NCM-830 at NWCF shut down. This UPS supplies power to the NWCF DCS, which controls the ventilation system. (The NWCF DCS is the only load on SUPS-NCM-830.) There is concern that failure of the UPS could result in contamination spread at NWCF due to loss of control of the ventilation system.

In late September 2001, testing was performed on the new EUSU standby power system. Commercial power to INTEC was shut off and the generators were brought on line. While standby power from the generators was being fed to NWCF, SUPS-NCM-830 automatically isolated itself from incoming power. The UPS continued to supply power to its loads from its battery bank. (It was reported in the INTEC Daily Plant Summary that "the NWCF UPS will not charge when supplied with stand-by power.")

It is believed that problems with the quality of power being supplied from the generators (excessive noise, harmonics, phase or voltage problems) caused the UPS to trip offline to protect itself. The Sabina variable frequency drive controllers for the main service waste pumps in CPP-797 (P-YDA-216, 217, 218, 219) also tripped offline while being fed power from the new generators during the test. Both the UPS and the Sabina's worked sufficiently with power from the existing generators.

Engineers responsible for the UPS at NWCF are in the process of obtaining some power analyzing equipment. The plan is to repeat the generator test with the analyzer connected to the feed to the UPS.

If power to the DCS is shut off, the outputs will de-energize. The effect this will have on devices controlled by the DCS is dependent upon individual configurations. Some valves or dampers will close, while others will open. Some blowers will stop, while some will continue to run. The default state of individual devices can be determined from the drawings and DCS configuration. These drawings and the DCS configuration were designed to minimize the spread of contamination under the loss of power to the DCS. In 1997, power was inadvertently shut off to the DCS (see Critique 97-039). The supply blowers stopped, the exhaust blowers remained running, and the cell inlet dampers closed. Surveys after the incident revealed that no contamination spread occurred.

It is highly undesirable to shut off the DCS. In some circumstances, this means that work must be performed while the power remains on, or “hot,” to avoid shutdown of the DCS. An example would be addition of a new load to the breaker panel feeding the DCS (a job like this was performed “hot” in 1997).

The DCS has some 120 VAC outputs, such as outputs to solenoids. These 120 VAC outputs cannot be locked out without shutting down major portions of the DCS. Rather, the outputs can be physically isolated and tagged out. To do this, a relay is removed and replaced with a specially made “dummy” relay. The dummy is prominently labeled, has provision for connecting a tagout tag, and has no electrical connections.

There are a number of USQs related to the standby power system, including “Modifications of Substations and Load Centers – Potential Loss of Power,” “Third Generator Added to Substation 60,” “Testing of the Three Generators Located in Substation 60 Will Disrupt the Electrical Power to Supplied Nuclear and Nonnuclear Facilities,” and “Standby Power Readiness.” No safety problems were identified.

EDF-0426 for Project 015692 describes an analysis of paralleling GEN-NCM-440-1, -2, and GEN-CFG-001 to supply all INTEC standby loads. The EDF concluded that harmonics and grounding will not be a problem.

EDF-1622 analyzes the potential for harmonic and grounding problems expected when paralleling the three generators in Sub 60. Apparently, harmonics problems and circulating currents in the neutral were encountered during operational testing of the original two generators in Sub 60. The EDF includes various recommended grounding schemes to minimize (but not eliminate) problems. The EDF also stresses the need to keep the loads on the three generators balanced.

There is a phase rotation mismatch problem at NWCF that most likely has no effect on the current configuration. NWCF was never able to parallel the GEN-NCM-440-1 and GEN-NCM-440-2 or use 440-2 as a backup to supply standby power because of this mismatch problem. To use these generators, extensive wiring changes would be required. The EUSU solved the problem by abandoning 440-2 and transferring its loads to other panels.

System Operability Issues or Concerns:

None.

Opportunities for Improvement:

CM-1 A number of the NWCF HVAC SSCs are listed in the facility Q-List and in the configuration management database, but the list and database are neither complete nor in accordance with MCP-540 and MCP-2449.

CM-2 The NWCF HVAC is a large, complex system. The new power distribution system is also a large complex system that has been under development and construction for several years. Additionally, the power distribution system is being brought on line as portions of the system are completed. Additional system testing and operator, engineer, and management training are required to better understand the impacts of the new power distribution system and standby power on the NWCF HVAC system.

Noteworthy Practices:

CM-1 The configuration management program is well-documented in company and Site-wide procedures that capture the requirements of the M&O contract.

Recommended Changes to Assessment Criteria and Guidelines:

None.

Criterion 2:

Limited technical walk-down of selected system components verifies that the actual physical configuration of these components conforms to design and safety basis documents for the system.

Is the Criterion Met?

Yes, with an opportunity for improvement.

How the Review Was Conducted:

See "How Review Was Conducted" section under Configuration Management Criterion 1.

A review of the essential drawings at the NWCF revealed that 8% have been red-lined/walked down.

The HVAC system has 22 essential drawings. Two of these drawings have been walked down.

The team discussed the general requirements of a system walk-down with the system engineer. The HVAC system essential drawings were reviewed and Drawing 133200, "Process and Instrumentation Diagram—Decontamination Exhaust Air System," Revision 18, was selected for walkdown. The drawing was last assessed on April 23, 1996.

The system engineer explained his roles and responsibilities with respect to the as-building of essential drawings as defined in MCP-2377, “Development, Assessment, and Maintenance of Drawings.” The team walked down the Decontamination Exhaust System and compared the actual configuration with the current drawing.

Discussion of Results:

The actual decontamination exhaust system configuration had a number of differences from the drawing. The confinement structure enclosing the two HEPA filtration units is not depicted on the drawing. The confined space is a radiological area that requires permission and personal protection equipment for entry. The area was not entered.

This structure contains numerous drains and instrumentation penetrations that were not shown on the drawing. Features and instrumentation that were shown were not depicted in the proper location that would allow a determination of whether or not entry into the radiological area would be required to perform maintenance.

In general, equipment labeling was not in accordance with the requirements of MCP-2987, Chapter XVIII—Equipment and Piping Labeling. Labels were not present, inappropriate labeling materials were used, and labels were not securely attached.

System Operability Issues or Concerns:

None.

Opportunities for Improvement:

CM-3 The Decontamination Exhaust Air System drawing had many deficiencies and the system labeling was not in accordance with company requirements. The facility should as-built/walk-down all NWCF HVAC essential drawings as soon as possible.

CM-4 The system engineers assigned to the NWCF require additional instructions on their roles and responsibilities. Additionally, the system engineers seem to have too many assignments unrelated to the system that detract from their ability to meet their primary system engineering responsibilities. The facility needs to evaluate their systems engineering program and assure it complies with the systems engineering requirements.

Noteworthy Practice:

CM-2 The interviewed system engineers displayed in-depth technical and operation knowledge of their respective system.

Recommended Changes to Assessment Criteria and Guidelines:

None.

Criterion 3:

Changes to the CVS safety basis requirements, documents, and installed components conform to the approved safety/authorization basis (safety envelope) for the facility; the appropriate change approval authority is determined using the Unreviewed Safety Question (USQ) process. Consistency is maintained among system requirements and performance criteria, installed system equipment and components, and associated documentation.

Is the Criterion Met?

Yes, with opportunity for improvement.

How Review Was Conducted:

See "How Review Was Conducted" section under Configuration Management Criterion 1.

Discussion of Results:

The Configuration Management process at the INEEL was developed using the guidance provided in DOE-STD-1073-93, "Guide for Operational Configuration Management Program." The company procedure implementing that process is MCP-2811, "Design Control." The procedure defines the process to maintain consistent and accurate design requirements, documentation and physical configuration of newly designed or modified configuration-managed SSCs. The procedure provides direction for obtaining the necessary reviews and approvals. All changes to SSC in Nuclear, Moderate-Hazard or High-Hazard facilities are screened for USQs using MCP-123, "Unreviewed Safety Questions."

NWCF has maintained control of changes and modifications to the HVAC system, but has not prepared or maintained system descriptions. INTEC has prepared a legacy recovery program, PLN-677, "INTEC Recovery Plan." The NWCF requires an "Adjusted Technical Baseline Recovery." The recovery will assure complete consistency of design basis requirements, documentation, and physical configuration. Several system descriptions have been prepared and are ready for issue. These documents refer to new safety analysis documents that have not been approved. When DOE approves these SARs the system description documents will be issued. Specifically, the HVAC DCS has an outdated system description that is included in the old NWCF SAR. This system description does not adequately describe the current system.

System Operability Issues or Concerns:

None.

Opportunities for Improvement:

CM-5 The NWCF recovery plan should be implemented as planned. Those system descriptions that have been prepared should be revised and issued as soon as possible. The new HVAC and DCS description should be developed.

Noteworthy Practices:

None.

Recommended Changes to Assessment Criteria and Guidelines:

None.

Criterion 4:

Facility procedures ensure that changes to the CVS safety basis requirements, documents, and installed components are adequately integrated and coordinated with those organizations affected by the change.

Is the Criterion Met?

Yes.

How the Review Was Conducted:

See “How Review Was Conducted” section under Configuration Management Criterion 1.

Discussion of Results:

A review of company-level and site area procedures and documents indicates that there is a clear process in place to ensure that changes to the CVS requirements, documents, and installed components are controlled and adequately integrated and coordinated with affected organizations.

The procedure establishes the system engineer as the lead member of the design change team and requires the system engineer to coordinate the entire change process from initiation through installation and closeout.

System Operability Issues or Concerns:

None.

Opportunities for Improvement:

None.

Noteworthy Practice:

None.

Recommended Changes to Assessment Criteria and Guidelines:

None.

Criterion 5:

The quality of computer software used in system components or functions is assessed, documented, and maintained.

Is the Criterion Met?

Yes, with opportunities for improvement.

How the Review Was Conducted:

An interview with the NWCF CVS, systems engineer, and the DCS subject matter expert was conducted. This interview included a complete discussion of the system and the process for developing and implementing changes. A review of the approval process used to authorize changes was also assessed.

Discussion of how the review was conducted is located in the "How Review Was Conducted" section under Configuration Management Criterion 1.

Discussion of Results:

The NWCF CVS operations are controlled by a DCS. The current system is based on an 8086 central processing unit (CPU) installed in 1984 through 1985, with system startup in 1986. The CPU for this system will be replaced with newer equipment later this fiscal year. The software for the operating system is supplier proprietary and is included with the hardware (CPU) provided by the supplier, while all the control software is developed and programmed inhouse. Years of operations and designated testing have proven the effectiveness of the software.

The facility has a simulator that represents the systems operated by the DCS. This simulator is used to verify changes to the DCS programming or modifications to the operating systems. The DCS upgrade group is planning to use the simulator to test the new DCS modifications and to verify the software. In this way they plan to change out the hardware and complete the startup testing and systems operability (SO) testing in one day. The SO tests have not been written nor is there a plan and schedule for this project.

One person has performed most of the DCS programming for the current system and for the new system. Programming and changes to the DCS software are controlled in accordance with INEEL and facility change control processes. System reviews of the program and program usage have been reviewed by Operations, Quality Assurance, and Configurations Management organizations, but no independent review has been performed by an organization with technical and/or programming knowledge.

System Operability Issues or Concerns:

The plan to use the simulator for the verification of the DCS software is a noteworthy practice. However, it is not obvious that the simulator can truly represent the operations of the actual operating systems. The NWCF should prepare a test program to assure that, during the acceptance testing after installation of the new equipment and software, all functions and controls perform as expected.

Opportunities for Improvement:

CM-6 The new DCS programming should be independently reviewed by an organization that is knowledgeable in DCS programming.

Noteworthy Practice:

CM-3 The use of the simulator is a very good tool to develop and verify new activities and processes. This can save many hours of time without impacting plant operations. This description document could also be used as the basis for developing operator training.

Recommended Changes to Assessment Criteria and Guidelines:

None.

System Maintenance

Objective:

The system is maintained in a condition that ensures its integrity, operability and reliability.

Criteria:

1. For the confinement ventilation system, maintenance processes consistent with safety classification are in place for prescribed corrective, preventive, and predictive maintenance.

2. The system is periodically walked down in accordance with maintenance requirements to assess its material condition.

Is the Criterion met?

1. No, the criterion is not met. There are significant opportunities for improvement.

2. Yes, the criterion is met with opportunities for improvement.

How the Review was Conducted:

(A) The CVS of the NWCF facility was walked down. Deficiencies and lines of inquiry were identified based on this visual inspection. Lines of inquiry were structured to follow Paragraphs 1-1 through 2-4 of the System Maintenance section of the "Assessment Criteria and Guidelines to Ascertain the Current Condition of Confinement Ventilation Systems In Defense Nuclear Facilities," dated August 2001.

(B) The performance of predictive maintenance activities (vibration analysis) was observed. Rotating equipment was closely inspected.

(C) Interviews with the following personnel were conducted:

- Facility Manager
- HVAC System Engineer
- Predictive Maintenance Engineer
- Rotating Equipment Cognizant Engineer
- Facility Electrical Engineer
- Planning and Scheduling Supervisor.

Interview questions were based on items noted during; the CVS Walk-down, the observation of predictive maintenance activities, and the approach outlined in Paragraphs 1-1 through 2-4 of the System Maintenance section of the "Assessment Criteria and Guidelines to Ascertain the Current Condition of Confinement

Ventilation Systems In Defense Nuclear Facilities," dated August 2001. Facility personnel were afforded the opportunity to provide documentation pertaining to the lines of inquiry.

Discussion of Results:

Background:

Maintenance management at the INEEL has been historically decentralized by program and facility area. DOE-ID revised its maintenance policy in August 2000, by issuing ID 0 433.A. This order requires the establishment of a single maintenance management program using DOE O 4330.4B as the base standard. This policy also makes no distinction between types of facilities and prescribes the eighteen elements of Chapter II, DOE 4430.4B as the foundation of the maintenance program. Both ID O 433.A and DOE 4330.4B are incorporated in the Bechtel BWXT Idaho, LLC (BBWI) contract as "List B" requirements.

In addition to revising its maintenance program requirements, DOE-ID has also established fee-bearing performance measures in the BBWI contract, specifically pertaining to maintenance. fiscal year (FY) 2001 measures included requiring the contractor to develop and implement a revised maintenance management program and to improve maintenance execution relative to preventive maintenance (PM) completion rates and a reduction in the mean time to repair for high-priority work. FY 2002 through FY 2004 measures include on-schedule completion of approved Maintenance Implementation Plan (MIP) actions, completion of configuration verification of MELs, inclusion of MELs in the automated maintenance database, and continued emphasis on PM completion and mean time reduction.

The INEEL management and operating (M&O) contractor has completed development of a new maintenance program, which became effective on September 26, 2001, and was in the process of implementation at the time of the review. MIPs including plans for INTEC, were submitted to DOE-ID for approval and were undergoing DOE-ID review. If the actions to close the gaps identified in the MIPs are completed, the program will meet local maintenance management requirements.

The calcining operations within NWCF have been shut down, but a final determination regarding facility disposition has not been made. The lack of such a decision makes the determination of the appropriate level of calcining inactivation, and the corresponding maintenance requirements nearly impossible for facility personnel to establish. This uncertainty has largely resulted in postponement of all but essential maintenance (required by TSRs) in the calcining portion of the facility. Facility personnel have compensated for this situation by adopting an operational philosophy that no actions will be taken that may compromise future decisions.

Based on Detailed Work Plan information provided by the contractor, maintenance appears to be directed to breakdowns rather than a balance of predictive, preventive, and corrective actions. It is unlikely that breakdown maintenance alone will be adequate to preserve the noncalcining portions of the facility for the remaining projected 15 years of facility life.

Notwithstanding the recent changes in INEEL maintenance policy and practices, DOE O 4330.4B has been applicable to NWCF as a Category II Nuclear Facility since the order was issued in 1994. Accordingly, the review expectation was that NWCF should be operated and maintained in accordance with DOE O 4330.4B. The review team found that full compliance with this order was not achieved or maintained at this facility.

- The existing NWCF MIP was dated 1992 and was not maintained in accordance with DOE O 4330.4B. Actions planned in this document and approved by DOE-ID were not completed as scheduled. Most notable was the MEL, which the contractor planned to have completed in 1995, but still has not accomplished. The proposed MIP for INTEC now shows this activity going out into 2004. A configuration-verified MEL is considered essential to a functional maintenance program.

- While maintenance work control processes are in-place within STD-101, other maintenance processes required by DOE O 4330.4B, particularly regarding PM's, predictive maintenance, trend analysis, facility inspections, etc., are only now being implemented within the new maintenance management program.

- The facility could not provide evidence of effective management of maintenance backlogs. Multiple sources had to be researched.

- The facility makes limited use of predictive maintenance techniques, mainly in the vibration analysis of rotating equipment; however, it appeared that this function is currently not being utilized to its full potential. The team also could not verify that vibration analysis was consistently incorporated into equipment history files or that the cognizant engineer was receiving effective feedback.

- Maintenance work is initially prioritized in accordance with STD-101, "Integrated Work Control Process." System engineers then coordinate with the facility manager to establish a facility priority list that is then coordinated with the overall INTEC schedule.

- Facility personnel interviewed were knowledgeable and responsive. The facility manager was aware of performance measures and issues and conducts weekly facility zone inspections.

Criterion 1:

For the NWCF CVS, maintenance processes consistent with safety classification are ***not*** in place for prescribed corrective, preventive, and predictive maintenance.

The following issues/deficiencies were identified:

- The facility has not developed and maintained a configuration-verified MEL or other essential maintenance elements as required by DOE O 4330.4B. A MEL is considered the vital hub for maintenance processes.

Corrective Maintenance:

- Duct Tape Used on HVAC Ductwork. The NWCF does not have a policy on temporary repairs; specifically, the use of duct tape in the ventilation system. The team identified the use of duct tape patches on the clean air supply plenum. Maintenance history and the system engineer did not have any record of this temporary repair.

- Teflon Tape Used as a Thread Sealant. Teflon tape was used as a thread sealant throughout the ventilation system. The team leader observed one Parker – Hannefin-style tube fitting sealed with Teflon tape. The contractor was unaware of the potential problems of using Teflon tape as a thread sealant in high-radiation areas. The facility did not have a policy on Teflon tape usage.

- Machinery Alignment Practices on Belt Driven Equipment. The blowers and motors in the NWCF CVS are belt-driven. The belt span between the motor and blower sometimes exceeds 36 in. The contractor stated that a simple straight edge was used to perform alignments between the sheaves of the blower and motor. The contractor was unaware that available laser alignment or reverse dial equipment could be utilized for superior belt-drive equipment alignments. The use of straight edge alignment devices does not provide a good alignment of the belt sheaves. Misalignment produces vibration, which in turn accelerates the wear on the belts, sheaves, and the blower and motor bearings.

- Maintenance Backlog/Record of Facility Deficiencies. The repair of HV-150-4 (an automatic valve in the evaporator system) was initiated on September 17, 2000 and involved the removal of LA2V-150-1 and LA2-8A, which were both properly tagged. However, Passport, the Computerized Maintenance Management System (CMMS) software, does not carry an open Work Order or a Work Request for this valve. The valve is on the facilities own "top 20" list of items that need repaired. This indicates that any maintenance backlog or equipment deficiency list generated from the CMMS would not be accurate. The ability to effectively prioritize, plan, and schedule maintenance work is compromised.

The Planning and Scheduling supervisor could not provide a complete maintenance backlog from the CMMS. Three separate databases were queried to provide a backlog for the NWCF CVS.

Preventive and Predictive Maintenance Practices:

Preventive and predictive maintenance practices are activities that are performed to prevent premature failure, wear, or equipment degradation; or are activities that are designed to monitor and periodically assess the condition of a component or asset. Some examples of these types of activities include: lubrication programs, lubricant analysis for tell tale signs of machinery degradation and contaminants, vibration analysis of rotating equipment, infrared thermography to identify overheating electrical connections and insulation break-downs.

Lubrication Program/Practices:

As such, a lubrication program does not exist. At the time of the review, the contractor could not address the following:

- Which specific bearings on motors and blowers are sealed, and therefore do not require lubrication.

- The proper methodology for lubricating nonsealed bearings. The contractor indicated that removal of the bottom grease plug for an hour or two did not result in the dropping out of old grease from the bearing. The National Electrical Manufacturers Association (NEMA) and major motor manufacturers recommend that the bottom grease plug be removed for 24 to 48 hours after greasing of unsealed bearings to allow time for the old grease to drop out of the bearing and cavity.

- NWCF uses Unirex N-2 grease while some of the manufacturer’s equipment labels specify Chevron SRI-2. Note that the SRI-2 is a ply urea base grease and Unirex N-2 is a lithium base grease. These greases may not be compatible if mixed together.

- Oil analysis does not test for cleanliness controls, i.e., particle counting. Current analytical practices test only for chemical and physical properties and wear metal content (spectrographic analysis). Particle contamination levels are a very good indicator of the condition of the oil system and provide a predictor of future machine wear. High particle counts will show up before wear metal concentrations start to increase.

- Reliability assessments of key components are not timely or of the highest quality. The contractor could not address basic issues regarding bearing life.

- The contractor indicated that the blowers and motors in the NWCF ventilation system had very good bearing life, but could not identify the average or typical bearing life as installed in the NWCF equipment. Furthermore, they could not indicate how their bearing life compared to the bearing manufacturer’s L10 predictions. Bearing life and specifically lifespan with respect to L10 values is a very good indicator of operator and maintenance practices. Lack of knowledge in this area indicates a general technical weakness with respect to machinery reliability, mean time between failures, and overall machinery asset management.

- Vibration analysis of rotating equipment has proven to be a very effective management tool for rotating equipment in industry and other DOE facilities. Its use should be significantly expanded at INTEC.

- The vibration engineer is well trained and experienced. The equipment and software used is state-of-the art.

- Network support for the vibration analysis software system is not being provided.

- Vibration analysis is not applied to all major rotating equipment across the INTEC facility.

Criterion 2:

The system is periodically walked down in accordance with maintenance requirements to assess it s material condition.

The system is periodically walked down by operations personnel in accordance with management direction and operational procedures. The vibration engineer also spends a considerable amount of time collecting rotating equipment vibration signatures.

The facility also employs a weekly zone inspection system where senior management routinely inspects various areas within the facility.

The efficacy of these walk-downs must be improved. During the facility walk-down by the team, good housekeeping practices were evident in terms of cleanliness, but there were other indicators of a decline in rigor and discipline. A number of temporary equipment identification (paper) tags were observed, many being several years old. Other tags were in place, but no longer used, such as monthly inspection tags dating to 1997. Duct tape was in use as an uncontrolled temporary fix in a number of situations and was not always functioning as intended. A HEPA filter change out (PM) was delinquent due to unresolved accessibility problems. Tools were "stashed" in a number of locations. Issue items such as instrumentation fittings were found stored in an uncontrolled manner. Evidence of past maintenance activities was easily found due to a lack of post-job cleanup in a number of locations. HEPA prefilter assemblies were found in varying stages of cleanliness, with varying conformance to "fit," varying as to composition, and were sometimes found to be held in place by the vacuum only and sometimes with duct tape.

Opportunities for Improvement:

- DOE-ID and the contractor must ensure that compliance with "List B" requirements is maintained, that planned actions are executed, and that accountability is enhanced regarding maintenance management and execution.

- An MEL must be developed and verified against the facility as-built condition, maintained in a current status, and be fully integrated with equipment histories and equipment bills of materials.

- Predictive maintenance such as vibration analysis, lubrication analysis, reliability assessments, etc. has proven to be a very effective management tool in industry and other DOE facilities. Its use is particularly relevant to aging or degrading systems and should be significantly expanded.

- The technical execution of corrective maintenance can be improved.

Noteworthy Practices:

- Maintenance work is initially prioritized in accordance with STD-101, "Integrated Work Control Process." System engineers then coordinate with the facility manager to establish a facility priority list that is coordinated with the overall INTEC schedule.

- Facility personnel interviewed were knowledgeable and responsive. The facility manager was aware of performance measures and issues and conducts weekly facility zone inspections.

Surveillance and Testing

Objective:

Surveillance and testing of the confinement ventilation system demonstrates that the system is capable of accomplishing its safety functions and continues to meet applicable system requirements and performance criteria (e.g., safety basis requirements such as technical safety requirements/limiting conditions for operation).

Criterion 1:

Requirements in applicable DOE rules and orders are invoked for the confinement ventilation system.

Is the Criterion met?

Yes, with one opportunity for improvement (S&T-1).

How the Review was Conducted:

Documents reviewed and personnel interviewed are listed below.

Documents reviewed:

- DOE letter from Secretary of Energy to Chairman DNFSB, June 4, 2001
- 10 CFR 830.2021, "Safety Basis"
- 10 CFR 830.204, "Documented Safety Analysis"
- 10 CFR 830.205, "Technical Safety Requirements"
- 10 CFR 835.209, "Concentrations of Radioactive Material in Air"
- 10 CFR 835.403, "Air Monitoring"
- DOE Order 420.1, "Facility Safety," October 13, 1995
- DOE Order 5480.22, "Technical Safety Requirements," February 25, 1992
- DOE Order 5480.23 "Nuclear Safety Analysis Reports," April 30, 1992
- DOE Guide 420.1-1 "Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria Guide for use with DOE O 420.1, Facility Safety," March 28, 2000

- DOE Guide 441.1-9, “Radioactive Contamination Control Guide for use with Title 10, Code of Federal Regulations, Part 835, Occupational Radiation Protection,” June 17, 1999

- DOE Standard 3020-97, “Specification for HEPA Filters Used by DOE Contractors,” January 1997

- DOE Standard 3022-98 “DOE HEPA Filter Test Program,” May 1998

- DOE Standard 3025-99 “Quality Assurance Inspection and Testing of HEPA Filters,” February 1999

- DOE-ID Order 420.D “Requirements and Guidance for Safety Analysis,” approved July 17, 2000

- DOE-ID letter CF&AO-M&O-01-111 “Modification M041 to Contract No. DE-AC07-99ID13727,” July 2, 2001

- BBWI SAR-103 “New Waste Calcining Facility” Revision 0, April 18, 2001

- BBWI TSR-103 “Technical Safety Requirements New Waste Calcining Facility,” Revision 0, April 18, 2001

- BBWI Operating Requirements Manual 6.5.1.4 “NWCF Ventilation and Process Off-Gas Requirements,” Revision 1B, effective April 27, 2000.

Personnel Interviewed:

- DOE-ID Radiological Controls Program Manager

- BBWI Radiological Controls Operations Manager

- BBWI Radiological Controls Technical Consultant

- BBWI System Engineers (3)

- BBWI Technical Specialist for HEPA Filter Testing

- BBWI Warehouseman.

Discussion of Results:

DOE rules and orders applicable to the NWCF CVSs were identified by the assessor to include sections of 10 CFR 830 and 10 CFR 835, DOE O 420 “Facility Safety,” DOE Order 5480.22, “Technical Safety Requirements” and DOE Order 5480.23, “Nuclear Safety Analysis Reports.” Federal regulations 10 CFR 830 and 10 CFR 835 are public law, and therefore, “List A” requirements under the current contract with BBWI. The DOE orders were included in the latest

“List B” requirements of contract modification M041 transmitted by DOE letter CF&AO-M&O-01-111 of 7/2/2001.

Of particular interest to the assessors was the recent commitment by the Secretary of Energy embodied in a June 4, 2001 letter to the chairman of the DNFSB. The letter committed the Department to “100 percent quality assurance testing of HEPA filters at the DOE Filter Test Facility (FTF).” The Secretary stated in his letter “These measures include the immediate implementation of the enclosed filter testing protocols and procedures by cognizant Lead Program Secretarial Officers at their sites.” However, the “List B” update forwarded to BBWI by the DOE-ID contracting officer in July 2001 (and applicable at the time of this assessment) did not include the Secretary’s commitments regarding 100% quality assurance (QA) testing of HEPA filters at the FTF. Department standards mandating 100% QA testing of HEPA filters, such as DOE-STD-3020-97 and DOE-STD-3022-98, were not specified as contract requirements for BBWI in the “List B” transmittal letter. The company procedure, MCP-2746 “Purchasing, Maintaining and Using HEPA Filters,” did not include any reference to the DOE Filter Test Facility and did not specify FTF QA testing as part of the HEPA filter procurement process. The local requirements document for NWCF HEPA filter testing and maintenance, ORM 6.5.1.4, did not require replacement HEPA filters to be 100% QA-tested at the DOE FTF prior to installation.

During his interview, the technical specialist cognizant over HEPA testing at INTEC stated that, during his ten years of service at INTEC, he had never seen a HEPA filter installed that did not bear a label indicating FTF testing. The assessors were satisfied through interviews (documented under Criterion 4 below) with the technical specialist, system engineers, and the warehouseman in charge of HEPA storage that all HEPA filters used for NWCF confinement ventilation systems had been FTF-tested prior to installation.

The failure of DOE-ID to capture the Secretary’s June 2001 commitment to the DNFSB Chairman in the List B requirements of the current BBWI contract, despite the List B update of July 2001, was determined to be a deviation from Criterion 1. Although the memorandum from the Secretary of Energy was neither a DOE rule nor an order, the commitment to the DNFSB constituted a valid Department directive requiring immediate implementation by the program and field offices. The assessors judged Criterion 1 as met (based on actual contractor performance) with one opportunity for improvement documented as S&T-1 below.

System Operability Issues or Concerns

None.

Opportunities for Improvement

S&T-1: The DOE Idaho Operations Office failed to capture the Secretary’s June 2001 commitment to the DNFSB Chairman (regarding 100% QA testing of replacement HEPA filters) in the List B requirements of the current BBWI contract, despite the List B update of July 2001.

Noteworthy Practice

S&T-8: The contractor continued to require FTF testing for procurement of replacement HEPA filters, even after DOE-ID dropped this specification from the contract. The contractor's insistence on testing beyond minimum contractual requirements was prescient and spared the Idaho Operations Office a difficult technical challenge.

Criterion 2:

Requirements for surveillance and testing necessary to demonstrate overall system reliability and operability are accommodated by the system design and are linked to the technical safety basis.

Is the Criterion met?

No.

Due to (1) the absence of TSR surveillances, (2) the inadequate breadth of surveillance-like ORM requirements, and (3) the lack of airflow instructions in the NWCF HEPA test procedures, the current surveillance testing and acceptance criteria were not adequate to ensure that the NWCF confinement ventilation system was capable of performing performance, design and safety functions described in the NWCF SAR. Therefore, Criterion 2 was not met.

How the Review was Conducted:

Documents reviewed and personnel interviewed are listed below.

Documents reviewed

- ASME N510-1989, "Testing of Nuclear Air Treatment Systems"
- Energy Research and Development Administration (ERDA) 76-21, "Nuclear Air Cleaning Handbook"
- 10 CFR 830.204, "Documented safety analysis"
- 10 CFR 830.205, "Technical safety requirements"
- DOE Order 5480.22, "Technical Safety Requirements," February 25, 1992
- DOE Order 5480.23 "Nuclear Safety Analysis Reports," April 30, 1992
- DOE-ID Order 420.D, "Requirements and Guidance for Safety Analysis," July 17, 2000
- DOE-ID Assessment Report INTEC-2001-53, "Standby Power System Operability Test (Final Report)," September 2001

- SAR-103, “New Waste Calcining Facility,” Revision 0, April 18, 2001
- TSR-103, “Technical Safety Requirements New Waste Calcining Facility,” Revision 0, April 18, 2001
- BBWI Operating Requirements Manual 6.5.1.1, “NWCF Stack Release Requirements,” Revision 0B, April 27, 2000
- BBWI Operating Requirements Manual 6.5.1.4, “NWCF Ventilation and Process Off-Gas Requirements,” Revision 1B, April 27, 2000
- BBWI Operating Requirements Manual 6.5.1.6, “NWCF Decontamination Spray Booth Requirement,” Revision 0B, April 27, 2000
- BBWI Operating Requirements Manual 6.5.1.7, “HLLWE Pressure Requirements,” Revision 0B, April 27, 2000
- TPR-P8.2-B1, “Calciner Area HVAC Startup and Shutdown,” Revision 16, February 22, 2001
- TPR-P8.0-Y1, “NWCF-Major Alarm Response,” Revision 15, April 16, 2001
- TPR-5054, “HEPA Filter In-Place Testing,” Revision 1, August 10, 1996
- TPR-5488, “NWCF Off Gas HEPA Filter In-Place (DOP) Testing,” Revision 3, November 24, 1998
- TPR-5489 “Calciner Area HVAC In-Place HEPA Filter Test,” Revision 0, January 28, 1997
- TPR-5494, “Decon Exhaust Plenum HEPA Filter In-Place (DOP) Testing,” Revision 0, March 17, 1998
- TPR-5497 “NWCF Particle Sizer In-Place HEPA Filter Testing,” Revision 0, January 28, 1999
- TPR-P8.4-J16, “NWCF HEPA Filter In-Place (Aerosol) Testing,” Revision 0, January 29, 2001
- TPR-P8.4-J6, “Replace Off-Gas Filter Components,” Revision 12, September 11, 2001
- TPR-P8.2-B5 “NWCF HVAC Normal Operations,” Revision 10, August 29, 2001
- TPR-P8.2-B1, “Calciner Area HVAC Startup and Shutdown,” Revision 16, February 22, 2001

- TPR-P8.2-B2 "Decon Area HVAC Startup and Shutdown," Revision 8, September 28, 2000
- TPR-P8.2-F4, "Operation of NWCF Stack Isokinetic Sample Systems," Revision 8, February 1, 2001
- BBWI Electronic Memorandum from Safety Analysis Special Projects Supervisor "NWCF Assessment – Response," October 29, 2001.

Personnel Interviewed:

- DOE-ID Radiological Controls Program Manager
- BBWI Radiological Controls Operations Manager
- BBWI Assessment Team Leader for 1999 HEPA Filter Program Assessment
- BBWI Radiological Controls Technical Consultant
- BBWI Technical Specialist for HEPA Filter Testing
- BBWI System Engineers (3)
- BBWI Warehouseman.

Discussion of Results:

Chapter 4 of SAR-103, "New Waste Calcining Facility" designated the POG system, the calciner area HV system, and the decontamination area HV systems as safety-significant SSCs. However, a review of the SAR-103, Chapter 3, Hazard and Accident Analyses, revealed that only two subsystems in the calciner area HV system (calciner cell ventilation flow instrumentation and calciner cell ventilation explosimeter) were safety-significant, based on consequences calculated for a design basis accident. The remainder of the POG, calciner area HV, and decontamination area HV systems appeared to be "defense-in-depth" SSCs. DOE-ID Order 420.D, "Requirements and Guidelines for Safety Analysis," Attachment III, paragraph 2.c, allows SSCs to be designated "defense in-depth" in cases where consequences from a postulated accident scenario meet the evaluation guidelines but additional barriers are desired to achieve acceptable risk. Per paragraph 2.e of DOE-ID Order 420.D, Attachment III, TSR-level controls are not specified for defense-in-depth SSCs. The assessor noted that TSR-103 controls, including surveillance requirements, applied only to the calciner cell ventilation flow instrumentation and calciner cell ventilation explosimeter. Because the calciner has been placed in standby mode for the foreseeable future, the TSR-level controls for the safety-significant calciner cell ventilation flow instrumentation and calciner cell ventilation explosimeter embodied in TSR-103 limiting condition for operation (LCO) 3.103.5 were no longer implemented for NWCF. All other operational requirements were listed as non-TSR-level controls in the ORM.

On October 22, 2001, the BBWI primary point of contact (POC) for this assessment, a system engineer "without portfolio," stated that BBWI considered all of the NWCF POG, calciner area HV and decontamination area HV systems to be safety-significant vice defense in-depth. The POC stated that the failure to include TSR-level controls, including surveillance requirements, for the majority of these CVS SSCs was a recognized shortcoming of the NWCF SAR and TSRs. The POC asserted that the NWCF SAR had been initially developed in advance of the EG, and that operational controls for most of the safety-significant CVS SSCs had been incorporated into the INTEC ORM. The NWCF SAR and TSRs had not been reevaluated, according to the POC, due to programmatic priorities placed on upgrades of the older INTEC plant safety documents (PSDs).

DOE Order 5480.22, "Technical Safety Requirements," requires TSRs to "define the operating limits and surveillance requirements, the basis thereof, safety boundaries, and management or administrative controls necessary to protect the health and safety of the public and to minimize the potential risk to workers from the uncontrolled release of radioactive or other hazardous materials and from radiation exposure due to inadvertent criticality." In addition, "Surveillance Requirements are requirements relating to test, calibration, or inspection to ensure that the necessary operability and quality of safety-related structures, systems, components, and their support systems required for safe operation of the facility are maintained.... In the event that Surveillance Requirements are not successfully completed or accomplished within their required frequency, the systems or components involved shall be assumed to be inoperative...."

Without TSR-level surveillances, operators cannot, by definition, determine the operability of the safety-significant CVS SSCs for NWCF. The lack of TSR-level surveillance testing for NWCF CVS safety-significant SSCs was, exclusive of other considerations, sufficient to evaluate Criterion 2 of this CRAD as not met. See system operability Issue S&T-2.

Because the portions of the NWCF CVS other than the calciner cell ventilation flow instrumentation and calciner cell ventilation explosimeter were not required to prevent or mitigate consequences of design basis accidents (DBAs) exceeding EGs, the assessors opted to evaluate "surveillance-like" requirements from the INTEC ORMs against Criterion 2.

Surveillance-like testing of NWCF CVS components was specified in a number of ORM sections as outlined below. The surveillance testing and acceptance criteria were not explicitly defined, but instead were dispersed in the text of various ORM requirement statements.

- ORM 6.5.1.1, "NWCF Stack Release Requirements"
    - "The on-line NWCF HVAC radiation monitoring system components (R1771-1C, F1785-1, F1785-3, and F1785-5 or R1771-2C, F1785-2, F1785-4, and F1785-6) shall be checked for operability once per 12-hour shift during NWCF operations."
        - "NWCF operations" defined as "operation of the calciner; operation of the high-level liquid waste evaporator [HLLWE]; use of the decontamination areas that are serviced by the calciner heating,

ventilating, and air conditioning [HVAC] system; or during in-cell decontamination operations."

- Acceptance Criteria:

  - "Operability"

  - "The HI HI alarm shall be set at or below a gross radioactive particulate rate of 5E+5 counts per minute (cpm) for the primary (R1771-1C) and backup (R1771-2C) radiation monitors for the NWCF HVAC isokinetic sample system"

- ORM 6.5.1.4, "NWCF Ventilation and Process Off-Gas Requirements"

  - "The HV system exhaust filter radiation instruments (RAM-NCM-953-48, RAM-NCM-953-55, RAM-NCM-953-56, and RAM-NCM-953-57) shall be inspected for operability a minimum of once per 12-hour shift."

    - Acceptance Criteria:

      - "Operability"

      - "The HV system exhaust filter radiation instruments (RAM-NCM-953-48 and RAM-NCM-953-55) shall be set to alarm at or below 150 mrem/h for the Calciner Area H V system"

      - "The HV system exhaust filter radiation instruments (RAM-NCM-953-56 and RAM-NCM-953-57) shall be set to alarm at or below 20 mrem/h for the Decontamination Area H V system."

  - "In-place aerosol testing of any NWCF HEPA filter or filter bank shall be performed initially upon installation and annually thereafter."

    - No specific acceptance criteria were detailed in the ORM for the Calciner area and decontamination area HEPA filters.

    - For the POG HEPA filters, the following acceptance Criterion was specified in the "BASIS" section of the ORM:

      - "The acceptance Criterion for the efficiency of the NWCF POG HEPA filter banks (F-NCC-130-1, F-NCC-130-2, F-NCC-130-3, and F-NCC-130-4) is an equivalency to a minimum of two HEPA filters in series."

TPR-5054, "HEPA Filter In-Place Testing," the company procedure for generic testing of HEPA filters, specified "dioctyl phthalate aerosol [DOP], Polyalphaolefin [PAO], also known as EMERY 3004, or approved equivalent" as the aerosols for HEPA filter testing. The technical specialist for HEPA testing at INTEC stated during his interview on October 23, 2001 that DOP was the aerosol used for HEPA testing at INTEC, although reviews of PAO were underway. The assessor noted that the technical procedure for NWCF HEPA testing, TPR-P8.4-J16, deferred to TPR-5054 for aerosol selection. Therefore, the technical specialists could switch from DOP to PAO within procedural bounds without a USQ screen or determination.

As noted in Table 4-1, acceptance criteria for HEPA filter testing were not specified in the ORMs for NWCF. The acceptance criteria for HEPA filter testing were outlined in a number of different technical procedures as summarized in Table 4-2 below.

Table 4-1. NWCF HEPA filter testing acceptance criteria.

HEPA Filter	Procedure	Acceptance Criteria
General HEPA filters	TPR-5054	0.03% maximum penetration of the aerosol, unless otherwise specified on INEL Form L-0420.2, HEPA Filter System Data Sheet
POG filters	TPR-5488 TPR-P8.4-J16	If highest percent penetration of any stage is greater than 2% the Facility Manager must be contacted for approval [three stages per bank]
		RELEASE FRACTION [defined as (percent penetration)(0.01)] (multiply the three filter stage release factors together) Release fraction less than 9×10^{-8} = pass
Calciner Area exhaust filters	TPR-5489 TPR-P8.4-J16	None listed (default to TPR-5054 acceptance criteria)
Decon Area exhaust filters	TPR-5494 TPR-P8.4-J16	None listed (default to TPR-5054 acceptance criteria)
NWCF Corridor HEPA filters	TPR-P8.4-J16	0.03% maximum penetration of the aerosol unless otherwise specified on INEEL Form-420.2, HEPA Filter System Data Sheet

Acceptance criteria from the NWCF ORM requirements and test procedures were compared to safety functions, functional requirements, performance criteria, assumptions and operating characteristics discussed in SAR-103, Section 4.3.

Table 4-2. Assessment of NWCF confinement ventilation surveillance testing adequacy.

System	Safety Function, Functional Requirement, Performance Criterion, Assumption or Operating Characteristic	Adequacy of TSR and ORM Surveillance Testing
POG SAR-103 4.3.1	Design objectives for the off-gas cleanup system provide decontamination factors of 3 x 10^{9} for particulate. Each stage is aerosol tested in-place, but the acceptance Criterion is for an overall bank efficiency equivalent to two HEPA filters (each having 99.97% removal efficiency) in series. Each bank of filters can handle 1,000 scfm, which is half the total off-gas flow at this point in the system.	ORM 6.5.1.4 requires POG filter bank testing but does not specify the decontamination factor of 3 x 10^{9}. Test procedures do not specify airflow for POG filters testing (see Note 1 below).
	Design objectives for the off-gas cleanup system provide decontamination factors of... 1 x 10^{3} for volatile ruthenium removal.	No ORM requirement.
	Each filter bank stage is monitored for high differential pressure. High differential pressure indicates that filters have excessive solids accumulation or have become wetted. Therefore, the filters are replaced when the differential pressure across any filter exceeds 10 in. of water column.	Adequately addressed by ORM 6.5.1.4 and TPRs.
	Each filter bank stage is monitored for low differential pressure. Low differential pressure may indicate that a new filter has been installed, or that a filter has been damaged or breached. After a new filter has been installed and aerosol tested in-place, a low differential pressure (approximately 1 in. of water column or less) exists until material accumulates on the filter media. Once the differential pressure starts to increase, a lower differential pressure could indicate a filter failure caused by a sudden high-pressure spike or a decreased airflow.	No ORM requirement.

Table 4-2. (continued).

System	Safety Function, Functional Requirement, Performance Criterion, Assumption or Operating Characteristic	Adequacy of TSR and ORM Surveillance Testing
NWCF Building Ventilation (Calciner Area & Decon Area) SAR-103 4.3.2	The HV systems maintain confinement of radioactive materials through a multiple-zone philosophy. Pressure differentials are maintained between the various building confinement zones and between the building and the outside atmosphere. This ensures that airflow is from zones of lesser contamination potential to zones of greater contamination potential (i.e., from occupied areas of the NWCF to the cell entryways, to the cells, and finally to the process vessels if they are breached). Inlet vanes on the exhaust blowers automatically control the negative pressure in the exhaust header. Instruments are provided to control and indicate pressure differentials between confinement zones. Alarms are provided in the control room to indicate pressure differentials that are not within the prescribed range. Pressure-controlled dampers are located in the walls of the maintenance area (218), the vehicle entrance (218), the low-level decontamination room (415), and the equipment decontamination room (418) to maintain a steady flow of air from areas of lesser contamination potential to areas of greater contamination potential.	No ORM requirement. See Note 2 below.
	The calciner area HV system was designed to confine radioactive materials under normal and abnormal operating conditions such as during tornadoes, earthquakes, and fires. It was also designed to reduce radioactive releases to below 1/100 of the limits given in 10 CFR 835 and DOE Order 5400.5.	No ORM requirement. See Note 3 below.
	A HEPA filter is provided to protect against reverse flow and spread of contamination at each location where the supply air enters a potentially contaminated area.	No ORM requirement. See Note 4 below.
	Should one [calciner area] supply or exhaust blower fail, the third standby blower automatically starts.	No ORM requirement.
	The HV system exhaust filter radiation instruments (RAM-NCM-953-48, -55, -56, and -57) shall alarm at or below 150 mrem/h for the calciner area HV system and 20 mrem/h for the decontamination area HV system. RAMs shall be inspected for operability once per shift.	Adequately addressed by ORM 6.5.1.4.

Table 4-2. (continued).

System	Safety Function, Functional Requirement, Performance Criterion, Assumption or Operating Characteristic	Adequacy of TSR and ORM Surveillance Testing
	Prompt HEPA-filter replacement is required when one or more of the following conditions exist: (1) the pressure drop across any HEPA filter exceeds 10 in. of water column, (2) a HEPA filter is unable to pass in-place aerosol testing, and (3) the filter bank exceeds radiation limits. HEPA filters shall be aerosol tested in-place prior to placement in service and at least annually thereafter.	Adequately addressed by ORM 6.5.1.4. However, airflows not specified by TPR. See Note 5 below.
	At the entrance to the exhaust plenums, impingement plates and manually operated water spray nozzles provide emergency cooling and fire protection.	No ORM requirement ensures operability of manually operated water spray nozzles
NWCF Stack Monitor SAR-103 4.3.4	The real-time stack monitor is calibrated to take into account all of the nuclides present, based on assumed worst-case nuclide ratios. The primary and backup monitoring systems shall be set to alarm at a gross radioactive particulate rate so that any release from the NWCF stack will not exceed the DOE Order 5400.5 airborne release limits at the nearest INEL site boundary.	No ORM requirement to check calibration of the stack monitor.
	The radiation monitor shall be checked for operability once per 12 hour shift during NWCF operations (calciner, evaporator, and decontamination activities).	Adequately addressed by ORM 6.5.1.1.

Notes:

1. Although the maximum release fraction from TPR-5488 and TPR-P8.4-J16 corresponded to the SAR-103 required removal efficiency, neither technical procedure tested the ability of the POG filter banks to maintain the removal efficiency at the specified flow rate of 1,000 scfm. Both TPR-5488 and TPR-P8.4-J16 required the filter bank under test to be offline with the inlet valve closed and the outlet valve open. The technical specialist for HEPA filter testing confirmed that the airflow for POG filter tests was via a two-inch line in the NWCF north operating corridor. The actual airflow was neither specified by nor recorded in the test procedure.

2. No ORM requirement tested the ability of the DCS to maintain adequate pressure differentials between various building confinement zones under normal and abnormal system lineups. No ORM requirement tested the capability of the pressure controlled dampers of the decontamination area HV system to "maintain a steady flow of air from areas of lesser contamination potential to areas of greater contamination potential."

Table 4-2. (continued).

3. The capability of the calciner area HV system to perform the expected design function under "abnormal operating conditions such as during tornadoes, earthquakes, and fires" was not verified by an ORM requirement. Recent System Operability (SO) testing of the INTEC Standby Power system (documented under DOE-ID assessment report INTEC-2001-53) revealed that the NWCF DCS inverter would not accept standby power from the CPP-1684 diesel generators. Since abnormal conditions such as those listed in the SAR could be expected to result in a loss of commercial power, DCS operation could only be expected for 20 - 40 minutes following the event. No ORM requirement ensured the capability of the Calciner Area HV system to adequately "confine radioactive materials" when DCS control was lost.

4. No ORM requirement checked the NWCF corridor HEPA filters to ensure the reverse flow/upset protection envisioned by the SAR was effective. The assessor noted that TPR-P8.4-J16 included a provision to test corridor HEPA filters, but no periodicity requirement was established by the ORM. The TPR specified airflow within +/-10% of design flow rate, but failed to stipulate the design flow rates or a method to measure the airflow. In addition, the direction of airflow specified by the technical procedure was from the corridors into the cells. The design function of the corridor HEPA filters envisioned the filters providing confinement when airflow was reversed and flowed out of the cells into the corridors.

5. The general company HEPA testing procedure, TPR-5054, states "Establish air flow through the HEPA filter system within +/- 10% of design flow rate. If this cannot be accomplished a test at reduced flow, as low as 5% rated system flow, can be done." The technical procedures for in-place testing of Calciner Area and Decontamination Area HEPA exhaust filters required the filters under test be "online" but did not specify a design airflow or require the flow rate be recorded. The technical specialist for HEPA filter testing stated that, in the most recent Calciner Area and Decontamination Area HEPA filter tests, he had changed the process by leaving both exhaust plenums in each system on line during the test to reduce airflow across the filter being tested. The reduced airflow improved the DOP dispersion at the filter inlet, according to the technical specialist.

The DNFSB staff observer pointed out that the acceptance criteria for newly installed HEPA filters were the same as the functional requirements assumed by the SAR. No provision for deterioration was included to ensure HEPA performance remained at or above SAR-assumed levels during the period (usually one year) between HEPA filter in-place tests. The assessors agreed that, since HEPA test acceptance criteria were identical to SAR assumptions, the in-place leak tests at NWCF did not account for normal material degradation and provided no assurance that the SAR assumptions were valid during the period between tests.

The BBWI Safety Analysis Special Projects supervisor responded to the observations from the DNFSB staff in an electronic memorandum dated 10/29/2001. The text of the response has been reproduced below:

> I have been reviewing the findings for the NWCF Assessment. For [Opportunity for Improvement] S&T-3 on the NWCF HEPA test acceptance criteria, I have the following response. In the accident analysis credit for HEPA filtration was not take [sic] for the NWCF Calciner Vessel Explosion accident or the NWCF HEPA filter failure accident. Therefore, the consequences of these accidents were unmitigated. A review of the nitrated-organic accident consequences indicated that the release path was split with 99% of the releases going out the stack, which was filtered and 1% a ground level release. The total dose consequences was [sic] driven by the unfiltered ground level release rather than the elevated filtered. Removing the filtration from the elevated release only increased the 100 m dose by 0.06 rem for a total dose of 5.76 rem. Therefore, for this accident the dose consequences were from the unfiltered pathway.
>
> Today, the safety analysis procedures require that all accidents be performed unmitigated to determine if credit needs to be taken for the HEPA filters. Back in the 1990-1996 time frame, if HEPA filters were used in the dose consequence analysis, reduced credit for the filtration was taken using the guidance of the LANL Guide book (LA-10294-MS) titled "A Guide to Radiological Accident Considerations for Siting and Design of DOE Nonreactor Nuclear Facilities." This guide provided specific guidance on reduction and removal factors for HEPA filters during accident scenarios. For the NWCF nitrated organic accident, the HEPA filter efficiency of 99.8% was taken, which equates to a reduction of 2E-04 rather than using a filter efficiency of 99.97% which equates to a reduction factor of 3E-04. Therefore filter degradation was accounted for in the analysis and the HEPA filter efficiency test of 99.97% is still valid as specified in Chapter 4, Section 4.4.1.3 [sic].

The DOE assessor reviewed the consequence analysis for the HLLWE Nitrated-Organic Reaction Accident presented in SAR-103, Section 3.3.2.1.3. The consequence analysis summary states, "Six assumptions were used for the consequence analysis," and describes assumptions related to dose evaluation distances from the release, meteorological conditions, NWCF building dimensions, the instantaneous nature of the release, and the default particle size of the release.

The assumptions described above by the Safety Analysis supervisor of release path (99% stack, 1% ground release) and the efficiency of the HEPA filter banks (99.8%) were not listed in the SAR consequence analysis of Section 3.3.2.1 or the functional requirements discussion of Section 4.3.1.3. Although the accident analysis appears to have captured and resolved the DNFSB staff concerns regarding assumed verses tested HEPA filter efficiencies, the assessor judged that the SAR-103 consequence analysis and functional requirements discussions should have included the release paths and assumed HEPA filter bank efficiency. See opportunity for improvement S&T-3.

System Operability Issues or Concerns

S&T-2: TSR-level controls, including surveillances, do not exist for the majority of NWCF confinement ventilation system safety-significant SSCs, contrary to the requirements of DOE Order 5480.22, "Technical Safety Requirements," paragraph 9.e. The analyses for SAR design basis accidents indicated that the majority of the NWCF CVS SSCs were not required to mitigate consequences above current evaluation guidelines, signifying that these CVS SSCs could be designated "defense in-depth" not requiring TSR-level surveillances. Even considering the surveillance-like requirements of the ORM, however, the breadth of testing and acceptance criteria was not sufficient to ensure the assumed SAR performance levels for NWCF CVS SSCs.

Opportunities for Improvement

S&T-3: Since NWCF HEPA test acceptance criteria are identical to SAR assumed performance, the in-place leak tests at NWCF do not account for normal material degradation and provide no assurance that the SAR assumptions are valid during the period between tests. Although the calculations used to estimate consequences from an NWCF stack release assumed a slightly lower HEPA filter efficiency, the lower HEPA filter efficiency was not reflected in the SAR descriptions of HEPA filter function or event consequence.

Criterion 3:

Surveillance and test procedures confirm that key operating parameters for the overall system and its major components are maintained within operating limits.

<u>Is the Criterion met</u>?

No.

The failure to specify and record airflow coupled with the lack of directions or acceptance criteria for test repeatability rendered the NWCF HEPA test procedures inadequate to confirm that key operating parameters for the overall system and its major components were maintained within operating limits. As noted in the evaluation of Criterion 2 above, many of the key operating parameters of the NWCF confinement ventilation system were not verified by surveillance testing. Therefore, Criterion 3 was not met.

How the Review was Conducted:

Document reviewed and personnel interviewed are listed below.

Documents reviewed

- DOE Order 5480.21, “Unreviewed Safety Questions,” December 24, 1991
- DOE Order 5480.19, “Conduct of Operations Requirements for DOE Facilities,” May 18, 1992
- American Society of Mechanical Engineers (ASME) N510-1989, “Testing of Nuclear Air Treatment Systems”
- Energy Research and Development Administration (ERDA) 76-21, “Nuclear Air Cleaning Handbook”
- DNFSB Technical Report 23, “HEPA Filters Used in the Department of Energy’s Hazardous Facilities,” May 1999
- ORM 6.5.1.1, “NWCF Stack Release Requirements,” Revision 0B, April 27, 2000
- ORM 6.5.1.4, “NWCF Ventilation and Process Off-Gas Requirements,” Revision 1B, April 27, 2000
- TPR-P8.2-B1, “Calciner Area HVAC Startup and Shutdown,” Revision 16, February 22, 2001
- TPR-P8.0-Y1, “NWCF-Major Alarm Response,” Revision 15, April 16, 2001
- TPR-5054, “HEPA Filter In Place Testing,” Revision 1, August 10, 1996
- TPR-5488, “NWCF Off Gas HEPA Filter In-Place (DOP) Testing,” Revision 3, November 24, 1998
- TPR-5489, “Calciner Area HVAC In-Place HEPA Filter Test,” Revision 0, January 28, 1997
- TPR-5494, “Decon Exhaust Plenum HEPA Filter In-Place (DOP) Testing,” Revision 0, March 17, 1998
- TPR-5497, “NWCF Particle Sizer In-Place HEPA Filter Testing,” Revision 0, January 28, 1999
- TPR-P8.4-J16 “NWCF HEPA Filter In-Place (Aerosol) Testing,” Revision 0, January 29, 2001

- TPR-P8.4-J6, "Replace Off-Gas Filter Components," Revision 12, September 11, 2001

- TPR-P8.2-B5, "NWCF HVAC Normal Operations," Revision 10, August 29, 2001

- TPR-P8.2-B1, "Calciner Area HVAC Startup and Shutdown," Revision 16, February 22, 2001

- TPR-P8.2-B2 "Decon Area HVAC Startup and Shutdown," Revision 8, September 28, 2000

- TPR-P8.2-F4 "Operation of NWCF Stack Isokinetic Sample Systems," Revision 8, February 1, 2001.

Personnel Interviewed:

- BBWI Assessment Team Leader for 1999 HEPA Filter Program Assessment

- BBWI Radiological Controls Technical Advisor

- BBWI Technical Specialist for HEPA Filter Testing

- BBWI System Engineers (3)

- BBWI Warehouseman.

Discussion of Results:

Assessors interviewed the technical specialist for HEPA filter testing on October 23, 2001, regarding performance of NWCF HEPA filter testing. The technical specialist confirmed that TPR-P8.4-J16 was the current procedure for NWCF HEPA filter testing. Although technical procedures TPR-5488, TPR-5489, and TPR-5494 were still active in the company's electronic document control system, they were no longer used at NWCF.

The general company HEPA testing procedure, TPR-5054, states, "Establish air flow through the HEPA filter system within +/- 10% of design flow rate. If this can not be accomplished a test at reduced flow, as low as 5% rated system flow, can be done." National standard ASME 510-1989 HEPA filter in-place test procedure Step 10.5.1 states, "Establish airflow through the HEPA filter bank at the flow rate specified by the test program or project specifications." Surveillance requirements in the ORMs did not specify flow requirements for NWCF HEPA filter testing, and the test procedure used by the technical specialist to perform the tests, TPR-P8.4-J16, neither required nor recorded system airflows for the tests.

The technical specialist for HEPA testing stated during his interview, that airflow rates less than the design rates were often preferable for in-place filter testing. In the case of the most recent calciner area and decontamination area filter tests, the technical specialist changed the process by leaving both exhaust plenums online to reduce airflow through the filter under test. Previous tests were performed with only the plenum under test online. The technical specialist stated that the reduced airflow improved the detailed operating procedure (DOP) dispersion. The test procedure, TPR-P8.4-J16, states only “Place plenum to be tested on-line” and does not specify the condition of the plenum not under test. The system engineers remembered being informed of the reduction in test airflow for the Calciner area HEPA bank, but stated that no USQ evaluation was performed, because no procedure change was involved. The failure of the technical specialist and the system engineers to recognize the need for a USQ evaluation prior to changing the test process was evaluated by the assessor as a deviation from the requirements of DOE Order 5480.21.

TPR-P8.4-J16 Section 4.8 “Testing NWCF Corridor HEPA Filter,” Step 4.8.4.2, included instructions to “Establish air flow through the HEPA filter system within +/-10 percent of design flow rate.” The technical specialist admitted during his interview that this step was not performed when testing NWCF corridor HEPA filters. Rather, the technical specialist informed NWCF operators of the test and performed the test under normal airflow conditions. The assessor noted that the test procedure did not provide the design airflows and did not require the airflow to be recorded as part of the test. The failure to perform the procedure instructions as written was a deviation from the requirements of DOE Order 5480.19.

The ERDA Nuclear Air Cleaning Handbook included the following discussion of HEPA test airflow rates in Section 8.3.1: “The in-place test can be made at rated system airflow or at reduced flow. Because diffusion is the primary mechanism of small-particle collection, the test at reduced flow is often more sensitive than the full test. The actual rate of airflow for the reduced flow test is a function of the sensitivity of the photometer....” Airflow, therefore, constitutes an essential technical element for HEPA filter in-place aerosol testing.

The assessors observed a walk-down of the POG HEPA filter tests prescribed by Section 4.2 of TPR-P8.4-J16 performed by the technical specialist. A system engineer was present for the procedure walk-down. The technical procedure instructions were less than adequate in several aspects, as noted below:

- The procedure failed to specify the desire airflow across the filters under test and provided no direction to record the airflow
  - The technical specialist stated during his interview that the airflow across the filter under test was close to normal expected flow rates
  - However, the system engineer estimated that the test procedure achieved only 20 - 40% of nominal system airflow
- The directions to position the “crabtraps,” actually diffusers installed for the purposes of aerosol testing, were vague in that the “TEST” position was ill-defined
- Not all valve operations were specified for testing of the filters
- No minimum time delay was specified to stabilize the indications after switching from inlet to outlet photometer readings

- The normal process of repeating the test at least twice to ensure proper equipment performance was not specified by the procedure
  - No acceptance criteria was specified for comparison of repeated DOP measurements
  - Assessors noted that ASME N510-1989 Section 10 required DOP tests to be repeated "until readings are repeatable within ± 5% of respective previous readings."

DOE Order 5480.19, Chapter XVI, paragraph C states "All procedures should provide administrative and technical direction to conduct the intent of the procedure effectively." In addition, the order requires "Procedures should incorporate appropriate information from applicable source documents...." System Operability Issue S&T-4 documented the above-noted inadequate technical direction for the NWCF HEPA test procedures.

Although TPR-P8.4-J16 was an expert-based procedure (vice standards based), the technical specialist was clearly capable of executing the test. Nevertheless, the failure to specify and record airflow coupled with the lack of directions or acceptance criteria for test repeatability rendered the procedure inadequate to confirm that key operating parameter of HEPA filter performance was maintained within operating limits. Furthermore, the review of Criterion 2 above concluded that many of the other key operating parameters for NWCF CVS were not periodically evaluated by surveillance or testing. Therefore, the assessors evaluated Criterion 3 as not met.

System Operability Issues or Concerns

S&T-4: Procedures for NWCF HEPA filter in-place tests lacked adequate technical direction for (1) airflow during testing, (2) valve operations, (3) photometer stabilization time delays, (4) visual inspections, and (5) repeatability requirements, contrary to the requirements of DOE Order 5480.19 Chapter XVI and BBWI Standard STD-9, as well as the technical guidelines of the ERDA Nuclear Air Cleaning Handbook Section 8.3.1, national standard ASME 510-1989 Sections 5 and 10, and BBWI TPR-5054.

Opportunities for Improvement

None.

Criterion 4:

Procurement, qualification, surveillance and testing of HEPA filters (or other filter media) enable monitoring of filter performance and demonstrate filter reliability and operability.

Is the Criterion met?

No.

The lack of a HEPA filter service life program and the failure of DOE-ID and its M&O contractor to address and provide adequate technical resolution to DNFSB service life concerns were the primary considerations. Additionally, the absence of detailed HEPA filter service records, the lack of a visual inspection component for HEPA filter testing, repeated HEPA filter storage deficiencies, and the use of closed-face "naked" HEPA filters not recognized by DOE-STD-3020-97 or ASME AG-1 contributed to the evaluation of Criterion 4 as not met.

How the Review was Conducted:

Documents reviewed and personnel interviewed are listed below.

Documents reviewed

- DOE Assessment "Report on Pilot Assessment of Confinement Ventilation System Assessment Criteria and Guidelines at LLNL Building 332," August 2001

- EXXON Nuclear Idaho Company, Inc. Technical Paper "DOP Testing HEPA Filter Banks in Series," Wallace D. Hanson, not dated

- ASME N510-1989, "Testing of Nuclear Air Treatment Systems"

- ERDA 76-21, "Nuclear Air Cleaning Handbook"

- DNFSB Technical Report 23, "HEPA Filters Used in the Department of Energy's Hazardous Facilities," May 1999

- DOE-ID letter OPE-OS-99-099, "Transmittal of Defense Nuclear Facilities Safety Board Technical Position 23 'HEPA Filters used in the Department of Energy's Hazardous Facilities'," September 16, 1999

- SAR-103, "New Waste Calcining Facility," Revision 0, April 18, 2001

- TSR-103, "Technical Safety Requirements New Waste Calcining Facility," Revision 0, April 18, 2001

- ORM 6.5.1.1, "NWCF Stack Release Requirements," Revision 0B, April 27, 2000

- ORM 6.5.1.4, “NWCF Ventilation and Process Off-Gas Requirements,” Revision 1B, April 27, 2000

- ORM 6.5.1.6, “NWCF Decontamination Spray Booth Requirement,” Revision 0B, April 27, 2000

- ORM 6.5.1.7 “HLLWE Pressure Requirements,” Revision 0B, April 27, 2000

- BBWI letter CCN 21189 “CONTRACT NO. DE-AC07-99ID13727 - DNFSB Recommendation 2000-2 INEEL Priority Facility Phase I Safety Class, Ventilation and Fire Protection Systems Second Assessment Report,” April 26, 2001

- BBWI Management Control Procedure (MCP)-2746, “Purchasing, Maintaining, And Using HEPA Filters,” Revision 2, August 23, 1999

- TPR-P8.2-B1, “Calciner Area HVAC Startup and Shutdown,” Revision 16, February 22, 2001

- TPR-P8.0-Y1, “NWCF-Major Alarm Response,” Revision 15, April 16, 2001

- TPR-5054, “HEPA Filter In Place Testing,” Revision 1, August 10, 1996

- TPR-5488, “NWCF Off Gas HEPA Filter In-Place (DOP) Testing,” Revision 3, November 24, 1998

- TPR-5489, “Calciner Area HVAC In-Place HEPA Filter Test,” Revision 0, January 28, 1997

- TPR-5494, “Decon Exhaust Plenum HEPA Filter In-Place (DOP) Testing,” Revision 0, March 17, 1998

- TPR-5497, “NWCF Particle Sizer In-Place HEPA Filter Testing,” Revision 0, January 28, 1999

- TPR-P8.4-J16, “NWCF HEPA Filter In-Place (Aerosol) Testing,” Revision 0, January 29, 2001

- TPR-P8.4-J6, “Replace Off-Gas Filter Components,” Revision 12, September 11, 2001

- TPR-P8.2-B5, “NWCF HVAC Normal Operations,” Revision 10, August 29, 2001

- TPR-P8.2-B1, “Calciner Area HVAC Startup and Shutdown,” Revision 16, February 22, 2001

- TPR-P8.2-B2, “Decon Area HVAC Startup And Shutdown,” Revision 8, September 28, 2000

- TPR-P8.2-F4, “Operation of NWCF Stack Isokinetic Sample Systems,” Revision 8, February 1, 2001

- Specification (SPC)-1, “Stock Material Specification for HEPA Filters,” Revision 2, May 1, 2000

- INEEL Report 00-SP-004, “INEEL Hazardous Facility HEPA Filter Program Assessment,” November 15, 1999.

Personnel Interviewed:

- DOE-ID Radiological Controls Program Manager

- BBWI Radiological Controls Operations Manager

- BBWI Assessment Team Leader for 1999 HEPA Filter Program Assessment

- BBWI Radiological Controls Technical Specialist

- BBWI Technical Specialist for HEPA Filter Testing

- BBWI System Engineers (3)

- BBWI Warehouseman

- BBWI Consulting Business Specialist.

Discussion of Results:

The assessors interviewed the NWCF system engineers for the CVS on October 23, 2001. The engineers agreed that many of the HEPA filters currently installed in NWCF were procured and installed during facility construction in the Fall of 1980. These originally installed HEPA filters included most of the decontamination area filter banks, the majority of one plenum of the calciner area filter banks, and most of the corridor HEPA filters. Due to the challenging service conditions of the (POG), POG filters have been routinely replaced over many years of operation. Although company procedure MCP-2746, “Purchasing, Maintaining, and Using HEPA Filters,” required the system engineers to maintain records on installation date of filters and performance parameters such as airflow rate, differential pressure ranges and radiation levels, the system engineers had no such records for those filters installed during NWCF construction and still in service. The technical specialist for HEPA filter testing, however, produced unofficial records maintained in his office of limited HEPA filter service history in NWCF from new construction through 1995.

The HEPA filters installed during NWCF construction pre-dated specification ASME AG-1, Section FC5000. Engineers were able to produce some evidence that the original filters still in service were procured to military specifications MIL-F-51068 and MIL-F-51079. Furthermore, the procurement specifications for the POG HEPA filters deviated from ASME AG-1, Section FC5000 requirements in specific areas due to the high temperature environment of the POG system. Although ASME AG-1, Section FC5000 was not the source procurement document for all of the NWCF HEPA filters, the assessors judged that the currently installed NWCF HEPA filters were appropriately qualified.

The system engineers were confident that the filter housings procured from Flanders Corporation were properly tested in accordance with ASME Code AG-1, Section TA or its predecessor specifications. However, the plenums for the decontamination area and calciner area HEPA banks were built by the construction subcontractor in 1980, and therefore not tested per the current ASME specification. Nevertheless, a paper entitled "DOP Testing HEPA Filter Banks in Series," presented at the 17th DOE Nuclear Air Cleaning Conference (date unknown) indicated that the plenum filter bank housings had received reasonable testing prior to acceptance.

During a walk-down of the facility on October 23, 2001, the DNFSB observer pointed out corridor HEPA filters not mounted in a filter housing and modified to accept a furnace-type prefilter. These "naked" closed-face HEPA filters lacked a filter housing meeting the intent of ASME Code AG-1 Section TA. As noted in the August 2001 DOE pilot assessment report of the Building 332 at Lawrence Livermore National Laboratory, these closed-face HEPA filters were not recognized by either DOE-STD-3020-97 or national standard ASME AG-1.

Through walk-downs and interviews with the system engineers, the assessors determined that visual inspections ports were installed only for the calciner area and decontamination area filter housings to enable in situ visual inspections of the HEPA filters. No inspection ports were installed for the POG filters or the bagout style corridor filters. No inspection ports were required for the "naked" corridor HEPA filters described above. However, the existence of inspection ports was judged irrelevant for the calciner area and decontamination area filter banks because the HEPA testing procedures included no provisions for visual inspections. National standard ASME N510-1989, Section 5 listed a number of visual inspections and acceptance criteria that could be applied to NWCF confinement ventilation systems under test. The lack of instructions for appropriate visual inspections during HEPA filter testing was captured in System Operability Issue S&T-4 above.

The assessors interviewed the BBWI warehouseman responsible for HEPA filter storage at INTEC and walked down the CPP-654 warehouse facilities on October 24, 2001. Shelf-life limitations were listed on Flanders Corporation labels attached to the HEPA filters. The warehouseman stated that the BBWI Passport database, used for integrated maintenance planning at the INEEL, was being updated to include shelf-life data for warehoused spare parts, including HEPA filters. Tape on HEPA filter packaging and labels affixed to HEPA filters confirmed that all HEPA filters in storage had been tested at the DOE Filter Test Facility in Oak Ridge. Assessors determined that HEPA filters were segregated in racks designated for quality level spares and that all requirements for HEPA filter storage from MCP-2746 were met with one exception. Four HEPA filters were found stored in the warehouse horizontally, contrary to packaging directions and the requirements of MCP-2746, Section 4.2.3.B.

In addition to the horizontally stored HEPA filters in the CPP-654 warehouse, assessors discovered two improperly stored HEPA filters in the calciner area exhaust plenum room in NWCF. One apparently unused HEPA filter was stored without packaging in the contamination area established for the filter bank housing, and the second HEPA, in an opened package, was stored behind one of the building support beams. In light of the 1999 assessment findings (discussed below) and the advance notification of this Phase II assessment, the assessors found the improperly stored HEPA filters to be a disturbing indication of line management disregard for proper HEPA filter storage. See Opportunity for Improvement S&T-5.

At the request of the assessors, the warehouseman obtained purchase order (PO) numbers for two types of HEPA filters in the CPP-654 warehouse: 23-00914 X-00-584303 for a standard HEPA filter, and 23-06392 X99-572578 for a POG HEPA filter. PO documentation was requested to determine the specifications for the two types of HEPA filters. The BBWI consulting business specialist provided copies of the PO documentation for assessor review. Both POs relied heavily on BBWI specification SPC-1, "Stock Material Specification For HEPA Filters." The BBWI specification established the technical requirements for the HEPA filters and, in particular, stipulated DOE-STD-3020-97 and ASME AG-1 Section FC.

System engineers admitted during interviews that BBWI had no HEPA filter [service] life program. ORMs and procedures required HEPA filters to be changed only upon failure of aerosol test criteria, high differential pressure, or high radiation levels. Although not specified in ORMs or procedures, the system engineers were aware that falling or low differential pressure could indicate filter failure and require replacement. However, no company policy or process was implemented to ensure installed HEPA filters were replaced before age impacted the strength of the HEPA filter media.

In May of 1999, the DNFSB issued Technical Report 23, "HEPA Filters Used in the Department of Energy's Hazardous Facilities." The report addressed various programmatic weaknesses in HEPA filter maintenance including the effect of age. Selected excerpts from the DNFSB Tech 23 report were reproduced below:

> Filter strength is affected by such factors as manufacturing variables, aging, loss of binder, loss of water-repellent capability, shelf life, history of prior wetting, exposure to high temperature, exposure to high radiation, exposure to chemicals, and exposure to moisture-laden air (Frethold et al., July 14, 1997; Bergman et al., 1994; Carbaugh, 1982; Johnson et al., 1988; Moeller, 1982; First, 1996). While many of these factors have been investigated, a quantitative assessment does not appear possible at this time. More important, a conservative limit on filter life is not currently mandated by DOE.
>
> These data suggest that remaining strength and ability to repel water are important considerations for continued HEPA filter use, but it is not possible to specify an exact service life. Qualitatively, however, the data clearly indicate that filters cannot stay in service indefinitely. Since an exact service life cannot be determined and data variability is significant, individual vulnerability assessments that examine the expected efficiency, life, and mission for installed HEPA filters would appear to be desirable.

> Since an exact service life cannot be determined and data variability is significant, individual vulnerability assessments that examine the expected efficiency, life, and mission for installed HEPA filters would appear to be desirable.
>
> Several attempts have been made to establish an age limit for HEPA filters, taking into consideration the weaknesses observed during testing. First (1996) of the Harvard Air Cleaning Laboratory recommends 5 years for HEPA filters used in biological cabinets. The Savannah River Site has a 5-year limit in place [limit since changed], including both shelf life and service life. LLNL previously proposed an 8-year limit, and is currently proposing a 10-year limit. Some DOE facilities have filters in service that were installed more than 20 years ago. A prominent filter manufacturer claims a 3-year shelf life, but only under proper storage conditions. No other age limits at DOE facilities have been proposed to date. Nor have any additional routine measurements or assessments to evaluate the residual strength of HEPA filters been proposed.
>
> Finally, systematic evaluations of the anticipated performance of installed HEPA filters compared with the tasks they are expected to perform should be completed. These evaluations should be based on reasonable but conservative assumptions regarding potential mechanisms for filter degradation, pending the conduct of meaningful research aimed at definitively establishing a better understanding of how filter strength varies with time.

In August 1999, the DOE-ID Operational Safety Division (OSD) performed "An assessment of the LMITCO [previous M&O contractor] HEPA filter program ... against concerns identified in DNFSB/TECH-23 report." The DOE-ID report, OSD-1999-31, identified deficiencies in warehousing practices for replacement filters but failed to document the lack of a HEPA filter service life program. The assessor interviewed the author of the 1999 DOE-ID report and learned that the OSD assessor was aware of the DNFSB concerns and the lack of an INEEL HEPA filter service life program. However, since the department had issued neither guidance nor requirements to establish a HEPA filter service life program or policy, he did not address the issue in his report.

In September 1999, the DOE-ID OSD Director tasked BBWI by letter to "perform a vulnerability assessment on the INEEL HEPA filter program relative to the DNFSB Technical Paper [Tech 23]." BBWI issued report INEEL-SP-004 in November 1999 but, like DOE-ID, failed to identify the lack of a HEPA filter service life policy or program as an issue relative to DNFSB Tech 23.

The DOE assessor briefly interviewed the assessment team leader for the 1999 BBWI assessment on October 24, 2001 and confirmed that the absence of a HEPA filter service life program was obliquely captured in issue SP-004-01: "Resolutions to the DNFSB issues require tracking and incorporation into INEEL HEPA Filter Program procedures after the DOE complex wide response." Issue SP-004-01 was entered into the contractor issues management database, ICARE, as deficiency report (DR) 10058 on 1/12/2000. However, the DR was cancelled without tracking or resolution with the following note: "This DR was CANCELLED as not valid on

02/15/2000 by [name deleted]. Justification: this issue was created by Independent Oversite [sic] and upon review it was found not to be a DR."

The Phase 1 review of the NWCF confinement ventilation system, forwarded by BBWI to DOE-ID by letter on April 26,2001, concluded as follows: "The CPP-659 HVAC system continues to meet the SAR requirements for the system. The assigned system engineer assures that the configuration management and maintenance programs are followed. The only trend that is of increasing concern is the aging of the HVAC equipment ***other than the filters themselves*** such as the dampers, flow instruments, controllers and differential pressure photohelic alarms [emphasis added]." Although the assessors agreed that surveillance testing of nonfilter portions of the NWCF confinement ventilation system were either nonexistent or inadequate to ensure proper operation of aging safety significant SSCs, the Phase 1 assessment team clearly overlooked the unresolved issue of indeterminate HEPA filter service life outlined in DNFSB Tech 23.

The assessors concluded the DOE Idaho Operations Office had failed to pursue resolution of the DNFSB Tech 23 issues regarding HEPA filter service life. The issue remains undocumented and unresolved despite widespread understanding of the DNFSB concerns and multiple assessments against Technical Report 23. See System Operability Issue S&T-6.

System Operability Issues or Concerns

S&T-6: The DOE Idaho Operations Office has not actively pursued resolution of the DNFSB Tech 23 issues regarding HEPA filter service life and has not tasked the contractor to develop a meaningful policy addressing the effects of HEPA filter aging. HEPA filters at NWCF approaching 20 years old continue to be used without a HEPA filter service life program or a technical resolution to published DNFSB concerns.

Opportunities for Improvement

S&T-7: Despite 1999 DOE-ID and M&O assessment findings and the advance notification of the Phase II assessment, the assessors found the improperly stored HEPA filters in the CPP-654 warehouse and the CPP-659 NWCF Calciner Area Exhaust Plenum room, contrary to the requirements of MCP-2746, Section 4.2.

Criterion 5:

Instrumentation and measurement and test equipment for the confinement ventilation system are calibrated and maintained.

Is the Criterion met:

Yes.

How the Review was Conducted:

Documents reviewed and personnel interviewed are listed below.

Documents Reviewed:

- ASME N510-1989, "Testing of Nuclear Air Treatment Systems"
- ERDA 76-21, "Nuclear Air Cleaning Handbook"
- TPR-5054, "HEPA Filter In Place Testing," Revision 1, August 10, 1996
- TPR-P8.4-J16, "NWCF HEPA Filter In-Place (Aerosol) Testing," Revision 0, January 29, 2001
- TPR-P8.4-J6, "Replace Off-Gas Filter Components," Revision 12, September 11, 2001
- TPR-P8.2-F4, "Operation of NWCF Stack Isokinetic Sample Systems," Revision 8, February 1, 2001
- SPC-1, "Stock Material Specification for HEPA Filters," Revision 2, May 1, 2000
- INEEL Report 00-SP-004 "INEEL Hazardous Facility HEPA Filter Program Assessment," November 15, 1999.

Personnel Interviewed:

- BBWI Technical Specialist for HEPA Filter Testing
- BBWI System Engineers (3)
- BBWI Warehouseman.

Discussion of Results:

As part of the interview with the BBWI technical specialist for HEPA filter testing on October 23, 2001, assessors reviewed records to confirm that all on-hand aerosol testing equipment, including photometers, were included in a calibration program. Assessors found all of the in-service aerosol testing equipment for INTEC within current calibrations with the exception of an upgraded photometer unit. The upgraded photometer unit was not maintained in calibration because the technical specialist was unhappy with the digital readout and preferred the older analog meters for performance of aerosol testing. Assessors evaluated Criterion 5 as met.

System Operability Issues or Concerns

None.

Opportunities for Improvement

None.

APPENDIX B: LESSONS LEARNED FROM ASSESSMENT

Because the New Waste Calcining Facility (NWCF) and Irradiated Fuel Storage Facility (IFSF) assessments were conducted within weeks of each other, a single set of Lessons Learned were developed and reported in both reports. The Lessons Learned from the two assessments are categorized and itemized as follows:

1. Assessment Team Selection

The team consisted primarily of DOE-ID and BBWI staff. The team selected was able to shorten the assessment time because of prior knowledge and the assessment also resulted in a lower cost, by minimizing travel costs. However, minor conflicts with normal duties occurred.

2. The Criteria Review and Approach Document (CRAD)

The DOE-approved CRAD does not specifically address the CVS operating procedures, the response-to-alarms procedures, and the interaction between the CVS and the facility fire suppression system.

Without specific criteria, the distinction between "Criteria met with opportunities for improvement" and "Not Met" became dependent on the assessor.

3. Pre-Assessment Preparations

Although the CRAD was provided to the facility operating staff, the facility staff underestimated the depth and breadth of the actual assessment. A pre-meeting with the facility manager and system engineer held well in advance of the assessment would have resolved this issue.

4. Report Format

The defined format does not have a place to document minor issues that were not associated with a specific CRAD.

5. Management Expectations

Although the nuclear facility manager and system engineer positions are well-defined, the management expectations for the operability and material condition of the safety system was not promulgated prior to the assessment.

APPENDIX C: BIOGRAPHIES OF TEAM MEMBERS

Robert D. Boston – Nuclear Safety Technical Lead, DOE-ID, Operational Safety Division/Nuclear Safety Branch

Mr. Boston is the Nuclear Safety Technical Lead for the INEEL. He has responsibility for oversight of the nuclear and nonnuclear safety analysis program. This program includes all 10 CFR 830 Documented Safety Analysis (DSA) reports, technical safety requirements, Unreviewed Safety Questions, hazard classifications (for both nuclear and nonnuclear facilities), and nonnuclear Safety Analysis Reports. Mr. Boston is DNFSB Recommendation 93-3 qualified in Nuclear Safety Systems. Previous employment assignments include: (a) Manager for restart of the Nuclear Material Inspection and Storage Facility; (b) Safety Analysis and Criticality Safety Subject Matter Expert (SME) for the INEEL Independent Oversight Group; (c) Criticality Safety Engineer for the Pit 9 Remediation Project; (d) Nuclear Regulatory Commission – Senior Reactor Operator; (e) U.S. Navy Nuclear Program - Engineering Officer of the Watch; (f) U.S. Navy Supervisor of Shipbuilding Engineering Duty.

Mr. Boston is the DOE-ID SME for INEEL action on the DNFSB 2000-2 Recommendation Implementation Plan.

Mr. Boston has a masters degree in nuclear engineering, is a certified health physicist, is the president of the Eastern Idaho Chapter of the Health Physics Society and is a member of the Idaho State University Reactor Safety Committee.

Previous assessments include:

1. Plutonium Finishing Plant Operational Readiness Review (ORR), September 2000;
2. Materials Test Reactor Canal and Plug Storage ORR, April 2001;
3. Special Manufacturing Capability (SMC) Integrated Safety Management Review, April, 2000;
4. Advanced Test Reactor (ATR) USQ Review Team Leader, January 2001;
5. ATR 2001 SAR Annual Update, August 2001;
6. Numerous PDSA/DSA/TSR reviews.

Norman E. Cole – Department Manager, Facility Support Programs, BBWI

Mr. Cole has 34 years in the nuclear submarine and nuclear programs engineering, plant maintenance, and operation. He is currently the department manager, Facility Support Programs, for Bechtel BWXT, LLC and responsible for the INEEL facility hazard identification and control programs. He was the former manager of the Naval Reactors Facility Prototype Support Engineering and Expended Core Facility New Projects. Mr. Cole was the chairman of the Nuclear Safety and Criticality Safety Committee at the Naval Reactors Facility. He worked on the preparation of DOE-STD-1073-93, Guide for Operational Configuration Management Program, and supported implementation of an INEEL-wide configuration management program.

Brian P. Conlon – DOE-ID Program Analyst

Mr. Conlon is presently assigned as the DOE-ID Maintenance Program Manager with the responsibility for consolidating and revamping maintenance practices at the Idaho National Engineering and Environmental Laboratory. With an academic background in quality engineering, Mr. Conlon has nearly 28 years of federal service, working primarily in facilities, program, and maintenance management.

Thomas (Tom) E. Fewell—Advisory Engineer for Conduct of Engineering

Mr. Fewell is currently an advisory engineer in the Conduct of Engineering department at the Idaho National Engineering and Environmental Laboratory (INEEL). He holds a master of science degree in mechanical engineering from Clemson University and has approximately 28 years in the defense, commercial nuclear, and national laboratory communities. His engineering experience was developed in the areas of project management, design, testing, development, fabrication, and operation, while working on the following programs: National Mixed Waste Focus Area, University Reactor Fuel program, Spent Fuel Storage, High Temperature Gas-cooled Reactor components and fuel for the New Production Reactor project, Seawolf Attack Submarine (S6W), Molten Salt Solar Receiver, Liquid Metal Steam Generators, and Light Water Reactor Steam Generators. Prior to joining the INEEL, he worked at the Combustion Engineering, Westinghouse Electric, and Babcock & Wilcox Corporations. His current assignments are focused on the development of an Engineering self-program and performance of engineering and configuration management assessments for the INEEL Facility Evaluation Board.

Lawrnel Harrison – Principal Engineer, Mechanical Systems, BBWI

Mr. Harrison is a principal engineer at the INEEL. He holds a masters degree in mechanical engineering and is a certified professional engineer. In the past he has served as technical lead of the INEEL HEPA Filter and Ventilation Test Group and was an active member of the ASME Committee on Nuclear Air and Gas Treatment. For over eight years he has provided technical assistance to the operation and maintenance of over 300 Air Cleaning (mainly HEPA filtered) and 200 Industrial Ventilation systems located at the INEEL. His most recent activities have included the design and testing of experiment systems and equipment associated with the Advanced Test Reactor located at the INEEL.

Michael B. Heiser

B. S. Chemical Engineering, Montana State University

Mr. Heiser has more than 25 years experience in the reprocessing of spent nuclear fuel and high level waste operations. Mr. Heiser's has been directly responsible for the operation, maintenance, and engineering support for the operation of the New Waste Calcining Facility and other HLW facilities at the Idaho Chemical Processing Plant (ICPP). Mr. Heiser participated with DOE-HQ on the writing of the DOE Order 435.1 and has become the subject matter expert for the INEEL on the Waste Incidental to Reprocessing determinations. Mr. Heiser is currently employed at BBWI, where he provides technical support on environmental issues related to HLW at the INEEL and throughout the nation.

Gerald T. Paulson – Director, Facility Hazards Identification and Control, BBWI

Dr. Paulson has 20 years experience in nuclear safety and nuclear operations. He holds a PhD in chemical engineering from Montana State University. He is currently the director, Facility Hazards Identification and Control, for Bechtel BWXT, LLC and responsible for the INEEL nuclear criticality safety, safety analysis, and facility hazard programs. He has held management assignments in a variety of environmental safety and health disciplines for Westinghouse, Lockheed Martin, and BBWI. He is also an adjunct professor of chemical engineering for the University of Idaho.

Carey R. Warren – Facility Representative, DOE-ID

Mr. Warren has over 22 years experience in reactor plant operations and maintenance. As the DOE-ID facility representative at the Idaho Nuclear Technology and Engineering Center (INTEC) for the past three years, Mr. Warren is the primary point of contact for support plant operations, maintenance activities, and operational events. Prior to his assignment at INTEC, Mr. Warren served as the DOE-ID facility representative for the Test Reactor Area where he led a ground-breaking environmental assessment team and performed routine oversight of Advanced Test Reactor operations. He has headed assessment teams for two INTEC conduct of operations assessments and a licensing readiness review for Nuclear Regulatory Commission (NRC) licensing of the Three Mile Island Unit 2 Independent Spent Fuel Storage Installation (ISFSI). Mr. Warren served as team member for the Transition Readiness Review of Department and Contractor readiness to assume the Fort St. Vrain ISFSI NRC license and for the Integrated Safety Management System Phase 2 Readiness Verification at the Radioactive Waste Management Complex and Waste Reduction Operations Complex.

Prior to joining DOE in 1994, Mr. Warren worked at Charleston Naval Shipyard for four years in the Nuclear Engineering Department as a mechanical engineer directing overhaul and repair of submarine reactor plants. Mr. Warren served as a U.S. naval officer for Mare Island Naval Shipyard managing short turnaround nuclear submarine repair activities as Ship Superintendent. As a naval officer, Mr. Warren qualified in reactor plant and submarine operations while serving aboard the USS Sea Devil, SSN-664.

Mr. Warren holds a bachelor of science degree in mathematics from the University of North Carolina at Chapel Hill and a master of science degree in nuclear engineering from Penn State University. In addition, Mr. Warren is a licensed professional engineer (mechanical).

Thomas L. Wichmann – Chief, Nuclear Safety Branch, Operational Safety Division, DOE-ID

Mr. Wichmann has 35 years experience in nuclear submarine and plant maintenance and operations. He is currently Chief of the DOE-ID Nuclear Safety Branch. A former member of Naval Reactors Idaho Branch Office, he was assigned as a technical representative to the

Director Naval Reactors responsible for the S1W Prototype and the Expended Core Facility in Idaho. He has conducted technical safety appraisals in maintenance and auxiliary systems for DOE at Hanford, Stanford Linear Accelerator, and Fermi National Laboratory.

Mr. Wickmann is designated as the subject matter expert in Conduct of Operations and Conduct of Maintenance for the Idaho Operations Office and as a member of DOE-ID Senior Safety Review Panel that reviews all authorization basis documents before recommending approval to the designated approving official.

Rick W. Winslow – Facility Engineer, DOE-ID, INTEC

Mr. Winslow is currently serving as the INTEC Infrastructure facility engineer, Mr. Winslow has 20 years experience in engineering, maintenance, and operations in the Nuclear Navy and private industry. He served six years in nuclear submarines, qualifying as a Naval Reactors Engineering Officer before entering private industry. He has worked in the power generation field (commercial nuclear and fossil) as a maintenance supervisor and reliability engineer. In this capacity, he was responsible for the development of ASME R-Stamp welding programs for fired and unfired pressure vessels, the planning and execution of plant-wide outages and the development of highly successful machinery reliability programs.

Mr. Winslow has developed and implemented highly successful maintenance reliability programs in the petro-chemical, chemical production, mining, and paper industries, including implementing state-of-the-art, cost saving, machinery monitoring technologies. He has also engineered, procured, and constructed large equipment retrofits to significantly improve process efficiency and effectiveness. He has previous DOE work experience at the Hanford Tank Farms.

Defense Nuclear Facilities Safety Board
Recommendations 2000-2
Configuration Management – Vital Safety Systems

Phase II Assessment of Waste Handling Building HVAC

Waste Isolation Pilot Plant

Carlsbad, New Mexico
December 2001

Phase II Assessment of Waste Handling Building HVAC
Waste Isolation Pilot Plant

Assessment Team Members:

Doug Tonkay, DOE.EM-23	Date
Richard Farrell, DOE/CBFO	Date
Kim Jackson, WTS	Date
Randy Elmore, WTS	Date
Jim Clark, Battelle	Date

Team Coordinator:

Joe Field, CTAC	Date

Team Leader:

Dr. Chuan-Fu Wu, DOE	Date

Approval:

Dr. Ines Triay, CBFO Manager	Date

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Acronyms

AHU	Air handling unit
ALARA	As low as reasonably achievable
ANSI	American National Standards Institute
AR	Action Requests
ASD	Adjustable Speed Drive
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BAS	Building Automation System
Board	Defense Nuclear Facilities Safety Board
CAS	Condition Assessment Survey
CDC	Continuous digital controls
CFR	Code of Federal Regulations
CH	Contact-handled (waste)
CMS	Central monitoring system
CMRO	Central Monitoring Room Operator
COTS	Commercial off-the-shelf
CVS	Confinement Ventilation System
DBE	Design basis earthquake
DBT	Design basis tornado
DDC	Direct digital controls
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U. S. Department of Energy
DP	Defense Programs
ERDA	U.S. Energy Research and Development Administration
ES&H	Environmental Safety and Health
FSM	Facility Shift Manager
HAZWOP	Hazardous Waste Operations
HEPA	High Efficiency Particulate Air
HVAC	Heating, ventilation and air condition
I&C	Instrumentation and control
ISMS	Integrated Safety Management System
JCO	Justification for Continued Operation
NEPA	National Environmental Policy Act
O&M	Operations & Maintenance
PDD	Pressure Differential Detectors
P&ID	Piping and Instrumentation Diagram
PLC	Programmable logic controller
PM	Preventive maintenance
QA	Quality assurance
RCRA	Resource Conservation and Recovery Act
RH	Remote-handled (waste)
SAR	Safety Analysis Report
SDD	System Description Document
SER	Safety Evaluation Report
SSCs	Structures, Systems and Components
STD	Standard
TSR	Technical Safety Requirement
UCNI	Unclassified Controlled Nuclear Information
UL	Underwriters Laboratory
USQ	Unreviewed Safety Question
VSS	Vital Safety Systems
WHB	Waste Handling Building
WIPP	Waste Isolation Pilot Plant
WTS	Westinghouse TRU Solutions

Glossary

Operable (operability) – Describes a system, subsystem, train, component, or device that is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electrical power, cooling water, lubrication, and other auxiliary equipment required for the system, subsystem, train, component, or device perform its function(s) are also capable of performing their related support functions(s).

Walkdown – A visual inspection of facility structures systems and components to identify the as-found physical configuration and any discrepancies with the currently approved facility documentation (see DOE STD 1073).

Introduction

The Waste Isolation Pilot Plant (WIPP) is the world's first underground repository licensed to safely and permanently dispose of transuranic (TRU) radioactive waste from the research and production of nuclear weapons. After more than 20 years of scientific study, public input, and regulatory struggles, WIPP began operations on March 26, 1999.

Located in the remote Chihuahuan Desert of southeastern New Mexico, project facilities include disposal rooms mined 2,150 feet underground in a 2,000-foot thick salt formation that has been stable for more than 200 million years. TRU waste is currently stored at 23 locations nationwide. Over a 35-year operational period, WIPP is expected to receive about 37,000 shipments.

The Waste Handling Facility at WIPP is designed to receive TRU waste in drums that are packed in TRUPACT-II containers. The facility's heating, ventilation, and air conditioning (HVAC) system is designed to provide HVAC as required for waste handling operations.

This document was produced in compliance with Commitment 11 of the DOE Implementation Plan for Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2000-2, *Configuration Management, Vital Safety* Systems. Commitment 11 tasks field element managers to assemble teams to assess the current condition of confinement ventilation systems that are important to safety, detailing the operational readiness of systems.

Team Composition and Assignments Matrix

The team assembled for this assessment includes the following individuals:

Lead: Dr. Chuan-Fu Wu, DOE Carlsbad Field Office (DOE/CBFO)

Coordinator: Joe Field, CBFO Technical Assistance Contractor (CTAC)

Team Members:
Doug Tonkay, DOE/EM-22
Richard Farrell, DOE/CBFO
Kim Jackson, WTS
Randy Elmore, WTS
Jim Clark, Battelle Albuquerque

Assignments of the team members to specific criteria are as follows:

Criterion	Team Members Assigned
Safety Function Definition	Richard Farrell, Kim Jackson, and Joe Field
Configuration Management	Doug Tonkay, Jim Clark, and Randy Elmore
System Maintenance	Randy Elmore, Kim Jackson, and Joe Field
System Surveillance and Testing	Kim Jackson and Joe Field

CH HVAC Operational Overview

Design Features

The following design features are provided in the WIPP Confinement Ventilation System HV01:

- The differential pressure between the Waste Handling Building (WHB) and the outside atmosphere is maintained at subatmospheric pressure. Any release of contamination within these areas is mitigated by high efficiency particulate air (HEPA) filter assemblies. Air flows to these filter assemblies through ducts that connect areas in which any likelihood of contamination increases progressively.

- In the event of a Design Basis Earthquake (DBE), provision is made to stop supply and exhaust fans and close all intake and exhaust ducts.

- In the event of a Design Basis Tornado (DBT), provision is made to stop supply and exhaust fans and the tornado dampers in the WHB exhaust and supply ducts will close.

The principal components consist of two air handling units, four HEPA filters units, and their four associated exhaust fans. This equipment can be operated independently from other HVAC systems. Operating status is monitored in the Central Monitoring System (CMS).

The system is designed to operate so that all areas which may contain waste are maintained at a subatmospheric pressure. These conditions are achieved by the use of a single Air Handling Unit (AHU), and one exhaust fan. The remaining units provide standby capacity.

CH Area Air Supply

Air is supplied to the contact-handled (CH) waste area from one of two AHUs. These units are draw-through types with filters, chilled water cooling coils, electric heating coils, and an evaporative cooler that is not in use. Temperature control is from a temperature transmitter in the Inventory and Preparation Area (Room 103) that controls the cooling coil and heater in sequence. Air flow is maintained at a constant rate by modulating the inlet vanes in the fan inlet from the electronic flow sensors in the supply duct.

Normal Operation

During normal operation, the subsystems HVO1 and HV02 supply properly conditioned air to normally occupied areas of the Waste Handling Building (WHB), provide control of pressure differentials in areas/rooms with the WHB, ensure airflow is confined to the prescribed flow path and pattern, and provide for continuous filtration of exhaust airstream from the WHB for ALARA compliance. The exhaust airstream is designed to collect the various exhaust streams into a single discharge point. During all plant operational modes, Station C provides radiation monitoring for air streams for HVO1 as well as HVO2 and Zone 2 of HVO3.

During normal plant operation, only one train of the HVAC systems in each area will be in operation at any time. Static pressure control is provided by pressure differential detectors (PDDs) installed in the exhaust air duct near room exhaust registers. During normal operation, continuous filtration of exhaust air from the CH Waste Handling Area is provided by the HEPA filter assembly in the HVAC train in operation in that area. All exhaust air is passed to the outside atmosphere through a monitored exhaust.

Air from the CH battery recharge area is exhausted through one of two smaller HEPA filter/exhaust fan trains provided for that area. This exhaust air is discharged into the single exhaust stack which services the WHB.

Exhaust air from the Mechanical Equipment Area is drawn through registers in the CH area exhaust ducts in Room 200. It is then filtered and exhausted along with CH area air as previously described. The Mechanical Equipment Room is maintained at a pressure slightly below atmospheric pressure by the fans that exhaust air form the CH area.

Off-Normal Operation

If a malfunction occurs in a CH area HVAC train, both the supply and the exhaust fans in that train will trip. The HVAC system standby train for that area can then be started up. This will ensure that the specified negative pressure can be maintained in areas where waste is being handled. In the event of a tornado, the tornado damper located in the WHB common exhaust duct will close. The exhaust fans, interlocked with the damper, will trip. As a consequence, the corresponding AHU fans will trip also. The system's response is the same following the occurrence of a seismic event.

Pressure Control

The exhaust flow rate from each room is varied by the PDDs to maintain the necessary room static pressure. As the room differential pressure varies, the PDD increases or decreases the exhaust flow rate to satisfy the controller set point. The pressure differential signal is processed through the control modules via pressure-integral-derivative control blocks in the controller module software. The controller module adjusts the exhaust fan flow rate based on the combined demand for exhaust flow form each PDD control signal.

HVAC in the Battery Recharge Area

The battery recharge area located on the North side of the CH Bay has a separate exhaust system provided for the removal of hydrogen generated when battery charging is in progress. The exhaust system for the battery recharge area consists of two HEPA filter assemblies and two exhaust fans. One exhaust fan and filter is on standby status.

Flow sensors are installed in the discharge ducts of the fans. These signals are processed by the Direct Digital Control (DDC) system to maintain a constant flow rate. The battery charging exhaust fans do not have inlet vortex vanes for flow control. One fan has an adjustable speed drive (ASD) for flow control and the other fan has an opposed blade damper in the inlet duct that is modulated.

Interlocks

The DDC system contains software –based interlocks that ensure proper operation of the system and avoidance of equipment failures resulting from incorrect operation. These may be summarized as follows:

- Permissive interlocks and latching relays prevent the simultaneous operation of two exhaust fans or two supply fans.

- An AHU supply fan can only be started if the corresponding exhaust fan is operating.

- The isolation dampers in the inlet and outlet ducts of the HEPA filters are automatically opened when their respective exhaust fans are started. When the fans are de-energized, the dampers are closed.

- If either AHU trips automatically due to a malfunction, the corresponding exhaust fan will also be tripped.

- Electrical heaters in the AHU can only be energized when their supply fans are running. Stopping the supply fan will de-energize the heater.

On-Site Assessment Methodology

STEPS

1. Document reviews (see Documents and References) included the relevant Sections of the Hazardous Waste Facility Permit (HWFP), the Safety Evaluation Report (SER), the (CH) Safety Analysis Report (SAR), Technical Safety Requirements (TSR), national standards, WIPP procedures, engineering drawings, and operator aids. From a quality assurance viewpoint, safety basis-related technical, functional, and performance requirements related to the confinement ventilation system were evaluated (table-top confirmations only) as to whether they were adequate, effective, and implemented. Objective evidence specific to the confinement ventilation system presented by Westinghouse TRU Solutions (WTS) to confirm implementation included memoranda, periodic inspection records, trending analysis sheets, scheduled preventive maintenance (PM) records.

2. A tour was conducted to determine the overall material condition and physical layout of the CH HV 01 system.

3. Processes/systems that capture track, correct, and close material deficiencies were compared to noted/documented material deficiencies.

4. Systems records were reviewed and personnel were interviewed to evaluate configuration management, maintenance, and surveillance and testing processes.

5. Using drawings and procedures, a technical walkdown was performed of a selected portion(s) of the system to confirm that as-builts conform to the technical documents.

6. The ability of the confinement system to reliably perform its safety function(s) over the remaining system lifetime was evaluated.

Assessment Summary Results

The assessed criteria for safety function, configuration management, system maintenance, and system testing and surveillance of the CH HVAC 01 confinement ventilation system were found to be adequate, implemented, and effective. Safety Analysis Report (SAR) documentation was found to be thorough and provided detailed descriptions of the CH HVAC functions, operational characteristics, and mitigative features.

Expectations Concerning Aging and Degradation of the CH HV01 System

With continued nominal corrective maintenance, preventive maintenance, and upgrade of applied technology, as parts become obsolete or defective and are replaced, the confinement ventilation system can be expected to last the projected lifetime of the facility, which is currently about 35 years.

Safety Function Definition

Consideration should be given to formation of an institutionalized group to continue vital safety system assessments. At some sites (for example, the Savannah River Site), an existing facility evaluation board is being utilized for ongoing facility assessments. At the WIPP site, this model could be applied to the CH and RH facilities. A panel of technical experts from the federal and contractor work forces, outside of the line management and cognizant engineers, could, in an ISMS context, periodically assess the condition of vital safety systems. One of the first evaluations could be the evaluation of the completed ventilation upgrades to the CH and RH system, in particular, the software administrative configuration management approach when fully mature.

Configuration Management

The Configuration Management program for the HV01 upgrade project at the WIPP facility was judged as being proactive in managing changes to safety-basis related requirements, documents, system configuration, and installation upgrade of system components. The procedures, administrative controls, upgraded program organization, personnel and proactive upgrade to digital controls have created an effective and efficient safety-system HV01 upgrade program that has resulted in savings of time, manpower, more efficient use of energy and, decreased cost of maintaining the system. The HV01 upgrade program is scheduled for completion around the April 2002 timeframe, after which the Configuration Management areas should be revisited to verify completion of all upgrade aspects.

The current HV01 upgrade program is approaching completion of digital-based controls installation and integration of instrumentation and controls (I&C) logic diagrams into facility as-built drawings. The administration, management and coordination of upgrades to the HV01 system should be considered a model program within the DOE.

System Maintenance

All assessment criteria were satisfied, with no exceptions found. A robust maintenance program is in place that includes corrective, preventive, and predictive maintenance to ensure sustained operation of the CH HVAC. Maintenance and cognizant engineers are well trained to identify trends and take appropriate corrective action. Procedures are in place for all aspects of the maintenance program. Mechanical, electrical, and instrumentation and control maintenance groups are integrated with the corresponding cognizant engineering functions to streamline maintenance operations and ensure open communication between engineering and the maintenance craft.

System Surveillance and Testing

All assessment criteria were satisfied, with no deficiencies identified. A robust maintenance program, with operability testing, is in place to ensure sustained operations of the CH HVAC. The CH HVAC was found to be in good condition. The project will soon be completed to upgrade the pneumatic controls to digital controls to improve system efficiency, improve troubleshooting activities and reduce maintenance costs. Preventive maintenance is performed annually on all components associated with this system.

The CH HVAC should continue to operate to support CH waste handling activities over the life of the facility, with continued corrective and preventive maintenance, and modifications as necessary to replace obsolete equipment. Facility operators were knowledgeable on the tests to ensure operability. Procedures are in place to perform a quality operability test. Annual HEPA filter testing is performed to verify system operation and integrity.

Lessons Learned

Noteworthy Practices

- The WIPP confinement ventilation system upgrade has pursued digital controls as a part of an upgrade to prevent parts obsolescence, resulting in decreased operational and maintenance costs with an increased efficiency.

  With the direct digital control system in place for CH HV01, an annual reduction of approximately $35,000 is achieved. With variable frequency drives added for the CH AHUs, additional annual costs savings amounted to $11,000.

- The management practice of co-locating waste handling engineers, cognizant engineers, and radiological technical personnel under the Waste Handling group reduced barriers to communication and effectively integrated systems experts with hands-on operations.

- When mature, this configuration management approach can be extended to digitally controlled software and is recommended as a credible method of software logic configuration control.

Opportunities for Improvement

- WIPP Management recognized the need for and appointed a digital data administrator for software configuration controls. This position has only recently been formally established with responsibilities over the installation and maintenance of software control logic and documentation. As a result, logic bugs are being worked out. Some set point values in software as-built drawings are not default values as stated in the SDDs.

Recommended Changes to Criteria and Guidance

- Recommend an Executive Summary be included at the front of the report.

- Recommend that a short format for biographies be specified.

- The CRAD covers software assessment adequately. The software appendix element in the guiding principles is redundant and should be eliminated.

Detailed Results

Except as noted in the following detailed assessment results sections, all assessment criteria were met. Similarly, any system operability issues or concerns, are explicitly addressed. Three recommendations or changes were made to criteria or guidance were noted in the Lessons Learned section above.

Safety Function Definition

Criterion: Requirements in applicable DOE rules and orders are invoked for the confinement ventilation systems in the appropriate site documents.

Approach: Review the appropriate safety/authorization basis documents, such as safety analysis reports, basis for interim operations, and TSRs, to determine if the definition/description of the safety functions of the confinement ventilation system includes:

- *The specific role of the system in detecting, preventing, or mitigating analyzed events.*

The following documents were reviewed: DOE/WIPP 95-2065, WIPP Safety Analysis Report – CH Operations, Rev 5.1 and DOE/WIPP 95-2125, Rev 5.1, Technical Safety Requirements, and WP 04-hv4021, CH HVAC Alarm Response.

Summary of Results

Chapter 4 of the SAR discusses the function, components, operating characteristics, and safety considerations and controls for the CH HVAC. Chapter 5 includes the Hazard and Accident Analysis and the corresponding defense-in-depth equipment that provides either preventive or mitigative features to protect workers. The CH HEPA filtration is a mitigative feature to protect workers and the environment in the event of an uncontrolled release of radioactive or hazardous materials.

Chapter 6 of the SAR discusses the derivation of technical safety requirements. The defense-in depth Structures, Systems, and Components (SSCs) are listed in Table 6-1. The applicable System Design Descriptions define defense-in-depth SSCs, describe their intended safety functions, and specify the requirements for design, operation, maintenance, testing, and calibration. WP 04-AD3001, Facility Mode Compliance, is implemented, and maintained to ensure that defense-in-depth SSCs are operated as required during each facility mode as described in Table 6-2 of the SAR.

- *The associated conditions and assumptions concerning system performance*

Summary of Results

The SAR, Section 6.4.5.2, and the Technical Safety Requirement (TSR) specifically require waste handling activities to be stopped in the event that a defense-in-depth SSCs fails to operate, or becomes unavailable during waste handling operations, or must be taken out of service for maintenance or repair. Waste Handling Operations shall not resume until all of the required defense-in-depth SSCs required for waste handling mode are capable of being operated, as required.

- *System requirements and performance criteria for the confinement ventilation system and active components, including essential supporting systems, for normal, abnormal, and accident conditions relied upon in the hazard or accident analysis.*

Summary of Results

Chapter 4 of the SAR describes the system function, components, and operating characteristics. During an abnormal event, the CH HVAC remains in service to provide its mitigative feature of HEPA filtration. Differential pressures are monitored to ensure the HVAC operates within normal operating conditions. Alarm response procedures are defined to direct activities in the event of a HEPA failure or clog.

Configuration Management

Criterion 1: Changes to confinement ventilation system safety basis requirements, documents, and installed components are designed, reviewed, approved, implemented, tested, and documented in accordance with controlled procedures.

Approach 1-1: On a limited basis, evaluate the change control process and procedures.

The following procedures were verified governing change control:

- WP 09-CN3007, Revision 12, Engineering and Design Document Preparation and Change Control, Management Control Procedure, 1/29/01.
- WP 09-CN3024, Revision 3, Configuration Management Board/Engineering Change Proposal, Management Control Procedure, 1/22/01.
- WP 15-PS3002, Revision 12, WTS Controlled Document Processing, Management Control Procedure, 9/11/01.
- WP 10-WC3011, Revision 6, Maintenance Process, Management Control Procedure, 11/06/01.

The following work packages were reviewed to determine whether the change control procedures are implemented:

- Work Order #9906375J, System HV01, Building 411 (install constant air volume boxes, add duct run, change remaining pneumatic controls to direct digital controls, and update software for modifications).
- Work Order #0104274M, System HV01, Building 411, Equipment 41B 861 (logic change for remote monitoring in manual mode).

The following interviews with cognizant line, engineering, QA managers and other personnel occurred to verify their understanding of the change control process and commitment to manage changes affecting design and safety basis in a formal, disciplined, and auditable manner:

- Project Engineer – GPP and Construction Management
- Cognizant Engineer- CH HVAC System
- DOE Facility Representative
- Assistant General Manager for Operations

Summary of results: The Phase 1 assessment results for VSS-1.3 items #5, #8, and #9 apply to configuration management. The procedures were confirmed and a robust, mature configuration control process that is applied to the confinement ventilation system exists. The work packages reviewed included the appropriate components (e.g., request, engineering change proposal, engineering change order) consistent with the procedures. Interviews confirmed solid understanding of procedures and processes by engineers and technical managers.

Criterion 2: Limited technical walkdown of selected system components verifies that the actual physical configuration of these components conforms to documented design and safety basis documents for the system.

Approach 2-1: The following technical walk downs were conducted:

- General layout of HV01 system components in the mechanical equipment room, using figure HV-I-5, SDD HV00.1, Revision 3, July 1998.
- Drawing 41-J-032-W3, Revision H, Waste Handling Building 411, CH Area Local Control Panel 411-CP-052-13 Wiring Diagram.
- Drawing 41-J-032-W4, Revision H, Waste Handling Building 411, CH Area Local Control Panel 411-CP-052-13 Wiring Diagram.
- Drawing 41-F-052-W1, Revision F, Waste Handling Building CH Area HVAC-AHU 41-B-812 and EXF 41-B-816 P&ID.
- Drawing 41-J-032-W4, Revision H, Waste Handling Building 411 CH Area Local Control Panel 411-CP-052-13 Schematic Diagram, AHU 41-B-812/EXF 41-B-816.
- Drawing #41-H-019-W2, System HV01, Bldg. 411 CH Area HVAC logic 41-B-817 control.
- Screen-shot from graphic interface system, Bldg. 411, Second floor CH Area, EXF-817, Live GFB, 10:38 a.m., 4 December 01.

Summary of results: During the walkdown of the AHU 41-B-812, both the mechanical P&ID (Dwg # 41-F-052-W1) and the I&C and electrical schematics were reviewed against the existing plant configuration. All mechanical components were found to be labeled (except some instrumentation hardware) and installed as reflected on the P&ID. The as-built did not fully reflect the upgrades to the digital control systems as they were currently installed. However, this is consistent with upgrades which are currently in progress under W09906375J. The contractor has as a task under the work order, a marked-up P&ID as-builts as one of the final deliverables. Further discussions revealed an expected completion date of about 4 months out, after which a review of CH as-builts should be revisited.

For the electrical and I&C systems, the P&IDs (Dwg # 41-J-032-W3, Dwg # 41-J-032-W4, and Dwg # 41-J032-W5) were found to accurately reflect the as-built status. Only 15-20 circuits/contacts were verified and all were found to be correctly labeled and documented.

Criterion 3: Changes to the confinement ventilation system safety basis requirements, documents, and the installed components conform to the approved safety/authorization basis (safety envelope) for the facility; the appropriate change approval authority is determined using the USQ process; and consistency is maintained among system requirements and performance criteria, installed system equipment and components, and associated documents.

Approach 3-1: Review documentation, such as change travelers and change packages, and interview individuals responsible for processing selected changes made to confinement ventilation system requirements, installed equipment, and associated documents.

Summary of Results: Two work orders in different phases of the planning and implementation process were reviewed and discussed with their assigned project managers.

Work Order #9906375J, System HV01, Building 441 (install constant air volume boxes, add duct run, change remaining pneumatic controls to direct digital controls, and update software for modifications).

- Documents affected by the change were identified
- Changes were documented, with approval signatures
- Involvement of the cognizant engineer, the construction engineer, the construction manager engineer, and configuration management board members was noted
- Evidence of screening for unreviewed safety questions (USQ), National Environmental Policy Act (NEPA), Environmental Safety and Health (ES&H), Resource Conservation and Recovery Act (RCRA) facility permit, and as low as reasonably achievable (ALARA) was found in the engineered work proposal as part of the work order

- The work package included appropriate installation instructions, e.g., job control information and testing requirements.

- Evidence that procedures were followed and configuration management is controlled.

Work Order #0104274M, System HV01, Building 411, Equipment 41B861

- Reviewed work package in preparation.

- Evidence of screening for USQ, NEPA, ES&H, RCRA Facility Permit, and ALARA was found in the engineered work proposal in preparation.

- Verified that WP 10-WC3011, Revision 6, Maintenance Process, Management Control Procedure provides a flowchart for creating implementing maintenance work documents covering Corrective, Skill of the Craft, Modification, Preventative, and Predictive work.

Criterion 4: Facility procedures ensure that changes to the confinement ventilation system safety basis requirements, documents, and installed components are adequately integrated and coordinated with those organizations affected by the change.

Approach 4-1: Determine whether engineering, operations, and maintenance organizations are made aware of confinement ventilation system changes that affect them and are appropriately involved in the change process. Verify integration and coordination with other organizations that could logically be affected by the change.

Summary of results: The WTS TRU Solutions management approach to HV01 upgrade process has been to form a project team under the same organization (CH Ramp-up Project) to facilitate communications and coordination of upgrades. It was observed during the assessment to be an effective management and operational approach resulting in a very effective exchange of information from the initial JCO authorization and subsequent date modifications through DOE to coordination of upgrades and installations on back-shift hours (whenever possible). This process resulted in restoration of ventilation by next-shift to facilitate CH operations. To date, installations of HV01 upgrades have not resulted in any CH waste handling delays and was judged to be an effective and efficient management and organizational matrix to facilitate the flow of information, coordination and communications of upgrades, and collateral responsibilities between projects and site disciplines.

Criterion 5: The quality of computer software used in system components or functions is assessed, documented, and maintained.

Approach 5-1: Reviewed software quality assurance controls applied to procurement of software.

Summary of results: The discussion of software quality assurance is found in Appendix A. We verified that commercial off-the-shelf software, developed under ANSI/ASHRAE standard 135-1995 is being used. The use of as-built drawings incorporating embedded software logic needs to be reviewed and consideration given to documenting setpoints within the as-builts. Conflicting setpoints and bias ranges for logic were observed on numerous occasions between SDD and as-built drawings. This needs to be resolved prior to finalizing and institutionalizing the use of digital controls in vital and building control systems.

Approach 5-2: Request facility staff to provide a list of computer programs used in instrumentation and controls used in the system. During the walkdown, assess completeness of the list of computer programs and software.

Summary of results:

- WTS indicated that EIKON, developed by Automated Logic Corporation, and an associated graphical interface package is the single software package used for HV01 and other ventilation systems.
- Confirmed use of off-the-shelf software developed by Automated Logic Corporation (EIKON, version 3.1) for digital control of ventilation systems.
- Assessed use of graphical logical diagrams for software logic reviewed, including comparison of operator graphics display with as-built drawings.

Approach 5-3: Review quality assurance records.

Summary of results: Software in use for digital control has completed quality assurance forms (see Appendix A) with records residing in the Engineering Data Center. The software itself is proprietary, a commercial off-the-shelf product, which cannot be changed unless upgrades are purchased. Implementation of the software is controlled through the same WIPP configuration management process used for plant systems and hardware under the administrative control of a Digital Data Administrator.

Approach 5-4: Interview facility engineering or operating staff to determine their awareness of software quality assurance requirements for system software programs under their cognizance.

Summary of results: Both the Digital Data Administrator and the cognizant engineer demonstrate awareness of procedures for software quality assurance. WTS Information management also approves software requests in accordance with corporate procurement policy.

System Maintenance

Criterion 1: For the confinement ventilation system, maintenance processes consistent with safety classification are in place for prescribed corrective, preventive, and predictive maintenance.

Approach 1-1: Verify that maintenance for the confinement ventilation satisfies system requirements and performance criteria in safety basis documents or other local maintenance requirements. [NOTE] The following approach statements 1-2 and 1-3 need to be reviewed only once for common site or facility-specific implementation of maintenance management processes or programs.

The following documents were reviewed: DOE/WIPP 95-2065, WIPP Safety Analysis Report – CH Operations, Rev 5.1; DOE/WIPP 95-2125, Rev 5.1, Technical Safety Requirements; WP 10-2, Rev 11, Maintenance Operations Instruction Manual; and WP 10-WC3010, Rev 3, and Maintenance PM/MWI Controlled Document Processing.

Summary of Results

Programmatic tests and inspections are conducted in accordance with the Maintenance Operations Instruction Manual (WP10-2) as required by TSRs. Preventive Maintenance for the Waste Handling Building CH Area HVAC Confinement Ventilation System (CVS) equipment is performed periodically in accordance with WP 10-WC3010. HV00 SDD Table HV G-9 Guideline for Frequency of HVAC Maintenance Activities provides guidance for the periodicity for HVAC equipment preventive maintenance.

Approach 1-2: Evaluate maintenance of aging confinement ventilation system equipment and components.

- Determine whether there are criteria in place to accommodate aging-related system degradation that could affect system reliability or performance
- Review the plans and schedules for monitoring, inspecting, replacing, or upgrading system components needed to maintain system integrity, including the technical basis for such plans and schedules
- Determine whether conditions that require filter replacement (replacement criteria) are specified and how filter aging is accommodated in maintenance processes.

The following documents were reviewed: WP 09, Rev 8, Engineering Conduct of Operations; WP 10-2, Rev 11, Maintenance Operations Instruction Manual; PM 041154, Rev 3, In-Place Testing of HEPA Filter Units.

Interviews were held with the following personnel:

- Robert Valenzuela – Maintenance Operations, Zone 2, Maintenance Engineer
- Gary Morrison – Maintenance Operation, BOP and Design Engineering Manager
- Ed Flynn – Maintenance Operations, I&C Maintenance Manager

Summary of Results

Age-related system degradation is assessed through requirements common to both the Engineering Conduct of Operations (WP 09) and the Maintenance Operations Instruction

Manual (WP 10-2). Criteria are established which identify the minimal requirements for Cognizant Engineers for each system who are responsible for working with Maintenance and Operations to maintain their assigned system. Requirements are established to verify the system Cognizant Engineer:

- reviews equipment history for past equipment problems to aid in corrective actions and develop work instructions.
- completes trending analysis for each completed corrective maintenance work order on equipment designated as mode compliance equipment or as requested.
- performs at least annually a system walkdown, documents the walkdown and the condition of the equipment in a log, and generates action requests for needed corrective actions. The purpose of the walkdown is to:
  a. ensure that current physical configuration matches existing design documentation, upgrades required to maintain system integrity.
  b. review open issues and actions associated with the system.
  c. ensure system deficiencies are identified.

These requirements coupled with the responsibilities of maintenance personnel during routine Preventive Maintenance periodically performed in accordance with WP 10-W3010, are established to identify degradation due to aging and upgrades required to maintain system integrity. Programmatic tests and inspections are conducted in accordance with the Maintenance Operations Instruction Manual (WP10-2) as required by TSRs.

Plans and schedules for monitoring, inspecting, replacing, or ungrading system components needed to maintain system integrity are coordinated and scheduled through Construction Management established through Engineering Conduct of Operations. HEPA filter inspection is performed per PM041154. Filters are annually tested for particle penetration, visually inspected to verify integrity, and continuously monitored for differential pressure. Inspections and tests are performed based on ASME standards. Differential pressure limits are defined in the SDDs. The site uses a very conservative differential pressure value for determining filter life (3.0" w.c.) coupled with dual HEPA filter banks has been assessed as very conservative approach for determining filter life. When differential pressure exceeds limits, particle penetration test is failed or visual inspection is failed; filters are replaced. Visual inspection and particle penetration are used to verify that filter condition due to age degradation is not excessive.

Walkdowns, system history, and trend analysis have prompted such system upgrades as:

- conversion of pneumatic control system to microprocessor based controls
- constant air volume supply for pressure zone de-coupling
- conversion of volume control from inlet dampers to variable speed drives
- duct sealing and repair

Approach 1-3: Determine whether maintenance source documents such as vendor manuals, industry standards, DOE Orders, and other requirements are used as technical bases for development of confinement ventilation system maintenance work packages.

The following documents, manuals, and work packages were reviewed: WP 10-2, Rev 11, Maintenance Operations Instruction Manual. Reviewed work packages and verified that O&Ms, WIPP specific procedures, drawings, and vendor cut sheets are utilized for work package development. Reviewed work packages 0107161C, 0107470C, 0105223M, 0104379C, 0008122C, 0100479C, and 0008122C, 9908667J.

Summary of Results

This area was judged to be adequate in the flowdown from the source documents to the actual work packages. The need for Preventive Maintenance Procedures are determined by Attachment 3 of the WP 10-2 (MOIM). Requirements are based on regulatory compliance, health or safety risk due to equipment failure, cost justification for replacement, potential to damage other systems, and manufactures recommendations.

Criterion 2: The system is periodically walked down in accordance with maintenance requirements to assess its material condition.

Approach 2-1: Verify that the system is inspected periodically according to maintenance requirements.

Summary of Results

The previous assessment results from the Phase I CRAD (VSS-1.1, 3.) were found to accurately address this criterion. In summary, the results are mentioned here.

Preventive Maintenance for the Waste Handling Building CH Area HVAC mode compliance equipment is performed periodically in accordance with WP 10-WC3010. HV00 SDD Table HV G-9 Guideline for Frequency of HVAC Maintenance Activities provides guidance for the periodicity for HVAC equipment preventive maintenance. For the CH HVAC (HV01), 94 preventive maintenance items are scheduled to be performed at varying periodicities. For mode compliance equipment, 47 items represent system HV01

Preventive maintenance items are performed in the Mechanical, Electrical, and Instrumentation & Control disciplines which cover those 47 items. Of the 94 preventive maintenance items, periodicity for the performance varies from Weekly, Monthly, and Quarterly to 60 month performance. Programmatic tests and inspections are conducted in accordance with the Maintenance Operations Instruction Manual (WP10-2) as required by TSRs.

Approach 2-2: On a sample basis, inspect the material condition of installed components and determine whether any observed deficiencies have been already identified and addressed in a facility condition assessment or deficiency tracking system.

The following work packages and procedures were reviewed: System walkdown and interview with Randy Elmore – CH Engineering, HV01 Cognizant Engineer. Reviewed work packages to determine if corrective action was required based on the trending analysis, and interviewed CAS Inspection Ed McGary. Performed a review of the annual CAS inspections and Action Requests generated for corrective actions. Performed a field walkdown – no other deficiencies were identified. Work packages 0107161C, 0107470C, 0105223M, 0104379C, 0008122C, 0100479C, and 0008122C, 9908667J , WP 10-2, Maintenance Operations Instruction Manual, 10-WC3011, Maintenance Process, Interview with Ed McGary, CAS Inspector.

Summary of Results

Conducted a system walkdown, and reviewed and inspected components of the system. It was noted that system duct was being repaired due to identified duct leakage. It was noted that damper positioning devices observed to be questionable had been replaced. It was noted that transmitter which were improperly scaled were being work to correct the scale ranges. It was noted that remote indication for certain non-mode compliance pieces of equipment were in the process of have modifications made to the control logic to allow remote indication during manual modes of operation.

Approach 2-3: Review system or component history files for selected system components for the past three years.

- Identify whether excessive component failure rates were identified.
- Determine how failure rates were used in establishing priorities and schedules for maintenance or system improvement proposals.

During this assessment, the following work packages and procedures were reviewed: Work packages 0107161C, 0107470C, 0105223M, 0104379C, 0008122C, 0100479C, and 0008122C, 9908667J, and WP 10-2, Maintenance Operations Instruction Manual, Section 9.0, Trending Program.

Summary of Results

A review of several work packages from the Phase I CRAD (VSS-1.4, 4b.) was performed. History revealed a failure of pneumatic components, that were replaced with direct digital controls. The history of failure in the controls were utilized to justify modification. The new modification resulted in decreased maintenance costs, increased system efficiency, and improved troubleshooting practices.

Over the past three years, 71 corrective type (S and C) work orders have been completed for the HV01 system. There were no work orders identified that were generated resulting from the CH HVAC system becoming inoperable or from a failure to operate on demand. The HV01 CH HVAC system has not failed in response to facility operating conditions.

Approach 2-4: Review the procedure and process for performing walk downs of the confinement ventilation system. Verify through manager and worker interviews that personnel performing walk downs understand operational features, safety requirements and performance criteria for the system.

The following documents and procedures were reviewed: Preventive Maintenance Activities List for HV01; WP 04-AD3005, Rev 1, Administrative Control of System Lineups; WP 04-EM1301, Rev 1, Surface Seismic Monitoring System Operation; and WP 04-EM1302, Rev 2, Quarterly operational Test of Surface Seismic Monitoring System, and WP 10-2, Maintenance Operations Instruction Manual, 10-WC3011, Maintenance Process,

Interviews were conducted with:

- Cognizant Engineer – CH HVAC System
- Maintenance Engineer – CH HVAC System
- Condition Assessment Survey Inspector
- Engineering Manager

Summary of Results

The previous assessment results from the Phase I CRAD (VSS-1.3, 5.) were found to accurately assess this criterion. They are:

> Preventive maintenance activities are scheduled and tracked against a due date in CHAMPS, the maintenance system used for scheduling, historical data, trending, etc.

Periodic preventive maintenance is conducted on defense in depth waste handling equipment to ensure reliable operation. A total of 47 pieces of waste handling equipment is designated as mode compliance, with 71 preventive maintenance activities conducted annually. See the attached Preventive Maintenance Activities List for HV01(attachment 2). In the event of a deficiency, corrective action is initiated.

Annual system engineer walkdowns are performed in accordance with WP 09, Engineering Conduct of Operations, to (1) ensure the current physical configuration matches the existing design documentation; (2) review open issues and actions associated with the system identified in Corrective Action Requests, landlord reports, etc; and (3) ensure any system deficiencies are identified.

Maintenance activities are scheduled and performed in accordance with WP 04-WC3010 (Maintenance PM/MWI Controlled Document Processing), WP 04-WC3011 (Maintenance Process), and WP 10-2 (Maintenance Operations Instruction Manual). Maintenance Programs effectively ensure the operational availability of the CH HVAC mode compliance equipment with scheduling, trending, and processes implemented in the above documents.

Other inspections include quarterly landlord inspections, and annual Condition Assessment Survey (CAS) inspections to assess the condition of areas and equipment. Action Requests (AR) are initiated if deficiencies are found, and forwarded to maintenance for corrective action.

The formally scheduled activities are identified in document attachments 6,7,8, and 9. This includes inspection of tornado dampers, damper operation, and Waste Handling Building (WHB) structure inspection.

System Surveillance and Testing

Criterion 1: Requirements in applicable DOE Rules and Orders are invoked for the confinement ventilation system.

Approach 1-1: Determine whether DOE Rules and Orders that apply to surveillance and testing of confinement ventilation and essential support systems are incorporated in the appropriate documents.

The following documents and procedures were reviewed: DOE/WIPP 95-2065, WIPP Safety Analysis Report – CH Operations, Rev 5.1, WP 04-HV1021, Waste Handling Building Zone 2 HVAC, Rev 2, WP 04-AD3001, Facility Mode Compliance, Rev 7, and WP 04-EM1302, Surface Seismic Monitoring System Quarterly Test, Rev. 2.

Summary of Results

Review of WP 04-AD3001, Facility Mode Compliance, Rev 7 – references both the SAR and TSR, which reference the DOE Rules and Orders. This procedure defines the operating requirements of the CH HVAC in order to commence waste handling activities in Attachment 4.

Review of WP 04-EM1302, Surface Seismic Monitoring System Quarterly Test (Rev 2) requires quarterly testing to verify the tornado dampers close on the event of a Design Basis Earthquake. This procedure references the normal operations procedures, which reference the WPP SAR.

Criterion 2: Requirements for surveillance and testing necessary to demonstrate overall system reliability and operability are accomplished by the system design and are linked to the technical safety basis.

Approach 2-1: Identify the acceptance criteria from the surveillance test procedures used to verify that the confinement ventilation system is capable of performing its safety functions. Compare the acceptance criteria with the safety functions, functional requirements, performance criteria, assumptions and operating characteristics discussed in the safety documents. Verify that there is a clear linkage between the test acceptance criteria and the safety documentation, and that the acceptance criteria are capable of confirming that safety/operability requirements are satisfied.

The following documents were reviewed: DOE/WIPP 95-2065, WIPP Safety Analysis Report – CH Operations, Rev 5.1 and DOE/WIPP 95-2125, Rev 5.1, Technical Safety Requirements, 04-AD3001, Facility Mode Compliance, Rev 7, WP 04-AD3008, Roundsheets and Operating Logs.

Summary of Results

WP04-AD3001, Facility Mode Compliance establishes the operational requirements (i.e., one HEPA filtered train in operation maintaining negative differential pressures.) in Attachment 4, which are verified by the CMRO before waste handling activities. Attachment 5 lists the defense-in-depth[1] equipment required for establishing mode – which references Table 5-1 of the TSR. Section 4.4.2.1.1 of the SAR includes the description of major components, operating characteristics, and safety considerations and controls. Additionally, the assumptions and operating characteristics directly ties to the safety considerations and controls outlined in Chapter 4 of the SAR, and to WP 04-AD3001, Facility Mode compliance. A weekly round by the Surface Roving Watch is conducted to ensure door configuration is maintained, in accordance with WP 04-AD3008, Roundsheets and Operating Logs.

The SAR also discusses how the tornado dampers will automatically close to prevent the outward rush of air caused by a rapid drop in atmospheric pressure. This verification of system operability is performed in accordance with the quarterly seismic test.

WP 04-AD3001, Facility Mode Compliance, is implemented, and maintained to ensure that defense-in-depth SSCs are operated as required during each facility mode as described in Table 6-2 of the SAR.

Recommended changes to criteria and guidance: Last sentence of the approach states that the acceptance criteria are capable of confirming…should probably reword to*: How do facility personnel verify that operability requirements are satisfied?*

Criterion 3 Surveillance and test procedures confirm that key operating parameters for the overall system and its major components are maintained within operating limits.

Approach 3-1: Review surveillance and testing procedures for the confinement ventilation system's major components. Review a sample of the test results. Perform a walkthrough of the surveillance test procedure with appropriate facility personnel and verify:

- Validity of test results
- System performance meets system requirements
- Performance criteria are appropriate for current facility mission life-cycle

[1] The tern defense-in-depth as used at WIPP, is defined in the facility CH Waste Disposal Operations SAR (DOE/WIPP-95-2065 Rev. 5).

- Parameters that demonstrate compliance with the safety requirements can be measured
- Test personnel are knowledgeable and able to satisfactorily perform the test

The following documents and instructions were reviewed: WP 04-EM1302, Surface Seismic Quarterly Operability Test, PM 0104735.

Summary of Results

Interviewed facility roving watch and FSM and asked them to explain the quarterly test. The team observed the roving watch conduct a field walkthrough of the performance of the test. The individual was very knowledgeable and performed the walkthrough in accordance with the test procedure.

Preventive maintenance work order 0104735, Surface Quarterly Seismic Test was reviewed and was verified correct. The system performance criteria, parameters, precautions, limitation, and acceptance criteria are included in the procedure. A comment section is available for discrepancies identified. Results are reviewed by the FSM and the cognizant engineer.

Criterion 4: Procurement, qualification, surveillance and testing of HEPA filters (or other filter media) enable monitoring of filter performance.

Approach 4-1: Determine if HEPA filters were qualified to ASME AG-1, Section FC5000.

The following documents and instructions were reviewed: Work Order 0101449, Annual Testing of CH HEPA Filters, Preventive Maintenance Instruction 041154, HEPA Filter Testing, and vendor results from NUCON International, Acceptance For In-Place testing for units 41-B-814 and 41-B-815.

Summary of Results

HEPA filters are tested annually in accordance with ANSI N510, which does tie to the ASME AG-1, Section FC5000 standard.

Approach 4-2: Determine if procurement specifications reference such standards as DOE-STD 3030-97 and ASME Code AG-1, Section FC.

The following document was reviewed: E-B-277.

Summary of Results:

Reviewed Equipment Specification E-B-227 for HEPA Filters, which does reference the ASME standards, ASTM D 1056-78, MIL-F-51068, MIL-F-51079, UL-586-77, UL-900-82, and NFPA 90A, and requires acceptance to be confirmed at a DOE Filter Test Facility.

Approach 4-3: Determine if an in-place filter test was performed by the filter housing vendor and that testing met standard requirements.

The following documents and instructions were reviewed: work order 0101449, Annual Testing of CH HEPA Filters, Preventive Maintenance Instruction 041154, HEPA Filter Testing, and vendor results from NUCON International, Acceptance For In-Place testing for units 41-B-814 and 41-B-815.

Summary of Results

Annual HEPA filter testing is performed by a vendor in March 2001 by NUCON International. The applicable work package was reviewed, with no discrepancies identified.

Approach 4-4: Not applicable

Approach 4-5: Determine whether the site has a HEPA filter lift program

The following documents and instructions were reviewed: work order 0101449, Annual Testing of CH HEPA Filters, Preventive Maintenance Instruction 041154, HEPA Filter Testing, and vendor results from NUCON International, Acceptance For In-Place testing for units 41-B-814 and 41-B-815.

Summary of Results

HEPA filters are replaced due to a clog or high differential pressure reading identified during the daily tours conducted by facility operations, or if a deficiency is identified during the annual HEPA filter testing that would require replacement.

Criterion 5: Instrumentation and measurement and test equipment for the confinement ventilation system are calibrated and maintained.

Approach 5-1: For the surveillance and test procedures and records reviewed, determine whether the test equipment used for testing was calibrated.

The following documents and instructions were reviewed: work order 0101449, Annual Testing of CH HEPA Filters, Preventive Maintenance Instruction 041154, HEPA Filter Testing, and vendor results from NUCON International, Acceptance For In-Place testing for units 41-B-814 and 41-B-815, field walkdown of seismic panel 413A-SMP-004-001, and HEPA indicators.

Summary of Results

Work orders were reviewed to verify equipment was properly calibrated – also a field walkdown was performed to verify indicators for operators are within calibration.

Documents and References

SDD HVOO.0, Rev. 3. Figure HV I-1, HVAC Equipment Configuration in Surface Waste Handling Facility, July 1998.

SDD HVOO.1, Rev. 3. Figure HV I-5, Layout of HV01, HV02, & HV03 Components in the Mechanical Equipment Room, July 1998.

WP 04 MD3003.1, FO-10B, July 22, 2001.

WP 16-IT3117, Rev. 2, Attachment 1 – Software Quality Assurance Plan

TRU Solutions Inter-Office Correspondence from J.J. Garcia, Deputy Manager to Distribution, Assignment of Direct Digital Control Administrator. OP:01:00729, September 10, 2001.

Supervision® brochure, Automated Logic Corporation, 1150 Roberts Boulevard, Kennesaw, GA, 30144, www.automatedlogic.com.

In-Place Testing of HEPA Filter Units, Maintenance Procedure, Continuous Use (HV01-4 and VU01), Rev. 3, PM041154.

Trending Analysis Mode Compliance Equipment form, EA10-2-12-0, Rev. 1, November 13, 2000.

Predictive Maintenance Program, WP 10-WC.02, Rev. 1.

Facility Mode Compliance, Management Control, WP 04-AD3001, Rev. 7.

Quarterly Operational Test of Surface Seismic Monitoring System, Technical Procedure, WP 04-EM1302, Rev. 2.

WIPP CH SAR, DOE/WIPP-95-2065 Rev. 5, Chapter 6, April 25, 2001.

CHAMPS Work Order 0101449, Preventive Maintenance, 60-RTW, 41B814 ANG SM Testing of HEPA Filter Units, Mode Compliance, 2/12/01.

CHAMPS Work Order 0104735, Preventive Maintenance, 70-Scheduled, 413A-SMP-004-001 QTG Surface Seismic Panel Test, 5/30/01.

WP 04-EM1302, Rev. 2, Attachment 1 – Surface SMS Quarterly Test Data Sheet.

WP 04-HV1021, Rev. 2, Waste Handling Building Zone 2 HVAC, Technical Procedure.

WP 04-EM1301, Rev. 1, Surface Seismic Monitoring System Operation, Technical Procedure.

WP 15-PS3002, Rev. 12, WTS Controlled Document Processing, Management Control Procedure.

WP 10-WC3011, Rev. 6, Maintenance Process, Management Control Procedure.

WP 09-CN3024, Rev. 3, Configuration Management Board/Engineering Change Proposal, Management Control Procedure.

WP 09-CN3007, Rev. 12, Engineering and Design Document Preparation and Change Control, Management Control Procedure.

WP 02-AR3001, Rev. 3, Unreviewed Safety Question Determination, Management Control Procedure.

Resumés of Team Members

Chuan-Fu Wu, Ph. D., CHP

PROFESSIONAL QUALIFICATIONS

1. Extensive knowledge and hands-on experience in nuclear facility management and strategic planning. Excellent skills in team-building; staff selection, motivation, and training; resource planning, administration, and control; regulator interactions and communication; and stakeholder outreach. Certified by the Project Management Institute.
2. Broad professional expertise in waste management, quality assurance, health physics, environmental monitoring, nuclear instrumentation, hazards analysis, nuclear safety, emergency management, and regulatory compliance. Certified by the American Board of Health Physics.

EDUCATION

Ph.D., Nuclear Engineering (major ***– Applied Radiation Physics,*** minor ***– Energy and the Environment),*** Massachusetts Institute of Technology, Cambridge, Massachusetts, USA, 1984 - 1987.

Executive MBA, University of New Mexico, Albuquerque, New Mexico, USA, 1995 - 1997.

MS, Health Physics, National Tsing-Hua University, Taiwan, 1977 - 1979.

BS, Nuclear Engineering, National Tsing-Hua University, Taiwan, 1973 - 1977.

EXPERIENCE

Carlsbad Field Office (CBFO), Department of Energy, Carlsbad, NM 88221
April 2000 – Present **Authorization Basis Senior Technical Advisor & Senior Technical Safety Manager**
Supervisor: Dr. Ines Triay, CBFO Manager, (505)234-7300
Duties: Manage the technical programs and resources that impact the safety and operations of the Waste Isolation Pilot Plant (WIPP, consisting of two facilities that are categorized as Hazard Category 2 Non-Reactor Nuclear Facilities). Ensure implementation and continuous enhancement of the WIPP Integrated Safety Management System (ISMS). Represent the Carlsbad Field Office Manager on WIPP authorization basis matters including Operational Readiness, Quality Assurance, Safety Analysis Reports, Technical Safety Requirements (TSRs), Hazards Assessment, Security and Emergency Management, National Environmental Policy Act (NEPA) Compliance, Resource Conservation & Recovery Act (RCRA) Permit, Repository Long-term Performance, Radiation Protection, Environmental Monitoring, Mine Safety, Price Anderson Amendments Act, and Inter-agency Agreements. Provide technical support to the mobile waste characterization facilities at small generator sites. Lead the efforts in streamlining WIPP regulatory framework and ensure long-term protection of workers, the public, and the environment. Identify and eliminate waste characterization and operational requirements that lack legal or safety basis. Interact with officials and members of the Environmental Protection Agency, Nuclear Regulatory Commission, DOE Headquarters and Offices, National Academy of Sciences, the State of New Mexico, transuranic (TRU) waste generators, professional societies, and the general public on WIPP subjects. Serve as the Carlsbad Field Office liaison to the Defense Nuclear Facilities Safety Board (DNFSB) and the Environmental Evaluation Group (EEG, a watchdog organization authorized by Congress to review the environmental and safety perspectives of WIPP operations). Lead the implementation of DNFSB recommendations. Qualified as a Senior Technical Safety Manager and serve as Qualifying Official of the Carlsbad Field Office Technical Qualification Program. Identify and implement technology alternatives to improve WIPP operational efficiency, cost-effectiveness, and safety. Selected by DOE/EH to serve on the Oversight Board of the DOE Laboratory Accreditation Program (DOELAP) for Personnel Dosimetry

Systems. Serve as a senior member of the WIPP Executive Safety Council. Act for the Carlsbad Field Office Manager during her absence.

Accomplishments:

1. Successfully led the completion and declaration of initial ISMS implementation at WIPP in July 2000, more than two months before the due date established by DOE Headquarters.
2. Led a team that developed the initial authorization basis of the Remote-Handled (RH) TRU Waste Program. The performance-driven RH program was established to use primarily process knowledge with rigorous quality assurance to comply with regulatory and safety requirements without costly waste sampling and characterization. This approach is expected to significantly reduce radiation exposures to workers and avoid significant waste characterization costs. Received a DOE Special Organizational Achievement Recognition (SOAR) Award in September 2000 for the innovation and effectiveness of this effort.
3. Identified and took actions to eliminate TRU waste characterization and operational requirements that lack regulatory or safety basis. This on-going effort in streamlining the TRU waste management regulatory framework significantly improves operational efficiency and safety.
4. Developed and implemented 14 corrective actions to address the five findings identified during the 2000 DOE Office of Independent Oversight and Performance Assurance review of the WIPP Emergency Management Program. Received a SOAR Award in April 2001 for leading this exemplary effort.
5. Rewrote the Carlsbad Field Office Functions, Responsibilities, and Authorities Manual (FRAM) in August 2001 to comply with the DOE Level-1 FRAM (DOE O 411.1-1B).
6. Led the WIPP efforts in implementing 10 CFR 830, *Nuclear Safety Management*, and DNFSB Recommendation 2000-2, *Configuration Management of Vital Safety Systems*. In August 2001, the seven-member CBFO implementation team received a SOAR Group Award for the efficiency and cost-effectiveness in accomplishing these tasks.

Westinghouse Electric Company, WIPP M&O Contractor, Carlsbad, NM 88221
1998 - 2000 Manager, Technical Integration Department, WIPP
Supervisor: Mr. Joe Epstein, Westinghouse General Manager, (505) 885-5324

Provided technical support to the WIPP efforts in mission expansion and research & development (R&D) projects, including international and domestic technological collaborations. Participated in strategic planning and technology implementation to improve efficiency and effectiveness of TRU waste operations while protecting workers, the public, and the environment. Interacted frequently with R&D funding agencies, research institutions, academia, regulators, oversight organizations, and the public. Served as the WIPP lead manager for all activities of the Transparency Project. The Transparency Project utilized the TRU waste management systems and infrastructure to demonstrate strategies and technologies for real-time monitoring of the storage, transportation, and disposition of special nuclear materials. Gained high-level familiarity with DOE Orders associated with safeguards and security, such as DOE O 474.1A, *Control and Accountability of Nuclear Materials*, and related manuals and guides. The demonstrations, displayed and presented at the 1999 DOE International Conference on Geologic Repositories and the 2000 Waste Management Symposium, received praises and attention from the safeguards and security community. As a result of the success, U.S. Congress has designated the WIPP as a Test-bed for Transparency Technologies. The WIPP Transparency Project Team received a Westinghouse Quality Contributor Award in 2000 for the success.

1995 - 1998 Manager, Environmental and Radiological Control (E&RC) Department, WIPP

Established and managed the Radiological Control Program, Radiochemistry Laboratory, Environmental Monitoring Program, and Nuclear Safety Program at the WIPP. Developed and implemented quality assurance requirements in these programs. Supervised three managers, two team leaders, 45 full-time employees, and 15 subcontractors. Successfully led the E&RC group through the 1997 – 1998 Operational Readiness Review that demonstrated the WIPP readiness for safe disposal of TRU waste. Provided technical supports to the WIPP licensing process in obtaining Compliance Certification from EPA, RCRA Permit from the State of New Mexico, Certificates of Compliance from NRC for Type B transportation casks, DOE Record of Decision on the Environmental Impact Statement, and DOE approval of facility Safety Analysis Report and Technical Safety Requirements. Conducted numerous communications with regulators, the public, and the media on WIPP issues. Served as Chairperson of the WIPP ALARA Committee. E&RC staff members and I received many team and individual Westinghouse Quality Contributor Awards for our exemplary work performance.

1990 - 1995 Manager, Dosimetry and Analytical Technology Section, WIPP
Implemented continuous improvements in the Dosimetry Program. Established the WIPP Low Level Counting Laboratory for radionuclide measurement, the Volatile Organic Compound (VOC) Monitoring Program to demonstrate compliance with EPA regulations, and the Analytical Laboratory for parts-per-billion (ppb) level gas analyses. All programs met technical and quality assurance requirements and achieved readiness for the proposed WIPP Bin-Scale Test in 1993. My Analytical Laboratory team received the prestigious Westinghouse Signature Award for Excellence in 1993 for accomplishing the tasks in a safe and cost-effective manner. I also received a special cash award from the President of Westinghouse for these achievements.

1989 - 1990 Manager, Dosimetry Program, WIPP
Established the WIPP Dosimetry Program to implement all regulatory requirements applicable to internal and external dosimetry programs. The program achieved DOELAP accreditation with outstanding performance in 1990 and has maintained accreditation with excellence ever since. Certified as a Quality Assurance Lead Auditor. Selected by DOE to serve as a DOELAP Assessor.

Oak Ridge National Laboratory, Oak Ridge, TN 37831
1988 - 1989 Senior Health Physicist (Health Physicist IV)
Supervisor: Dr. Myint Thein, Dosimetry & Records Section Head
Developed and implemented operating procedures for *in vivo* radiobioassay measurements (whole-body counting, lung counting, and thyroid counting). Designed, procured, installed, and tested a shadow-shield whole-body counting system for quick and precise measurements of photon-emitting radioisotopes in the body. Conducted internal dose assessments for actinides and fission and activation products.

Massachusetts Institute of Technology (MIT), Cambridge, MA 02139
1984 - 1987 Research/Teaching Assistant, Ph.D. Program, Nuclear Engineering Department
Conducted small-angle neutron and X-ray scattering research on protein and polymer solutions. Performed neutron and X-ray scattering experiments using nuclear reactors and X-ray machines at Argonne National Laboratory, Oak Ridge National Laboratory, and Brookhaven National Laboratory. My Ph.D. thesis research resulted in ten publications in technical journals including Physical Review, Chemical Physics, Physical Chemistry, and Physical Review Letters. Assisted in teaching graduate level radiation laboratory courses. Received the prestigious Thompson Fellowship in 1985 for being selected as the most outstanding graduate student of the year.

Institute of Nuclear Energy Research (INER), Taiwan, ROC
1981 - 1984 Group Leader, Radiation Dosimetry & Measurement, Health Physics Division
Supervised the personnel dosimetry, whole-body counting, and radiation measurement programs at the INER. Provided operational health physics support to the nuclear power plants of Taiwan (four Boiling-

Water Reactors and two Pressurized-Water Reactors). Conducted bioshield testing, neutron field characterization, and gamma spectra measurements in support of the startup test of the Maanshan Nuclear Power Plant. Served as Principle Investigator for collaborative projects between the INER and medical centers to study biological effects of radiation.

Military Service, Taiwan, ROC
1979 - 1981 Maintenance Officer and Safety Instructor
Led a group of mechanics and technicians performing maintenance and repair of vehicles (trucks, tanks, cars, and jeeps). Taught nuclear and radiation safety training courses.

National Tsing-Hua University, Taiwan, ROC
1977 - 1979 Research Assistant, Health Physics Program, Institute of Nuclear Sciences
Conducted indoor and outdoor environmental radon measurements. Developed a computational model and applied the measurement data to assess internal doses and human health effects caused by inhaled radon progenies. Research results were published as a Master's thesis and presented at the 1980 Conference of the International Radiation Protection Association (IRPA).

PROFESSIONAL CERTIFICATIONS AND AFFILIATIONS

1. Certified Health Physicist (CHP), American Board of Health Physics, 1990 – present.
2. Certified Project Management Professional (PMP), Project Management Institute, 2000 – present.
3. Member, U.S. Technical Advisory Group to the International Electrotechnical Commission (IEC) Technical Committee 45 "Nuclear Instrumentation," 1996 – present.
4. Chair, Standard Revision Committee of ANSI N42.18, "American National Standard – Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents," 2000 – present.
5. Oversight Board Member (2000 – present) and Assessor (1990 – present), DOE Laboratory Accreditation Program for Personnel Dosimetry Systems.
6. Member, American Nuclear Society (ANS), 1986 – present; member, ANS Public Information Committee, 1998 – 2001; Chair, ANS Carlsbad Section 1992, 1995, 1999 & 2001.
7. Plenary Member, Health Physics Society (HPS), 1988 – present; member, HPS Continuing Education Committee, 1999 – 2002; Chair, 2001 HPS Professional Enrichment Program.
8. Co-founder, National Institute of Standards and Technology (NIST) Radiochemistry Intercomparison Program (NRIP); Chairperson, NRIP Steering Committee, 1997 – 2000.
9. Program Advisory Committee, Waste Management Symposia, 1998 – present.
10. Adjunct Faculty Member, New Mexico State University, 1990 – 1995; Adjunct Faculty and Academic Program Task Force Member, College of the Southwest, 1997 – present.

PUBLICATIONS AND PRESENTATIONS

Published 52 scientific journal articles, technical reports, and conference papers. Taught radiation safety and waste management courses at universities, conferences, and workshops.

Douglas Wayne Tonkay

Education

Tyrone Area High School, Tyrone, PA May 1976
Pennsylvania State University, Altoona and University Park, PA
Major: Nuclear Engineering
Degrees: Bachelor of Science Nuclear Engineering, awarded with high distinction May 1980
Master of Science Nuclear Engineering awarded with highest distinction November 1981

Work Experience

12/30/90- present United States Department of Energy (DOE), Environmental Management, Germantown, MD 20874

Current Position: Waste Management Engineer, Waste Isolation Pilot Plant Office

- Identifies and implements integrated solutions, working with DOE field and program staff, to optimize disposal of transuranic (TRU) waste at the Waste Isolation Pilot Plant (WIPP);
- Focuses technology research and development activities for TRU waste as headquarters program contact for the TRU and Mixed Waste Focus Area and co-chair of their end-users' steering committee;
- Coordinates international waste management activities for the Office of Integration and Disposition, developing, in conjunction with other Federal Agencies, the National Report required by the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, if ratified by the United States; and
- Monitors WIPP emergency preparedness and implementation of safety orders.

Previous DOE Positions:

- Waste Management Engineer, Office of Technical Program Integration
- Team Leader, Waste Type Plan Development Team
- Transuranic Waste Systems Manager
- Baseline Environmental Management Report Team Leader
- Acting Chief, Operations Section/WIPP
- Waste Management Engineer/WIPP

11/1/83- 12/29/90 Cost Engineer/Project Manager
Roy F. Weston, Inc., 955 L'Enfant Plaza, SW, Washington DC, and
20030 Century Boulevard, Suite 301, Germantown MD 20874

- Provided consulting services to DOE Office of Civilian Radioactive Waste Management, including development of a geologic repository cost tool, cost estimates for program documents and analyses, and cost estimating structure to support repository site selection;
- Provided program management support to DOE Surplus Facilities Management and Formerly Utilized Sites Remedial Action Program (FUSRAP), including cost and budget analyses, review of historical and environmental analyses, and progress tracking; and

11/15/81- 10/31/83 Engineer/Senior Engineer
NUS Corporation, 910 Clopper Road, Gaithersburg, MD

- Provided engineering consulting services to nuclear utilities and government clients;

- Developed a post-accident systems analysis for conditions at Three-Mile Island Unit-2; and
- Performed nuclear safety analyses using radiological shielding and thermal hydraulics computer codes

Other Qualifications

Security Clearance: Active Q clearance, U.S. Citizen

Training Courses: Introduction to Supervision, Seven Habits of Highly Effective People, EEO, Program Execution and Evaluation; Hazardous Waste Operations, Ethics, Environmental Regulations, Performance Appraisal, Project Management, Integrated Safety Management, New Congress and Congressional Conference, and Information Management (Windows, Outlook98, Netscape, PowerPoint, MS Word, and Web Page Design)

Awards and Accomplishments:
Federal employment outstanding job performance ratings (1991-2000)
Awards for superior job performance (1991-2000)
Special service awards (1995, 1996, 1996, 1997, 1999, 2000)
Department of Energy PRIDE Award (1998)
Environmental Management Quarterly Quality Award (1996)

Professional and Honor Societies:
American Nuclear Society (1978-present)
Engineer-in-Training, Commonwealth of Pennsylvania (1980)
Tau Beta Pi, Phi Kappa Phi, and Golden Key National Honor Societies (1979-1980)

Publications and Presentations:

Achieving Integration and Disposition in the DOE Environmental Management Program, co-author and presenter, Spectrum-2000 Conference (2000)
Achieving Efficiencies through Program Integration, co-author and presenter, WM'99 Conference (1999)
EM Integration, co-author and presenter, American Nuclear Society Topical Meeting on Nuclear Materials and Spent Fuel, (1998)
EM Program Integration, co-author and presenter, WM'98 Conference (1998)
Transuranic Waste Planning, co-author, WM'97 Conference (1997)
EM Ten Year Planning, co-author and presenter, WM'96 Conference (1996)
Ten Year Planning, author and presenter, American Society of Military Engineers Rocky Mountain Conference (1996)
Three-Mile Island–2 Mass Balance, co-author and presenter, American Nuclear Society Summer Meeting (1983)
Radiation Dose from a Buried, Leaky, Krypton-85 Container, Pennsylvania State University, graduate thesis (1981)

Richard F. Farrell
Carlsbad Field Office

CAREER HIGHLIGHTS:

Environmental, Safety, and Health (E,S&H) professional with over 23 years of diversified experience in industrial safety/hygiene, health physics, environmental/effluent monitoring, and regulatory compliance. Skilled in technical and communication skills associated with the E,S&H and regulatory compliance field.

Participated in the development, management, and oversight of the U. S. Department of Energy's (DOE) Waste Isolation Pilot Plant (WIPP) programs for industrial safety/hygiene, radiological control, environmental compliance monitoring, underground occupational safety, and permitting emergency management, and operation of waste disposal activities.

Managed the development of the WIPP Safety Analysis Report (SAR) for contact-handled transuranic (CH-TRU) waste disposal. Developed the DOE's safety evaluation report (SER) or approval basis of the WIPP SAR for the CH-TRU waste disposal.

Developed and managed the Radioactive Source Materials License compliance programs for a NRC licensed facility (an operating uranium mill/mine) including: Industrial Safety/Hygiene, ALARA, Quality Assurance, Respiratory Protection, and Occupational and Environmental Surveillance programs.

Developed the Carlsbad Area Office's (CAO) application for the National Performance Review - Hammer Award leading to the CAO staff being recognized by the Vice President of the United States for re-inventing government resulting in saving resources. Twice lead the team which applied National Baldridge Quality Criteria to the CAO business activities resulting in CAO staff being recognized by the State of New Mexico for exhibiting substantial quality characteristics in their business activities.

OTHER ACCOMPLISHMENTS:

- Conducted a review of major environmental, safety, and health federal statutes and regulations, and 43 specific DOE orders pursuant to recommendations made by the Defense Nuclear Facilities Safety Board for application to the Waste Isolation Pilot Plant.
- Conducted the approval assessment of the WIPP Radiation Protection Plan (RPP) in accordance with 10 CFR 835, *Occupational Radiation Protection Regulations*.
- Supported final operational readiness of planned WIPP CH-TRU waste disposal operations leading to the opening of the nation's first deep geological repository for disposal of nuclear waste.
- Managed industrial safety/hygiene, environmental monitoring and Mine Safety and Health Administration (MSHA)/regulatory compliance activities for uranium milling and mining facilities.
- Characterized and mitigated effluent releases within the CERCLA framework including the development of remedial investigation and corrective action reports.
- Permitted hazardous waste generating and radioactive mixed waste disposal activities, uranium milling operations, and groundwater protection plans
- Supported the DOE's interface with the New Mexico Environment Department and the Environmental Evaluation Group oversight of the Waste Isolation Pilot Plant.

- Mitigated groundwater contamination seepage from a uranium tailings impoundment by managing and operating groundwater collection and injection systems.

- Developed occupational exposure monitoring programs and computerized data evaluation systems for uranium mill and mine workers.

EXPERIENCE:

U. S. Department of Energy   September 1992 - Present
Safety Officer Carlsbad Field Office (CBFO) The Safety Officer's top priority is to ensure that operations at the TRU waste generator and interim storage sites and at the WIPP are conducted in a manner that ensures the safety the safety of workers and the public, the protection of the environment, and compliance with applicable requirements.

U. S. Department of Energy   September 1992 - Present
Radiological Safety Manager Carlsbad Area Office (CAO) Responsibilities include oversight and assessment of CAO radiological safety/control activities; WIPP *Occupational Radiation Safety* (10 CFR Part 835); WIPP safety analysis and documentation; ES&H regulatory compliance programs; environmental/effluent radiological monitoring programs; and industrial hygiene assessment. Developing and preparing DOE safety evaluation reports of WIPP safety analysis documentation. Administering DOE Price-Anderson Act and Amendment oversight and compliance activities for CAO.

Westinghouse Electric Corporation   April 1990 - September 1992
Senior Engineer at the Waste Isolation Pilot Plant Responsibilities include the management of interface activities with oversight and auditing groups, evaluation of applicable regulations and DOE orders, and support of audits of waste generator sites with regard to waste acceptance criteria.

Homestake Mining Company   1977 - April 1990
(Nuclear Regulatory Licensed Uranium Milling and Mining)
Environmental Safety and Health Department On-Site Manager, 1983 - April 1990 Responsibilities included department administration, industrial safety/health, emergency management, RCRA compliance and hazardous waste management, CERCLA remediation and monitoring activities, occupational health, and regulatory compliance. Responsible for radiation safety/health programs as the Radiation Protection Officer (RSO) for the NRC licensed facility. Supervised 5 - 8 ES&H professional and technicians.

Radiation Protection Administrator; 1980 - 1983 Responsibilities included management of the health physics/industrial hygiene programs and hazardous waste activities, training, environmental and effluent monitoring, and regulatory compliance. Served as the RSO for a NRC licensed facility.

Industrial Safety/Environmental Engineer; 1978 - 1980 Responsibilities included evaluation of industrial safety/health, monitoring data, and regulatory requirements; and the development of monitoring and emission control programs to assure compliance with occupational and environmental regulations.

Industrial Safety/Environmental Technician; 1977 - 1978 Responsibilities included occupational and environmental monitoring associated with uranium mining and milling.

EDUCATION:

B.S., Chemistry major - biology minor, Northern Arizona University, 1975. Twelve (12) semester hours of graduate level chemistry work, and six (6) semester hours of graduate level radioactive waste management; University of New Mexico; 1981 and 1992, respectively. Strong background in applied mathematics and statistics equivalent to a minor area of study [twenty (20) semester hours], Brigham Young University; 1993 - 1996. Effective Public Speaking - - Dale Carneige Institute 1995 Three (3) semester hours credit.

JOE LANE FIELD, CIH

SUMMARY

Mr. Field, a Certified Industrial Hygienist with 26 years of experience in the environmental industry provides engineering, regulatory analysis, and proven project management capabilities to commercial and federal clients. Mr. Field has experience reviewing federal policies, programs, and regulations in the energy and environmental fields, including those of the Department of Energy, the Environmental Protection Agency, the National Aeronautics and Space Administration, and the Nuclear Regulatory Commission. He has also prepared numerous reports to the Congress, the Department of Energy, and other federal government agencies. Mr. Field also specializes in performing risk assessments in support of site investigations, facility decontamination and decommissioning, process safety, and implementation of remedial actions.

Technical/Computer Skills

- Safety Analyses: **Integrated Safety Management (ISM)**; Behavior-Based Safety; Fault Tree Analysis; Failure Modes and Effects Analysis; Accident Investigation and Analysis (DOE); Occurrence Investigation and Analysis (DOE); Management Oversight and Risk Tree (MORT) Analysis; Probabilistic Risk Analysis (PRA)
- Quality: Process Management and Improvement; Assurance; Control; Reliability
- Facilitation: Issues Management, Facilitation, and Resolution; Occurrence Investigation and Resolution
- Facility Management: Computerized Maintenance Management System
- LANL Systems Databases: DataWarehouse [Global User => MWA Database, Safety Concerns Database, LabWide Systems Database]; JetForm, Eudora Pro
- Database Systems: R-base, d-Base, Lotus, Microsoft Access
- Project Control: Primavera P3 and Suretrak; Microsoft Project
- Application Programs: Microsoft: Word, Project, Powerpoint, Excel, Outlook, FrontPage 98, Publisher, Image Composer; also: PrintShop Pro Publisher, Paint Shop Pro, Visio, Flowcharting PDQ; Netscape, Internet Explorer, REASON Causal Analysis; Occurrence Reporting of Process Information (DOE).

Undergraduate & Graduate Education / Certification

- Bachelor of Science **-** 1976 **-** University of Houston **-** Biology with Chemistry Minor
- Texas A&M University**-** 1978 **-** Industrial Hygiene and Safety Engineering graduate coursework toward Master's Degree.
- Certified Industrial Hygienist **-** Comprehensive Practice (#6569) **-** American Board of Industrial Hygiene

Experience and Relevant Accomplishments

Principal Research Scientist 2001 – present Battelle Memorial Institute at CTAC at the Waste Isolation Pilot Plant, Carlsbad, NM

Principal Research Scientist. Regulatory Integration Office subcontract unit to Portage Environmental, Inc. Regulatory assessments, audits, and technical support to the Carlsbad Field Office of the Department of Energy.

Project Manager 2000 – 2001 L&M Technologies, Inc. at the Waste Isolation Pilot Plant, Carlsbad, NM
General Manager. Provided day-to day management oversight of L&M's Technical Support Services subcontracted to Westinghouse TRU Solutions (WTS), LLC. Technical Support Service Groups included Project Records Services, Document Services, Warehouse Operations, and Engineering Configuration Management Services.

Developed and executed multimillion budget for 54 FTE positions tasked to interface and provide technical support for WTS and DOE customers. Implemented ISMS and Quality Process Analysis and Improvement through the Quality Process Delivery System.

Senior Scientist 2000 Portage Environmental, Idaho National Engineering and Environmental Laboratory - Idaho Falls, Idaho
Provided engineering, regulatory analysis, and project management services to INEEL. Performed risk assessments in support of site investigations, facility decontamination and decommissioning, process safety, and implementation of remedial actions. Reviewed federal policies, programs, and regulations in the energy and environmental fields – DOE, EPA, NASA, and NRC.

ES&H Manager 1999 - 2000 Los Alamos National Lab, NM
ES&H Manager for Business Operations Division of LANL.
Mentored the division-wide implementation of **Integrated Safety Management Program** by means of Management WalkAround Program, Safety and Ergonomics Representative Program. Coordinated with Group Tenants and Facility Management to install the ISM program to correct unsafe conditions. Coordinated the BUS ES&H Representatives for Division's ISM Safety Program. Coordinated the BUS Management Safety Council activities for Management WalkArounds to implement Integrated Safety Management. Coordinated and performed ergonomic asssessments, made intervention recommendations, created ergonomics assessment database program, and tracked personnel assessments to closure. Wrote Appendix F ES&H Self-Assessments for BUS Division for the last 2 ½ years. Alternate POC for Laboratory Standards Project implementation.

Assistant Facility Manager 1997-1999 Los Alamos National Lab, NM
Assistant Facility Manager for the Business Operations Division (BUS) of LANL. Contributed to development of Computerized Maintenance Management System as a committee member; wrote LIR-driven O&M Criteria, maintained FMU62 Space Database Annual Review and Periodic Update; Facility-Related Ergonomic Work; DOE Order 232.1A Occurrence Investigations; Alternate POC for Laboratory Standards Project; Facility Management Council work; wrote the Facility Safety Plans – FMU62 Facility Management – Tenant Agreements (24 in 1997; 30 in 1998); wrote GPP Project budget request for $5MM for SM-30 West Renovation and Office Addition; addressed Security Training on Building Security Issues – TA-3-261 Otowi; supported the Division-wide Ergonomic Initiative Assessment Program; assessed BUS Division Hazard Control Plans submitted to LANL ISM management for assessment by DOE ES&H personnel.

Manager, Quality and Safety 1996-1997 White Sands Missile Range, NM
Manager of Quality, Environment, Safety, and Health for Orion International Technologies, Inc. - at the White Sands Missile Range Directorate of Applied Technology, Testing and Simulation (DT). Established and integrated Total Quality Management program with Behavior-Based, Employee-Driven Safety Program. Developed the Facility Quality Service Process by implementation of quality function deployment (QFD) and just-in-time (JIT) training, established Corporate Safety Program Initiatives; identified and assessed industrial hygiene workplace environmental hazards including laser, electromagnetic, radioactive, and radio frequency sources; established, reviewed and assessed project process quality, and wrote numerous system safety operating procedure requirements supporting the DT testing programs; developed, scheduled, and administered site-specific quality, environmental, safety, and industrial hygiene audits, surveys, ergonomic assessments; conducted and facilitated mission- and project-related resolution of issues; implemented and conducted compliance, and project-related employee training.

Manager of Safety and Health 1995-1996 Naval Subase, Kings Bay, GA
Manager of the Safety and Industrial Hygiene Department for Johnson Controls, Inc. at the Kings Bay Support Project at the Naval Submarine Base - Kings Bay located in Saint Marys, Georgia. Wrote the Process Management Quality Assurance plan for the safety and industrial hygiene operations interface with the Navy; directed the OSHA Compliance programs, including process safety, high voltage electrical safety, chemical hygiene, asbestos management, security and emergency response; managed the workers compensation program; investigated, sampled, and resolved indoor air quality concerns. **Clearance: DoD**

Industrial Hygienist/Occurrence Investigator 1991-1995 Los Alamos National Laboratory, NM
Mentored facility managers; prepared budgets for ES&H programs and projects; surveyed, sampled, analyzed, and wrote reports on workplace hazards and contaminants; coordinated the asbestos program for the laboratory;

performed occurrence investigations and wrote occurrence prevention program; quality assurance programs for group operations and laboratory quality control for asbestos laboratory operations; supported compilation of OSHA 200 occupational injury and illness log for University of California and subcontractor organizations; investigated occupational illnesses and injuries.

Industrial Hygienist 1990 NASA **-** White Sands Test Facility, NM
Surveyed, sampled, analyzed, and wrote reports on workplace hazards and contaminants for safety and industrial hygiene concerns; performed indoor air quality assessments; investigated occupational illnesses and injuries; served as technical resource for occupational safety and health considerations in manned space shuttle missions and Space Station Freedom project; performed design review of experimental devices; verified safety procedures and safe execution of test stand activities; maintained the OSHA 200 occupational injury and illness log for NASA and Lockheed employees at the site.

ES&H Consultant 1986-89 ETI **-** Magnolia, TX
Managed multiple ongoing projects and directed technical staff in surveying, sampling, and analysis of ES&H client projects. Hazardous waste site remediations. Asbestos abatement projects. Sampled for airborne chemicals, dusts, noise, odors, magnetic fields, Volatile Organic Compounds (VOCs), ozone, lead, metal dusts and fumes (selenium, tellurium, copper, gold, silver, platinum, palladium, arsenic, iron, lead, and aluminum), hydrofluoric acid, sulfuric acid, flammables, and boiler emissions. Stack sampled spray paint facilities, chemical, and petrochemical plants.

Safety Professional 1985 City of Houston, TX
Investigated injuries and illnesses of City employees; analyzed accidents; inspected transportation fleet; wrote and implemented the laboratory safety program for the Police Crime Laboratory; wrote and implemented the Hazard Communications training program for 22,000 City of Houston employees; presented findings to City departments and City Council.

ES&H Consultant 1984 The Environmental Companies **-** Katy, TX
Surveying, sampling, and analysis of ES&H projects for clients in chemical, manufacturing, engineering, government, legal, insurance, academia, and privately owned businesses.

Loss Control Consultant 1981-83 Ctek **-** Houston, TX
Servicing over 300 client accounts involving all aspects of comprehensive industrial hygiene practice ranging from small businesses to petrochemical and chemical plants.

Environmental Hygienist 1980 Dresser Industries **-** Houston, TX
Provided industrial hygiene, safety, fire protection, and environmental remediation technical services and resources to 150 companies in North America owned by Dresser Industries. Primary work was performed in Dresser Magcobar, the oil field services division, in direct support to oil field service work throughout Texas and Lousiana, and raw material acquisitions, including **MSHA** safety program implementation for barite mining operations in northern Nevada, Wyoming, and Missouri.

Faculty Lecturer 1979-84 University of Houston, TX
Designed course curricula, received accreditation, and taught graduate level courses in Industrial Hygiene and Safety Engineering in the Industrial Engineering Department of the Cullen College of Engineering.

Safety Professional 1979 Metropolitan Transit Authority **-** TX
Administered safety engineering, industrial hygiene, fire protection, environmental site assessments of new and existing bus terminal operations (including water quality assessments); regional transportation accident and injury investigations.

Research Fellowship 1977-78 Texas A&M **-** College Station, TX
Assessed the relative protection afforded by protective clothing to known fiber concentrations of asbestos fibers. Thesis topic was : *Relative Protection Afforded by Protective Clothing to Vapor-State Methyl Parathion*.

Safety Professional 1977 Brown & Root, Inc. - Houston, TX
Supervised safety training and operations of aerial lifts, concrete work, cranes and hoists, electrical safety, fall protection, fire protection, floors and stairways, heavy equipment, heavy lifts, ladders and scaffolds, lighting, material and personnel hoists, materials handling and storage, personal protective equipment, steel erection, tool hazards, and trenching and excavation.

Safety Professional 1976 Hudson Engineering - Houston, TX
Performed industrial safety inspections and fire protection assessments; industrial hygiene assessments of noise, lighting, sanitation; and accident investigations.

MAJOR SKILL SETS

Management and Process Improvement

- Mentored facility managers, business executives, and owners in risk management, facility operations, and process improvement.
- Evaluated LANL Lab ES&H Standards for applicability and implementation in BUS Division.
- Assessed and benchmarked client and institutional Loss Control Programs.
- Prepared budgets for account service and ES&H programs and projects.
- Estimated project costs for competitive bid submissions.

Safety and Industrial Hygiene

- Project manager for ES&H professional and technical services.
- Managed, coordinated, and quantitatively assessed asbestos management programs.
- Evaluated client ES&H programs.
- Performed classical industrial hygiene surveys, sampling, and analyses and reports.
- Designed large industrial hygiene evaluation and control programs.

Program Development, Implementation, and Assessment

- Quality Assurance Programs – White Sands Missile Range
- Laboratory safety programs, hazard communications, ergonomics
- Occurrence Investigation Program development at LANL
- ES&H Programs – Classical Industrial Hygiene Sampling Programs, Asbestos, Ergonomics, Management Walkarounds
- Implementation of LANL LPRs, LIRs, and LIGs, ISM, MWA for BUS Division.

Trainer, Teacher, and Mentor

- Mentored facility managers on conduct of facility operations at LANL.
- Designed curricula, received accreditation, and taught graduate courses in Industrial Hygiene and Safety Engineering at the University of Houston Cullen College of Engineering.
- Trainer and consultant to corporate, legal, insurance groups, and employees on **OSHA & MSHA** regulations, standards, and laws.

JAMES LESLIE CLARK

EDUCATION

M.S.	-	Nuclear Engineering, University of New Mexico; 1990
M.S.(equiv.)	-	Nuclear Engineering, Naval Nuclear Power School; 1982
B.S.	-	Nuclear Engineering, University of New Mexico; 1981
H.S	-	Eldorado High School, Albuquerque, NM; Diploma, 1976

WORK EXPERIENCE SUMMARY

Nuclear Engineer with more than twenty years experience in oversight, operations, maintenance, management, probabilistic risk assessment and safety analysis, accident analysis, authorization basis document development, and lead technical and management assistance and engineering in support of operation of civilian, DoD, and DOE Nuclear Reactors, Non-Reactor Nuclear Facilities, and Non-Nuclear facilities.

PROFESSIONAL WORK EXPERIENCE

1/2001 – present **Senior Research Scientist, Battelle**
801 University Blvd., SE – suite 102
Albuquerque, NM 87106

Senior Staff Member/Manager responsible for providing direct support to the DOE. Provides technical and analytical support for Process Hazard Analyses in support of the Pit Declassification and Conversion Facility (PDCF). Responsible for developing various hazard/safety analyses in support of Title I design Preliminary Hazard Analysis.

11/1999 – 1/2001 **Senior Engineer, Omicron Safety and Risk Technologies Corp.**
PO Box 93065
Albuquerque, NM 87199-3065

Technical Staff Member/Manager responsible for providing direct support to Los Alamos National Laboratory (LANL) Nuclear Materials Technology (NMT) 15 division. Provides technical, analytical, and managerial support for authorization basis and associated hazard and accident analyses in support of the Technical Area 55, plutonium facility Safety Analysis Report (SAR) upgrade. Responsible for leading various accident analyses of evaluation basis accidents encompassing the worst-case accident and consequences based upon current facility operations. Responsible for writing and delivery of final SAR product to NMT-15.

Technical Manager/Lead, responsible for ARIES Process Hazard Analysis (PrHA) development in support of various ARIES glovebox pilot processes.

9/1995 - 11/99 **Senior Engineer, Digital Systems International Corp.**
PO Box 5400
Albuquerque, NM 87185-5400

Technical Staff Member/Manager responsible for providing direct support to the DOE Albuquerque Operations Office Qualification and Training Division (QTD) and the Los Alamos Area Office (LAAO). Provides technical, analytical, and managerial support for oversight of nuclear training programs at DOE/AL nuclear sites. Responsible for assisting the Qualification and Training Division (QTD) in the oversight of DOE/AL nuclear facility training programs including development of analysis and assessment tools for the implementation of nuclear facility specific training and qualification, and certification programs as mandated by DOE Orders.

Previously, Mr. Clark was the project manager and primary author in the development of DOE self study training materials for Problem Analysis and Risk Assessment and Nuclear Fundamentals. He also developed and delivered live DOE-wide interactive televideo broadcast training on nuclear criticality safety fundamentals in support of the Department of Energy's technical qualification program implementation plan for the Defense Nuclear Facility Safety Board (DNFSB) recommendation 93-3.

Lead technical staff member responsible for developing the risk -based assessment of AL-wide positional responsibilities for prioritization of the modification and development of federal qualification standards. This initiative was used to identify and document the priority of qualification standard development for the Technical Qualification Program (TQP).

Lead technical staff member responsible for identify training and qualification program elements to justify the creation of a DOE-AL Training and Development Center of Excellence for Nuclear Facility Training and Criticality Safety. Also responsible for identifying additional programmatic needs for a comprehensive DOE training program. AL Committee member for review and development of an implementation plan to address DNFSB recommendation 97-2 on DOE Criticality Safety Program.

4/1988 – 5/1995, Senior Engineer, Science & Engineering Associates, (SEA) Inc.
6100 Uptown Blvd., NE
Albuquerque, NM 87110

Project manager for a reliability analysis of the Canadian Deuterium 3U shutdown safety systems to support a licensing request from the Atomic Energy of Canada, Ltd., (AECL) to the U.S. Nuclear Regulatory Commission. The analysis explored the combined failure of the CANDU 3U safety rod shutdown and liquid injection safety systems and analyzed data specific to the CANDU designs so as to incorporate any common cause failures as well as for developing fault tree models to assess system reliability.

Project manager in support of a combined nuclear utilities' initiative to implement a graded quality assurance pilot program, providing expertise to assist the NRC in evaluating both quality assurance and evaluation of probabilistic risk assessment associated with pilot utility initiatives. The effort involved development of NRC pilot plant guidance as well as review and comment on Nuclear Energy Institute initiatives in the development of industry guidance. An NRC pilot program inspection guide was also developed.

Project manager for the overall performance of a quantitative risk assessment associated with the Hanford SY-101 radioactive waste storage tank to support a Safety Analysis Report (SAR) for the operation of the mixing pump within the tank. As lead technical team member under contract to the Los Alamos National Laboratory, developed a fault tree model was to assess the "Pump Bump" and "Phase I" operating procedures in support of mixing pump normal and abnormal operations. The results were published as an appendix to the full SAR performed on the SY-101 tank, addressing the risk of a hydrogen detonation or deflagration.

Task leader for the core damage and risk assessment associated with equipment qualification of components and systems, in addition to Levels I, and II Probabilistic Risk Assessment (PRA) support for PRAs at various DOE facilities. These efforts included fault tree, event tree, data analyses, and accident progression and phenomenology modeling, computer analysis and documentation of results. Provided technical and computer support for a DOE common cause analysis of the Savannah River K Reactor Facility, as well as having performed a fault tree analysis of the Savannah River Site Grid to gain cost benefit insights and make recommendations on proposed improvements.

Other responsibilities included supporting development of system descriptions, and diagrams for several DOE facilities. Existing system descriptions, fault trees, event trees, system one-line and detailed schematics, normal and emergency operating procedures, and other similar documents were analyzed in order to develop numerous integrated systems diagrams incorporating multiple systems and associated interfaces and flow paths. The diagrams were prepared for a total of three DOE facilities to support SAR work, operations, maintenance, training, and risk analyses within the facilities.

4/1986 – 4/1988, Engineer, Science Applications International, Inc.
2109 Airpark Rd.
Albuquerque, NM 87106

Led Level II technical and computer support and analysis for the Hanford N Reactor confinement risk assessment project. The work included probabilistic failure analysis and studying, analyzing, and modeling core and confinement performance under various accident scenarios. Major contributions while working on this project included the development of the Accident Progression Event Tree for the Level II analysis and preparing "white papers" which highlighted phenomenological issues associated with the N Reactor confinement design. Contributed to the review and modification of the confinement system fault trees for an N Reactor mini-PRA.

Provided technical and analytical support on an equipment qualification sensitivity study which involved assessment of core damage and resulting risk increase associated with equipment/ system operation and whose failure could be environmentally influenced, resulting in significant changes in core damage frequency or relative risk.

Provided technical and analytical support for a Preliminary Safety Analysis Report of the Sandia National Laboratories' Strategic Defense Facility. Assessed risk to both on-site personnel and the public based on facility design, equipment, and operation under both internal and external accident conditions. Techniques employed included development of a failure modes and effects analysis to assess potential accidents and associated risks.

1986 - 1988, Graduate Student, University of New Mexico.

Completed an experimental thesis on the Sandia Particle Beam Fusion Accelerator II ion switch flashboard performance leading to a M.S. in Nuclear Engineering.

1981 - 1986, Officer, U. S. Navy.

Served aboard the USS BARB (SSN596) following completion of the Nuclear Navy pipeline schools. Qualified Submarines and all subordinate watches. Served as various division and temporary department head officer positions for various lengths of time while aboard the submarine. Responsible for the administration, coordination, scheduling, training, records review, preventative maintenance, and supervision of day-to-day operation within the division/department. Daily in port duties included supervision and coordination of maintenance and daily routine while standing in port duty officer aboard the USS BARB. At sea, responsible for supervision of ship and reactor plant operation while standing officer of the deck and engineering watch officer.

Currently active as a Commander in the U.S. Naval Reserves where he has served two tours as a reserve unit commanding officer and two tours as an executive officer during his 19 year active and reserve career. He was recently hand picked as a senior member of a new unit supporting the Office of Naval Research in Test and Evaluation where he is serving a third tour as Executive Officer. The reserve unit is located in Albuquerque, New Mexico. Unit support responsibilities include evaluation of Naval procurement and future technology needs programs and supervision of all unit personnel supporting assigned projects.

OTHER QUALIFICATIONS/AWARDS/PROFESSIONAL AFFILIATIONS

Nominated as outstanding Engineering Options Graduate, University of New Mexico, 1981.
Tau Beta Pi, 1980.
Engineer in Training, New Mexico, 1982.
Reserve Officer of the Year, Navy and Marine Corps Reserve Center, 1994.
Received Navy Achievement Medal as Commanding Officer, NR BADGER (FF-1063), 1992.
Received Navy Achievement Medal as Commanding Officer, NR TARAWA (LHA-1), 1995.
Nominated for Joint Service Achievement for performance during Active duty, August, 1997.

SECURITY CLEARANCE

Department of Defense SECRET, Active
DOE Q, Active

SELECTED PUBLICATIONS

“Problem Analysis and Risk Assessment Self-Study Guide,” United States Department of Energy, Technical Qualification Program, February, 1997.

“Nuclear (non-weapons) Self-Study Guide,” United States Department of Energy, Technical Qualification Program, with Jim Dahl, August, 1996.

"A Preliminary Analysis of the Reliability and Independence of the CANDU 3U Shutdown Safety Systems," with S. Mattern, and F. Sciacca, SEA95-2707-101-A:1, March, 1995.

"A Safety Assessment for Proposed Pump Mixing Operations to Mitigate Episodic Gas Releases in 241-SY-101: Hanford Site, Richland, Washington," with H. Sullivan, et al., LANL; LA-UR-92-3189, March 1994.

"Los Alamos Analysis of SRS Loss of Grid and 484-D Powerhouse Contribution to Risk at K Reactor," with M. K. Sasser, et al., LANL; J. Clark, and W. Thomas, SEA; N-6-93-174, 1992.

"K Reactor Electrical System Restart Configuration Analysis," with D. Stack, et al., LANL; J. Brideau, J. Clark, and W. Thomas, SEA; SEA90-500-001-A:3, September 1990. (UCNI)

"Savannah River K Reactor Confinement Safety Assessment," with D. Stack, et al., Los Alamos National Laboratory; J. Darby, D. V. Rao, B. Simpkins, S. Ross, and J. Clark; Draft Report, September 1990. (UCNI)

"An Analysis of the Frequency of Loss of 115 kV Grid Power to the Savannah River Site K Reactor," with D. Stack, et al., Los Alamos National Laboratory; J. Clark, J. Brideau, and W. Thomas, SEA; Draft Report, September 1990. (UCNI)

"Accident Progression Event Tree Analysis for Postulated Severe Accidents at N Reactor," with Greg Wyss, et al., SAND89-2100 UC-610, June 1990.

"Common-Cause Analysis of the Savannah River K Reactor," with D. Stack, et al., Los Alamos National Laboratory; W. Thomas, J. Brideau, J. Clark, R. Clark, and B. Simpkins, SEA; Draft Report, May 1990. (UCNI)

"Equipment Qualification (EQ) Risk Scoping Study," with L. Bustard, J. Clark, et al., NUREG/CR-5313/SAND88-3330, January 1989.

Randy Elmore

Professional Experience:

- System Cognizant Engineer for HV01 system at the WIPP site employed by Westinghouse TRU Solutions, LLC, qualified through procedures required by permits and DOE directives. HV01 is a HEPA filtered ventilation system that serves as a mitigation system in the Defense in Depth safety concept and a system for confinement and flow control to fulfill As Low As Reasonably Achievable policies. As the system Cognizant Engineer, duties include a proven knowledge of system technical aspects, operation, and design of the system with proven knowledge of the policies and procedures required to maintain compliance for the support of operations. The System Cognizant Engineer is responsible for and is considered the owner of system design and all system technical aspects.

- Independent Contractor performing HVAC control contracts and Startup Test Procedures primarily for WIPP.

- Performance in the capacity as Area Representative (West Texas area)for Simplex Time Recorder, Inc. Job assignment included resurrection of a West Texas Branch Office through sales, customer relations, and project management. Duties encompassed estimating, generation of proposals, negotiations, design, project oversight, and scheduling. Additionally, responsibilities included over-site of start-up and verification of proper system operation for jobs.

- Performance in the capacity as project coordinator and manager for control and HVAC modifications for Compliance Services Group. Primarily working on projects providing consulting services for Westinghouse Electric at the Waste Isolation Pilot Project in Carlsbad, NM. Additionally served as customer liaison (with a 9-month project site assignment). Directly managed HVAC Control Upgrade Design Projects.

- Responsible for project cost estimation, quotations, bid services, contract negotiation, subcontracting, coordination of trades, system designs, installation supervision, initial start-ups, trouble shooting, quality control, field coordination, budgetary control, customer relations, and financial collections. Job requirements included documented start-up procedures and witnessed implementation of the documented procedures to verify proper system operation.

- Six years as principal sales engineer and stockholder with a southwestern based manufacturers representative firm responsible for sales of heating, ventilating, and air conditioning systems, industrial fans and blowers, boilers, pumping systems, valves, piping specialties, and controls. Traveled throughout a multi-state regional area with sales calls to commercial, institutional, and industrial clients. Tasks included start-up and documentation for equipment (air side, steam, electrical, hydronic, and hydraulic systems).

- Assistant to project engineer with a southwestern based semiconductor and electronics manufacturer specializing in military project assembly. Responsible for assisting with coordination of manufacturing projects.

- Two years experience as a facilities project designer and mechanical engineer with a regional consulting engineering firm with design responsibility for HVAC systems, plumbing systems, fire protection systems, utility distribution, and project specifications. Responsibilities included on-site job inspections and start-up witnessing.

- Two and one-half years as a field services technician and roustabout with a pipeline division of a major US oil production company. Responsibility for limited scope technical assignments involving oil distribution, pipeline installation, pump station operation, and general activities including equipment assembly and start-up.

Professional History:

HV01 Cognizant System Engineer 2001
Westinghouse TRU Solutions, LLC.
Carlsbad, New Mexico

Proprietor 2000
El Tech
Lubbock, Texas

West Texas Representative 1998 to 2000
Simplex Time Recorder, Inc.
Lubbock, Texas

Project Manager 1996 to 1998
CSG (Compliance Services Group)
Lubbock, Texas

Co-Founder and Principal 1992 to 1996
Con-Tech (Control Technologies)
Lubbock, Texas

Principal Sales Engineer / Stockholder 1986 to 1992
David G. Halley & Co., Inc.
Lubbock, Texas

Project Engineer 1985 to 1986
Texas Instruments
Abilene, Texas

Design Engineer 1984 to 1985
Williams, Tippet, and Associates, Inc.
Abilene, Texas

Roustabout / Relief Technician 1980 to 1982
Shell Pipeline Corp.
Hamlin, Texas

Education:

B.S. in Mechanical Engineering
Texas Tech University
Graduated 1984 (Magna Cum Laude)

Kim A. Jackson

1120 Tracy Pl.
Carlsbad, NM 88220
505-234-8928 W 505- 887-7345 H
jjackson@cavemen.net

PROFESSIONAL EXPERIENCE

Westinghouse Electric, Waste Isolation Division August 1993 - present
Waste Isolation Pilot Plant, Carlsbad, NM

CH Waste Handling Manager September 2000 - present

- Manage day to day operation of material handling processes and personnel. Developed and implemented initiatives to cut initial startup handling times by 50% and reduced annual operating cost by $500k.
- Utilize labor management tools to resolve union conflicts to improve working relationships.
- Coordinate departmental plant activities to maximize efficiencies for material handling, mining operations, maintenance, and facility operations.

Systems Engineering Manager September 2000 – May 2001

Manage systems engineering projects, utilizing project management principles and cost benefit analysis to determine plant improvement projects. Participate in design development and review meetings to ensure configuration control is maintained throughout the design process.

Facility Shift Manager June 1995 - September 2000

- Managed day to day operation of entire facility. Approved equipment tagout/lockout and plant maintenance activities to ensure availability of plant systems and maintain operability of systems during normal and abnormal conditions.
- Coordinated RCRA Emergency response events to mitigate, control, cleanup, as well as conduct notification to site personnel and the public.
- Participated as department lead for Operational Readiness Review to demonstrate facility operations readiness for receiving waste.
- Department lead for startup and training on new equipment and systems. Projects included installation of a load bank to perform generator loading; modification of HVAC pnuematic systems to direct digital control; installation of a new 115kV ring-bus utility substation; and installation of a redundant 600-hp underground ventilation fan.

Facility Planning Supervisor February 1994 - June 1995

- Led Facility Inspection Teams to evaluate plant repair and replacement needs. Forecasted future projects and needs to maintain site, prioritized site construction projects and authored annual Site Development Plan.

Operations Engineer August 1993 - January 1994

- Responsibilities included developing system training material and training personnel on new equipment and systems, developing and revising operating and administrative procedures, participating in audit reviews, developing emergency response drills and objectives, and providing input for plant modifications.

EDUCATION

University of Oklahoma August 1993
Norman, OK

- Bachelor of Science in Industrial Engineering

ACHIEVEMENTS

- Certified Project Management Professional June 2000
- Winner of the George Westinghouse signature Award of Excellence May 1997

Appendix A

Software Quality Assurance for I&C Systems

The WIPP site began transitioning from predominantly pneumatic CH ventilation system controls to programmable logic digital control systems in 1998. During the ventilation system assessment conducted during the week of 3 December on the current condition of the WIPP confinement ventilation system, the objective evidence reviewed indicated that all of the “mode-compliant” equipment will be converted to digital, programmable controls for the CH ventilation system. All of the Mode-Compliant I&C equipment will be fully converted to digital PLCs. Some balance-of-plant I&C controls and logic will also be converted; some of these are currently in the process of upgrade.

The selection of a Windows-compatible software to be embedded in the PLCs employed a quality assurance check to verify that the commercial-off-the-shelf (COTS) product chosen (Automated Logic Controls) graphical user interface (GUI) and logic modules were chosen to permit the BACnet Protocol to be employed for future embedded I&C programmable software. This process was followed, but documented after the fact. Much of the process of integration is consistent with other vendors’ products, allowing the end user to use the GUI with the BACnet protocol logic modules. The QA forms used in the original software evaluation (after the fact) are included at the end of this Appendix. Also identified during the evaluation, where modification of software logic is identified through the improvement process, independent review is employed for the logic change process, which is implemented through WP-WC3010 Rev. 3, Maintenance PM/MWI Controlled Document Processing.

Final approval and download into PLCs is contingent upon “bench testing” the new logic, followed by operational testing after the logic is installed into the respective PLC. Much of the testing involves remote operations or indications verification from the CMR. Final approval of installation and operations resides with the Digital Control Administrator, of which, a primary and alternate Digital Control Administrator have been formally designated by management in writing.

As a final note, the use of as-built drawings incorporating embedded software logic needs to be reviewed and consideration given to documenting setpoints within the as-builts. Conflicting setpoints and bias ranges for logic were observed on numerous occasions between SDD and as-built drawings. This needs to be resolved prior to finalizing and institutionalizing the use of digital controls in vital and building control systems.

As evidenced during the review, WIPP WHC has been proactive in upgrading ventilation logic and control systems from pneumatic analog to digital PLC systems with embedded software logic. The upgrade process was planned and executed well in advance of DNFSB concerns identified as Configuration Management for Vital Safety Systems. This assessment has verified this and evidence has been observed in the form of updated and working logic (PLC) software and hardware as-built documents for both mode-compliant and balance-of-plant equipment. A listing of HV01 system as-built drawings is included as an attachment in Appendix B. Much of the process is being defined and institutionalized as the upgrades are in progress, demonstrated a forward-looking program consistent with DOE and DNFSB quality approaches. Of particular note is the integration of as-built software logic drawings into the existing plant CAD/CAM database and the steps in implementing a process that has only been formalized in the past 8 weeks. The process is being trained and implemented through the cognizant engineers.

The end result of these efforts is anticipated to be an unparalleled, well documented program that will need to be reviewed and revised upon completion of its rollout phase. The program as it exists is exemplary and is on the cutting edge of technology integration into ventilation and other facility systems. The results of integrating digital control technology into operations and maintenance programs are already measurable, as evidenced by the following preliminary indications of increased efficiency and cost savings at the WIPP facility:

- A 3000 man-hours/year reduction in I&C preventive maintenance for Building 451.
- Additional, but as-yet unquantified savings are expected on mechanical and electrical maintenance, and energy efficiency.
- Additional savings due to reduction in corrective maintenance costs are expected to become more apparent within the next couple of years as data is collected. To date, there have been no hardware failures associated with the PLCs or ASDs.

One additional note with respect to reliability: since the installation of PLCs in the ventilation control systems began in 1998, not a single PLC failure has been observed. This compares to a history of numerous failures of individual analog hardware that was originally installed during construction of the WIPP facility.

Appendix B