DEPARTMENT OF ENERGY REPORT ON PHASE II ASSESSMENT OF FIRE DETECTION AND SUPPRESSION SYSTEM IN BUILDING 371

March 2002

U.S. Department of Energy
Rocky Flats Field Office
Golden, Colorado

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ACRONYMS

AB	Authorization Basis
ASME	American Society of Mechanical Enegnieers
BIO	Basis for Interim Operation
CVS	Confinement Ventilation System
DACS	Data Acquisition and Control System
D&D	Decontamination and Decommissioning
DNFSB	Defense Nuclear Facilities Safety Board
DOE	Department of Energy
DOP	Decommissioning Operations Plan
ELPM	Electronic Linking and Procedure Maintenance
EPD	Electrical Power Distribution System
FHA	Fire Hazards Analysis
GBO	Glovebox Overheat Detection
HVAC	Heating Ventilation and Air Conditioning
ISM	Integrated Safety Management
IWCP	Integrated Work Control Process
KH	Kaiser Hill
LCO	Limiting Condition for Operation
LLW	Low Level Waste
MAA	Material AccessArea
MCC	Motor Control Center
NFPA	National Fire Protection Association
PM	Preventive Maintenance
RFETS	Rocky Flats Environmental Technology Site
RFFO	Rocky Flats Filed Office
SNM	Special Nuclear Material
SOE	Stationary Operating Engineer
TGEN	Turbine Generator
TRU	Transuranic Wastes
TSR	Technical Safety Requirements
UPS	Uninterruptible Power Supply System
USQ	Unreviewed safety Question Process
VSS	Vital Safety Systems
WIPP	Waste Isolation Pilot Plant

EXECUTIVE SUMMARY

This report documents the results of the Department of Energy, Rocky Flats Field Office Phase II Assessment of the Fire Detection and Suppression System in Building 371. The review was conducted February 18 through 22, 2002 by a team of specialists representing the Rocky Flats Field Office and Kaiser Hill LLC. The scope, depth and breadth of this review were defined in the Department of Energy Assessment Plan, dated February 2002. The assessment team performed a detailed review of all areas specified in the Fire Detection and Suppression System Criteria and Review Approach Documents specified in the Plan. Review activities included a detailed walkdown and examination of vital Fire Detection and Suppression system components, conduct of over 20 interviews and review of pertinent facility documentation including Authorization Basis documents, planning documents, engineering-related documents, work packages, maintenance packages and procedures.

Statement of System Operability

In summary, the assessment team determined Building 371 Fire Detection and Suppression System operability and reliability to be adequate based on the material condition of system components, facility implementation of Technical Safety Requirements and associated surveillances, implementation of a graded preventive maintenance program and corresponding corrective maintenance activities. Further, the assessment team determined that each of the objectives specified in the Criteria and Review Approach Documents has been met. The team also concluded that facility management, operations and support staffs have an appropriate level of technical qualification and system familiarity to ensure the Fire Detection and Suppression System will be maintained in accordance with applicable requirements.

During the course of the review the assessment team identified strengths that will support successful operation of the Fire Detection and Suppression System as well as vulnerabilities that may limit its ability to achieve this success. Principle issues included:

Operability Issues/Concerns:

- The performance of the annual sprinkler surveillance failed to identify miss-orientation of a small number of sprinkler heads. Proper orientation is required to assure spray pattern adequacy. Sprinkler flow is not affected. *(System Surveillance and Testing, Criterion 2)* It is the position of the assessment team Fire Protection Engineers that the overall operation of the sprinkler system was not compromised for the following reasons:

- The miss-oriented sprinkler heads will still provide a timely flow alarm to the on-site fire department
- Only a small percentage of the sprinkler heads in the facility were affected (validated during subsequent facility walkdown)
- The miss-oriented sprinkler heads will still provide water for cooling the hot gases from a postulated fire and will also provide limited extinguishment capability.

Opportunities for Improvement:

- During the course of the review, it was noted that discrepancies exist between the BIO LCOs, Surveillance Requirements, System Evaluation Reports, and implementing surveillance procedures. The building had previously identified this issue and is working to correct the deficiency under a corrective action plan developed under Price Anderson Amendments Act report NTS-RFO-KHLL-1999-0003 and a subsequent assessment.*(Safety Function Definition, Criterion 1)*

- System Evaluation Report diagrams for the fire suppression system were found to be inconsistent with the actual system configuration. These documents should be updated in a timely manner.

- The B371 Fire Hazards Analysis (FHA) needs to include an appropriate discussion of the basis for removal of the Turbine Generator (TGEN) CO_2 system. Also the FHA should be updated to reflect the retention and maintenance of the TGEN fire detection system as a fire protection good practice. *(System Maintenance, Criterion 1)*

- The assessment team observed that nitrogen controlling valves for the nitrogen supplies and the controlling valves to low pressure supervisory switches to the two pressure tanks were not locked in the open position. To improve overall system reliability it is recommended that these controlling valves be locked in the open position and verified during the performance of the surveillance procedure(s). *(System Surveillance and Testing, Criterion 1)*

Good Practices:

- The Electronic Linking and Procedure Maintenance (ELPM) implementation at B371 provides an effective mechanism to readily identify implementing documents for AB and safety basis requirements. The process helps ensure that configuration management of AB requirements is maintained through electronic linking of the Basis for Interim Operation (BIO), System Evaluation Reports, and implementing documents. *(Safety Function Definition, Criteria 1)*

- Facility implementation of PRO-1475-ADM-371, Building 371/374 Implementation Document Change Control Process, provides an effective process for ensuring accurate management of the System Evaluation Report, Authorization Basis, and implementing procedures with respect to changes affecting the safety basis.

(Configuration Management, Criteria 3 & 4)

- The facility Fire Protection Engineer is fully integrated into the Project, and is providing value-added input to all facets of the Project fire protection program. *(System Surveillance and Testing, Criterion 1)*

A more exhaustive discussion of these issues is provided in the report sections that follow this summary. Appendix A provides a detailed discussion of assessment results itemized by Criteria and Review Approach Document.

1.0 INTRODUCTION

On March 8, 2000, the Defense Nuclear Facilities Safety Board (Board) issued Recommendation 2000-2, concerning the degrading conditions of vital safety systems and the capability to apply engineering expertise to maintain the configuration of these systems. Specifically, the Recommendation identified possible degradation in confinement ventilation systems and noted that the Department of Energy (DOE or Department) has not adopted the nuclear business' long-standing practice of designating system engineers for systems and processes that are vital to safety. The Board recommended that the Department take action to assess the condition of its confinement ventilation systems, develop programs for contractor and federal technical personnel that strengthen safety system expertise, and improve the self-assessment processes that evaluate the condition of vital safety systems.

On April 28, 2000, the Department accepted the Board's Recommendation and in October 2000, issued the approved *Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2000-2.* After the initial Phase I review of "facilities of interest" this Implementation Plan calls for Phase II assessments of VSS of facilities as designated by the field office. The Rocky Flats Field Office, in consultation with DOE Headquarters, has selected the ventilation and fire detection and suppression systems in Building 371 for Phase II assessment. This assessment report provides results of the assessment of the fire detection and suppression system in Building 371.

2.0 BACKGROUND

RFETS Building 371 Plutonium Facility

The original mission of the Building 371/374 Complex consisted of three elements: 1) to replace the plutonium (Pu) bearing residue recovery and waste operations in Buildings 771 and 774; 2) to recover Pu from weapons returned from the stockpile; and 3) to provide large-scale storage of Pu and Pu-bearing materials. Construction of the Building 371/374 Complex started in the early 1970s and was completed in 1981. Systems operations tests and safety system performance verifications were performed on the Building 371/374 Complex before radioactive materials were introduced into the buildings. Waste processing operations in Building 374 functioned acceptably, but problems with the Pu recovery operations in Building 371 were discovered during startup in 1981. Building 371 was unable to achieve designed Pu recovery capabilities due to many deficiencies in the design or construction of its process equipment. Because of these deficiencies, numerous safety-related incidents, and excessive SNM holdup in equipment and piping, DOE directed the Site contractor to curtail Pu recovery operations in 1981. Waste operations in Building 374 continued functioning.

Subsequent to termination of Pu recovery operations in 1981, a Pu Recovery Modification Project (PRMP) was initiated to develop modifications to Building 371. The purpose of the first pilot PRMP project, the Pu Recovery Operability Verification Exercise (PROVE), was to make equipment modifications in order to conduct aqueous

Pu recovery processes. Construction of the PROVE project was approximately 95% complete when the project was terminated in 1989 when all nuclear production operations ceased at the RFETS. Due to incomplete shutdown, many Pu recovery processes require removal of hazardous materials before decontamination or decommissioning (D&D) may begin. These activities are identified as "deactivation" activities in the Decommissioning Operations Plan (DOP).

Since the termination of all nuclear production operations at the Site in 1989, Building 371 has been used primarily for the storage of Pu and uranium (U) metal, oxide, residues, transuranic (TRU) wastes, low-level wastes (LLW), and Resource Conservation and Recovery Act (RCRA) regulated mixed wastes and residues. SNM is stored in the Central Storage Vault (CSV), vault-type rooms, and other designated areas. Building 374 has continued to conduct waste processing operations.

In support of the Site activity of consolidating SNM, all Category I and II quantities of SNM have been moved to Building 371 for interim storage. Materials are to be processed and repackaged. Current plans call for storage of SNM in Building 371 until the SNM is shipped offsite. The storage mission includes storage of up to approximately 13 metric tons (MT) of Pu and 6.3 MT of highly enriched U. In addition, there could be up to 13.0 kg of Americium (Am) present in numerous residue and other forms due to concentration during prior processing or ingrowth. Inclusive in this mission is the stabilization and interim storage of packaged Pu residues and TRU wastes until waste can be shipped to disposal facilities, such as the Waste Isolation Pilot Plant (WIPP).

Building 371 is also used to perform related SNM handling activities and other activities to support material stabilization and area decontamination and decommissioning. Building 374 continues to be used to process radioactively contaminated liquid waste streams as required unless and until those functions are assumed by new, more economical facilities. As operations in the Building 371/374 Complex are no longer required, these affected areas are being prepared for D&D.

Fire Detection and Suppression System

Building 371 is protected with multiple active fire protection systems that include automatic sprinklers, plenum deluge, glovebox overheat, and smoke detection. Each system is briefly discussed below:

Automatic Sprinkler Systems

The Automatic Sprinkler System is designed to provide suppression in the event of a fire. The BIO LCO requirements are applicable to the portion of the Automatic Sprinkler System which protects fire areas at all times in the Building 371 Material Access Area (MAA), Building 374, Support Facility Room 3189, Room 3921 (Dock 21T), and in Rooms 3187-A/B when radiological material is present. The LCO applies to areas served by Risers 371-B, -C, -D, and 374-A and does not apply to those for MAA areas served by Riser 371-A, including Rooms 2335-A, -B, -C, 2337, and Airlock 2008. These LCO protected areas contain significant quantities of source term materials (material-at-risk), that could result in

a contamination release during a fire.
Each of the sprinkler systems was originally installed to an Ordinary Hazard Pipe Schedule per National Fire Protection Association (NFPA) 13, 1975, which is the Code of Record. These systems consist of a series of overhead pipes (branch lines) with small discharge nozzles (sprinkler heads) located throughout the building. The pipes are under either air or water pressure, except during scheduled maintenance or system testing. When a fire occurs, heat rising from the fire causes individual sprinklers to fuse, as they are heated to their design temperature, initiating water flow. The water impinges on the sprinkler head deflector to produce a uniform spray pattern. The resulting flow of water is detected by the alarm check valve, which initiates a fire alarm that is transmitted to the Fire Dispatch Center (FDC) and activates the building fire bells. The sprinkler system was designed based on smooth ceiling construction per NFPA 13.

The sprinkler system begins at the PIV in the firewater supply line. At the point the water supply piping enters the building, alarm check valves (alarm valves) are installed to detect the flow of water. The alarm valves incorporate a clapper that lifts from its seat when water flows through the system. As the clapper lifts, it uncovers a passageway to an alarm port through which water flows to a retard chamber on its way to a pressure-operated alarm switch and a water motor gong. The clapper in the alarm valve also acts as a check valve to minimize water hammer actions and to minimize the possibility of contaminating the DCW System with water normally held stagnant in the fire protection system. The alarm valves are fitted with a manual valve piped to a drain (2-inch main drain). Comparing the system pressure reading taken with the main-drain valve closed (static pressure) to a reading with the main drain fully open (residual pressure) provides a limited indication of the water supply availability and the condition of the supply piping.

The detection device in the automatic sprinkler systems is the sprinkler head. When a fire occurs, heat rising from the fire causes individual sprinklers to fuse as they are heated to their design temperature. Sprinkler heads and their function are also a component of a fire suppression system that is detailed in Chapter 10, Fire Suppression System System Evaluation Report. The alarm valve of the Automatic Sprinkler System riser detects the resulting flow of water.

The alarm valve incorporates a clapper that lifts from its seat when water flows through the system. As the clapper lifts, it uncovers a passageway to a retard chamber. A drain in the retard chamber allows water to drain out of the chamber at a slower rate than the water enters the chamber. This ensures activation with the flow equivalent to one sprinkler head and prevents nuisance alarms due to supply pressure spikes. Once the chamber is filled, the water activates a pressure-operated switch. The pressure-operated switch is wired directly to a fire alarm control panel, which transmits alarm and trouble signals to the FDC. The water also activates a water motor gong mounted on the exterior walls of the building, adjacent to the riser.

Plenum Deluge Systems

The HEPA filters in the Heating, Ventilating, and Air Conditioning (HVAC) exhaust plenums are the last containment mechanism for contaminated products of combustion. The integrity of the exhaust plenum HEPA filters is essential to prevent release of contamination in the event of a fire. Deluge Systems in the exhaust filter plenums protect the HEPA filters in the event of fire.

Deluge Systems protect 14 filter plenums in Building 371 and 3 filter plenums in Building 374. The filter plenum deluge systems employ open nozzles located inside the plenums attached to a piping system exterior to the plenum supplied by deluge valves. When a deluge valve opens, water flows into the piping system and discharges from all associated nozzles.

Each plenum has two systems; 1) Automatic Deluge System just upstream of the particle impingement separation screens (demister); and 2) a Manual Deluge System that is manually activated upstream of the first stage of HEPA filters.

Heat detectors are installed in the inlet ducts to the filter plenum. When high-temperature (190°F) air passes over the heat detector the contacts within the detector change state, closing a detection circuit. The associated fire alarm control panel simultaneously sends an alarm to FDC, and the utilities control room while activating the deluge solenoid, which in turn activates the deluge valve that provides a water curtain for the demister stage of the filter plenums.

Glovebox Overheat (GBO) Detection

Fixed temperature, rate-compensated heat detectors set to activate typically at 190°F are located on the ceiling of specific Gloveboxes (GBs). When heat reaches or exceeds the design temperature of the detector(s), the associated detection circuit closes, resulting in alarm notification to the FDC. The GBO panels are also configured to provide local audible annunciation of the overheat condition at the panel. Rooms 3701, 3206, 1103, 1105 and 1115 are equipped with a system of GBO chime/strobes. These chimes/strobes annunciate in the event of a closed (activated) GBO detection circuit.

Turbine Generator Enclosure Detection

The TGEN enclosure was protected by a high-pressure Carbon Dioxide (CO_2) extinguishing system. Heat detectors were set to actuate at or near 325°F are mounted inside the generator enclosure. Currently the system is to remain out-of-service, however, the heat detectors still alarm at the FDC and a work request has been written to also arrange this detection to automatically shut-down the turbine.

Smoke Detection Systems

Smoke detectors in Buildings 371 and 374 are of three types; spot-type ionization, spot-type photoelectric, or room air sampling. When smoke particles enter an ionization chamber, they decrease the conductance of the air by attaching to the ions, causing a reduction in ion mobility. When the conductance is below a predetermined level, the detector responds. When smoke particles enter a photoelectric detector, the smoke

prevents a beam of light from reaching a photosensitive receiving device. Smoke particles entering the light path cause the detection device to respond. Air sampling detectors are activated when air is pulled through a network of piping into a detector unit where a laser scans the sample for particles. When smoke particles are detected, the detector responds. The signal transmitted from the smoke detector indicates an alarm condition at the panel and notifies the FDC.

Support Systems

Electrical Power Distribution System

The electrical power distribution system (EPD) provides a source of power for the electrical loads in the Building 371/374 complex. Site power originates at the 115kV alternating current ring bus that receives power from two Public Service of Colorado 115kV alternating current transmission lines.

Two independent 115kV alternating current lines deliver power from the load side of the ring bus to Substation 517/518 via primary switches 9135A or 9135B for 518 and 9136A or 9136B for 517. Public Service of Colorado retain control and maintenance of the two 115kV feeder lines up to the line side of the Automatic Line Switches at the 517/518 Substation. Substation 517/518 is comprised of two transformers which step the 115kV down to 13.8kV for primary distribution to the Building 371/374 transformers. Two independent 13.8kV lines distribute power to the building transformers. Substation 517/518 also has an automatic tie-breaker that allows for transfer of power from the main-breaker of one transformer to the feeder breakers of the other transformer. Substation 517/518 feeds six transformers that supply power Buildings 371/374 and other loads and Buildings. Other onsite substations can also be used to supply power to the Building 371/374 transformers. This can be accomplished via configuration of various line switches. The other on-Site substations operate similar to Substation 517/518. At the building transformers, the 13.8kV alternating current is stepped down to 2400V and 480V alternating current, and distributed via their respective Switchgear/Emergency Switchgear (SWGR/ESWGR) throughout the buildings to electrical loads.

There are two sources for EPD buses:

- Site Power
- Emergency Power

The normal buses distribute power supplied by Building SWGR 731-1/2 and SWGR 371-3/4 to their respective loads. The "E" busses distribute power supplied by Building ESWGR 371-5/6 to their respective loads, which in turn feeds ESWGR 371-7/8. They can also receive backup power from the TGEN in the event that Site power is lost.

Uninterruptible Power Supply System (UPS)

The UPS System supplies Alternating Current (AC) to its connected loads from the normal AC-supply, Turbine Generator (TGEN), or batteries. In the event that offsite and

TGEN power are interrupted, the UPS System supplies critical electrical equipment with continuous power from battery backup. The UPS system consists of the following major components:

- Dual UPS Units
- Battery Bank
- Distribution Network

Turbine Generator (TGEN) System

The TGEN system supplies power (alternating current) to its connected loads via the Building 371/374 Emergency "E" busses in the event that Site power is lost. The TGEN provides a defense-in-depth function to assist the EPD in supporting designated process and safety equipment including; Heating, Ventilating and Air Conditioning systems, and the Fire Detection and Reporting system, among others.

The TGEN for Building 371 is 2400V, 3-phase, 2500kW turbine-driven generator located in Room 3583 of Building 371. Plant air is used to start a diesel engine, which in turn spins the turbine up to starting speed with the use of a gearbox. The TGEN system is normally inactive and in automatic standby as long as Site power to the building is energized. Upon loss of Site power sources, there is approximately a 5-second delay to permit distinguishing power bumps from an actual outage, after which the generator starts automatically.

Generator protection is provided by the following fault trip relays located in the TGEN control panel:

- Device "51G" Over-current Relay, Time Delay, Neutral Ground
- Device "51V" Over-current Relays, Time Delay with Voltage (3 total, 1 for each phase)
- Device "87" Differential Protections Relays (3 total, 1 for each phase)

Compressed Gas System

The Building 371/374 Compressed Gas system is comprised of the following systems:

Instrument Plant Air System – provides is important for facility worker safety and providing defense-in-depth to minimize radiological releases form the facility. BIO credited SC-3 function provided by the Instrument Air System include:

- Providing control air to dampers for Heating, Ventilating, and Air Conditioning (HVAC) Systems 1,2,3,4 and 9.
- Providing air to dry automatic sprinkler lines.

Nitrogen System – provides a backup supply of compressed gas to the Instrument Plant Air System providing nitrogen gas to the Inert Ventilation System, in addition to providing a nitrogen supply to the filter plenum deluge fire water storage tanks. The

nitrogen system is important for providing defense-in-depth to minimize radiological releases.

Breathing Air System – provided lean dry air for workers in supplied breathing air garments and supplied air respirators.

Helium Gas and Helium Regeneration Gas Systems – provides compressed gas for pneumatic operation, welding operation. And helium GB atmosphere for PuSPS

3.0 SCOPE OF ASSESSMENT

The assessment focussed on the Building 371 fire detection and suppression system as credited in the facility's safety documentation (i.e. Building 371/374 Basis for Interim Operation (BIO) and System Evaluation Report). Representative portions of the systems were selected for detailed assessment and evaluation in accordance pre-determined assessment criteria. Assessment of the fire suppression system included the "B" riser firewater supply, the Automatic Sprinkler System in selected process area rooms, the Plenum Deluge System and selected valves, piping, and appurtenances from and including the post indicator valve (PIV) for the "B" riser to the sprinkler heads, deluge nozzles, and hose connections. Assessment of the fire detection and alarm system included selected detection devices, fire alarm panels, fire alarm control panels, and associated detection and activation circuits from the individual devices back through the associated fire alarm control panels.

Support systems for the fire detection and suppression system that perform an active function were also assessed. In accordance with the assessment plan, support system assessment was limited to the Electrical Distribution System. The assessment consisted of a material condition walkdown of control and power distribution devices, including the interconnecting cabling, from the fire alarm control panels back to the associated emergency lighting panel supply breaker. See the Phase II Assessment Report for the Confinement Ventilation System that provided assessment results for the other support systems.

4.0 ASSESSMENT RESULT SUMMARY

Safety Function Definition

The assessment team found that the safety basis-related technical, functional, and performance requirements for the B371 fire detection/suppression system are identified/defined in appropriate safety documents. The Basis for Interim Operation (BIO) Building 371/374 Complex, Revision 5 and System Evaluation Report Chapter 10 appropriately describe the fire detection/suppression systems' safety functions including role of the fire detection/suppression systems in detecting, preventing, or mitigating analyzed events in the BIO. The safety function descriptions include associated conditions and assumptions and requirements and performance criteria for the fire detection/suppression systems. Active components and essential supporting systems are

identified for normal, abnormal, and accident conditions. The B371 System Evaluation Report Chapter 10 provides information and description of the fire detection/suppression systems that address significant elements of DOE-STD-3009 since much of this information is not included in the present BIO. This information includes system descriptions, safety function/categorization of safety class/safety significant SSCs, system boundaries, functional requirements, and ability of the safety class SSCs to meet performance criteria. The System Evaluation Report is not a DOE approved authorization basis (AB) document. However, it serves a key role in addressing the above elements of DOE-STD-3009 as safety basis documentation for the fire detection/suppression systems in B371/374. B371 implementing procedures are based on the System Evaluation Report safety bases.

The following Opportunity for Improvement and Good Practice were noted:

Opportunity for Improvement:

- During the course of the review, it was noted that discrepancies exist between the BIO LCOs, Surveillance Requirements, System Evaluation Reports, and implementing surveillance procedures. The building had previously identified this issue and is working to correct the deficiency under a corrective action plan developed under Price Anderson Amendments Act report NTS-RFO-KHLL-1999-0003 and a subsequent Fast Scan Assessment. (Fast Scan Assessments are essentially surveillance activities conducted in accordance with Kaiser Hill 3-B52-ADM-02.01 *Conduct of Assessment Activities*). *(Safety Function Definition, Criterion 1)*

Good Practice:

- The Electronic Linking and Procedure Maintenance (ELPM) implementation at B371 provides an effective mechanism to readily identify implementing documents for AB and safety basis requirements. The process helps ensure that configuration management of AB requirements is maintained through electronic linking of the Basis for Interim Operation (BIO), System Evaluation Reports, and implementing documents. *(Safety Function Definition, Criteria 1)*

Configuration Management

The assessment of the Configuration Management topic area was conducted to determine if changes to safety basis-related requirements, documents, and installed components are adequately controlled. The assessment concluded that changes to the fire detection/suppression systems' authorization basis requirements, documents and system components have an adequate change control process. Significant progress has been made by the facility since the determination of programmatic deficiency in the area of configuration management within the facility. The process being used to review and update the System Evaluation Reports is comprehensive and should result in accurate documents. Changes to the fire protection system's safety basis requirements, documents, and installed components were reviewed and found to 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. Facility procedures ensure that changes to the fire protection system's safety basis requirements, documents, and installed components are adequately integrated and coordinated with those organizations affected by the change.

One issue noted was the lack of up-to-date drawings for the facilities safety systems. The building (and Rocky Flats Site) has instituted several controls to ensure that drawings are first field verified to be correct or modified as needed to document the as found condition before they are used. The BIO safety requirements are rooted in functionality of the safety systems and operability is determined through a series of defined functional requirements, and associated compliance requirements and acceptance criteria. The availability of completely accurate drawings, although desirable, is not deemed to be a deficiency that needs to be corrected due to implemented compensatory actions and the short (2-3 year) remaining life of the facility. In a couple of cases, system diagrams in the System Evaluation Report were found to not represent the field condition. The facility has an action to update these diagrams as part of the review process currently underway. Results of the configuration management of software are discussed separately.

The following Opportunity for Improvement and Good Practice were noted:

Opportunity for Improvement

- System Evaluation Report diagrams for the fire suppression system were found to be inconsistent with the actual system configuration. These documents should be updated in a timely manner. *(Configuration Management, Criterion 2)*

Good Practice:

- Facility implementation of PRO-1475-ADM-371, Building 371/374 Implementation Document Change Control Process, by the facility provides an effective process for ensuring accurate management of the System Evaluation Report, Authorization Basis, and implementing procedures with respect to changes affecting the safety basis. *(Configuration Management, Criteria 3 & 4)*

System Maintenance

The material condition of fire detection/suppression systems was assessed utilizing document reviews, interviews, and observations from independent walk downs and surveillance simulation. From the "maintenance" viewpoint, the systems are functional and impairments receive appropriately prioritized attention. Building and alarm system craft personnel are adequately trained, have necessary technical resources, and have significant experience. Procedures, with varying levels of checks and balances, are in place to ensure maintenance issues are documented from initial identification through to sign off at completion. The work package development process encompasses inclusion

of all parties who have cognizance over the specific item, and those who will be involved in performance of the work. The Team did not identify any deficiencies regarding the maintenance of fire detection/suppression systems. A related item requiring action is revision of the B371 Fire Hazards Analysis (FHA) to include appropriate discussion of the basis for removal of the Turbine Generator (TG) CO_2 system. Also the FHA should be updated to reflect the B371 decision to retain and maintain the TG fire detection system as a fire protection good practice.

The following Opportunities for Improvement was noted:

Opportunity for Improvement:

- The B371 Fire Hazards Analysis (FHA) needs to include an appropriate discussion of the basis for removal of the Turbine Generator (TG) CO_2 system. Also the FHA should be updated to reflect the retention and maintenance of the TG fire detection system as a fire protection good practice. *(System Maintenance, Criterion 1)*

System Surveillance and Testing

Team member Fire Protection Engineers reviewed the surveillance and testing of the fire detection and suppression systems for the exhaust filter plenums. The review concluded that the surveillance for the exhaust filter plenums demonstrates that B371 is capable of accomplishing the safety functions and continue to meet the applicable system requirements and performance criteria. This conclusion was based on the review of the facility surveillance procedure as well as a walkdown of the procedure with the subcontractor personnel. The review and walkdown demonstrated that the requirements for the surveillance and testing are adequate to demonstrate overall system reliability. The surveillance and test procedures confirm key operating parameters for the overall system and its major components are maintained within operating limits. Instrumentation and measurement test equipment for the system testing are calibrated and maintained.

An operability issue was identified regarding the mis-orientation of a small number of sprinkler heads in the facility, which was not identified during the annual surveillance. The surveillance procedure clearly calls for a check of head orientation, i.e. up or down. The surveillance has been performed four times in Building 371 by a sub-contractor. No recorded instance of mis-oriented heads was noted. Yet the Team identified several heads which were mounted in the wrong orientation. When this issue was identified building management took prompt action to suspend operations in the affected areas, replace the affected heads, and inspect the orientation of other heads in the facility. Overall a very small percentage of mis-orientation was identified facility wide. Team Fire Protection Engineers judged that the overall operation of the facility sprinkler system was not compromised.

One Opportunity for Improvement was noted for the need to lock open the controlling valves for the nitrogen supply to the fire water pressure tanks as a means to further ensure system reliability. A Good Practice was also noted.

Operability Issues/Concerns:

- The performance of the annual sprinkler surveillance failed to identify miss-orientation of a small number of sprinkler heads. Proper orientation is required to assure spray pattern adequacy. Sprinkler flow is not affected *(System Surveillance and Testing, Criterion 2).* It is the opinion of the assessment team Fire Protection Engineers that the overall operation of the sprinkler system was not compromised for the following reasons:

  - The miss-oriented sprinkler heads will still provide a timely flow alarm to the on-site fire department:
  - Only a small percentage of the sprinkler heads in the facility were affected (validated during subsequent facility walkdown)
  - The miss-oriented sprinkler heads will still provide water for cooling the hot gases from a postulated fire and will also provide limited extinguishment capability.

Opportunity for Improvement

- The Assessment team observed that nitrogen controlling valves for the nitrogen supplies and the controlling valves to low pressure supervisory switches to the two pressure tanks were not locked in the open position. To improve overall system reliability it is recommended that these controlling valves be locked in the open position and verified during the performance of the surveillance procedure(s). *(System Surveillance and Testing, Criterion 1)*

Good Practice

The facility Fire Protection Engineer is fully integrated into the Project, and is providing value-added input to all facets of the Project fire protection program. *(System Surveillance and Testing, Criterion 1)*

Software Quality Assurance

Software used in the fire detection/suppression system was assessed to ensure it is subject to a software quality process consistent with 10CFR830.122. The assessment revealed that changes and modifications to the Building 371 SC-1/2 and SC-3 Fire Detection and Suppression System software are controlled through the Site Engineering Design Process, the Site Integrated Work Control Program (IWCP), the Building 371/374 Administrative Control Program, and the Site Computer Software Management Manual. The changes and modifications must also meet the requirements of the Building 371/374 Complex Basis for Interim Operation (BIO). The Site Engineering Design Process includes requirements to identify required document changes, perform walk downs and control field changes. The Engineering Design Process also includes a review for designs that involve affected organizations. Engineering design reviews are performed that are formal, thorough, and involve the necessary technical disciplines. The IWCP controls the

fieldwork, provides a list of materials required for the job, and controls post work testing for hardware and software modifications, design changes and repairs.

During this assessment a review was performed on two Integrated Work Control Packages. One IWCP reviewed installed new Simplex computers in the Fire Dispatch Center and Secondary Dispatch Center due to aging equipment that is not replaceable. This work also included the removal of the software from the old computers and reinstalling it on the new Simplex computers. The required Engineering, IWCP and other reviews and approvals were obtained prior to starting work. The scope of the work package was very thorough and included a work package "step" to prepare a mock-up of new Simplex Computer equipment and verify operability of equipment prior to new installation. Hold points, requiring post work testing prior to starting the next task, were placed after each major task had been completed.

During this assessment it was determined the Simplex software used in the fire detection/suppression system instrumentation and control components is subject to rigorous quality assurance requirements documented in the Site Software Management Manual. This manual is based on ASME/NQA-1, 1994 Edition, Subpart 2.7, Quality Assurance Requirements of Computer Software for Nuclear Facility Applications.

Support Systems

1. Electrical Power Distribution System

The Team walked down the electrical power routing to a fire alarm control panel. The panels were clearly labeled and conduits were tagged leading to the next panel in series. Breaker panel door mounted index cards were legible and concise to identify breaker functions. An interview revealed that a building wide program had been conducted to clearly and accurately tag, label and mark electrical circuits/ components.

Surveillance and preventive maintenance actions required for the electrical power distribution system were reviewed. Surveillance requirements as well preventive maintenance required on the system, is identified in System Evaluation Report 11, Section 8.1.1. The surveillance procedure performed on the system was sampled to determine if it is consistent with the System Evaluation Report. A minor discrepancy between one section of the surveillance procedure and the System Evaluation Report was noted and identified to the facility for corrective action. This discrepancy does not impact the actual surveillance performed on the system.

APPENDIX A

DETAILED DISCUSSION OF RESULTS

Assessment Form

DNFSB Recommendation 2000-2 Phase II Assessment

Building 371 Fire Detection/Suppression System

Topic Area: Safety Function Definition	**Criteria Met?**	
	Yes X	**No**

Objective

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

Criteria

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

Approach

Record Review:

1-1 Review the appropriate safety/authorization basis documents (Basis for Interim Operation (BIO) Building 371/374 Complex, Revision 5 and System Evaluation Reports 9 and 10) to determine if the definition/description of the system safety functions includes:

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

Interviews: None

Observations: None

Process

Records Reviewed:

- BIO for B371/374, Revision 5
- System Evaluation Report Chapter 10
- NTS Report NTS-RFO-KHLL-371OPS-1999-0003
- NTS Report NTS-RFO-KHLL-SITEWIDE-2000-0001
- September 27, 2001 Memorandum, "Revision of PAAA Corrective Action Task Associated with NTS-RFO-KHLL-SITEWIDE-2000-0001 – JLH-035-01"
- October 4, 2001 Memorandum, "Closure of PAAA Report NTS-RFO-KHLL-371OPS-1999-0003, Task 30 [29], PATS 99-002098, Plan 03, Task 03 – MWH-016-01"
- PRO-1475-ADM-371, "Building 371/374 Implementation Document Change Control Process"
- November 16, 2001 Memorandum, "Closure of PAAA Report NTS-RFO-KHLL-371OPS-1999-0003, Task 30, PATS 99-002098, Plan 03, Task 04 – MWH-018-01"
- June 15, 2001 Memorandum, "Closure of PAAA Report NTS-RFO-KHLL-371OPS-1999-0003, Task 31, PATS 99-002098, Plan 03, Task 05 – MWH-010-01"
- AC 5.8 MAP Cards
- August 15, 2001 Memorandum, "Closure for NTS-RFO-KHLL-371-1999-0003 Task 32 and 33 – JWL-024-01"
- June 28, 2001 Memorandum, Building 371/374 Authorization Basis Mapping – JWL-019-01." B371/374 System Evaluation Report Index with electronic linking of requirements among BIO, System Evaluation Reports and implementing documents.
- June 12, 2000 Letter from Barbara Mazurowski to Robert Card, "Authorization Basis Development"

Personnel Interviewed:

- Nuclear Regulatory Division Director, DOE RFFO
- Nuclear Regulatory Division, DOE RFFO
- Nuclear Safety Manager
- Operations Manager
- Project Chief Engineer
- Electrical Engineer
- Nuclear Safety Manager, K-H
- Nuclear Safety, K-H
- Nuclear Safety, K-H
- Quality Assurance, K-H
- Quality Assurance Manager, K-H
- Price Anderson Program, K-H

Results:

Record Review/Interviews:
The Basis for Interim Operation (BIO) Building 371/374 Complex, Revision 5 and System Evaluation Report Chapter 10 appropriately describe the fire detection/suppression systems' safety functions including role of the fire detection/suppression systems in detecting, preventing, or mitigating analyzed events in the BIO. The safety function descriptions include associated conditions and assumptions and requirements and performance criteria for the fire detection/suppression systems. Active components and essential supporting systems are identified for normal, abnormal, and accident conditions.

The B371 System Evaluation Report Chapter 10 provides information and description of the fire detection/suppression systems that address significant elements of DOE-STD-3009 since much of this information is not included in the present BIO. This information includes:

- System descriptions
- Safety function/categorization of safety class/safety significant SSCs
- System boundaries
- Functional requirements
- Ability of the safety class SSCs to meet performance criteria.

The System Evaluation Report is not a DOE approved authorization basis (AB) document. However, it serves a key role in addressing the above elements of DOE-STD-3009 as safety basis documentation for the fire detection/suppression systems in B371/374. B371 implementing procedures are based on the System Evaluation Report safety bases.

PAAA NTS reports (NTS-RFO-KHLL-371OPS-1999-0003 and NTS-RFO-KHLL-SITEWIDE-2000-0001) issued in 1999/2000 identified sitewide (including B371) violations and deviations with respect to assurance of operability and functionality of safety class and safety significant SSCs. Inconsistencies were found with the System Evaluation Reports and implementing procedures and the facility ABs. Sitewide corrective actions were initiated to break the link between System Evaluation Reports and the ABs and to capture all operability requirements and associated acceptance criteria within the applicable AB, and not in the System Evaluation Reports.

Since B371 is still processing nuclear material, adoption of the DBIO format (and breaking the tie to the System Evaluation Report) has been deferred. The following corrective actions have been implemented as identified in NTS-RFO-KHLL-371OPS-1999-0003 to ensure accurate management of the System Evaluation Report, AB, and implementing procedures:

- Task 29: Procedure PRO-1475-ADM-371 has been issued to manage the B371/374 change control process (reference October 4, 2001 Memorandum,

"Closure of PAAA Report NTS-RFO-KHLL-371OPS-1999-0003, Task 30 [29], PATS 99-002098, Plan 03, Task 03 – MWH-016-01")

- Task 30: Independent reviews of the 16 System Evaluation Report chapters have been completed and 15 require revision (reference November 16, 2001 Memorandum, "Closure of PAAA Report NTS-RFO-KHLL-371OPS-1999-0003, Task 30, PATS 99-002098, Plan 03, Task 04 – MWH-018-01")
- Task 31: The B371 Configuration Control MAP Cards have been revised for improved effectiveness in the internal assessments (reference June 15, 2001 Memorandum, "Closure of PAAA Report NTS-RFO-KHLL-371OPS-1999-0003, Task 31, PATS 99-002098, Plan 03, Task 05 – MWH-010-01")
- Task 32: Electronic linking of System Evaluation Reports and implementing procedures has been completed (reference June 28, 2001 Memorandum, Building 371/374 Authorization Basis Mapping – JWL-019-01").

Two additional corrective actions were identified in response to NTS-RFO-KHLL-371OPS-1999-0003 to provide additional assurance of closure for this issue:

- Task 34: Perform a fast scan assessment of the effectiveness of completed tasks 28-33 and 35 (scheduled for June 17, 2002 completion)
- Task 35: Revise and implement revisions to System Evaluation Report Chapters 1-4 and 6-16 to address the results of the independent review conducted per task 30 (scheduled for April 15, 2002 completion).

Review of the above corrective actions and closure documentation and completion of Task 35 provides acceptable basis to ensure consistency among the AB, System Evaluation Report and implementing procedures.

Review of the process for implementation of NTS-RFO-KHLL-371OPS-1999-0003 Task 35 revealed a rigorous and thorough approach to review and resolve independent reviewer's comments and to revise the System Evaluation Report, including a "roundtable" review among appropriate entities (nuclear safety, operations, maintenance, engineering, etc.). System Evaluation Report Chapter 10 for the fire detection/suppression systems has been identified as requiring revisions to ensure consistency with the AB and implementing procedures. This is scheduled for completion by April 15, 2002. This is identified as an Opportunity for Improvement.

Observations:
N/A

Conclusion:
The B371 BIO and System Evaluation Report Chapter 10 appropriately identify and describe 1) the fire detection/suppression system's safety functions and the safety functions of essential supporting systems, and 2) the fire detection/suppression system's requirements and performance criteria that the system must meet to accomplish its safety

functions. The safety function definition criteria for the fire detection/suppression systems are met.

Operability Issues/Concerns:
None

Opportunities for Improvement:

- During the course of the review, it was noted that discrepancies exist between the BIO LCOs, Surveillance Requirements, System Evaluation Reports, and implementing surveillance procedures. These discrepancies may have contributed to some of the other deficiencies noted elsewhere in this report. The building had previously identified this issue and is working to correct the deficiency under a corrective action plan developed under Price Anderson Amendments Act report NTS-RFO-KHLL-1999-0003 and a subsequent Fast Scan Assessment.

Good Practices:

- The Electronic Linking and Procedure Maintenance (ELPM) implementation at B371 was identified as a good practice. It provides a good mechanism to readily identify implementing documents for AB and safety basis requirements and helps ensure that configuration management of AB requirements is maintained through electronic linking of the BIO, System Evaluation Reports and implementing documents.

Assessment Form

DNFSB Recommendation 2000-2 Phase II Assessment

Building 371 Fire Detection/Suppression System

Topic Area: Configuration Management	**Criteria Met?**	
	Yes X	**No**

Objective

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

Criteria

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

2. Limited technical walkdown of selected the fire detection/suppression system's components verifies that the actual physical configuration of these components conforms to documented design and safety basis documents for the systems.

3. Changes to the fire detection/suppression system's 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 fire detection/suppression system's safety basis requirements, documents, and installed components are adequately integrated and coordinated with those organizations affected by the change.

5. Software used in the fire detection/suppression system's 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

Record Review:

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.

3-1a Review documentation, such as work packages, for selected changes made to the fire detection/suppression system's requirements, installed equipment, and associated documents. Determine whether:

- System changes 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

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

Interviews:

1-2 Interview a sample of cognizant fire detection/suppression systems line, engineering, 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.

3-1b Interview individuals responsible for processing selected changes made to the fire detection/suppression systems requirements, installed equipment, and associated documents. Determine whether:

- System changes 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.

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

Observations:

2-1 Walkdown selected fire detection/suppression 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 fire detection/suppression systems or (2) the adequacy of the change control or document control processes, including drawing revision, applied to the fire detection/suppression systems.

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

Process

Records Reviewed:

- Integrated Work Control Program (IWCP) packages:
  - TO106547, Removal of Overheat Detectors in Rm. 3408 (Set 24).
  - TO107011, Replacement Sprinkler Heads Zones 16/17 Basement Rm. 2107
  - TO1-7790, Remove and Replace Sprinkler Heads, Rm. 5101
  - TO108298, TS&R Smoke Detector in Rm. 2128

- Engineering Design Packages:
  - EO 51151, (TO103488) Install SAAM Rm. 3602, C-Cell
  - EO 52105, (TO106722) Install Sprinkler Heads in Rm. 1111
  - EO 52154, (TO106701) Deactivate FCID 371 Bin Alarm Panel
  - EO 52384, (TO107315) Fabricate and Install a Physical Barrier in Glovebox 47
  - EO 52562, (TO108455) Remove C902Eauto Restart and Sequencer
  - EO 52554, (TO108462) Add a Remote Overheat Alarm
  - EO 52649, (TO109096) Magnehelic Gauge on GB-70A
  - EO 52644, ((TO109305) Install Point Source Capture for LANL Head Space Gas Sampling Cart in Rm. 2217, B371.

- Procedures and Other Documents Reviewed
  - MAN-128-CCCP-1.0, *Configuration Change Control Program Manual/Site Configuration Control Description*
  - 1-V51-COEM-DES-210, *Site Engineering Process Procedure*
  - MAN-027-SERM, *Site Engineering Requirements Manual*
  - MAN-071-IWCP, *Integrated Work Control Program*
  - 1-PRO-072-001, *Inspection and Acceptance Test Process*
  - PRO-664-NSP-USQP, *Nuclear Safety Program Unreviewed Safety Question Program*
  - PRO-815-DM-01, *Developing and Maintaining Documents*
  - PRO-1368-FHA-001, *Preparing Fire hazard Analysis*
  - MAN-131-QAPM, *Quality Assurance Program Manual*
  - 1-W59-COEM-AMN-161, *Preparation, Review, and Approval of System Evaluation Reports*
  - PRO-1475-ADM-371, *Building 371/374 Implementing Document Change Control Process*

- 3-MAN-033-ACP-AC5.0, *Building 371/374 Administrative Control program Manual*
- Fast Scan Assessment Report, *An Effectiveness Evaluation of the Corrective Actions Implemented for B371 Administrative Control (AC) 5.8, Configuration Management*
- Report on Pilot Assessment of Confinement Ventilation System Assessment Criteria and Guidelines at LLNL Building 332
- Report on Pilot Phase II Assessment of Confinement Ventilation System (CVS) of H-Canyon at Savannah River Site
- Rocky Flats Environmental Site Response to Request Defense Nuclear Facilities Safety Board Recommendation 2000-2, Prepared on February 28, 2001

Personnel Interviewed:

- Project Chief Engineer
- Mechanical Engineer (HVAC)
- Civil Engineer
- AB Implementation Lead
- Engineering Lead
- Fire Protection Engineer
- Facility Manager
- Deputy Project Manager
- Operations Manager

Operations Observed:
N/A

Results:

Record Review:
The change control process and procedures that implement this process in Building 371 were reviewed. For safety system components, the change control process is implemented through the Site Engineering Process Procedure (1-V51-COEM-DES-210). The purpose of this procedure is to provide instructions for developing and controlling design documents at the site including engineering design packages drawings, specifications, calculations and engineering procurements. This procedure ensures that design and design changes are defined, controlled, verified, approved and revised. Chapter 3 provides the criteria for selecting the appropriate engineering approach for the specific task. When a SSC is constructed or modified, a formal Engineering Design Package (EDP) is required. Chapter 4 specifies the requirements and provides the instructions for developing an EDP. Design requirements are established in section 4.3 of the procedure, with specific instructions for the design in section 4.4. These instructions include identification of the interfacing disciplines and use of the planning team from the Integrated Work Control Program (IWCP). Part of the planning process is the performance of a walkdown to ensure a clear

understanding of the technical scope (including drawings) and documentation of the walkdown results. Development of inspection and testing requirements is specified in section 4.4.3 [8] and [9] of the procedure, using the requirements of the Inspection and Acceptance Test Process procedure (1-PRO-072-001). EDP checking, independent verification and review by the planning team organizations are specified in sections 4.4.5 and 4.4.6. EDPs are approved by the designated Responsible Engineering Manager (REM) (section 4.4.7). Instructions are also established for temporary modifications (section 4.4.14).

The revision process for EDPs, Calculations, Specifications, and Drawings is contained within the respective chapters of DES-210, these are:

- Chapter 5, *Engineering Change Requests*, for EDPs,
- Chapter 7, *Calculations and Other Documents*, section 7.3.4 for Calculations,
- Chapter 8, *Specifications,* section 8.7 for Specifications and
- Chapter 9, *Drawings,* section 9.6 for Drawings

Consistency among the VSSs performance criteria, installed equipment and associated documents is maintained through several means. For modifications to the system, the Baseline Document Change Form (BDCF), DES-210 Appendix4.3, is completed. The BDCF is used to identify controlled documents affected by the design activity. These documents include drawings, specifications, preventive maintenance orders, surveillances, and System Evaluation Reports). The responsible facility manager is required to indicate on the BDCF which items require update prior to system return to service, and the Project Chief Engineer determines which documents require update at project closeout. The building implements a procedure (PRO-1475-ADM-371, *Building 371/374 Implementing Document Change Control Process)* that ensures consistency among the various procedures and authorization basis controls. Use of and evaluation of this procedure is described in more detail in Criteria 3 and 4 below.

Nuclear Safety Manual (1-MAN-018-NSM) section 6.1.1, Nuclear Safety Authorization Basis (AB) Documentation, specifies the site requirements, guidance, and expectations for the preparation, review, and approval of facility safety analysis and nuclear safety AB documents, in compliance with DOE Order 5480.23 which sets forth the definition, basis, and requirements for developing nuclear safety analysis reports. (This order has since been replaced by the Nuclear Safety Rule and Order 5480.23 is slated to be removed from the Kaiser Hill contract). Section 6.1.1.7 of the manual requires that AB changes made to a facility or activity be evaluated and documented in the nuclear safety AB on a real-time basis. Changes may occur from as-discovered conditions or from planned events. DOE, RFFO approval is required for changes to the AB documentation that exceed the approved authorization bases. An annual review of a nuclear safety AB document is also performed. Annual reviews include a review of the facility System Evaluation Report to ensure compliance with the surveillance requirements identified in the System Evaluation Report.

In November 1999, the project determined that configuration control pursuant to Section 10 of the Building 371/374 Administrative Control (AC) Program Manual was not being adequately followed and a Programmatic Deficiency was declared. Procedures implementing requirements from System Evaluation Reports were found to be inconsistent with the System Evaluation Report requirements and the process for ensuring this was found to be ineffective. Price Anderson Amendments Act report NTS-RFO--KHLL-371OPS-1999-0003 was issued. Twenty-six corrective actions (CAs)were identified, the last of which involved the conduct of a "Fast Scan Assessment" to measure the effectiveness of the actions taken by the building to closeout the CAs Fast Scan Assessment, number FY01-092-QA371, was completed in April 2001. It assessed the effectiveness of the (CAs) implemented for the Building 371/374 Programmatic Deficiency issued against Administrative Control (AC) 5.8, Configuration Management. The Fast Scan assessment was scheduled following the discovery of additional failures to maintain consistency between the related Authorization Basis (AB) documents, System Evaluation Reports, surveillance procedures, and actual configuration of the building. The Fast Scan Assessment concluded that certain CAs were not effective. Supplemental CAs were developed which added CAs 28 through 35.

As of this assessment, all supplemental CAs are complete except numbers 34 and 35. CA 35 requires the revision of certain System Evaluation Reports. CA 34 requires the performance of another "Fast Scan Assessment" to measure final effectiveness. Completion of the System Evaluation Report revisions is to be completed by April 15, 2002. The Fast Scan is scheduled to be completed by June 15, 2002.

The change control process was evaluated and it was determined that the corrections made to 3-MAN-033-ACP-AC5.0, Rev. 1, Chapter 10 (AC5.8) due to the CAs as outlined in Fast Scan Assessment FY01-092-QA371 are sufficient. This covered changes from System Evaluation Reports, AB documents, Designs, or Procedures as part of the Program summary in Section 10.5 of the B371/374 *Administrative Program Manual.*

Additionally, the Document Change Impact Form, found in PRO-1475-ADM-371, *Building 371/374 Implementation Document Change Control Process*, was revised as the result of a CA to ensure that all documents affected by a change would be identified, updated appropriately, and implemented in a coordinated manner ensuring that configuration controls of AB related documents were kept consistent and revised in a timely manner. A review of several work control documents and engineering design packages was performed. No issues were noted, compliance with the site and facility procedures was found, and there is a process in place to ensure the document change process.

Interviews:
Interviews were conducted with the Project Chief Engineer, several system engineers and line management personnel. The engineers who perform most of the engineering design work in the facility had excellent knowledge of the implementation of

configuration management and the documents that require this (Site Engineering Process Procedure, Integrated Work Control Manual), and the importance of maintaining the safety basis of the facility. However, they did not have an understanding of the *Configurations Change Control Manual/Site Configuration Control Description,* MAN-128-CCCP-1.1 (the overall site configuration management program). Discussions with the Project Chief Engineer revealed that his emphasis with the staff engineers has been to ensure they understand and comply with the implementing documents rather than the overall site requirements. Additionally, he intends to improve their knowledge through upcoming training as part of the System Engineer qualification process. Interviews conducted with the line management personnel revealed a good understanding of the program and its importance to maintaining the safety basis of the facility.

Observations:
N/A

Conclusion:
This criteria has been satisfactorily met. The facility is continuing implementation of corrective actions regarding consistency of the System Evaluation Reports to the implementing procedures under a formal corrective action plan. This item is noted as an Opportunity for Improvement in the Safety Function Definition Functional Area.

Operability Issues/Concerns:
None

Opportunities for Improvement:
None

Good Practices
N/A

Criterion 2: Limited technical walkdown of selected the fire detection/suppression system's components verifies that the actual physical configuration of these components conforms to documented design and safety basis documents for the systems.

Process

Records Reviewed:

- 1-V51-COEM-DES-210, Site Engineering Process Procedure
- Building 371/374 Basis for Interim Operation
- Building 371/374 System Evaluation Report, Chapters 9 and 10
- Work Package T0106422, Replace Sprinkler Heads in Basement
- Drawing 25155-706, Plutonium Recovery Facility Partial Bsmnt. - Fire Protection Plan Zone #5
- Drawing 25155-707-01A, Plutonium Recovery Facility Basement Pu Bldg. Zone #3
- Drawing 51537-0903, Building 371 Dock 21 T Fire Protection Dry Pipe System Schematic
- Drawing 51537-0901, Building 371 Dock 21 T Fire Protection Plan and Support Details
- Drawing 51482-0463, Building 371 Priority Upgrades Nitrogen Backup Supply for Tank D-711 Fire Protection Deluge System 2

Personnel Interviewed:

- Lead Fire Protection Engineer

Operations Observed:

Walkdowns were performed of selected portions of the fire detection and suppression systems. Automatic Sprinkler System 371-B was walked down from the post-indicating valve that supplies water to the facility, to various rooms and exhaust plenums were fire suppression is provided. Fire alarm panels, glovebox overhead detectors in several gloveboxes and sprinkler heads in several rooms were inspected.

Results:

Record Review:

See Observations section below

Interviews:

See Observations section below

Observations:

Selected portions of the fire suppression and the detection and alarm systems were walked down. Original construction drawings for the suppression system are available. Some updates to these drawings have been made as noted on the drawings. Also, drawings were located for several notable changes to the system that have been

recently (within the last 5 years) updated. These include system modifications made to the filter plenum deluge systems as part of the DNFSB 94-3 upgrades and the addition of Dock 21T to the facility. Discussions with the fire protection engineer revealed that facility drawings for the fire suppression and the detection and alarm systems have not been maintained consistently over the life of the facility and therefore cannot be relied upon without first performing a field verification.

Investigation of site procedures and requirements revealed a specific acknowledgement that site drawings do not reflect the actual configuration of buildings. To this end, procedures and manuals stipulate that walkdowns must be conducted prior to design or construction activities to document the actual conditions and configuration of the project being worked. Site and B371 procedures and manuals listed below confirm the requirement to conduct walkdowns to verify all drawing information prior to use.

1) CCCP – *Configuration Change Control Manual,* Section 5.3 *Document Control* second paragraph states: "Due to the inaccuracy of Site drawings, the Engineering Program SHALL require that prior to any design work proceeding the area under the proposed design work must first be walked down to confirm the existing configuration."

2) MAN-027-SERM, *Site Engineering Requirements Manual,* Section 6.4 states: "Existing Site drawings SHALL not be used as the sole source basis for design. Field verified drawings represent the best and most complete information presently available on Structures, Systems and Components (SSCs) at the Site. However, much of the detailed information expected on a drawing is not shown or is not available. In other instances, the drawing may be incorrect or incomplete."

3) 1-V51-COEM-DES-210 (DES-210), Revision 7, *Site Engineering Process Procedure,* Section 4.4.1, *Design Inputs Identification,* step 11, states: "Perform a walkdown to ensure clear understanding of the technical scope and constructability/destructability issues, utilizing necessary craft, planning, safety, and operations personnel. Participation in the walkdown by HDIT organizations may be limited, but the Designer should contact them for input. The extent of the walkdown will be limited by ALARA considerations. Document the pertinent Walkdown Results/Conclusions in the EDP Template, Section 7. [A] Based on walkdown results, revise outputs from Steps [2{- [11], as necessary."

4) Basis for Interim Operation Building 371/374 Complex, Volume I, BIO, Appendix A, Section 5, *Configuration Management,* Subsection 5.8.2, *Key program Elements,* item c states: "When facility modifications are to be performed, walkdowns are conducted to confirm configuration; applicable requirements are incorporated; controlled changes are confirmed to be technically correct; and affected controlled documents are consistently modified.

5) 3-MAN-033-ACP-AC5.0, Revision 1, *Administrative Control Program Manual,* Administrative Control (AC) 5.8 - Chapter 10, *Configuration Management,* Section 10.3, *Credited program Elements,* item b, states: "When facility modifications are to be performed, walkdowns are conducted to confirm the current configuration; applicable

requirements are incorporated; controlled changes are confirmed to be technically correct; and affected controlled documents are consistently modified."

A review of the accuracy of the System Evaluation Report system diagrams provided in the System Evaluation Report Chapter 10 to actual system configuration in the facility was performed for selected elements of the suppression system. The review revealed a couple of discrepancies on Attachment 3, Figure 7. The labeling of the supply valves for filter plenums 121A and 121B are not consistent with that on the system diagram. Also, the supply valves for Tank D-711 on Figure 8 of Attachment 3 are mislabeled. Although these diagrams are not used as official system drawings, they are important operational aides for facility personnel, and should be accurate representations of the systems.

Additionally, during the walkdown it was discovered that three sprinkler heads were not correctly oriented for the type of head installed (i.e. a pendant head was installed in a position where an upright sprinkler head should have been installed, and an upright head was installed where a pendant head should been installed). This condition was immediately reported to the facility and corrective actions were initiated. A review of the drawings for Zones #3 and #5 was performed; it could not be determined from those drawings if the incorrect sprinkler heads had been installed during original construction or later during a modification to the system. This item is discussed in detail under Criteria 2 in the System Maintenance Topic Area.

The engineering process also requires that drawings of systems be updated after modifications are performed. Chapter 9 of the Site Engineering Process Procedure contains the instructions for the use and update of drawings. These instructions require that the responsible engineering manager determine which drawings are to be updated at project closeout and provides the process for doing so. The instructions do not require that all elements of at drawing be updated; only those portions affected by the modification. An example of this (evaluated as part of the ventilation system assessment) is the Integrated Work Control Package for replacement of ventilation interlock relays and removal of the high differential pressure interlocks. The drawings for the interlocks was walked down during the work planning process and at project completion, the drawings for the interlocks were confirmed to be updated in the site EDOC system.

A review of the Phase I assessment report was also conducted. The report notes that the fire suppression, and detection and alarm systems have generally been available to support their safety functions and building operations. In the case where individual components have experienced unavailability, the system has sufficient redundancy to maintain performance of its safety function. This assessment's conclusions confirm this. Other than the isolated incident were three sprinkler heads were discovered to be of the wrong type, all indications are that the system will perform its intended safety function when needed.

In summary, the lack of availability of completely accurate drawings of the fire suppression, and detection and alarm systems does not hinder the facility from safely operating over its short remaining life. The building (and Rocky Flats Site) has instituted several controls to ensure that when drawings are utilized, they are first field verified to be correct or modified as needed to document the as found condition. The assessment team found evidence that these walkdowns are occurring and that the engineers and operations personnel are properly aware of the situation. Additionally, the BIO safety requirements are rooted in functionality of the safety systems. System operability is determined through a series of defined functional requirements, and associated compliance requirements and acceptance criteria. The availability of completely accurate drawings, although desirable, is not deemed to be a deficiency that needs to be corrected due to the implemented compensatory measures and the short (2-3 year) remaining life of the facility.

Conclusion:
This criteria has been adequately met. The process established to ensure walkdowns are performed prior to conduct of work are well established and understood by the facility. Inconsistency between system diagrams in the System Evaluation Report for the fire suppression system were discovered; these should be corrected in a timely manner.

Operability Issues/Concerns:
None

Opportunities for Improvement:
- System Evaluation Report diagrams for the fire suppression system were found to be inconsistent with the actual system configuration. These documents should be updated in a timely manner.

Good Practices:
N/A

Criterion 3: Changes to the fire detection/suppression system's 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.

Criterion 4: Facility procedures ensure that changes to the fire detection/suppression system's safety basis requirements, documents, and installed components are adequately integrated and coordinated with those organizations affected by the change.

Process:

Records Reviewed:

- Work Package T0107790, Remove and Replace Sprinkler Heads, Room 5101
- SES-371-02.0181-EWT
- Work Package T0107011, Replace Sprinkler Heads, Zones 16/17 Basement
- Categorical Exclusion (per PRO-664-NSP-USQP) for T0107011
- Work Package T0108298, TS&R Smoke Detector in Room 2128
- Work Package T0106547, Remove Glovebox Overheat Detector in Room 3408
- USQD-371-01.1416-KKK
- Work Package T0107507, TS&R Tank D-710, Fire Suppression Piping
- Categorical Exclusion (per PRO-664-NSP-USQP) for T0107507
- Nuclear Safety Programmatic Compliance Assessment Report FY01-241-KHE; independent assessment of USQD process
- PRO-1475-ADM-371, "Building 371/374 Implementing Document Change Control Process"
- PRO-664-NSP-USQP, Unreviewed Safety Question Determination Procedure
- MAN-071-IWCP, Integrated Work Control Process
- MAN-016-ISM, Integrated Safety Management
- MAN-066-COOP, Conduct of Operations
- MAN-128-CCCP-1.0, Configuration Change Control
- PRO-ZZZ-NSP-IVR, Implementation Verification Review
- USQDs and SESs for B 371 HVAC (completed 2001 and 2002)
- IP-01-048 (PGC-371-01.1916-SJS); *PRO-1475 implementation*
- USQD-371-02.0283-SJS
- IP-01-054 (PGC-371-02.0307-SJS); *PRO-1475 implementation*
- October 4, 2001 Memorandum from Matthew Hadecek to Frank Casella, "Closure of PAAA Report NTS-RFO-KHLL-371OPS-1999-0003, Task 30 [29], PATS 99-002098, Plan 03, Task 03 – MWH-016-01"

Personnel Interviewed:

- Quality and Compliance Program Manager
- PA and EP Manager
- Nuclear Safety Specialist
- Nuclear Safety Manager
- Authorization Basis/Administrative Control Implementation Lead

- Operations Manager
- Project Chief Engineer
- Electrical Engineer
- Nuclear Safety Manager, K-H
- Nuclear Safety, K-H
- Nuclear Safety, K-H
- Quality Assurance, K-H
- Quality Assurance Manager, K-H

Operations Observed:
N/A

Results:

Record Review/Interviews:
Selected work packages (T0107790, T0107011, T0108298, T0106547, & T0107507) and associated USQDs/SESs/Categorical Exclusions for B371 fire detection/suppression system changes were reviewed. Each of the work packages identified the SC or SS SSCs and applicable safety requirements (LCOs, SRs, etc.) affected by the change. Appropriate USQDs, SESs, AB page changes, or categorical exclusions were conducted for the change. In addition, appropriate independent safety reviews (ISRs), "Return to Service & Operability Checklist," and/or "Post Work Tests" were conducted for the change and for assurance of operability.

The USQD/SES evaluations completed in 2001 and 2002 related to B371 fire detection/suppression system changes to the system/equipment, AB, System Evaluation Report, and implementing documents were reviewed. The review indicated that appropriate safety reviews are being conducted. In addition, results and conclusions of the Nuclear Safety programmatic compliance assessment (FY01-241-KHE) for B371 USQDs and SESs were reviewed. This is an annual independent review, conducted by K-H Nuclear Safety as required by the Nuclear Safety Manual, of the adequacy of USQD and SES evaluations, etc. The K-H NS independent review concluded (for a random sample of 29 evaluations) that all USQD/SES evaluations performed by B371/374 exceeded the acceptance criteria for adequate justifications and conclusions and most provided additional, pertinent information beyond the "adequate" criteria. Note: One evaluation was not reviewed and rated since it was in process and not a final evaluation at the time of the independent review.

The review of B371 work packages and associated USQD/SES evaluations and interviews of B371 personnel concluded that B371 is appropriately implementing the USQD process. System changes are reviewed to ensure 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.

Review of the work packages and interviews of B371 personnel concluded that appropriate affected organizations are appropriately involved in the change process. Operations, Maintenance, Nuclear Safety, and Engineering (design authority and appropriate technical disciplines for process control, electrical, mechanical, chemical, HVAC, nuclear, criticality, structural, etc.) are made aware of system changes that affect them. The review found that B371 is conducting appropriate integration and coordination with other affected organizations (e.g., facility training, document control, construction, radiological control, OSHA occupational safety, industrial hygiene, occupational medicine, hazard analysis/safety basis, safeguards and security, and fire protection).

B371 implemented corrective actions in response to violations and deviations identified in PAAA Report NTS-RFO-KHLL-371OPS-1999-0003 (Task 29) to ensure accurate management of the System Evaluation Report, AB, and implementing procedures. Procedure PRO-1475-ADM-371 has been issued to manage the B371/374 change control process (reference October 4, 2001 Memorandum from Matthew Hadecek to Frank Casella, "Closure of PAAA Report NTS-RFO-KHLL-371OPS-1999-0003, Task 30 [29], PATS 99-002098, Plan 03, Task 03 – MWH-016-01"). Review of PRO-1475 and implementation by B371 personnel; found a line management process that has objectives to:

- Ensure proposed AB implementing document changes are necessary and sufficient
- Ensure AB/System Evaluation Report/ACPM controls and requirements are incorporated in appropriate documents and work instructions
- Ensure facility personnel are knowledgeable of changes to AB/System Evaluation Report/ACPM controls and requirements
- Ensure AB/System Evaluation Report/ACPM controls and requirements have been implemented through the Implementation Validation Review (IVR) or Operational Readiness Review (ORR/RA) process in accordance with PRO-ZZZ-NSP-IVR.

Samples of PRO-1475 Implementation Plans and associated documentation were reviewed: IP-01-048 (PGC-371-01.1916-SJS & USQD-371-02.0283-SJS) and IP-01-054 (PGC-371-02.0307-SJS). Implementation of PRO-1475 by B371 was considered a good practice.

The review of Implementation Plan IP-01-048 for PRO-1475 implementation, "Post Implementation Actions" identified "System Evaluation Report Ch 8 changes IAW System Evaluation Report updates." Inquiry into this revealed that an "additional" change in the Page Change was to remove the 5# propane tank. This was not initially identified as part of the page change and therefore was added as a "Post Implementation Action" during processing of the implementation plan. However, it does not appear that this change would be verified through the IVR process since it was not included on the IVR Checklist for IP-01-048. It is recommended that facility management review the process to ensure that post actions which impact the AB, System Evaluation Report or implementing documents be included for appropriate

IVR to verify implementation of the change in the safety documentation and implementing documents. This minor issue was identified to B371/374 for evaluation and action as appropriate.

Another minor issue noted was use of the "Return to Service and Operability Checklist," (Appendix 23 of the Site Conduct of Operations Manual MAN-066-COOP). The checklist states that "Procedures have been issued or revised, as applicable" and "System Evaluation Reports have been updated, if required" in Part 4.b. and 4.d., respectively. In review of Work Package T0106547 for removal of glovebox overheat detection in room 3408, the items had been marked as "In Process" and were initialed off and dated. Response from B371 is that the checklist "... is only a tool to be used in assisting the Configuration Control Authority (CCA) in returning equipment to service. Further, the COOP Manual requirement is simply that the CCA "verify satisfactory completion of the necessary work to regain operability..." The reviewer acknowledges the appropriateness of the B371 response. However, good practice would ensure that procedure revisions and System Evaluation Report updates, applicable to the work package change, are completed before the checklist is initiated off as complete. It is recommended that B371 reevaluate the practice of initialing off on applicable procedures and System Evaluation Report changes, prior to completion of the revision or update to ensure proper completion of these activities for adequate configuration management.

Observations:
N/A

Conclusion:
Changes to the fire detection/suppression systems' 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. Criterion 3 is met.

Facility procedures ensure that changes to the fire detection/suppression systems' safety basis requirements, documents, and installed components are adequately integrated and coordinated with those organizations affected by the change. Criterion 4 is met.

Operability Issues/Concerns:
None

Opportunities for Improvement:
None

Good Practice(s):
- Facility implementation of PRO-1475-ADM-371, Building 371/374 Implementation Document Change Control Process, by the facility provides an effective process for

ensuring accurate management of the System Evaluation Report, Authorization Basis, and implementing procedures with respect to changes affecting the safety basis.

Criterion 5: Software used in the fire detection/suppression system's instrumentation and control (I&C) components that perform functions important to safety is subject to a software quality process consistent with 10 CFR 830.122.

Process

Records Reviewed:

- Rocky Flats Environmental Technology Site Engineering Requirements Manual, MAN-027-SERM, Revision 2, dated 1/21/02
- Rocky Flats Environmental Technology Site Quality Assurance Program Manual, MAN-131-QAPM, Revision 1, dated 11/01/01.
- Rocky Flats Environmental Technology Site Computer Software Management Manual, 1-MAN-004-CSMM, Revision 0, dated 2/20/97.
- Rocky Flats Environmental Technology Site Configuration Change Control Program Manual/Site Configuration Control Description, MAN-128-CCCP-1.0, Revision 6, dated 12/21/00.
- Rocky Flats Environmental Technology Site, Site Engineering Process Procedure, 1-V51-COEM-DES-210, Revision 7, dated 7/31/01.
- Rocky Flats Environmental Technology Site Building 371/374 Administrative Control Program Manual, 3-MAN-033-ACP-AC5.0, Revision 1, dated 5/8/00.
- Rocky Flats Environmental Technology Site, Site Documents Requirements Manual, MAN-001-SDRM, Revision 4, dated 6/1/01.
- Rocky Flats Environmental Technology Site, Integrated Work Control Package Number T0108164, Install New Simplex Computers in B115 and B121.
- Rocky Flats Environmental Technology Site, Integrated Work Control Package Number T0107059, Upgrade Site Simplex Network Cards and Operating System.

Personnel Interviewed:

- Building 371 Utilities Manager
- Building 371 Data Acquisition and Control System Administrator
- Building 371 Stationary Operating Engineer
- Building 371 Compliance Tracking Coordinator
- Building 371 Quality Assurance Engineer
- Senior Principal Engineer (Fire Protection)
- Fire Protection Engineer
- K-H Business Applications Manager
- K-H Quality Program Manager
- K-H Technical Specialist

Operations Observed:

None

Results:

Record Review:
The Fire Detection/Suppression system for Building 371 utilizes a software system called Simplex, that is a commercial off-the shelf product manufactured by Graphic Command Center in Gardner, Massachusetts. The software has been independently tested by Underwriters Laboratory (UL) and received UL certification. Installation of this software began in 1999 and it has undergone several upgrades since that time. Quality Assurance (QA) requirements applicable to software are documented in the Site Quality Assurance Program Manual and the Computer Software Management Manual. The Site Engineering Process and the Integrated Work Control Program (IWCP) control configuration changes to the Simplex software system. The Configuration Management requirements detailed in the IWCP include Software identification, version control, and evidence of evaluation, and approval.

During this assessment a review was performed on two Integrated Work Control Packages (IWCP), the details are as follows: Work Package Number T0108164, Install new Simplex Computers in FDC and SFDC (B115/121) originated on October 30, 2001. The purpose of this IWCP was to install new Simplex computers in the Fire Dispatch Center and Secondary Dispatch Center due to aging equipment that is not replaceable. This work package also included the removal of the software from the old computers and reinstalling it on the new Simplex computers. The required Engineering, IWCP and other reviews and approvals were obtained prior to starting work. The work package task instructions were very thorough and included a work package task to prepare a "mock-up" of new Simplex Computer equipment and verify operability of equipment prior to new installation. Hold points, requiring post work testing prior to starting the next task, were placed after each major task had been completed. The final post work testing was successfully completed on December 18, 2001.

Work Package Number T0107059, Upgrade Site Simplex Network Cards and Operating System, originated on June 20, 2001. The purpose of this IWCP was to install new Simplex executive software on the graphic command center (GCC) computers and new firmware in the Fire Alarm Control Panels (FACP) to allow new nodes to be added or deleted without impacting the remaining FACPs. This upgrade will eliminate intermittent communication problems in the Simplex Fire Alarm System. The required Engineering, IWCP and other reviews and approvals were obtained prior to starting work. The work package task instructions were very specific and included the appropriate level of detail to upgrade all 7 Building 371/374 Fire Protection Nodes. The work package also included a task to load the latest database and hardware changes on the Simplex "mock-up" system to verify their operation. Testing of each Building 371/374 Node was performed after completion of the task. The final Post Testing of all Nodes was completed on August 17, 2001. The

action corrected a deficiency noted by the Phase I assessment of the fire protection systems in Building 371.

Two Fire Protection Engineers are currently assigned to plan, coordinate and perform data point, alarm initiation and hardware changes for the Simplex system. They displayed a high degree of professionalism and provide adequate assurance that an appropriate degree of independence exists for Software QA functions. Operational problems with the Simplex system are documented and screened in the Occurrence Reporting Process and reported as required. If necessary, corrective actions are scheduled to resolve the operational problems.

Interviews:
Interviews were conducted with three Site and Building 371 Fire Protection Engineers and additional Building 371 operations personnel. During the interviews a brief overview of the Simplex operation and change control process was discussed. The Simplex system was procured and installed on Site as proprietary equipment and Site personnel do not have the ability to make code changes to modify the functionality of the software. The manufacturer can only make software-programming changes to this equipment. The Site fire protection/detection system architecture is an electronic loop that is established with a series of data points attached. If a fire detection/suppression problem occurs, the data points interrupt the electronic circuit and a combination of audio and electronic alarms are initiated. Data points and the series of alarms to be initiated are defined to the Simplex system through tables created by the Building 371 Fire Protection Engineers and are entered as changes to the Simplex system. The changes the Fire Protection engineers perform do not alter the manufacture's proprietary Simplex programming.

The Fire Protection Engineers are highly experienced, trained and qualified to make periodic configuration changes, trouble shoot and repair the Simplex system if necessary. They have been associated with the Site Fire Protection Organization for a collective 37 years. The Site and facility personnel interviewed were aware of the QA requirements in the Site Quality Assurance Program Manual, MAN-131-QAPM, Revision 1, dated 11/01/01. Additional software configuration change controls and QA requirements are applied using the Engineering Design Process documented in the Site Engineering Process Procedure, 1-V51-COEM-DES-210. The Site Engineering and Design process includes requirements to identify required document changes, perform walk downs and control field changes. Engineering design reviews are performed that are formal, thorough, and involve the necessary disciplines. An engineering calculation is also prepared that will review change objectives, methods and provide an assumptions and technical basis for the change. An Integrated Work Control Package (IWCP) is issued as required by the Site Integrated Work Control Program Manual, MAN-071-IWCP, to control the work for the Software change. The IWCP controls the fieldwork for the software and hardware changes, provides a list of materials required for the job, and controls post work testing for design changes and repairs. The IWCP will include specific task instructions, hold points for QA verifications and post work inspections and testing. The testing will include

100% of the software changes performed and 10% of the software that was not altered by the change to ensure system operability.

The procurement documents detailing the QA standards and controls for the acceptance of the Simplex system were not available for review during this assessment. However, extensive operational testing on the system during installation and periodic testing and the functionality of the system since 1999, provide sufficient assurance that the Simplex Software is acceptable for use and is adequately performing it's associated safety functions.

Observations:
None

Conclusion:
During this assessment it has been determined that Criteria 5, listed at the beginning of this Assessment Form, has been met. The Simplex software used in the fire detection/suppression system instrumentation and control components are subject to rigorous Quality Assurance Requirements documented in the Site Software Management Manual which is based on ASME/NQA-1, 1994 Edition, Subpart 2.7, Quality Assurance Requirements of Computer Software for Nuclear Facility Applications. The software was thoroughly tested after installation in mid-1999 and has been operating efficiently and effectively since that time. Changes to the software have been formally documented, evaluated and approved using the Site engineering process under the Site Engineering Process Procedure, 1-V51-COEM-DES-210. As detailed earlier in this report, extensive testing is performed after a change has been completed to ensure proper operability of the Simplex software. Testing is also performed on all components of the simplex system during scheduled surveillances to ensure operability, reliability and functionality.

Operability Issues/Concerns:
None

Opportunities for Improvement:
None

Good Practices:
N/A

Assessment Form

DNFSB Recommendation 2000-2 Phase II Assessment

Building 371 Fire Detection/Suppression System

Topic Area: System Maintenance	**Criteria Met?**	
	Yes X	**No**

Objective

The fire detection/suppression systems are maintained in a condition that ensures their integrity, operability and reliability.

Criteria

1. Maintenance processes consistent with the Fire Detection/Suppression systems safety classification are in place for prescribed corrective, preventive, and predictive maintenance, and to manage the maintenance backlog.

2. The Fire Detection/Suppression systems are periodically walked down in accordance with maintenance requirements to assess their material condition.

Approach

Record Review:

1-1 Verify that maintenance for the fire detection/suppression systems 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. Therefore these will be assessed only once during this assessment.

1-2 Evaluate maintenance of aging fire detection/suppression 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 fire detection/suppression systems are inspected periodically according to maintenance requirements.

2-3 Review fire detection/suppression system/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.

2-4a Review the procedure and process for performing walk downs of the fire detection/ suppression systems.

Interviews:

2-4b Verify through manager and worker interviews that personnel performing walk downs understands operational features, safety requirements and performance criteria for the system.

Observations:

2-2 On a sample basis perform a walkdown inspection of the fire detection/suppression systems 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.

Criterion 1: Maintenance processes consistent with the Fire Detection/Suppression systems safety classification are in place for prescribed corrective, preventive, and predictive maintenance, and to manage the maintenance backlog.

Process

Records Reviewed:

- Sprinkler drawing 25115-0707-01A
- PMO M* 424003 Preventive Maintenance Inspection of Clayton Deluge Valves, Sitewide
- PMO MM 424003 Annual Cleaning of Clayton Deluge Strainers
- Bldg. 371/374 System Evaluation Report; Chapters 9 & 10 including sketches & Fire Protection SC3 Credited Compliance Matrix.
- Work Packages:
  - TO106547 Removal of Overheat Detectors in Rm. 3408
  - TO107011 Replace Sprinkler Heads Zones 16/17 Basement Rm. 2107
  - TO107790 Remove and Replace Sprinkler Heads, Rm. 5101
  - TO108298 TS&R Smoke Detector in Room 2128
- LCO Compliance Tracking Forms for surveillance PRO-270-FD-371-PLEN: Semiannual 2/4/02; Annual 8/16/01
- Fire Prevention Violation Summary Report 2/22/02
- RFETS Fire Protection System Impairment List, 2/22/02
- MAN-129-FPPM, Fire Protection Program Manual, 1/7/02
- Fire Hazard Analysis
- Surveillance procedure PRO-270-FD-371-PLEN, Annual and Semi-annual inspection/test of deluge sprinkler system, plenum 241 configuration.

Personnel Interviewed:

- ISS Sprinkler Technician (2)
- Project Team Lead For D&D (Maintenance Supervisor)
- Project Fire Protection Engineer
- Project Electrical Engineer
- Project Chief Engineer
- Project Configuration Control Authority
- DOE Facility Representative
- ARCIE Forman (fire alarm panels)
- ISS Supervisor & Impairments Coordinator

Operations Observed:

A general material condition walk through of both plenum deluge systems' configurations including the Nitrogen pressurized water tank and appurtenances.

A walk through starting at the exterior water supply Post Indicating Valve to the B Riser in Rm. 3585 including riser appurtenances was performed. Spot observations of sprinkler distribution piping and heads.

A walk through was conducted tracing the electrical circuitry from a Fire Alarm Control Panel to the Building feed into electrical switchgear Room. 3581 including backup power supply turbine generator in Room 3583.

A surveillance simulation IAW PRO-270-FD-371-PLEN.

Results:

Record Review:
The maintenance of fire protection systems is tied to six initiating activities/events: surveillances, fire prevention inspections, fire protection engineer determinations, site fire protection program, Preventative Maintenance Orders, and catastrophic failure. Maintenance actions are performed under minor maintenance orders as applicable, but primarily via a formal work package process typically being initiated by the Configuration Control Authority (CCA). Interviews and document reviews verified that development and approval of work packages involves all cognizant parties including those external to the Project such as ISS. The "responsible manager", Chief Engineer, and Facility Manager are the key integrators with the fire protection engineer as the common denominator. Work packages require walk down of affected systems to ensure configuration accurateness of the package. While participants/reviewers have the opportunity for input, Management establishes the priority for maintenance actions with the given that those tied to AB documents happen and within time requirements. A driving benchmark is maintenance of the systems to the level where there are no impairments to the ability to operate or be tested.

The conduct of surveillances is tracked under the Maintenance Management System by the Preventative Maintenance Coordinator who ensures schedules are maintained and initiates a delinquency should any slip beyond the specified grace period. Surveillance technicians must clear with the CCA to start, immediately notify the CCA of impairments, and have the CCA sign off upon completion which includes formal notification of all discrepancies. The project has been demonstrating an excellent record of impairment abatement with the records showing no open Priority A impairments, no recent history (readily available records Oct.-Feb.) of any open over 30 days, and only one A in the Dec.-Feb. period which was closed the same week as opened. There are sixteen entries on the Impairment Deficiency List. However, approximately half of these represent paperwork catch up for systems/components permanently removed from service, entered for a planned outage, or having been abated. The remainder are Category D Impairments in various stages of being addressed that do not impair the ability of the systems to operate or be tested.

Fire prevention inspection violations are reported to the CCA for action initiation upon completion of a visit. These are typically abated under minor maintenance with

FPE involvement if issues are raised by the "responsible manager". Again the recent history of Project responsiveness is excellent with only one violation for B371 appearing on the 2/22 tracking list, being an electrical panel clearance item opened 2/11. Most probably this was handled as an on-the-spot abatement and is in paperwork catch up status.

The Project fire protection engineer, in conjunction with coworkers such as the Facility Manager and Maintenance Manager, identifies fire protection maintenance items in the course of performance of his job. This requires sensitivity to recognition of problem indicators based on knowledge of system operation and experiencing events over time. A current example is the repair/replacement of wet pipe sprinkler riser retard chambers as outages occur or are otherwise scheduled. The problem was identified as a result of false alarms with follow up evaluation determining component aging problems with the retard chambers. The Simplex fire alarm panel upgrade of a couple years ago also resulted from the determination that selected panels would not function to closure and replacement was initiated.

The Site Fire Protection Program (FPP) establishes programmatic requirements with a related example being it is the driver, under the Fire Protection Program Manual Chapter 3, Section 4, for the Fire Protection System Impairments and Deficiencies program which classifies and tracks impairments under surveillance and planned outage activities. In addition, the FPP identifies issues such as the recent sprinkler head manufacturers' recalls and attention to prescribed preventative maintenance such as NFPA code requirements for sprinkler heads reaching specified in-service ages. Building 371 has shown responsiveness to FPP issues with the current example being the replacement of recalled sprinkler heads which to date numbers several hundred. This is a meticulously planned project encompassing such factors as: areas most impacted by a spurious discharge, contamination spread, accessibility, and ALARA for pipe fitters. Also under this program are sitewide PMOs such as PMO M*424003 listed above. Predictive maintenance includes replacement of fire alarm control panel batteries when a surveillance notes them as being between 3.5 and 4 years old; in excess of 4 years generates an "impairment", initiating immediate abatement action.

The Project also performs building specific PMOs such as the one for cleaning and flushing of deluge system strainers listed in the preceding document list. Adequate manufactures' technical information is available to perform work, either via locally accessible tech manuals or using Internet resources.

An example of catastrophic failure induced maintenance was exemplified a few months ago when the underground water supply feed to a sprinkler riser ruptured. In addition to the AB requirements of operations' suspensions and compensatory measures, the Project reacted with immediate permanent repair actions.

The carbon dioxide flooding extinguishing system for the turbine generator (TGEN) was placed out of service several years ago under a DOE wide reactive safety

initiative. The detection portion of the system has remained in service to detect and transmit an alarm of fire within the unit. There has been considerable dialogue on the topic of the requirement for the turbine generator and an internal extinguishing system. There is agreement that the TGEN is credited as a defense-in-depth installation with subsequently no nuclear safety calculation required relative to an internal fire suppression system. Parties agree on maintaining the detection system as a good fire protection practice based on being there and being operable. Protection for the host facility is provided by the room overhead automatic sprinkler system. While the FHA provided for the team's review supports these positions, it does not provide sufficient detail to warrant the system remaining out-of-service under the site Fire Protection Program. Details that are needed include maximum possible fire loss (MPFL) calculations that demonstrate the lack of a CO_2 system will not exceed DOE loss criteria.

Interviews:
See Records section above.

Observations:
See Records section above.

Conclusion:
Adequate processes for maintenance of fire detection/suppression systems are in place and are followed.

Operability Issues/Concerns:
None

Opportunity for Improvement:

- The B371 Fire Hazards Analysis (FHA) needs to include an appropriate discussion of the basis for removal of the Turbine Generator (TGEN) CO_2 system. Also the FHA should be updated to reflect the retention and maintenance of the TGEN fire detection system as a fire protection good practice.

Good Practices:
N/A

Criterion 2: The Fire Detection/Suppression systems are periodically walked down in accordance with maintenance requirements to assess their material condition.

Process:

Records Reviewed:
See Criterion 1 above

Personnel Interviewed:
See Criterion 1 above

Operations Observed:
See Criterion 1 above

Results:

Record Review:
"Maintenance" for the purpose of this report encompasses scheduled system servicing/component replacement, and response to conditions identified by such programs as surveillances and manufacturer recalls. The detection/suppression systems are not periodically "walked down" as a function of maintenance requirements. Scheduled walk downs are conducted of water suppression systems during surveillances discussed under the System Surveillance and Testing Topic Area of this report. Walk downs are conducted as a requirement of work package preparation as discussed under Criteria 1. In addition, building experienced electricians, pipe fitters and engineers make informal observations in their conduct of business movement throughout the building. The Assessment Team walk down did not reveal observable evidence of poor or necessary maintenance (a surveillance discrepancy addressed under the System Surveillance and Testing Topic Area of this report was observed). Systems appeared in good condition with document reviews and interviews supporting this observation. The Team walk down of the electrical power routing to a fire alarm control panel was notable with panels clearly labeled and conduits tagged leading to the next panel in series. Breaker panel door mounted index cards were legible and concise to identify breaker functions. An interview revealed that a building wide program had been conducted to clearly and accurately tag, label and mark electrical circuits/components.

Conclusion:
This Criterion is determined to be adequately met. System walkdowns are occurring during prescribed surveillance activities, and the material condition observed during the assessment team walkdowns was noted to be good.

Operability Issues/Concerns:
None

Opportunity for Improvement:
None

Best Practices:
N/A

Assessment Form

DNFSB Recommendation 2000-2 Phase II Assessment

Building 371 Fire Detection/Suppression System

Topic Area: System Surveillance and Testing	**Criteria Met?**	
	Yes X	**No**

Objective

Surveillance and testing of the fire detection/suppression systems demonstrates that they are capable of accomplishing their safety functions and continue 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

Record Review:

1-1 Identify the acceptance criteria from the surveillance test procedures used to verify that the fire detection/suppression systems are capable of performing their 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.

2-1a Review surveillance and testing procedures for the fire detection/suppression systems' major components. Review a sample of the test results 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.

Interviews: Performed during walkthrough

Observations:

2-1b Perform a walkthrough of the surveillance test procedure for one of the Fire Detection/ Suppression systems' major components with appropriate facility personnel and in conjunction with the record review 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

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

Process

Records Reviewed:

- PRO-270-FD-371-PLEN, Building 371 LCO Filter Plenum Heat Detection Surveillance
- PRO-163-FD-371-SPR, Building 371 Sprinkler System Surveillance

Personnel Interviewed:

- ISS Technician
- ISS Technician
- ISS Supervisor/Impairment Coordinator
- Project Fire Protection Engineer

Operations Observed:

Team members witnessed a performance of PRO-270-FD-371-PLEN, Building 371 LCO Filter Plenum Heat Detection Surveillance, to ensure the procedure demonstrates that the plenum deluge system will perform its intended safety function. The ISS personnel, did not actually perform the surveillance, but explained each step in the procedure in the field, as they would normally perform the surveillance procedure. The fire alarm panel was opened, calibrated equipment was in place however the configuration of the valves was not changed or was the computer based Simplex fire alarm panel accessed via their pass code.

Results:

Record Review:

The team reviewed the above referenced procedures and concluded that the procedures are sufficient to ensure operability of the plenum deluge system and the Building 371 sprinkler system. The necessary Limiting Condition for Operation (LCO) and NFPA code required criteria are tested to ensure the safety function of the valve is demonstrated. For example, the plenum deluge surveillance acceptance criteria for the valves includes the following major attributes:

- Visual inspection of all fire detection devices,
- Performance test of all fire detection devices,
- Validation of the operation of all deluge solenoids (two per valve),
- Validation that the deluge valve "trips" upon activation of the appropriate fire detection device,
- Proper orientation of the deluge controlling valves,
- Proper alarm notification at the Central Alarm Station (Fire Department),
- Proper supervisory alarm notification at the Central Alarm Station,
- Visual inspection of the fire alarm control panel

Interviews:
Three ISS personnel were interviewed. The Supervisor/Impairment Coordinator for ISS, and two ISS technicians.

The Project Fire Protection Engineer was also interviewed in regards to these procedures.

See Observations discussion below for results of interviews.

Observations:
During the interview with the ISS Supervisor/Impairment Coordinator, it was very clear to the team that he was aware of the National Fire Protection Association Code (NFPA) and Authorization Basis (AB) related requirements of the procedures to ensure operability of the deluge valves. He also recognized the limitations with the existing drawings and explained how he worked with his own drawings and through field walkdowns.

The ISS technicians were also very clear on the performance of the deluge procedure and how it ensures operability of the deluge fire suppression system. They were knowledgeable on the operation of the valve and what safety functions each section of the procedure was ensuring.

The Project Fire Protection Engineer was very familiar with this procedure and stated that he had reviewed it prior to it becoming final. He stated that his review ensured that the procedure would demonstrate the overall system reliability and operability and it was clearly linked to the technical safety basis and the criteria in the applicable NFPA Code. He further stated that experience has shown that the procedure works properly and that the identification of the various LCO criteria is very clear in the procedure and to the CCA.

Although not part of the plenum deluge procedure being observed, it was noted by the team that nitrogen controlling valves for the nitrogen supplies and the controlling valves to low pressure supervisory switches to the two pressure tanks were not locked in the open position. To improve the overall system reliability it is recommended that these controlling valves be locked in the open position and verified during the performance of the surveillance procedure(s).

Conclusion:
Facility surveillance procedures are sufficient to demonstrate operability of the fire detection and suppression systems. The procedures clearly define those safety functions that are linked to the technical safety basis and to the Code required functions.

Operability Issues/Concerns
None

Opportunities for Improvement:

- The Assessment team observed that nitrogen controlling valves for the nitrogen supplies and the controlling valves to low pressure supervisory switches to the two pressure tanks were not locked in the open position. To improve overall system reliability it is recommended that these controlling valves be locked in the open position and verified during the performance of the surveillance procedure(s).

Good Practices:

- The facility Fire Protection Engineer is fully integrated into the Project, and is providing value-added input to nearly all facets of the Project fire protection program.

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

Process:

Records Reviewed:

- PRO-270-FD-371-PLEN, Building 371 LCO Filter Plenum Heat Detector Surveillance
- PRO-163-FD-371-SPR, Building 371 Sprinkler System Surveillance

Personnel Interviewed:

- ISS Technician
- ISS Technician
- ISS Supervisor/Impairment Coordinator
- Project Fire Protection Engineer

Operations Observed:

Team members witnessed a performance of the above referenced procedure to ensure the procedure demonstrates that the plenum deluge system will perform its intended safety function. The ISS personnel did not actually perform the surveillance, but explained each step in the procedure in the field, as they would normally perform the surveillance procedure. The fire alarm panel was opened, calibrated equipment was in place however the configuration of the valves was not changed or was the computer based Simplex fire alarm panel accessed via their pass code.

General facility walkdowns were also performed to assess the general material condition of the facility.

Results:

Record Review:

The ISS personnel were very knowledgeable with the above referenced procedure. They also conducted a very detailed pre-evolution brief for the procedure. The pre-evolution brief and the procedure were very clear on the limits, precautions, system and test prerequisite conditions, data required and the acceptance criteria. They were familiar with all specific facility safety requirements and were aware of the limitations and requirements of the RWP for the procedure. This was evidenced by the fact they were fully aware that they could not perform any work above 8 feet in the facility. This knowledge was brought-out during the team's walkdown of the pressure tank and the team's attempt on confirming the presence of no counterfeit bolts on the system. In order to observe the bolts a stepladder had to be utilized. The ISS personnel advised the team of the restrictions within the RWP and performed the inspection of the bolts within the criteria of the RWP. This situation also demonstrated compliance to COOP.

Interviews:
Three ISS personnel were interviewed; the Supervisor/Impairment Coordinator for ISS, and two technicians with ISS. During the interview with the Supervisor/Impairment Coordinator, it was very clear to the team that he was aware of the NFPA and AB related requirements of the procedures. He also recognized the limitations with the existing drawings and explained how he worked with his own drawings and through field walkdowns.

The ISS technicians were very clear that they only perform work to the approved procedure. This was validated within the pre-evolution brief and also within the surveillance procedure itself in regards to the requirement to notify the CCA of any deficiencies discovered while performing the procedure. It was very evident to the team that the ISS personnel have an in-depth knowledge of the workings of this procedure. This was demonstrated during the walkdown of the procedure with the team.

Observations:
The team witnessed a mock performance of the above referenced procedure and concluded that this surveillance procedure produces valid results. The performance of the procedure ensures the system meets its system requirements. This surveillance is for the newly installed UL listed deluge valves (installed as part of the DNFSB 94-3 effort) and consequently they are more than sufficient for the facility mission life-cycle. The procedure clearly provides measurable operability results.

The surveillance technicians were very knowledgeable to the procedure and were able to satisfactorily perform the test. The technicians were also very well informed on what attributes of the procedure related to LCO conditions. All appropriate data for the surveillance was included and recorded within the procedure. The procedure allows for the documentation of deficiencies encountered during its performance. The procedure also requires the immediate notification to the CCA of any deficiencies. The CCA is required to review the results of the surveillance and then sign-off on the procedure prior the technicians leaving the facility.

During the team walkdowns, several sprinkler heads were noted to be incorrectly oriented. Upon further investigation a total of five sprinkler heads were found to be incorrectly orientated in room 2310. The Project Fire Protection Engineer took immediate compensatory actions with the CCA and terminated operations in room 2310. The facility then conducted a complete surveillance of the facility and discovered a total of eight sprinkler heads incorrectly installed. The Kaiser-Hill Chief Engineer advised all projects of this discovery and requested each project to survey their facilities to check for similar sprinkler head issues. Results of this review have indicated limited sprinkler head problems and appropriate actions are being taken. Review of PRO-163-FD-371-SPR, Building 371 Sprinkler System Surveillance, indicated that inspection of sprinkler heads, including orientation (Section 9, step [5]), is required on an annual basis and that the surveillance personnel had inadequately performed this surveillance.

Conclusion:
Through a review and walkdown of Pro-270-FD-371-PLEN, Rev 0, Building 371 LCO Filter Plenum Heat Detector Supv., the team concluded that the procedure as written and as performed ensures operability of the plenum deluge suppression systems.

Deficiencies were noted in performance of the annual sprinkler system inspection with regards to detection of miss-oriented sprinkler heads. Although this situation is being addressed as an operability issue, the overall operation of the sprinkler system was not challenged for the following reasons:

- The miss-oriented sprinkler heads will still provide a timely flow alarm to the on-site fire department;
- Only a small percentage of the sprinkler heads in the facility were affected (proven during the subsequent walkdown);
- The miss-oriented sprinkler heads will still provide water for cooling the hot gasses from the fire and will also still provide limited extinguishment; and
- The timely action to suspend operations in the affected area and quick replacement of the miss-oriented sprinkler heads by the facility.

Operability Issues/Concerns

- The performance of the annual sprinkler surveillance failed to identify miss-orientation of a small number of sprinkler heads. Proper orientation is required to assure spray pattern adequacy. Sprinkler flow is not affected.

Opportunities for Improvement:
None

Good Practices:
See the item under Criterion Number 1.

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

Process

Records Reviewed:

- Pro-270-FD-371-PLEN, Rev 0, Building 371 LCO Filter Plenum Heat Detector Surveillance

Personnel Interviewed:

- ISS Technician
- ISS Technician
- ISS Supervisor/Impairment Coordinator
- Project Fire Protection Engineer

Operations Observed:

Team members witnessed a performance of the above referenced procedure to ensure the procedure requires the utilization of calibrated instrumentation and measurement equipment.

Results:

Record Review:

Pro-270-FD-371-PLEN, Rev 0, Building 371 LCO Filter Plenum Heat Detector Surveillance was reviewed and it contains a clear requirement to validate the operability of the plenum fire suppression system with calibrated equipment. The procedure validates the calibration number and date of calibration for all necessary water gauges and for the stop watches used to time certain attributes of the test.

Interviews:

Three ISS personnel were interviewed; the Supervisor/Impairment Coordinator for ISS, and two technicians with ISS. During the interview with the Supervisor/ Impairment Coordinator, it was very clear to the team that he was aware of the use of calibrated equipment. He explained that one person in his organization is responsible for the maintenance of the calibrated test equipment. He further explained that the water gauge calibration is the responsibility of the facility. Interviews with facility personnel confirmed their responsibility for this aspect of the calibration program.

The ISS technicians were also very clear that they only perform work to the approved procedure. This was validated within the pre-evolution brief and also within the surveillance procedure it's self in regards to the requirement to notify the CCA of any deficiencies discovered while performing the procedure. It was obvious to the team that the ISS personnel have an in-depth knowledge of the workings of this procedure. This was demonstrated during the walkdown of the procedure with the team.

Observations:
The team verified the following during the walkdown of the procedure with regards to the calibration of the instrumentation and test equipment:

- All water gauges utilized for the procedure were properly calibrated and within the calibration test interval (12 months),
- The stopwatch used for the surveillance was calibrated and within the calibration tests interval, calibration ID RF095472, good until: 3/02.
- The procedure properly documents the above calibration information.

Calibration of gauges and other items was checked during the general facility walkdowns. No deficiencies were noted; all equipment inspected was noted to have current calibration stickers.

Conclusion:
The team has concluded that the surveillance and test procedures and records that were reviewed the test equipment used for testing was calibrated. No deficiencies regarding calibrated equipment were noted during facility walkdowns.

Operability Issues/Concerns
None

Opportunities for Improvement:
None

Good Practices:
See item under Criterion Number 1.

APPENDIX B

BIOGRAPHIES OF TEAM MEMBERS

Michael S. Karol
Mike Karol graduated from the University of Arizona after earning a Bachelors and Masters degree in Nuclear Engineering. Mr. Karol served in the Naval Nuclear Propulsion Program as a member of the submarine service. After joining the Department of Energy (DOE) in 1976, Mr. Karol spearheaded the first DOE "Operational Readiness Review Program" at the Hanford Site in Hanford, Washington. He lectured on readiness reviews at the first training course on readiness reviews by EG&G (sponsored by DOE-HQ) for approximately three years. He was also principle author of the first DOE Readiness Review Guidance Document (completed 1982, issued 1987) by DOE HQ ES&H. Mr. Karol joined the Rocky Flats Field Office in 1989 and served in various positions including Assistant Manager for Site Operations, Assistant Manager for Site Operations and Waste Management, and Assistant Manager for Project Management and Engineering until late 1995. Mr. Karol is currently the Division Director for Engineering Support. Mr. Karol's career also includes chairmanship of several Type A and B accident investigations in the DOE complex, lead negotiator for a major lawsuit against DOE in Colorado District Court, and Chairman of a DOE investigation team responding to whistleblower allegations regarding safety, safeguards, design control and quality assurance at Hanford that received scrutiny from Congressman Dingell's congressional investigation sub-committee. More recently, Mr. Karol led the successful Operational Readiness Review of the Plutonium Stabilization and Packaging System in Building 371.

Daniel C. Ford
Daniel Ford is a President of Ford Consulting Group, Inc., and currently serves as Senior Technical Consultant with over twenty-four years of experience in nuclear facilities engineering, safety management and regulatory oversight. Mr. Ford served as senior level consultant to the United States Nuclear Regulatory Commission (NRC) for eleven years and has testified as an expert witness on behalf of the NRC during several Atomic Safety & Licensing Board hearings. His experience includes three years as technical advisor to the Department of Energy's Office of Nuclear Safety in the areas of event analysis, authorization basis, and nuclear safety oversight. At Rocky Flats for six years, he assisted the DOE Field Office in the areas of facility and process authorization basis, engineering, internal assessment, and coordinated Field Office initiatives in response to Defense Nuclear Facility Safety Board recommendations. Mr. Ford holds American National Standards Institute (ANSI) nuclear systems inspection and testing certifications in the areas of electrical power and instrumentation and control systems, and an American Society for Quality Control (ASQC) Quality Engineering certificate.

Mr. Ford's formal assessment experience includes participation in nuclear safety assessment of over forty commercial license holders while serving a consultant to the NRC, and assisting the NRC in development of assessment programs for examination of plant licensing, design, installation, maintenance, inspection and testing programs. While with the Office of Nuclear Safety Mr. Ford participated in several Operational Readiness Reviews including the High Level Tank Draining evolution at RFETS Building 771, resumption activities in RFETS Building 707, and review of nuclear operations at Savannah River, Oak Ridge and Pantex facilities.

Jan K. Fretthold
Mr. Fretthold is a Subject Matter Expert (SME) on HEPA filters and HEPA filter exhaust/supply systems. He was a design engineer at DOE / Rocky Flats Environmental Technology Site for 17 years, Manager of In-place Testing 2 years, and Manger of DOE Central Div. Filter Test Facility RFP for 2-years. He is experienced in mechanical design engineering including machine design, hydraulics, pneumatics, material handling, conveyors, HVAC, and dust collection. Mr. Fretthold has also been an active member of the ASME / COMMITTEE ON NUCLEAR AIR AND GAS TREATMENT (CONAGT) In the following groups and subcommittees:

- Task Group on Aging of HEPA Filters
- CBO Task Group on Decommissioning
- Subcommittee on Field Testing Procedure (ASME N–510)
- Subcommittee on Ventilation and Air Cleaning Equipment
- Subgroup on HEPA Filters
- Subgroup on Special HEPA Filters – Chair
- Subgroup on Moisture Separators

Mr. Fretthold participated in the development of the "Assessment Criteria and Guidelines To Ascertain the Current Condition of Confinement Ventilation Systems In Defense Nuclear Facilities" document for conducting the Phase II assessments on confinement ventilation systems. He was a team member on the two pilot Phase II assessments at Savannah River Site and the Lawrence Livermore National Laboratory and was also a team member of a Phase II assessment the confinement ventilation system for the Plutonium Finishing Plant facility at Hanford.

Jeff Fauble
Mr. Fauble is a mechanical engineer at the Rocky Flats Environmental Technology Site (RFETS) and has nearly 20 years of science and engineering experience, 12 of which at Rocky Flats. He has Bachelors of Science degrees in Geology and Geophysics from the University of Utah and a Masters of Science Degree in Mechanical Engineering from the University of Colorado. He attained his Professional Engineer's License in 1998. Mr. Fauble has specialized in design and systems engineering and has extensive experience in chemical process design, environmental design, mechanical equipment design, nuclear ventilation systems, facility design, field engineering, and construction engineering within the DOE nuclear complex. He has held positions of increasing responsibility including design engineer, project engineer, lead engineer, and first and second level management positions.

Robert Williams
Mr. Williams received a BS degree in Fire Protection Engineering from the University of Maryland in 1965. The following two years were spent with the District of Columbia Fire Department with assignments as a firefighter and fire prevention inspector. He was employed as a fire protection engineer with the shore facilities command of the Department of the Navy for five years after which I became the operations fire protection engineer for Pennsylvania Power and Light Company, a position held for seven years.

He returned to the Navy Department in 1979 in the staff position of Assistant Director of Fire Protection for the Navy. He transferred to the Naval Sea Systems Command in 1985 as a supervisory fire protection engineer for navy ships. He accepted the DOE-RFFO fire protection engineer position in October 2000. During the above years, he has completed numerous fire-related courses at training and college levels. He was a state firefighting training instructor in Pennsylvania and Maryland, taught a fire science course at community college, and served on fire-related commissions and advisory boards. He served on two Codes/Standards Committees of the National Fire Protection Association. He has been an auxiliary firefighter in Baltimore City and an active member of three volunteer fire departments, serving as Chief of the College Park Maryland Department. He is a registered Professional Engineer in the States of Maryland and Pennsylvania and a member of the local chapter of The Society of Fire Protection Engineers.

Bruce Campbell
Mr. Campbell is a Senior Fire Protection Engineer with over 24 years of fire protection engineering experience of which 16 years are in the nuclear field. He is the Director of the Denver Office for Hughes Associates, Inc. and is a subcontractor to Kaiser-Hill. His experience also includes over 8 years as a senior loss control engineer for a highly protected risk insurance carrier where he conducted surveys of large industrial facilities. These industrial facilities included fully integrated steel mills, chemical facilities, aircraft hangers, etc.

At the Rocky Flats Environmental Technology Site (REETS), Mr. Campbell has been involved will all aspects of the fire protection program for his entire tenure. He assisted with all operational readiness reviews prior to the D&D mission for the site. Presently he is the contractor Authority Having Jurisdiction in all matters relating to fire protection. Mr. Campbell is a charter member of the DOE Fire Safety Committee and was active in the preparation of several complex-wide fire protection standards including DOE Order 5480.7A, fire protection for gloveboxes and fire protection for filter plenums. He has presented a number of papers on various fire protection subjects at national and international conferences. In addition to his duties as the Fire Protection Programs Manager, Mr. Campbell is the Subject Matter Expert for HSP 31.11, Transfer and Storage of Plutonium for Fire Safety and HSP 31.15, Control of Generated Flammable Gas.

Bill Prymak
Mr. Prymak is an engineering expert in the RFFO Engineering Support Division and has nearly 20 years of nuclear and radioactive waste management experience, 12 of which at Rocky Flats. He has a Bachelors of Science degree in Chemical and Petroleum Refining Engineering and a Masters of Science Degree in Ecological Engineering, both from the Colorado School of Mines. He has extensive experience in nuclear operations including being a qualified watch officer a nuclear submarine for 2 years, a Shift Refueling Engineer at the Charleston Naval Shipyard for 2 years and a DOE Facility Representative in Buildings 771 and 707 for 2 years. He has completed the Technical Qualification Program in the functional area of Decommissioning. He has substantial experience in radiological controls from his Navy, shipyard and Rocky Flats experiences. Mr. Prymak

was the DOE Project Manager for development and implementation of the Site Treatment Plan for mixed wastes for 3 years and has been a member of several Headquarters waste steering committees. He has completed numerous assessment courses and is qualified as a lead assessor. He currently holds the following certifications: Certified Hazardous Material Manager; and Registered Environmental Manager. He has been a member of a DOE Type A accident investigation at Rocky Flats and has served on numerous review teams. He has led numerous readiness determination oversight teams for various decommissioning activities at Rocky Flats including the Building 440 Operation Readiness Review, glovebox removal and size reduction in Building 779 and 771, and demolition of Building 779. Most recently, he was the Deputy Team Lead of the Operational Readiness Review of the Plutonium Stabilization Packaging System in Building 371.

Howard Saunders
Mr. Saunders is a registered Professional Engineer with over 30 years of engineering experience including 16 years of experience in the nuclear field with in-depth experience in structural design, architectural design, assessments, records documentation and management, project engineering, engineering group management, and engineering procedures, standards and specifications.

While at the Rocky Flats Environmental Technology Site (RFETS), Mr. Saunders has been involved in many aspects of engineering and engineering management including modifications to existing process facilities, development of the site engineering design process, manager of the Site Design Document Control group, and manager of the site structural, civil and architectural engineering groups. Mr. Saunders was also on the team that completed the pre-operational readiness review for the PuSPS project in B371 that allowed nuclear material to be placed in sealed containers for storage and shipment. Additionally, Mr. Saunders has lead assessments of several outside Architectural/Engineering Companies that have completed design and construction at RFETS.

Wayne Burch
Mr. Burch is a Quality Assurance Specialist with over twenty years of experience in Quality Assurance at Rocky Flats. He was previously employed by the Site contractor as an inspector and certifier of War Reserve weapons product in Rocky Flats production areas. He has been assigned to RFFO Quality Assurance organizations since December 1990. He has completed the Technical Qualification Program in the General Technical Base, Site Specific and functional areas for Quality Assurance Engineers and Specialists. He has participated in numerous assessments including oversight of the K-H Corporate Operations Readiness Review of Building 371 Tank Draining & Caustic Waste Treatment System Operations and the Building 707 Salt Stabilization Readiness Assessment. He also participated in the recent Engineering Review of the Plutonium Stabilization and Packaging System (PuSPS) in Building 371. He has performed independent Quality Assurance Assessments at the Site for RFFO since 1991 using various Quality Assurance standards. The standards include 10CFR830, Subpart A, Quality Assurance Requirements; DOE Order 414.1A, Quality Assurance; and

ANSI/ASME NQA-1, Quality Assurance Program Requirements for Nuclear Power Plants. He has reviewed numerous implementation and corrective action plans for RFFO and contractor Quality Programs. He has also performed Safety Management Program (Quality Assurance) reviews for the Site Safety Analysis Report, and Basis for Interim Operations (BIOs) reviews for buildings 707, 771,774,776,777 and 906.

Neil Chismar
Neil has over twenty years experience in data processing. This experience includes computer and peripheral equipment operations, tape library maintenance, and applications support. Neil has held positions in data security, email administration, and configuration management. He has experience as an Instructor in the proper use of computer software packages and has mentored/cross trained coworkers in software Quality Assurance and Quality Control methodologies.

Neil is the Education Coordinator for the Software Quality Association in Denver (SQuAD). SQuAD is a non-profit group of Software Quality professionals in Colorado that gather to network, exchange information, and support one another. SQuAD hosts certification examinations, has monthly meetings where a presentation is given, and holds a yearly vendor showcase to highlight available tools for automation of testing, configuration management, problem management, and source code management. Neil has held past positions on the Board as Vice President and Secretary, and is a founding Board member.

Neil has received the professional designation of Certified Quality Analyst from the Quality Assurance Institute. This certification indicates training in communications, auditing and control, disaster recovery, and quantitative methods. Certification also demonstrates knowledge of software Quality Management, Quality Assurance, and Quality Control methodologies.

Neil is presently the Quality Assurance Manager for DynCorp Systems & Solutions LLC at the Rocky Flats Environmental Technology Site. Responsibilities include, but are not limited to, monthly reports, participation in proposal responses, assistance and contribution to the Project Management Plan, review of documentation and work products, monitoring test activities and test plans, review of project activities for compliance, and recommending corrective actions for any errors, discrepancies, and items of non-conformance or non-compliance. Neil is responsible for audits to include reporting of reviews and results to senior management, conducting reviews and audits of subcontractor activities, auditing internal Configuration Management activities, and tracking non-conformance issues to closure. Neil was instrumental in DynCorp Systems & Solutions attaining a Software Engineering Institute Capability Maturity Model Level 3 rating in February of 2001.

John Cox
Mr. Cox has 30 years experience in engineering, management, and consulting in commercial nuclear and DOE nuclear programs. Mr. Cox has a BS in mechanical engineering and holds a DOE Q clearance. He is co-founder/owner of Phoenix

Consultants Inc., a small business, consulting firm, providing senior consulting services to DOE and DOE Contractors. Prior to this, Mr. Cox was Vice President with Tenera LP having responsibility for government services support to DOE facilities. Before joining Tenera, he had 19 years experience with Tennessee Valley Authority (TVA) in various management and engineering positions associated with their commercial nuclear power program. As the Licensing Manager, Mr. Cox represented TVA in nuclear plant (Browns Ferry, Sequoyah, Watts Bar, Bellefonte, Hartsville, and Phipps Bend) construction permit and operating license applications with NRC-NRR, Office of Inspection and Enforcement, Advisory Committee on Reactor Safeguards, and Atomic Safety and Licensing Boards. Mr. Cox has been involved in operational readiness reviews, facility/program assessments, and ESH&QA reviews at numerous DOE facilities across the DOE Complex as well as commercial nuclear power plants. Mr. Cox has supported INEEL, Hanford, Oak Ridge, Savannah River, Rocky Flats, Brookhaven National Laboratory, and Argonne East in operational readiness reviews and ESH&QA assessments (as the team lead and in support roles) and in development and implementation of compliance assurance programs for DOE Order compliance and Price-Anderson Amendments Act implementation.