Department of Energy
Savannah River Operations Office
P.O. Box A
Aiken, South Carolina 29802
May 3, 2002

Mr. W. J. Johnson, Vice President
and General Manager
Nuclear Materials Management Division
Westinghouse Savannah River Company
Aiken, South Carolina 29808

Dear Mr. Johnson:

SUBJECT: Transmittal of F-Canyon Ventilation 2000-2 Phase II Assessment Final Report.

The enclosed report documents a 2000-2 Phase II assessment conducted on F-Canyon Exhaust Fans 2 and 3 by DOE-SR and Westinghouse Savannah River Company personnel. The assessment identified no significant findings or concerns but did find some system operability issues, opportunities for improvement and recommendations for analysis.

Please provide me within 30 days your proposed resolution to the issues, recommendations and improvement opportunities identified in the report.

The action taken herein is considered to be within the scope of the existing contract and does not authorize the Contractor to incur any additional costs (either direct or indirect) or delay delivery to the Government. If the Contractor considers that carrying out this action will increase contract costs or delay any delivery, the Contractor shall promptly notify the Contracting Officer orally, confirming and explaining the notification in writing within five (5) working days. Following submission of the written notice of impacts, the Contractor shall await further direction from the Contracting Officer.

If you have any questions, please contact me or have your staff contact Gary Borba at 952-4123.

Sincerely,

Howard B. [illegible]

for Roy J. Schepens
Assistant Manager for Material
and Facility Stabilization

NMED:GB:mag

UD-02-040

Enclosure:
Phase II Assessment Plan for
F-Canyon Confinement Ventilation

cc w/o enclosure:
J. French, WSRC, 703-F
M. R. Beckmeyer, WSRC, 707-F

bc
AMMRS

Final Report
Phase II Assessment of
F-Canyon Confinement Ventilation System
Canyon Exhaust Fans 2 and 3
at the Savannah River Site (SRS)

April 2002

Team Members Approval

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

Gary Borba
Team Leader
DOE-SR

Date 4/30/2002

Robert Edwards
DOE-SR

Date 4/30/02

Alexander Mackay
DOE-SR

Date 4/29/02

James McAndrews
WSRC

Date 4/29/02

Jerald Taylor
DOE-SR

Date 4/30/02

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Acronyms

AB	Authorization Basis
AEC	Atomic Energy Commission
AM	Assistant Manager
ANSI	American National Standards Institute
AOP	Abnormal Operating Procedures
CAEX	Canyon Exhaust
CM	Configuration Management, Corrective Maintenance
CMMS	Computerized Maintenance Management System
COE	U.S. Army Corps of Engineers
CSI	Computational Systems, Inc
CVS	Confinement Ventilation System
DBA	Design Basis Accident
DBE	Design Basis Earthquake
DNFSB	Defense Nuclear Facilities Safety Board
DOE	Department of Energy
EQ	Environmental Qualification
FMEA	Failure Modes and Effects Analysis
HAN	Hydroxyl Ammonium Nitrate
HEPA	High Efficiency Particulate Air
HVAC	Heating, Ventilation, and Air Conditioning
I&C	Instrument and Control
IEEE	Institute of Electrical and Electronics Engineers
ISRP	Integrated System Reliability Program
LOI	Lines of Inquiry
NMMD	Nuclear Materials Management Division
NNSY	Norfolk Naval Shipyard
P&ID	Process and Instrumentation Drawings
PdM	Predictive Maintenance
PHA	Process Hazards Analysis
PM	Preventive Maintenance
PMO	Preventive Maintenance Optimization
RCO	Radiological Control Operations
RIE/CGD	Replacement Item Evaluation /Commercial Grade Dedication
SAR	Safety Analysis Report
SC	Safety Class
ShRINE	Savannah River Information Network Environment
SOM	Shift Operations Manager
SOP	Standard Operating Procedure
SR	Savannah River
SRP	Savannah River Plant
SRS	Savannah River Site
SS	Safety Significant
SSC	Systems, Structures, and Components

TBP	Tributylphosphate
USQ	Unreviewed Safety Question
USQD	Unreviewed Safety Question Determination
VSS	Vital Safety System
WPPSS	Washington Public Power Supply System
WSRC	Westinghouse Savannah River Company

Executive Summary

A Phase II assessment was conducted on F-Canyon Confinement Ventilation System (CVS) Exhaust Fans 2 and 3, including associated dampers and ductwork. The assessment was conducted on April 1-4, 2002. Criteria used in the assessment included those found in the *Model Assessment Criteria and Guidelines For Performing Phase II Assessments of Safety Systems At Defense Nuclear Facilities*, and supplemental criteria covering system operations, environmental qualification and planned projects and upgrades.

No major concerns or findings were identified during the assessment. There were several minor system operability issues identified as well as some opportunities for improvement.

The facility did not meet the first acceptance criterion for environmental qualification, one of the supplemental criteria assessed. As there is not current mandatory requirements for environmental qualification, this failure to meet criteria was not listed as a significant concern or finding.

The team concludes that Canyon Exhaust Fans 2 and 3 are adequately operated, maintained and controlled to meet Authorization Basis requirements, and that future exhaust ventilation functionality is being sufficiently assessed and addressed by Westinghouse Savannah River Company.

Introduction

The Department of Energy (DOE) Implementation Plan for the Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2000-2 specifies two phases of assessments to be implemented on "Vital Safety Systems" (VSS). Phase I assessments call for a review of operational and maintenance records and a qualitative determination of a "readiness state" for each vital safety system within defense nuclear facilities of interest as listed in Appendix E of the 2000-2 Implementation Plan. Phase II assessments call for more detailed assessments of the operational readiness of systems. To conduct the Phase II assessments the Department developed the *"Model Assessment Criteria and Guidelines For Performing Phase II Assessments of Safety Systems At Defense Nuclear Facilities"* (November, 2001). Savannah River Site (SRS) was to conduct two Phase II assessments as documented in *2002-2 Phase II Plan and Schedule* (George Clare to DOE, AM Jeff Allison, March 7, 2002). One of the Phase II assessments was to be conducted on F-Canyon Exhaust Fans 2 and 3. This report documents the results of that assessment.

The scope of the assessment included the material condition of Canyon Exhaust Fans 2 and 3, and included the mechanical components including the associated dampers and ductwork. The assessment criteria used the four topical areas found in the *Model Assessment Criteria and Guidelines* document, as well as three additional topical areas. All seven topical areas are found in Appendix A.

A multidisciplinary team of individuals was selected to conduct the assessment. These included personnel from DOE-SR and from WSRC. A biography of the team members is provided in Appendix B. Assessment team members reviewed a number of documents related to the system design, safety basis and controls, maintenance, surveillance and operations. The assessment was conducted on April 1-4, 2002. The assessment team also received presentations, conducted interviews with appropriate facility engineering, maintenance and operations staff, reviewed additional documentation, and participated in tours of the facility to evaluate the material condition and configuration of the system, as recommended in the assessment criteria and guidance.

Background

Savannah River Site (SRS)

The SRS is one of several government-owned, contractor-operated sites in DOE's nuclear defense complex. On June 12, 1950, the US Atomic Energy Commission asked E.I. Du Pont de Nemours and Company to design, construct, and operate what was to become the Savannah River Plant (SRP). The Atomic Energy Commission approved the location of the present site in November 1950, and purchased tracts of land totaling 310 square miles in Aiken, Barnwell, and Allendale Counties in South Carolina, adjacent to the Savannah River. Construction began on February 1, 1951, and the first facility, the heavy water plant, began operating in August 1952. The first production reactor started operating in December 1953. Irradiated materials were moved from the reactors to one of the two chemical separation plants. In these facilities, known as "canyons," the irradiated fuel and target assemblies were chemically processed to separate useful products from waste. After refinement, nuclear materials were shipped to other DOE sites for final application. During the Cold War, SRS served the nation by producing nuclear materials critical to developing and maintaining a strong nuclear deterrent. SRS produced about 36 metric tons of plutonium from 1953 to 1988. In 1989 Westinghouse Savannah River Company (WSRC) replaced Du Pont as the site prime operations contractor.

F-Canyon Facility

Building Design

The 221-F Canyon Chemical Separations Facility and related support facilities were designed to process plutonium for national defense purposes. The Canyon building is a reinforced concrete, blast-resistant structure that is built on a reinforced concrete slab. The building consists of seventeen 43-foot sections and one 85-foot section at the south end. Two parallel canyons each 15 feet wide at the bottom and 30 feet wide at the top extend from Sections 5 through 18 and constitute the processing areas. These two canyons contain high activity materials and lower activity materials and are designated as the Hot Canyon and Warm Canyon respectively. The center section is a service and process auxiliary area and is divided into four levels as follows:

Fourth Level	Control room and general office space.
Third Level	Feed tank gallery and sample aisles.
Second Level	Pipe gallery, mask and tool decontamination room, and Canyon air supply room.

First Level	Change rooms, services, maintenance facilities, old cold feed preparations, electrical control rooms, HVAC equipment, office space, and Radiological Control Operations (RCO) count room and instrument room.

The Gang Valve Corridors that support Warm and Hot Canyon operations are located just below ground level at the outside lower part of the respective canyon.

Building Ventilation

The 221-F is supplied by three ventilation systems: Canyon Air System, Center Section Air System, and the Gang Valve Corridor System. Air supplied by these systems is exhausted by separate systems: Canyon Air Exhaust, Center Section Exhaust, Process Vessel Vent System, and Recycle Vessel Vent System. The ventilation system is designed to prevent the spread of airborne contamination to clean areas and for airflow to travel from lower contamination areas into higher contamination areas. This confinement is accomplished by maintaining positive static pressure in clean areas, atmospheric pressure in areas with low contamination potential and a slight vacuum in areas with high contamination potential. Air enters the Hot and Warm Canyons through registers along the crane ways and exits through registers near the bottom of each canyon cell. The downward air flow helps keep contamination inside the canyon cells. F-Canyon Exhaust Fans in Building 292-F pull the air through the sandfilters (294-F and 294-1F) and discharge it to the stack. A total of four F-Canyon Exhaust Fans are located in Building 292-F.

Scope of Assessment

The assessment included all Systems, Structures, and Components (SSC) which comprise the F-Canyon Exhaust Fans 2 and 3 as described below:

- Canyon Exhaust Fans 2 and 3
- Inlet Dampers for Exhaust Fans 2 and 3, including associated inlet ductwork.

The items within the Scope of Assessment are not being upgraded in Project S-4404. Project S-4404 is upgrading various SSCs of the H and F Canyon Confinement Ventilation Systems, including new fans, motors, dampers, electrical supply and distribution. Originally project S-4404 was expansive in the scope of its upgrades but, over the years, project scope and funding have been significantly reduced.

Assessment Results

Based on review of documents, interviews with facility engineering staff, presentation material, and facility tours to validate the information, the assessment team did not find any significant issues or concerns. The following is a summary of the team's results:

Major Issues or Concerns

None

Proficiencies

- Auxiliary operator and first-line manager have good knowledge of systems, functional classification, and operating and casualty procedures.

- The Preventive Maintenance Optimization (PMO) program is providing a documented basis for types and frequencies of Preventive Maintenance (PM) activities, including condition-directed PMs.

- The system engineer is knowledgeable and engaged.

- Except for drawing updates the Configuration management program is good.

Observations and Recommendations

- WSRC should verify that the large opening at the south end of the 292-F building wall (to provide access for project S-4404 equipment) has been evaluated for process and natural phenomenon hazards, and that any potential consequences to SC and SS SSCs are consistent with process hazards analysis and AB assumptions.

- The updating of essential drawings is not being done in a timely manner as required by the 7E manual

- The environmental qualification (EQ) of Fans 2 and 3 during a seismic event, where the integrity of the outside chemical storage tanks is not assured, should be evaluated. The assessment team could find no formal EQ program.

- The supply fans failed the interlock test on the latch function. This is the first for-credit time the test had been conducted for the latching function. WSRC should evaluate the 12-month PM frequency.

- WSRC should show why a USQ evaluation is not required for physical changes to CAEX fans 2 and 3 as a result of PMO recommendations. Only a USQD (USQ-FCAN-2002-00482) was performed.

- WSRC should continue to monitor and evaluate the cost and benefit of increasing maintenance worker knowledge of the functional classification of SSCs and its importance to their work activities.

- Related damper and ductwork should be included in SOP 221-F-51230, Section 7.1.5.

- Heating and Ventilation systems should be listed by name in the Scope section of SOP 221-F-60999 in order to preclude misconstruing the procedure is for the HVAC servicing the 292-F building.

Additional Observations

There were some items the assessment team identified that either were being assessed by WSRC or for which information was incomplete for the team properly evaluate. These are presented as items for WSRC to continue to evaluate or monitor:

- The team was aware of issues regarding the 254-13F (A and B train) diesel-generators.

- The team is aware that the material condition of the lower sandfilter structures are not well known and did not assess its present or future condition, performance or requirements.

- The ability to restore ventilation after a seismic event within 48 hours, if one or more of the outside chemical storage tanks are breached, should be evaluated for personnel protective requirements and on-hand inventory of personal protective supplies.

Conclusion

The team concludes that there are adequate measures to operate CAEX Fans 2 and 3 with no major issues or concerns identified.

Operations and maintenance personnel, procedures and management give reasonable confidence that the fans will operate during normal and upset conditions. Safety Analysis identifies dominant accidents and matches SSCs functions and performance requirements. Engineering activities, including the ISRP, System Health Reports, PMO, and systems engineering knowledge and

participation are improving equipment condition and performance knowledge, and are helping WSRC to better manage and maintain the equipment. System surveillances help ensure the equipment performs as required. The periodic review of SSC material condition helps to identify and correct age and/or wear related conditions of the Fans before they significantly impact fan operations.

Some observations identified potential conditions or scenarios that WSRC should further evaluate. While it is possible that these evaluations may identify issues or concerns, any impact to current or long-term operability of the CAEX system will need to be evaluated at that time.

Lessons Learned

1: The use of site personnel did permit the team to rapidly start assessing without the need for lengthy briefings.

2: The *Model Assessment Criteria and Guidelines* document provides a good base for conducting the Phase II assessment, but the criteria and approach should be adapted (additions, modifications, and deletions) to the Vital Safety System(s) (VSS) being reviewed.

3: Consideration should be given to increasing the review criteria in the *Model Assessment Criteria and Guidelines* for additional operations review criteria.

4: The use of an operating contractor “point of contact” was helpful and helped reduce some of the administrative burden from the team.

Detailed Discussion of Results
Introduction

There were a total of seven assessment topics the assessment team used. Four of these were directly from the Criteria and Approach section of the *Model Assessment Criteria and Guidelines for Performing Phase II Assessments of Safety Systems at Defense Nuclear Facilities* document and are:

- Safety Function Definition
- Configuration Management
- System Maintenance
- System Surveillance and Testing

Each topical area includes sections on Objectives, Criteria, and Approach. These are included in Attachment A.

In addition the team used three additional assessment topics. These were:

- System Operations
- Environmental Qualification
- Planned Upgrades and Projects

These topical areas were formatted like those found in the *Model Assessment Criteria and Guidelines* document and are also included in Attachment A.

What follows in this section will be each topical area, its Objective, a listing of each Acceptance Criterion (Criteria). Under each criterion will be whether the criterion was met, how the team member performed the evaluation for that criterion, the results of the evaluation, any system operability issues, and opportunities for improvement.

Safety Function Definition

Objective:

Safety basis-related technical, functional, and performance requirements for the system are identified/defined in appropriate safety documents.

Criterion 1:

Safety/Authorization Basis documents identify and describe (1) the system safety functions and the safety functions of any supporting systems, and (2) the system requirements and performance criteria that the system must meet to accomplish its safety functions.

Is the Criterion met:

Yes

How review was conducted:

Review the appropriate safety/authorization basis documents, such as safety analysis reports, basis for interim operations, technical safety requirements, safety evaluation reports, and hazards and accident analyses, to determine if the definition/description of the system safety functions includes:

- The specific role of the system in detecting, preventing, or mitigating analyzed events
- The associated conditions and assumptions concerning system performance
- Requirements and performance criteria for the system and its active components, including essential supporting systems, for normal, abnormal, and accident conditions relied upon in the hazard or accident analysis.

References:

1. WSRC-TR-97-0226, F-Canyon Preliminary Hazards Analysis Report (U), Rev. 2, December 2001.
2. WSRC-TR-98-00042, Functional Classification Report for the F-Canyon Facility, Rev.3, June 2001.
3. WSRC-SA-2001-00004, Rev. 0, Safety Analysis Report Savannah River Site F-Canyon, FA-Line And Outside Facilities, September 2001

Interviews conducted:

Sterling Robertson, F-Area Technical Support Manager
Bert Branham, F-Canyon Technical Support Engineer

LOI#1 *Does the Authorization Basis definition/description of the system specifically identify and describe system safety functions and the safety functions of any essential supporting systems for detecting, preventing, or mitigating each analyzed event?*

The accidents identified by the PHA were binned according to the guidance in DOE Standard 3011-94 into one of four "scenario classes" (I – IV). The "dominant" accidents (scenario classes I and II) were brought forward for further evaluation in the SAR, which included identification of preventive and mitigative controls. The safety class and safety significant controls identified for these accidents were selected per the functional classification procedure E7 2.25.

The SAR identifies one preventive function for the ventilation system for criticality. The geometry of the Hot and Warm Canyon Air Tunnels is credited to prevent a criticality in the exhaust tunnel. Specifically, there are no areas within the tunnel where undetectable fissile material will accumulate.

Radioactive material confinement is achieved by the combination of the F-Canyon structure and the ventilation system, including the sandfilter and exhaust stack. This is a mitigating function. Several events identify and describe mitigating functions for the ventilation system. They are:

Dominant Accidents from Accident Analysis that depend on Canyon Ventilation

Scenario (S6)	Explosion: TBP-Nitric Acid Runaway Reaction (Scenario Class I)
Scenario (S7)	Explosion: Hydrogen Explosion (Canyon Vessels) (continued) (Scenario Class I)
Scenario (S8)	Explosion: Hydrogen/Ammonia Explosion (Dissolver) (Scenario Class I)
Scenario (S9)	Explosion: HAN/Nitric Acid Runaway Reaction (Scenario Class II)
Scenario (S10)	Explosion: Ammonium Nitrate (Scenario Class II)
Scenario (S11)	Fire: Organic or Solvent Fire (Scenario Class II)
Scenario (S20)	Natural Phenomena Event: Earthquake F-Canyon and Outside Facilities (Scenario Class II)

Safety Class Systems:

- Sandfilters 294-F and 294-1F
- 221-F Canyon Exhaust Tunnel Low Vacuum/Auto-Start Standby Fan Interlock
- 221-F Canyon Exhaust Tunnel Low Vacuum/Canyon Supply Fans Interlock
- 221-F Canyon Exhaust System Failure Alarm
- 221-F Canyon Exhaust Fans
- 292-F Electrical Distribution System

Design Features:

- 221-F Canyon Building
- 221-F Canyon Exhaust Air Tunnel
- 292-F Building Structure
- 291-F Stack and Stack Liner (Safety Significant)

Based on examination of the referenced documents, the reviewer concluded that the Safety Analysis Report (SAR) definition/description of the ventilation system and design features specifically identifies the needed safety functions and the safety functions of essential supporting systems for preventing or mitigating each analyzed event.

LOI#2 *Does the Authorization Basis definition/description of the system specifically identify and describe associated conditions and assumptions concerning system performance?*

Ventilation systems are employed in F-Canyon to protect workers and the public from airborne radioactivity. In general, air flows from zones of lower contamination to higher contamination. Fans that maintain the required air flow and differential pressures are located in 292-F Fan House and discharge directly to the 291-F Exhaust Stack.

Filtered outside air is supplied to F-Canyon by fans. Air enters the Hot and Warm Canyons through registers along the crane ways and exits through registers near the bottom of each canyon cell. The downward air flow helps keep contamination inside the canyon cells. F-Canyon Exhaust Fans in Building 292-F pull the air through the sandfilters (294-F and 294-1F) and discharge it to the stack. A total of four F-Canyon Exhaust Fans are located in Building 292-F. Two of the four fans are designated as SC fans and must be equipped with an auto-start interlock. The accident analysis assumes that at least one F-Canyon Exhaust Fan can be returned to service within 48 hours following a Design Basis Earthquake (DBE). The sandfilters are constructed of layers of progressively smaller aggregate, starting with coarse stone on the bottom and ending with fine sand on the top. Airflow is out the top. The two sandfilters operate in parallel, removing about 99.98% of the particulate radioactivity from the air, equivalent to a HEPA filter. The accident analysis in the SAR assumes that the sandfilters are 99.51% efficient (0.49% filter penetration factor) in removing any radioactive particulates that are airborne in the F-Canyon exhaust air stream.

Radioactive material confinement is achieved by the combination of the F-Canyon structure and the ventilation system, including the sandfilter and exhaust stack. All accidents that result in a release to atmosphere, except for criticality accidents take credit for the filtration effect of the sandfilter.

Based on review of the referenced documents, and information above, the SAR adequately describes the conditions and assumptions required by the accident analysis for system performance. The functional requirements are carried forward into the SAR.

LOI#3 *Does the Authorization Basis definition/description of the system specifically identify and describe requirements and performance criteria for the system and its active components, including essential supporting systems, for normal, abnormal, and accident conditions relied upon in the hazard or accident analysis.*

Each of identified Structures, Systems, and Components have specifically identified functions and associated performance requirements, listed in the SAR:

221-F Canyon Exhaust Air Tunnel (Design Feature) (SC2)

Function
The function of the Canyon Exhaust Air Tunnel is to provide confinement of ventilation flow of any credible release of radioactive material or hazardous material from the primary confinement boundary (which consists of the process vessels and their associated off-gas systems).

Requirement(s)
The Canyon Exhaust Air Tunnel must provide confinement of ventilation flow and must direct the ventilation flow to the 291-F Stack via Sand Filters 294-F and 294-1F.

The geometry of the Hot and Warm Canyon Air Tunnels is also credited to prevent a criticality in the exhaust tunnel. Specifically, there are no areas within the tunnel where undetectable fissile material will accumulate.

Sand Filters 294-F and 294-1F (SC3)

Function
The sand filters provide the final reduction of particulates in the ventilation exhaust stream before it is exhausted through the 291-F Stack. This filtration minimizes the offsite and onsite doses.

Requirement(s)
The sand filters must have a removal efficiency of at least 99.51% for 0.7 micron particles.

221-F Canyon Exhaust Fans (SC4)

Function
Four Canyon Exhaust Fans are located in Building 292-F. The Canyon Exhaust Fans provide motive force to carry airborne radioactive contaminants through the sand filters (294-F and 294-1F) to the 291-F Stack. Running any combination of the four fans is acceptable provided the minimum vacuum stated below is satisfied. At least two of the four fans must be designated as Safety Class and must have a Safety Class power supply. This functional classification scheme provides a high degree of confidence that at least one Canyon Exhaust Fan is capable of being returned to service within 48 hours following a DBE.

Requirement(s)
At least two of the four fans must be designated as Safety Class. The Safety Class fans must be equipped with a F-Canyon Exhaust Tunnel Low Vacuum/Auto-Start Standby Fan Interlock.

The Canyon Exhaust Fans must be capable of maintaining a vacuum in the Canyon Exhaust Air Tunnel of at least -1.0 inches of water column with respect to atmosphere.

221-F Canyon Exhaust Tunnel Low Vacuum/Auto-Start Standby Fan Interlock (SC5)

Function
The Canyon Exhaust System Interlocks provide for activation of system backups and to place the system in a more desirable state if some type of failure within the Canyon Exhaust System occurs. In doing so, the interlocks help to ensure that the minimum vacuum is maintained in the Canyon Exhaust Air Tunnel. The interlocks are pressure switches, located in the 292-F Building, which activate if the static pressure of the Canyon Exhaust Tunnel becomes less negative than the set point of the associated pressure switch.

The 221-F Canyon Exhaust Tunnel Low Vacuum/Auto-Start Standby Fan Interlock is designed to start the standby Canyon Exhaust Fan. Starting the standby fan helps to maintain the vacuum in the Canyon Exhaust Air Tunnel.

Requirement(s)
The 221-F Canyon Exhaust Tunnel Low Vacuum/Auto-Start Standby Fan Interlock shall start the standby Canyon Exhaust Fan once the tunnel static pressure reaches the interlock set point. The interlock setpoint must be greater than or equal to -1.0 inches of water column with respect to atmosphere.

221-F Canyon Exhaust Tunnel Low Vacuum/Canyon Supply Fans Interlock (SC6)

Function
The Canyon Exhaust System Interlocks provide for activation of system backups and to place the system in a more desirable state if some type of failure within the Canyon Exhaust System occurs. In doing so, the interlocks help to ensure that the minimum vacuum is maintained in the Canyon Exhaust Air Tunnel. The interlocks are pressure switches, located in the 292-F Building, which activate if the static pressure of the Canyon Exhaust Tunnel becomes less negative than the set point of the associated pressure switch.

The 221-F Canyon Exhaust Tunnel Low Vacuum/Canyon Supply Fans Interlock is designed to shutdown the canyon supply fans. Shutting down the supply fans helps to prevent air reversals from occurring within the canyon that could spread airborne activity releases to occupied areas.

Requirement(s)
The 221-F Canyon Exhaust Tunnel Low Vacuum/Canyon Supply Fans Interlock shall shut down the Canyon Supply Fans once the tunnel static pressure reaches the interlock set point. The interlock setpoint must be greater than or equal to -1.0 inches of water column with respect to atmosphere.

221-F Canyon Exhaust System Failure Alarm (SC7)

Function
The 221-F Canyon Exhaust System Failure Alarm alerts operations personnel to an abnormal condition within the Canyon Exhaust System. Operator action can then be taken to ensure that the minimum vacuum is maintained in the Canyon Exhaust Air Tunnel or shutdown canyon operations if the minimum vacuum cannot be maintained. The alarm is activated via a pressure switch located in the 292-F Building if the static pressure of the Canyon Exhaust Tunnel becomes less negative than the set point of the associated pressure switch.

Requirement(s)
The 221-F Canyon Exhaust System Failure Alarm must provide an audible and visual alarm in the F-Canyon Control Room once the tunnel static pressure reaches the alarm set point. The alarm setpoint must be greater than or equal to -1.0 inches of water column with respect to atmosphere.

292-F Electrical Distribution System (SC12)

Function
The 292-F Electrical Distribution System is required to provide electrical power to those Canyon Exhaust Fans designated as Safety Class. A Safety Class diesel generator supplies electrical power. Electrical power must be available in order for the Canyon Exhaust Fans to carry out their safety function.

Requirement(s)
The 292-F Electrical Distribution System must be capable of providing power to the Canyon Exhaust Fans designated as Safety Class. Following a DBE, power must be restored to at least one Canyon Exhaust Fan within 48 hours. (The accident analysis assumes that at least one fan will be operational within 48 hours following a DBE.)

292-F Building Structure (Design Feature) (SC13)

Function
The 292-F Building Structure houses equipment required for the operability of the 292-F Electrical Distribution System and the Canyon Exhaust Fans.

Requirement(s)
The 292-F Building Structure must remain intact following a DBE. (The accident analysis assumes that at least one Canyon Exhaust Fan will be operational within 48 hours following a DBE.)

291-F Stack and Stack Liner (Design Feature) (SS2)

Function
The 291-F Stack and Stack Liner support the F-Canyon Exhaust System by providing an elevated release. Neither the stack nor the stack liner is credited in the accident analysis following a DBE. The stack liner will likely fail (i.e., collapse) during a DBE and could obstruct the discharge path of the Canyon Exhaust Ventilation System. Therefore, action must be taken to ensure that a discharge path is maintained following a DBE so that at least one Canyon Exhaust Fan is returned to service within 48 hours as assumed in the accident analysis.

Requirement(s)
The 291-F Stack and Stack Liner must be capable of providing an elevated release.

Based on review of the SAR and information above, the reviewer concluded the definition/description of the system specifically identifies and describes requirements and performance criteria for each system and its active components, including essential supporting systems, for normal, abnormal, and accident conditions relied upon in the hazard or accident analysis. The safety functions are then translated into functional requirements for system operation and supported by appropriate surveillances to ensure continued system operability. The reviewer concluded the safety basis provides adequate information to identify required safety functions and to described operational requirements for these systems and components.

System operability issues or concerns:

None

Opportunities for improvement:

None

Configuration Management

Objective:

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

Criterion 1:

Changes to system safety basis requirements, documents, and installed components are designed, reviewed, approved, implemented, tested, and documented in accordance with formally controlled procedures. Consistency is maintained among system requirements and performance criteria, installed system equipment and components, and associated documents as changes are made.

Is the Criterion met:

Yes, with an Opportunity for Improvement

How Review Was Conducted:

The review was conducted using interviews with facility and program management, engineering, configuration management, and maintenance personnel. A tour of building 292-F with Canyon Exhaust Fans 2 and 3 was conducted. A walk-down using a drawing from a design change package for Canyon Exhaust Fans 2 and 3 was completed, along with an explanation by facility personnel. Procedures related to work control and change control were also reviewed.

Procedures and manuals reviewed:

Configuration Management procedure 7E
Engineering Manual E7
Design package W/O 321796-1
Drawing M M6 F 3846, E E9 F 1262

Tours and Walk-downs:

Tour of Building 292-F
Walk-down of Drawing used for the change Drawing M M6 F 3846

Interviews:

Configuration Management Lead Engineer
Technical Support Specialist

Discussion of Results:

The work control/design change process describes the processes for requesting, reviewing, approving, and conducting work activities in the facility. Processes and guidelines are in place to assure that changes to the system safety basis requirements and installed components are designed, reviewed, approved, implemented, tested, and documented in accordance with controlled procedures. These processes and procedures were reviewed and evaluated, along with the associated design changes packages and work packages, to insure that the change control process and procedures are adequate and effectively implemented. Changes were accurately described, reviewed, and approved as appropriate. Installation instructions, post-mod testing instructions, and acceptance criteria for turnover to operations was specified. However, the important documents affected by the change (P&ID drawings) were not updated in a timely manner. A representative sample of line, engineering, configuration management personnel were interviewed to verify their understanding of the change control process and commitment to manage changes affecting the design and safety basis in a formal, disciplined and accountable manner.

System Operability Issues or Concerns:

None

Opportunities for Improvement:

In the case of the P&ID drawing of the Canyon Exhaust Fans #2 and #3 there appeared to be excessive lag time in updating drawings following facility modifications. Some of the modifications appeared to be closed but the drawings have not been updated. This does not align with the procedure that requires that all essential drawings be update before the release of the system for operation. This condition has been known to exist for some time. A lack of funding in this area due to budgetary constraints and other more pressing priorities has allowed this condition to continue along. The facility and configuration management recognizes this situation and is taking steps to alleviate the lag time issue.

Criterion 2:

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

Is the Criterion Met:

Yes

How Was Review Conducted:

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

Discussion of Results:

The selected system components were walked-down to compare the actual configuration of those components to the documents for the system, such as design and authorization basis documents. These components were also compared to the system design descriptions, and the system drawings, the piping and instrument drawings. There were no temporary changes or discrepancies that would affect the operability or reliability of the system. The documentation of the change reviewed matched the tag designation for piece of equipment inspected exactly.

System Operability Issues and Concerns:

None

Opportunities for Improvement:

See "Opportunities for Improvement," Configuration Management, Criterion 1.

Criterion 3:

Changes to system safety basis requirements, documents, and installed components conform to the approved safety/authorization basis (safety envelope) for the facility, and the appropriate change approval authority is determined using the Unreviewed Safety Question (USQ) process.

Is the Criterion Met:

Yes

How Was Review Conducted:

See "How Review Was Conducted," Configuration Management, Criterion 1.

Discussion of Results:

Interviews, review of Plant Modification Travelers, design change packages, work packages and observation of completed modifications of components and systems confirm that the change control process is being effectively implemented. Reviewed changes to ensure that system requirements and performance criteria would not adversely affect the safety function of the system. As confirmed by procedure, changes affecting the safety basis are documented, tracked, and reviewed. The changes are screened to ensure that the changes conform to the approved safety/authorization basis for the facility.

System Operability Issues and Concerns:

None

Opportunities for Improvement:

See “Opportunities for Improvement,” Configuration Management, Criterion 1.

Criterion 4:

Facility procedures ensure that changes to the system 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 Was Review Conducted:

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

Discussion of Results:

It was determined that engineering was made aware of the system changes that would affect them. They were also very involved in the change process. It was also verified that any change was integrated and coordinated with other organizations that could logically be affected by the change such as facility training, document control, construction, radiological control, industrial hygiene, hazard analysis/safety basis.

System Operability Issues and Concerns:

None

Opportunities for Improvement:

See “Opportunities for Improvement,” Configuration Management, Criterion 1

Criterion 5:

Software used in system instrumentation and control (I&C) components that perform functions important to safety is subject to a software quality process consistent with 10 CFR 830.120.

Is the Criterion Met:

Yes

How Was Review Conducted:

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

Discussion of Results:

The software quality assurance plan (in 10 CFR830.120) is used when making a software change in the facility. Configuration management procedures exist to control changes, which are made to the software. All controls necessary to successfully implement a software change are included in the software quality assurance plan. Documentation that was reviewed for this assessment did not contain any software changes.

System Operability Issues and Concerns:

None

Opportunities for Improvement:

See “Opportunities for Improvement,” Configuration Management, Criterion 1

System Maintenance

Objective:

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

Criterion 1:

Maintenance processes consistent with the system safety classification are in place for prescribed corrective, preventive, and predictive maintenance, and to manage the maintenance backlog.

Is the criterion met:

Yes

How review was conducted:

The review consisted of procedure and document reviews, interviews with NMMD management and craft personnel, review of the work history in PASSPORT (a CMMS), review of applicable Preventive Maintenance Optimization analysis and a review of the Predictive Maintenance (PdM) activities associated with CAEX fans 2 and 3 and their related motors. A walkdown of the 292-F building and equipment was conducted to assess the overall material condition of the SSCs found there.

Documents reviewed included:

- Work Order Package 00301900, Semiannual Inspection/Lubrication Actuator Damper #2 Canyon
- Work Order Package 00315325, Inspect Belt/sheaves CAEX Fan #2
- Work Order Package 00301291, Replace Oil Bearings With Grease Bearings Fan #2
- SOP W-11325 (Rev 4), Removing, Replacing, Aligning, and Tensioning Adjustment for V-Belts
- MAINT W-11399 (Rev 1), Vibration Data Collection Using CSI Model 2120 Analyzer
- SOP F-11929 (Rev 5), Power Equipment Lubrication Log, 200-F
- FS-292000-CAEX-FAN-002-FAN-002, Failure Modes and Effects Analysis for Canyon Exhaust Fan #2
- FS-292000-CAEX-FAN-002-MO-002, Failure Modes and Effects Analysis for Motor – 200 H.P. #2 Canyon Exhaust Fan
- Miscellaneous PASSPORT PM and CM work order tasks, status and history printouts relating to the CAEX Fans and Motors 2 and 3

- Presentation: Engineering Assessment of F-Canyon Exhaust (CAEX) System, Canyon Exhaust System Health (2/4/2002)
- USQ-FCAN-2002-00482, Unreviewed Safety Question Process, USQ Screening – Part A to Implement Preventive Maintenance Optimization (PMO) for Canyon Exhaust Fan(s)
- 2000-1 Phase 1 report for F-Canyon, Canyon Exhaust Fans (2 and 3)
- Vibration measurement point history data for motor and fan bearings for CAEX Fans 2 and 3
- PdM Survey Reports for F-Separations, December, 2001 and February, 2002.
- Vibration triaxial spectral plots for CAEX Fan #2 Point FFA (March 4, 2002) and Fan #3 Point FFA (March 19, 2002).
- Vibration Alarm Setpoints for CAEX Fans

Discussion of Results:

A review of PASSPORT historical data does not indicate any trends or significant unresolved issues associated with corrective maintenance (CM). CMs were infrequent and showed no obvious trending. Interviews with the Facility Services Maintenance Manager confirmed the PASSPORT data that no present recurring issues exist with the SC or SS attributes of the equipment.

The majority of the maintenance work performed on CAEX Fans/Motors are PMs and PdMs. The PMs are shown performed as scheduled except when project S-4404 work or equipment being out-of-service results in a PM deferral. Most PMs are for lubrication and damper lubrication and operation checks. Most PdMs are for vibration monitoring of the fan and motor bearings.

A review of a sample of work packages found them to be in good condition with no errors of significance noted. Since the maintenance craft may not have a complete understanding of the meaning of equipment classification and the impacts of maintenance activities on Operations, as a compensatory measure there are training sheets in the work packages that maintenance workers are to review. All packages reviewed either had the applicable training sheets in the work package or directed them where to review the training sheet. While this does appear adequate, training the maintenance workers in the meaning of functional classification and the operational impacts of maintenance activities would eliminate the need for the training sheets.

The NMMD PM program is undergoing significant change due to the Preventive Maintenance Optimization (PMO) work underway. The PMO method adopted by NMMD is to use a modified Failure Modes and Effects Analysis (FMEA) to identify functional and performance attributes of SSCs. Then, based on safety importance, regulatory requirements, and vendor and manufacturer data the attributes are ranked. The attributes are either matched with a new or modified PM, or with a condition-based PdM that would trigger a PM when warranted, or allowed to run-to-failure where that strategy is appropriate. Existing PMs would either be used as-is, modified to match PMO results

or deleted if the PM is not warranted. Monitoring of equipment performance and PM/PdM results will permit PMO to be further refined in the future.

A review of the PMO package for CAEX Fan and Motor #2 indicates the PMO process is providing a realistic basis for what are included in PMs and their execution. The basis for performance, affected procedures and change justifications are documented. The PMO database includes the FMEA analysis results including ranking methodology, and supporting documentation and interviews.

In some instances, the PMO will recommend changes or modifications to SSCs. For the CAEX Fans/Motors 1 and 4 there were recommendations to change the backstop clutch from oil filled to one that is grease filled. Also the types of lubricants used in the bearings was being changed. A review of the associated USQD screening (USQ-FCAN-2002-00482) answered all questions "No" which implies the proposed activity does not have the potential to create a USQ. While a change to a SC or SS SSC or procedure does not necessarily mean a safety evaluation is always required, physical changes to SC and SS SSCs generally do need further evaluation than a USQD screening. WSRC should document why this USQD screening, by itself, is appropriate.

The FMEA analysis stated that polyurea grease had a 100,000-hour oxidation life, equivalent to the L10 bearing life. This was documented in the PMO database as an interview with an NMMD staff engineer (the division lubrication technical resource and the site lubrication committee chairman). The engineer's basis for the claim was not documented in the database. The need to corroborate PMO supporting data with empirical data or manufacturer data was identified as an observation in the assessment closeout meeting. Prior to writing this report WSRC did include the manufacturer's high-temperature oxidation life test data in the database. Therefore this item is resolved and is not identified as an opportunity for improvement.

Because of the emphasis on vibration monitoring as a condition-monitoring tool, the PdM vibration data collection and analysis methodology for Fans 2 and 3 was reviewed. The NMMD PdM organization uses vibration analyzers to monitor at specific points on the bearings. The triaxial data is collected and software from the same vendor as the analyzers permits viewing the data in the frequency domain and/or time domain. Each bearing has frequency-banded alarm limits that permit rapid identification of potential problems. When an alarm limit is reached, or if there are identified anomalous results then further investigation is done. Once a condition is confirmed, the PdM group will make recommendations based on the type of condition found and its severity. Generally, the PdM group can identify incipient failures long before there are overt indications.

A review of Fan and Motor 2 and 3 alarm limits, vibration history and a sample of the frequency and time domain data plots was conducted. The alarm limits are frequency dependent and are tailored, not generic. This helps to identify problems very early compared to using overall vibration criteria or generic alarm limits. In addition, the frequency data does show that the PdM group is diligent in collecting the data. Sometimes when equipment is out-of-service, the PdM data collection is deferred until

the equipment is in-service. Two monthly PdM reports applicable for F-Canyon were reviewed and problem equipment was identified. The low incidence of CMs noted in PASSPORT history may be an indication that the PM and PdM programs are effective.

System operability issues or concerns:

None

Opportunities for improvement:

WSRC should continue to monitor and evaluate the cost and benefit of increasing maintenance worker knowledge of the functional classification of SSCs and its importance to their work activities.

PMO includes some recommendations that result in the reductions of PM frequencies, the elimination of PMs, or changes to SC or SS equipment. WSRC should evaluate the USQD screening process for these types of changes and ensure the USQD screening performed is appropriate.

Criterion 2:

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

Is the criterion met:

Yes

How review was conducted:

This criterion was evaluated through interviews with maintenance workers and with the NMMD Maintenance Facilities Service Manager, review of PASSPORT history, and a walkdown of the 292-F building.

Discussion of Results:

The maintenance workers were asked if they found a problem or something they believe could be improved upon would their recommendation be appropriately reviewed and acted on. They answered yes and they also stated that there exists good dialog between supervision and themselves when it comes to identifying such items.

The Facility Services Manager stated that age-degradation items found are addressed through the deficiency tracking system and that presently there are no such deficiencies identified for the SSCs under the scope of this assessment. He also stated that Maintenance participates in material condition inspections that are periodically conducted, and that material condition deficiencies may also be identified when PMs are

performed, some of which include inspections of material degradation, as verified from maintenance history records within PASSPORT.

A tour of building 292-F found that the equipment pedestals appeared to be in very good condition, as well as the equipment itself. There was minor debris noted that could be corrected with housekeeping. No obvious instances of major corrosion, wear, or damage were noted. The inlet damper actuator arms appeared to be somewhat flimsy and appeared to be somewhat bowed. A large opening was made in the 292-F building (on the stack side of the building) to accommodate the movement of equipment for the S-4404 project. When the system engineer was asked about whether natural phenomenon hazards were considered by leaving the opening in place, he stated that it was believed the large diesel in the building would protect three fans from missiles, but a missile could impact one fan. On the last day of the assessment it was discovered that the S-4404 project had anticipated closing the opening, but funding for this activity was cut from the project.

WSRC should verify that the opening in 292-F has been evaluated for process and natural phenomenon hazards, and that any potential consequences to SC and SS SSCs are consistent with process hazards analysis and AB assumptions. This should also include any increase in frequency or consequence associated with non-NMMD activities that could affect SSCs in the 292-F building such as the Wackenhut helicopter use.

<u>System operability issues or concerns:</u>

None

<u>Opportunities for improvement:</u>

WSRC should verify that the opening in 292-F has been evaluated for process and natural phenomenon hazards, and that any potential consequences to SC and SS SSCs are consistent with process hazards analysis and AB assumptions. This should also include any increase in frequency or consequence associated with activities such as the Wackenhut helicopter use.

System Surveillance and Testing

Objective:

Surveillance and testing of the safety system demonstrates that it is capable of accomplishing its safety functions and continues to meet applicable system requirements and performance criteria.

Criterion 1:

Requirements for surveillance and testing are adequate for demonstrating overall system reliability and operability, and are linked to the technical safety basis.

Is the criterion met:

Yes

How review was conducted:

The review consisted of attending a presentation provided by the Lead System Engineer for F-Canyon Ventilation where a system overview, performance of equipment, and purpose of the F- Canyon exhaust system were presented. A separate review of the following documents was also conducted:

- 5480.23.1-FCAN-AA "Authorization Agreement for the F-Canyon and Outside Facilities F-Area, (provides list of AB Documents)
- DPW-85-101 "Operational Safety Requirements for F-Canyon and FB-Line" (AB safety basis document)
- SOP 221-F-51230 "F-Canyon, OF-F and FA-Line Safety-Related Systems"

Discussion of Results:

The requirements for surveillance and testing are in AB document DPW-85-101 under section 3.1 "Surveillance and Testing". This demonstrates a direct link to the technical safety basis. Section 3.1 states that the requirements in this document apply to the surveillance and testing of equipment that is directly related to safety in the F-Canyon. The objectives of the requirements in DPW-85-101 are to ensure the operability of systems, equipment, and components that are essential to safety during operation. The surveillance requirements applied are based on national codes and standards and/or site requirements whenever they exist. If they do not exist, surveillance requirements are based on past operating experience and engineering judgement. DPW-85-101 also includes a Table 3.1 "Surveillance and Testing Requirements" which list the F-Canyon Confinement and Ventilation Exhaust System and requires a surveillance/test interval of 12 months for the systems safety systems. Procedure SOP 221-F-51230 provides by name the safety related systems that require the 12-month surveillance/test interval.

System operability issues or concerns:

None

Opportunities for improvement:

None

Criterion 2:

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

Is the criterion met:

Yes

How review was conducted:

The following surveillance and testing procedures were reviewed and where appropriate discussed with the System Engineer for F-Canyon Ventilation:

- SOP 221-F-51230 "F-Canyon, OF-F and FA-Line Safety-Related Systems
- SOP 221-F-60999 "Outside Auxiliary Systems Operator Round Sheets"
- AOP 221-F-944 "Earthquake Response for 221-F/OF-F
- SOP 221-F-61032 "Preparation for Two Canyon Exhaust Fan Operation"
- AOP 221-F-90201 "Response to Failure of 221-F Ventilation System"
- F-810070 "Canyon Exhaust System Interlock and Alarm, Functional Test, Building 292-F"
- W-850005 "Troubleshooting Scope of Work Maintenance"
- SOP 221-F-60999 "Outside Auxiliary Systems Operator Round Sheets"

The Lead System Engineer for F-Canyon Ventilation conducted a tour of the 292-F Fan House. The Canyon exhaust fans, dampers, and ductwork were visually inspected.

Discussion of Results

Procedure SOP 221-F-51230, Section 7.1.5 "221-F Canyon Exhaust Fans" states that no safety related surveillance requirements are required for the fans. A discussion with the System Engineer for F-Canyon Ventilation confirmed that this also included the fan dampers and related ductwork. Section 7.1.6 "221-F Canyon Exhaust System Interlocks and Alarms" of Procedure SOP 221-F-51230 provided the surveillance requirements for the interlocks and alarms that control the 221-F Canyon Exhaust System airflow. An assessment of the interlocks and alarms was conducted with the results below.

An actual test/surveillance of the canyon exhaust system interlock and alarm functional test for building 292-F was conducted on 2/06/02. This test/surveillance process was reviewed with the Ventilation Work Group Representative who was responsible for conducting the test/surveillance. The test/surveillance was performed in accordance with Test/surveillance procedure F-810070 and included the following:

- Canyon Exhaust Fan Auto-start Interlock, Fan #2
- Canyon Exhaust Fan Auto-start Interlock, Fan #3
- Canyon Supply Fan Interlock
- Failure Canyon Exhauster Alarm

The process used to schedule the test/surveillance is as follows:

- Facility is notified by PASSPORT that the test/surveillance is due
- Every Tuesday a scheduling meeting is conducted to schedule the work with operations and the appropriate Work Group
- The Planner develops the Work Package for required approvals using procedure F-810070
- Procedure F-810070 is used to perform the test/surveillance and record results
- If a failure occurs the Shift Operations Manager (SOM) is notified immediately of the failure so that appropriate action can be taken
- A new work package is developed in accordance with "Troubleshooting Scope of Work Maintenance" W-850005 to identify the problem.
- The results of the test/surveillance are loaded into PASSPORT History and a hard copy is sent to the Works Management Center.

The Canyon Supply Fan Interlock failed the test/surveillance. The SOM was notified and the supply fans have been locked out in the off position so that they can not be operated until the interlock is fixed.

In addition to the test/surveillance requirements, Procedure SOP 221-F-60999 was reviewed as it provides a daily monitoring record of auxiliary systems equipment outside Building 221-F which includes the canyon exhaust fans. A review of an actual round sheet for the time period of 0700, 3/23/02 to 0700, 3/24/02 was conducted with details below.

The daily monitoring record of auxiliary systems equipment although not safety related provides information that can be analyzed from day to day to detect any abnormalities. Some of the readings taken are:

- Fan bearing temperature – inboard
- Fan bearing temperature – outboard
- Motor bearing temperature – inboard
- Motor bearing temperature – outboard
- Running lights illuminated

- Switch positions On/Off/Auto
- Standby light illuminated
- Phase A current
- Phase B current
- Phase C current

System operability issues or concerns:

Because the Canyon Supply Fan Interlock failed the test/surveillance and the Canyon Supply Fans have not been in operation for the last couple of years, the surveillance/test interval of 12 months should be re-evaluated if the Canyon Supply Fans are to be brought back on line.

Opportunities for improvement:

In SOP 221-F-51230 under section 7.1.5 (or a new section) the related dampers and ductwork with the 221-F Canyon Exhaust Fans should be included.

In SOP 221-F-60999 under the scope, heating and ventilation systems should be listed by name as it could be misunderstood that this procedure only covers the heating and ventilation systems for the building proper.

Criterion 3:

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

Is the criterion met:

Yes

How review was conducted:

Reviewed the canyon exhaust interlock and alarm, functional test for the canyon exhaust system conducted on 2/6/02 with the Ventilation Work Group Representative responsible for conducting the test/surveillance to see how instrumentation, measurement and test equipment calibration is maintained and recorded. Reviewed document:

- F-810070 “Canyon Exhaust System Interlock and Alarm, Functional Test, Building 292-F”

Discussion of Results:

Procedure T/S F810070, Attachment 7.1 “Test Data Sheet” provides a record of the measuring and test equipment used. The test data sheet lists:

- Equipment type
- Measuring & Test Equipment Number
- Calibration expiration date

Physically looked at a testing measuring device and found that each unit is labeled with the equipment number, date calibrated, and date the calibration expires.

System operability issues or concerns:

None

Opportunities for improvement:

None

System Operations

Objective:

Equipment is operated in normal, abnormal and accident conditions using approved procedures and qualified personnel.

Criterion 1:

Plant procedures verify that Systems, Structures, and Components (SSCs) are properly aligned, started, operated, checked, and shutdown.

Is the Criterion met:

Yes

How review was conducted:

The following procedures were reviewed and evaluated for adequacy:

- SOP 221-F-61402, CANYON EXHAUST FAN No. 2 OPERATION, BUILDING 292-F
- SOP 221-F-61043, CANYON EXHAUST FAN No. 3 OPERATION, BUILDING 292
- SOP 221-F-51230, F-Canyon, OF-F and FA-Line Safety-Related Systems
- SOP 221-F-62408, 292-F INSTRUMENT AIR COMPRESSOR OPERATION
- SOP 221-F-61032, PREPARATION FOR TWO CANYON EXHAUST FAN OPERATION
- SOP 221-F-61000, CONYON EXHAUST FAN INLET DAMPERS ADJUSTMENT
- SOP 221-F-60999, OUTSIDE AUXILIARY SYSTEMS OPERATOR ROUND SHEETS
- WSRC-SA-2001-0004, REV.0 F-CANYON SAFETY ANALYSIS REPORT

Discussion of Results:

The operability of the Canyon Exhaust System is defined in the Safety Analysis Report as being able to maintain a vacuum in the Canyon Exhaust Air Tunnel of at least –1.0 inches of water column. A review of the operating procedures and round sheets was performed to determine how the exhaust system is operated to maintain the AB minimum. Canyon operating procedures establish a normal lineup of 3 Canyon Exhaust Fans online. Operator round sheets require Canyon Exhaust Tunnel static pressure to be monitored and verified to be above –2.5 inches of water column. Additionally, the general condition of the fans are observed for indications of problems and bearing temperatures

are monitored to ensure that elevated bearing temperatures are addressed before failure occurs. Appropriate guidance is provided for the startup and shutdown of equipment.

System operability issues or concerns

None

Opportunities for Improvement:

None

Criterion 2:

Plant abnormal and emergency procedures ensure that the safety functions of SSCs are maintained during upset and accident conditions.

Is the Criterion met:

Yes

How review was conducted:

The following surveillance and testing procedures were reviewed:

- AOP 221-F-944, EARTHQUAKE RESPONSE FOR 221-F/OF-F
- AOP 221-F-90201, RESPONSE TO FAILURE OF 221-F VENTILATION SYSTEM
- AOP 221-F-90601, RESPONSE TO A POWER FAILURE IN BUILDING 292-F
- AOP 221-F-90301, RESPONSE TO 291-F STACK LINER FAILURE
- 221-F-ARP-DA-1B-01, FAILURE CANYON EXHAUSTERS
- 221-F ARP-DA-11-B3, 292-F INST AIR RECEIVER “A” PRESSURE LOW
- 221-F ARP-DA-11-B4, 292-F INST AIR RECEIVER “B” PRESSURE LOW
- 221-F-ARP-DA-1D-04, LOW STATIC PRESSURE CANYON EXHAUST TUNNEL
- 221-F-ARP-DB-1C-01, 292 BUILDING GENERATOR ON

Discussion of Results:

Reviewed the procedures sited above. WSRC-SA-2001-0004, REV.0 F-CANYON SAFETY ANALYSIS REPORT (SAR) requires that the facility be able to restore one Canyon Exhaust Fan to operation within 48 hours of a Design Basis Earthquake. The response procedures provide personnel with adequate instruction to accomplish this task. Additionally, the SAR requires that the tunnel static pressure be maintained above –1.0 inches of water column. The Canyon Exhaust Failure alarm is set at –1.9 inches of water column. Response procedures for this alarm direct personnel to take actions that attempt to prevent vacuum from falling below –1.0 inches of water column. Response actions are

also provided for loss of instrument air and electrical power. Response actions also ensure that appropriate personnel notifications and protective actions are initiated.

System operability issues or concerns

None

Opportunities for Improvement:

None

Criterion 3:

Operator training and qualification verifies that personnel are qualified to operate SSCs during normal, abnormal and accident conditions.

Is the Criterion met:

Yes

How review was conducted:

Reviewed the following documents:

- NSFOOXI1.Q0101, F-OUTSIDE FACILITIES QUALIFICATION CARD FOR 292-F AUXILIARY SYSTEMS OPERATOR
- NSFOOF12O0101, OJT GUIDE AUXILIARY SYSTEMS F-CANYON 292-F AUXILIARY SYSTEMS OPERATOR
- NSFOOF12.W0100, 292-F AUXILIARY SYSTEMS OPERATOR OPERATIONAL EVALUATION
- F CANYON/OF-F VENTILATION SYSTEMS REFERENCE MANUAL
- NSF00XC1 292-F AUXILIARY OPERATOR QUALIFICATION LIST
- NSFSXSQ1 AUXILIARY SYSTEMS FIRST LINE MANAGER QUALIFICATION LIST

Interviewed an Auxiliary Systems Operator and an Auxiliary Systems First Line Manager.

Discussion of Results:

A review of the training and qualification and program was performed. The training program provides trainees with a detailed description of the Canyon Exhaust System as well as its interface with other ventilation systems. The training also covers the importance of the system from a safety basis perspective. Emergency response actions are also addressed. Trainees must pass a written exam, complete on the job training, complete an operator evaluation and pass an oral examination to be considered qualified. The training program is considered to be of sufficient depth to allow operators and

supervisors to safely operate the Canyon Exhaust System in both normal and abnormal conditions.

An Auxiliary Systems Operator and First Line Manager were interviewed. The interviewees were questioned about the safety basis, equipment configuration, functional classification and emergency response actions. Both interviewees demonstrated good working knowledge of the canyon exhaust system and its importance to safety.

System operability issues or concerns

None

Opportunities for Improvement:

None

Criterion 4:

Equipment status is maintained and effectively displays actual plant configuration.

Is the Criterion met:

Yes

How review was conducted:

The review consisted of evaluating the Confinement and Ventilation electronic status board.

Discussion of Results:

F Canyon uses an electronic status board to identify and maintain the status of Canyon Exhaust Fans #2 and #3. The board is reviewed at a minimum at the beginning and end of each shift. Changes in the status of equipment are highlighted during the shift turnover process. Any compensatory measures that have been implemented due to out of service equipment are briefed at that time. The status board is updated as field conditions change.

System operability issues or concerns

None

Opportunities for Improvement:

None

Environmental Qualification

Objective:

Ensure that equipment and associated functions important to safety are maintained in environmental conditions expected during normal, upset and accident conditions.

Criterion 1:

Identify whether SSCs with safety functions have been environmentally qualified.

Is the criterion met:

No

How review was conducted:

The review consisted of interviews with the system engineer and the F-Canyon engineering manager. In addition document searches were conducted to identify any WSRC or DOE requirements to environmentally quality SC and SS equipment.

Discussion of Results:

The system engineer was not aware of any environmental qualification performed on CAEX Fans or associated equipment.

The F-Canyon engineering manager was not aware of any EQ program for NMMD but did state that certain EQ attributes may be assessed, as was done for the Process Vessel Vent fan replacement.

A review was conducted on ShRINE to identify any sitewide WSRC requirements for an EQ program. None were found, but the following information does identify or discuss EQ:

- EQ is identified as one of the potential critical characteristics to consider in the RIE/CGD process (Manual E7, Procedure 3.46)
- Suspect/counterfeit parts source list (WSRC-TR-93-408) identifies a rack with potential EQ issues
- Attachment 1 of the Engineering Standards Manual (WSRC-TM-95-1) identifies IEEE 323 as a National Code and Standard for SC engineering design
- The Backfit Analysis Process (Manual E7, Procedure 3.41) identifies EQ as a design requirement or document review prior to upgrading SSCs to SC or SS
- Attachment 1, Procedure 1.05, Manual 11Q (Example of Margin of Safety) identifies EQ as a question to consider when evaluating whether a proposed activity involves a change to the facility as described in the Documented Safety Analysis

- Environmental qualification is identified as one of the attributes of the definition of the word *service*.

Prior to being cancelled in January 2002, the Department of Energy DOE Order 5480.23 (Attachment 1, Section 4.f.(3).(d).11.n) identifies Environmental Qualification as one of the items to assess in accident analysis:

> *Accident analyses should document the derivation of environmental qualification requirements for safety components. This includes establishing the environmental conditions (e.g., radiation levels, humidity, pressure, temperature) that could be created in rooms containing safety components by credible accidents during which those components would be called upon to function. The analyses should justify the capability of components to withstand these conditions and accomplish their intended function.*

A detailed discussion of environmental qualification for current directives or guides is contained in DOE G-420.1-1, Nonreactor Nuclear Safety Design Criteria and Explosive Safety Criteria Guide for use with DOE O 420.1 Facility Safety, which identifies the following action:

> 5.1.1.3 **Environmental Qualification**
>
> **Environmental qualification** must be used to ensure that safety-class SSCs can perform all safety functions, as determined by the safety analysis, with no failure mechanism that could lead to common cause failures under postulated service conditions. The requirements from ANSI/IEEE 323 for mild **environmental qualification** must be used unless the environment in which the SSC is located changes significantly as a result of the DBAs. In general, qualification for mild environments should consist of two elements:
>
> Ensuring that all equipment is selected for application to the specific service conditions based on sound engineering practices and manufacturers' recommendations.
>
> Ensuring that the system documentation includes controls that will preserve the relationship between equipment application and service conditions.

Additional DOE references to environmental qualification are found in:

- DOE M 232.1-1A, *OCCURRENCE REPORTING AND PROCESSING OF OPERATIONS INFORMATION*
- DOE G 433.1-1, *Nuclear Facility Maintenance Management Program Guide for Use with DOE O 433.1*
- DOE O 414.1A, *QUALITY ASSURANCE*

Because current mandatory requirements do not exist to perform environmental qualification assessments of SC and SS SSCs, the criterion, while not being satisfied, is not classified as a concern but is instead an observation.

System operability issues or concerns:

None

Opportunities for improvement:

The assessment team could find no formal EQ program.

Criterion 2:

If there is no environmental qualification program identified determine whether SSCs with safety functions have been assessed for capability to perform their safety functions in environmental conditions expected during normal, upset and accident conditions.

Is the criterion met:

Yes, with an opportunity for improvement.

How review was conducted:

A review of potential accidents was performed to identify any potential upset or accident conditions that could potentially result in Fans 2 and 3 being exposed to other than a mild environment.

Discussion of Results:

This criterion was included in case there was not a formal environmental qualification program identified by the assessment team. This would permit the team to determine if any form of environmental qualification was done, or whether any potential adverse environmental affects to CAEX Fans 2 and 3 SSCs could be potentially identified.

The team members could not identify any analyzed accidents that would create specific adverse environmental impacts to the CAEX fans. The only potential scenario identified was where a seismic event results in the breach of one or more of the outside chemical tanks, resulting in chemical vapors entering the 292-F Building.

This scenario was presented to the system engineer. The system engineer had the opinion that the vapors from a chemical tank breach would not result in rapid degradation of the equipment in the 292-F Building.

System operability issues or concerns:

None

Opportunities for improvement:

The environmental qualification (EQ) of Fans 2 and 3 during a seismic event, where the integrity of the outside chemical storage tanks is not assured, should be evaluated.

Planned Upgrades and Projects

Objective:

Material degradation and equipment obsolescence, plus improvements are identified and addressed through planned upgrades and projects that will be completed in time to prevent equipment failure, result in an abnormal operating condition, or cause an upset or accident.

Criterion 1:

Degraded SSCs are identified and an appropriate upgrade path or project exists.

Is the criterion met:

Yes

How review was conducted:

The review consisted of attending a presentation provided by the Lead System Engineer for F-Canyon Ventilation where a system overview, performance of equipment, and purpose of the F- Canyon exhaust system were presented. The Lead System Engineer conducted a tour of the 292-F Fan House. Canyon exhaust fans, dampers, and ductwork were visually inspected. The report on Pilot Phase II Assessment of Confinement Ventilation System of H-Canyon at the Savannah River Site (SRS) was reviewed. Confirmed with the System Engineer for F-Canyon Ventilation that the same monitoring, inspections, predictive maintenance, and corrective maintenance is performed for the F-Canyon exhaust system as is for the H-Canyon exhaust system.

Discussion of Results:

The assessment team devoted attention to the processes and programs for monitoring and managing degradation as components age (maintenance, inspection, refurbishment, and performance monitoring) to support “long term” operability in addition to assessing “current” system operability. The assessment team also recognized the aging condition of various structures, systems, and components. Degradations of equipment were particularly notable from a team review of:

- historical photographs of the old F & H sand filters which indicate scattered settlement of the sand pile over the years,
- the project to replace the main F & H canyon exhaust fans due to deteriorating fan performance (Due to the closure of F-Canyon the F-Area portion of the project has been de-scoped to only include replacement of F-Canyon Exhaust fans #1 & #4 and replacement of the outlet dampers and discharge ductwork on fans #2 & 3.

- the pending project to seal air leakage at the joint between the concrete exhaust tunnel and the metal plenum to the stack (since the closure of the F-Canyon this will now only be done in H-Area)

Because of this information, the H-Canyon inspection team devoted attention to the processes and programs for monitoring and managing degradation as components age (maintenance, inspection, refurbishment, and performance monitoring) to support "long term" system operability in addition to assessing "current" system operability. The H-Canyon team felt that the reliability and operability of the CVS, although aging, was being monitored for deterioration and upgraded where required, based on the predictive maintenance, corrective maintenance, and preventative maintenance plans in-place. Some examples of the plans in-place or actions being taken that the team based their conclusions on are:

- the periodic 7 year structural integrity inspection of the stack that uncovered air leakage at the joints
- replacement of the main canyon exhaust fans, due to monitoring of the deterioration of the fans performance
- the in-place plan for periodic testing and inspection of the sand filter
- the facilities newly developed predictive maintenance plan, which will complement and reduce the required effort for corrective maintenance and preventative maintenance plans presently in place.
- the Integrated System Reliability Program (ISRP).

Since the same monitoring, inspections, predictive maintenance, and corrective maintenance is performed for the F-Canyon exhaust system, as is for the H-Canyon exhaust system, it is felt that the same conclusion from the H-Canyon assessment can be reached. To further highlight the maintenance programs in place, the F-Canyon Exhaust System has had no unplanned system outages in over 30 years. The conclusion of the assessment team is that reliability and operability of the F-Canyon exhaust system is being monitored for deterioration and upgraded where required.

Based on the closure of the F-Canyon, ventilation upgrade projects for the F-Canyon ventilation system are being re-evaluated for deletion or descoping to suit the new mission.

<u>System operability issues or concerns:</u>

None

<u>Opportunities for improvement:</u>

None

Criterion 2:

Projects are initiated, scoped, funded and completed in time to prevent failure, or operate in a abnormal condition, or cause a serious upset or accident.

Is the criterion met:

Yes

How review was conducted:

The review consisted of attending a presentation provided by the Lead System Engineer for F-Canyon Ventilation where descoping of the ventilation upgrade project S-4404 was discussed because of the closure of the F-Canyon.

Discussion of Results:

The existing upgrades project S-4404 has been descoped to remove replacement of the F-Canyon Exhaust Fans # 2 & #3. On project S-4404 the fan discharge dampers and discharge ductwork will be replaced for fans #2 and #3.. For future projects a careful evaluation will be performed to address the upgrade required verse the life of the facility.

System operability issues or concerns:

None

Opportunities for improvement:

None

Criterion 3:

The facility periodically assesses the condition of SSCs to ensure that any new material condition degradation and equipment obsolescence issues are identified.

Is the criterion met:

Yes

How review was conducted:

Reviewed the report on Pilot Phase II Assessment of Confinement Ventilation System of H-Canyon at the Savannah River Site (SRS). Reviewed the monitoring, inspections, predictive maintenance, and corrective maintenance programs of the F-Canyon ventilation systems with the System Engineer for F-Canyon Ventilation and confirmed that the same monitoring, inspections, predictive maintenance, and corrective

maintenance is performed for the F-Canyon exhaust system as is for the H-Canyon exhaust system.

Discussion of Results:

The facility periodic assessments for the conditions of SSCs are described in detail in Criteria 1 of this section.

System operability issues or concerns:

None

Opportunities for improvement:

None

Appendix A

Topical Areas Assessed

Safety Function Definition

Objective:

Safety basis-related technical, functional, and performance requirements for the system are identified/defined in appropriate safety documents.

Criteria:

Safety/Authorization Basis documents identify and describe 1) the system safety functions and the safety functions of any essential supporting systems, and 2) the system requirements and performance criteria that the system must meet to accomplish its safety functions.

Approach:

Review the appropriate safety/authorization basis documents, such as safety analysis reports, basis for interim operations, technical safety requirements, safety evaluation reports, and hazards and accident analyses, to determine if the definition/description of the system safety functions includes:

• The specific role of the system in detecting, preventing, or mitigating analyzed events
• The associated conditions and assumptions concerning system performance
• Requirements and performance criteria for the system and its active components, including essential supporting systems, for normal, abnormal, and accident conditions relied upon in the hazard or accident analysis.

Configuration Management

Objective:

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

Criteria:

1. Changes to system safety basis requirements, documents, and installed components are designed, reviewed, approved, implemented, tested, and documented in accordance with controlled procedures. Consistency is maintained among system requirements and performance criteria, installed system equipment and components, and associated documents as changes are made.

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.

3. Changes to system safety basis requirements, documents, and installed components conform to the approved safety/authorization basis (safety envelope) for the facility, and the appropriate change approval authority is determined using the Unreviewed Safety Question (USQ) process.

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

5. Software used in system instrumentation and control (I&C) components that perform functions important to safety is subject to a software quality process consistent with 10 CFR 830.120.

Approach:

1-1 On a sample basis, review and evaluate the change control process and procedures and associated design change packages and work packages to determine whether the change control process and procedures are adequate and effectively implemented. Determine whether:

• SSCs and documents affected by the change are identified
• Changes are accurately described, reviewed and approved as appropriate
• Installation instructions, post-modification testing instructions and acceptance criteria for turnover to facility operations are specified, and
• Important documents affected by the change (e.g., operating and test procedures, Master Equipment List, etc.) are revised in a timely manner.

1-2 Interview a sample of cognizant line, engineering, QA managers and other personnel 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.

2-1 Walkdown selected system components and compare the actual physical configuration of these components to system documents such as design basis and safety/authorization basis

documents, system design descriptions, and system drawings such as piping and instrumentation diagrams. Identify any temporary changes, or configuration discrepancies that call into question (1) the operability or reliability of the system or (2) the adequacy of the change control or document control processes, including drawing revision, applied to the system.

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

• Changes to the system are reviewed to ensure that system requirements and performance criteria are not affected in a manner that adversely impacts the ability of the system to perform its safety functions
• The USQ process (i.e., USQ screens and USQ safety evaluations/determinations) is being appropriately used

4-1 Determine whether engineering (including the design authority and technical disciplines for process control, electrical, mechanical, chemical, HVAC, nuclear, criticality, structural, etc.), operations, and maintenance organizations are made aware of 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 such as facility training, document control, construction, radiological control, OSHA occupational safety, industrial hygiene, occupational medicine, hazard analysis/safety basis, safeguards and security, and fire protection.

5-1 For software used by safety system I&C components, request the facility staff to identify:

• The applicable software quality assurance requirements,
• The software quality assurance standards/controls applied to software development, procurement, acceptance, and testing
• The basis for acceptance of these standards/controls as providing adequate assurance that the software is acceptable for performing its associated safety functions

5-2 Review software quality assurance requirements, procedures, and records. Determine whether:

• Software quality assurance documentation exists for software in use
• Configuration management procedures exist for updates, changes, and version control of software and related documentation such as software design documents and a list of software configuration items installed on computer-based components
• An appropriate degree of independence exists between those responsible for software development and quality assurance functions
• A process is in place and used to identify, evaluate, and resolve operational problems that are attributable to software

5-3 Interview facility engineering and operations staff to determine their awareness of software quality assurance requirements for system software under their cognizance.

System Maintenance

Objective:

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

Criteria:

1. Maintenance processes consistent with the system safety classification are in place for prescribed corrective, preventive, and predictive maintenance, and to manage the maintenance backlog.

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

Approach:

1-1 Verify that maintenance for the system 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.

1-2 Evaluate maintenance of aging 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

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 system maintenance work packages.

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

2-2 On a sample basis, perform a walkdown inspection of the system with emphasis on the material condition of installed equipment, components, and operating conditions. Identify and document any observed conditions that could challenge the ability of the system to perform its safety function (e.g., leaks, cracks, deterioration, or other degraded or abnormal conditions). Determine whether observed deficiencies have been identified and addressed in a facility condition assessment or deficiency tracking system.
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.

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

System Surveillance and Testing

Objective:

Surveillance and testing of the safety system demonstrates that it is capable of accomplishing its safety functions and continues to meet applicable system requirements and performance criteria.

Criteria:

1. Requirements for surveillance and testing are adequate for demonstrating overall system reliability and operability, and are linked to the technical safety basis.

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

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

Approach:

1-1 Identify the acceptance criteria from the surveillance test procedures used to verify that the 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 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.

2-1 Review surveillance and testing procedures for the 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
• Parameters that demonstrate compliance with the safety requirements can be measured
• Test personnel are knowledgeable and able to satisfactorily perform the test
• The procedure cites applicable Technical Safety Requirements/Limiting Conditions for Operation
• Limits, precautions, system and test prerequisite conditions, data required, and acceptance criteria are included
• Appropriate data recording provisions are included or referenced and are used to record results
• The procedure includes provisions for listing discrepancies
• The procedure requires timely notification of facility management about any failure or discrepancy that could impact operability
• Appropriate personnel reviewed the test results and took appropriate action

3-1 For the surveillance and test procedures and records reviewed, determine whether the test equipment used for testing was calibrated.

System Operations

Objective:

Equipment is operated in normal, abnormal and accident conditions using approved procedures and qualified personnel

Criteria

1. Plant procedures verifies that Systems, Structures, and Components (SSCs) are properly aligned, started, operated, checked, and shutdown.

2. Plant abnormal and emergency procedures ensure that the safety functions of SSCs are maintained during upset and accident conditions.

3. Operator training and qualification verifies that personnel are qualified to operate SSCs during normal, abnormal and accident conditions.

4. Equipment status is maintained and effectively displays actual plant configuration.

Approach

1-1 On a sample basis review and evaluate the following types of procedures as applicable:

- System lineups
- Startup and operation procedures
- Rounds
- System impairment procedures
- Abnormal operating procedures
- Post-maintenance testing and return-to-service procedures

2-1 Review and evaluate a sample of procedures for operating SSCs during upset and accident conditions. Verify that the procedures address upsets and accidents contained within the facility authorization basis.

3-1 Review and evaluate a sample of operator training and qualifications.

3-2 Interview a sample of operations personnel to verify their training and qualifications are effective.

4-1 Review how the facility identifies and maintains equipment status and evaluate its effectiveness.

Environmental Qualification

Objective:

Ensure that equipment and associated functions important to safety are maintained in environmental conditions expected during normal, upset and accident conditions.

Criteria

1. Identify whether SSCs with safety functions have been environmentally qualified.

2. If there is no environmental qualification program identified determine whether SSCs with safety functions have been assessed for capability to perform their safety functions in environmental conditions expected during normal, upset and accident conditions.

Approach

1-1 Using a sample of SSCs verify that they have been environmentally qualified to perform their safety functions during normal, upset and accident conditions in anticipated environments, including any synergistic effects or unacceptable accelerated aging, of any of the following that are applicable:

- Temperature
- Humidity
- Radiation
- Chemicals
- Fire, smoke, or products of combustion
- Dust
- Pressure or vacuum
- Submergence in water or process fluids
- Steam
- Static electricity

2-1 If no environmental qualification of SSCs has been performed assess whether any or all the applicable attributes in 1-1 above have been assessed for a sample of SSCs and determined to not impact their ability to perform their safety functions during normal, upset and accident conditions.

2-2 Interview a sample of facility and site engineering management and determine whether an environmental qualification program exists, or is anticipated.

Planned Upgrades and Projects

Objective:

Material degradation and equipment obsolescence, plus improvements are identified and addressed through planned upgrades and projects that will be completed in time to prevent equipment failure, result in an abnormal operating condition, or cause an upset or accident.

Criteria

1. Degraded SSCs are identified and an appropriate upgrade path or project exists.

2. Projects are initiated, scoped, funded and completed in time to prevent failure, or operate in a abnormal condition, or cause a serious upset or accident.

3. The facility periodically assesses the condition of SSCs to ensure that any new material condition degradation and equipment obsolescence issues are identified.

Approach

1-1 Verify that a sample of SSCs identified as in poor material condition or obsolete have an appropriate project or upgrade path.

2-1 From the sample of SSCs identified in 1-1 verify the following:

- Project or upgrade scope is commensurate with the identified problem and planned solution. If the SSC issue is new and does not yet have a upgrade path or project, verify the issue is at an appropriate level of assessment.

- Funding is approved, or if not, funding risk is low.

- The proposed project or upgrade scope appears effective at addressing the problem.

- The timeline for completing the project or upgrade reasonably reduces the risk of equipment failure, operating in an abnormal condition, or resulting in an upset or accident.

3-1 Verify that condition assessments are performed periodically and would reasonably identify material condition deficiencies or SSC obsolescence.

3-2 Verify that the results of the condition assessments are appropriately tracked and dispositioned.

Appendix B

Biographies of Team Members

Gary D. Borba, Senior Engineer, Nuclear Materials Engineering Division, DOE-SRS

Gary has 17 years experience within the Department of Energy and commercial nuclear field with experience in startup and testing, safety analysis and maintenance.

After receiving his BS in Nuclear Engineering from the University of California, Berkeley in 1984. Gary worked as a Startup, Test, Design and Analysis engineer for the General Electric Company. He participated in the startup or restart of Hatch Unit 2 (recirculation piping replacement), WPPSS Unit 2 (initial startup), Perry Unit I (initial startup), Fermi Unit 2 (initial startup) and the Pilgrim plant (restart). Associated duties included outage management, modifications, and transient analysis.

Gary began working for the Department of Energy at Savannah River in December 1988. He had varied responsibilities associated with preparing for reactor restart, including: reactor Safety Analysis Report upgrades, Technical Specifications upgrades, the preparation of the initial SRS 10CFR50.59 type program, Fire Protection, systems engineering and startup testing.

After the suspension of reactor restart work, Gary was responsible for the reactor-area Facility representatives and engineers, until he was transferred to the H and F-Area Separations facilities where he was assigned maintenance and engineering responsibilities. He is presently a Team Leader for the Nuclear Materials Engineering Division.

Robert E. Edwards, III – DOE Senior Facility Representative, F Canyon-SRS

Robert Edwards has sixteen years of experience in the nuclear industry. Since February of 2000, Robert has been the Senior Facility Representative (FR) for the F-Canyon facility. In this capacity, he is responsible for the daily DOE oversight of the facility and serves as the principle interface between the facility and DOE. Prior to his current assignment, Robert was the Senior FR at the H Canyon Facility at SRS. Robert has also been assigned as a FR in HB Line, the Receiving Basin for Offsite Fuels and the Uranium Solidification Facility at SRS. Prior to joining the Department of Energy, Robert held the position of Branch Chief of the Technical Branch in the Reactor Engineering Division at the Charleston Naval Shipyard. Robert holds a BS degree in Mechanical Engineering.

Alexander F. Mackay - General Engineer, Engineering and Analysis Division, DOE SRS

Alexander has 26 years of experience in engineering and construction including 10 years at SRS. He has worked in design, construction, project management, program management, and cost estimating.

Alexander began his career in the oil industry, working in the oil and gas production and distribution business. In 1980 he began to work for the U.S. Army Corps of Engineers (COE). This began a 10 period of his career in cost estimating, design, and construction activities for the COE in the southeast U.S. and overseas in Saudi Arabia. In 1990 Alexander began working at SRS, initially with the COE as a project manager for the Sitewide Fire Protection Project. In 1992, he transferred to DOE, working as a COE point of contact to DOE for construction matters. In 1998 he became a DOE contact point to Bechtel Savannah River, Inc. His role has recently been changed again to include the monitoring and review of three engineering organizations within WSRC. He is a registered Professional Engineer.

James J. McAndrews - Sr. Fellow Engineer, Westinghouse Savannah River Company Projects, Engineering and Construction Division, Site Standards Department

Jim has 35 years of experience in engineering including 20 years of service in the nuclear field, with in-depth experience in process ventilation, plant service systems, project management, and engineering standards.

Jim began his professional career in 1966 with E. I. DuPont in the Engineering Department's Power Services and Ventilation Group. In 1982, Jim was transferred to the Atomic Energy Commission (AEC) Engineering Section of the DuPont Company were he was the lead designer and principal engineer for a number of projects at the Savannah River Site (SRS). Jim developed the studies of process ventilation systems that would be used to upgrade the FB-Line plutonium handing facilities at SRS.

Jim transferred to SRS as a Staff Engineer in 1989 and became the project manager for the FB-Line Plutonium Ventilation Upgrades Project. He was also a Separations Area technical liaison for process ventilation and Halon Fire protection systems.

In 1997 Jim was transferred to the SRS Standards Department. He is now the coordinator for the site's standard program, secretary of the Technology and Engineering management Integration Council (TEMIC), and chairman of the site's Ventilation and Filtration Technical Committee. In the chairman position, Jim lead the development and was a significant author of the site's HEPA filter standard, HEPA filter specification, and site confinement ventilation standard.

Jerald L. Taylor - Nuclear Materials Engineering Division DOE SRS

Jerry Taylor is an engineer in Nuclear Material Engineering Division whose primary responsibility is review and approval of Authorization Basis Documents. Jerry came to DOE in August, 1990 and qualified as a Facility Representative at K-Reactor. He served in that capacity throughout the Restart and Power Ascension Test Program and then transferred to Separations Division, where he served as a Facility Representative until June, 1995.

Prior to joining DOE, Jerry was employed in the Nuclear Engineering Department of Norfolk Naval Shipyard (NNSY) for eleven years, where he was a qualified senior Shift Test Engineer. During his time at NNSY, Jerry acted as a Senior Shift Test Engineer and Assistant Chief Test Engineer as well as technical writer for various engineering projects supported by his department. Jerry also served as an instructor and lead instructor, responsible for training Shift Test Engineers for all classes of submarine Nuclear Propulsion Plants. In this capacity he was responsible for course content, instructor performance, preparation and administration of examinations and oral evaluations.

Jerry served in the US Navy for twelve years, during which time he qualified as a nuclear power plant operator, Engineering Watch Supervisor and was the supervisor of the Nuclear Repair Coordinator's office for an intermediate level maintenance facility. Jerry holds a Bachelor of Science Degree in Nuclear Engineering Technology from Thomas Edison State College.