	EA Enterprise Assessments	Number: EA CRAD 31-12 Revision: 1 Effective Date: 1/25/2018
Fire Protection Program Criteria and Review Approach Document		
Authorization and Approval	C.E. (Gene) Carpenter, Director, Office of Nuclear Safety and Environmental Assessments Date: 1/28/18	Lead: Rosemary Reeves Title: Nuclear Engineer Date: 1/23/2018

1.0 PURPOSE

The mission of the U.S. Department of Energy (DOE) Office of Environment, Safety and Health Assessments (EA-30) is to assess the effectiveness of safety and emergency management systems and practices used by line and contractor organizations and to provide clear, concise, rigorous, and independent evaluation reports of performance in protecting workers, the public, and the environment from the hazards associated with DOE activities.

In addition to the general independent oversight requirements and responsibilities specified in DOE Order 227.1A, *Independent Oversight Program*, this criteria and review approach document (CRAD), in part, fulfills the responsibility assigned to EA in DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*, to conduct independent assessments of high consequence activities. This CRAD specifically relates to assessments of fire protection programs under DOE Order 420.1C, *Facility Safety*, Attachment 2, Chapter II, "Fire Protection," which establishes comprehensive fire protection program requirements for DOE, including the National Nuclear Security Administration, facilities and emergency response organizations.

The CRADs are available to DOE line and contractor assessment personnel to aid them in developing effective DOE oversight, contractor self-assessment, and corrective action processes. The current revision of EA's CRADs are available at http://www.energy.gov/ea/criteria-and-review-approach-documents.

This CRAD supersedes EA CRAD 31-12, revision 0.

2.0 APPLICABILITY

The following CRAD is approved for use by the Office of Nuclear Safety and Environmental Assessments.

3.0 FEEDBACK

Comments and suggestions for improvements on this CRAD can be directed to the Director, Office of Environment, Safety and Health Assessments.

4.0 CRITERIA AND REVIEW APPROACH

The review of contractor fire protection programs (FPP) will evaluate the effectiveness of fire protection programs and processes, the integration of the fire hazards analysis (FHA) with the Documented Safety Analysis (DSA), and implementation of engineered design features, operations, emergency response, surveillance testing, maintenance, fire hazard analysis and assessments, and wildland fire management. The review will also evaluate acceptable methods and any alternate approach for implementing DOE O 420.1C, Attachment 2, Chapter II, as provided in DOE-STD-1066-2016, *Fire Protection* (DOE O 420.1C, Attachment 2, Chapter II, 3.h). This fire protection CRAD is separated into the following major assessment areas:

- Fire Protection Program
- Fire Prevention and Protection SSCs and Design Requirements
- Operations, Surveillance, Testing and Maintenance
- Contractor Self-Assessment Program
- Configuration Management

These functional areas are designed as stand-alone sections to be used in any combination based on the needs of the specific assessment.

Note: Throughout this CRAD, the revision year of referenced NFPA codes and standards has been omitted. It is up to the reviewer to verify the most current version of the NFPA codes and standards at the time of the review, and the subsequent requirements, as applicable to the site contractor within the context of the specific contractual agreement(s) for each DOE site and facility.

OBJECTIVES

4.1 Fire Protection Program

FP.1: Site contractor line management has established requirements for comprehensive FPPs in DOE facilities and emergency response organizations to ensure effective implementation and control of all fire protection activities. (10 CFR Part 830; 10 CFR Part 851; DOE O 420.1C, Attachment 2, Chapter II, *Fire Protection*)

Criteria:

1. Policy. The site contractor has an established Policy Statement that affirms the contractor's commitment to provide a comprehensive fire protection and emergency response program in

accordance with applicable DOE directives and other related requirements. (DOE O 420.1C, Attachment 2, Chapter II)

- Does the contractor have a policy statement that details the strategies for fire prevention measures and the level of service that will be provided for site emergency response organizations?
- Do existing contracts reflect the essential elements of a complete fire safety program, commensurate with the nature and the scope of the work encompassed by the contracts?

2. Codes and Standards. The applicable building code and National Fire Protection Association (NFPA) codes and standards are identified in the fire protection and emergency response programs. (DOE O 420.1C, Attachment 2, Chapter II; applicable codes and standards from the site-specific contract)
   - Are new facilities and significant modifications to existing facilities required to meet applicable codes and standards (e.g., International Building Code (IBC), NFPA) in effect when design criteria for electrical, fire, and life safety are approved?
   - Do notification and restoration requirements for responding to a fire alarm, supervisory, and trouble condition meet NFPA 72, *National Fire Alarm and Signaling Code*?
   - The special industrial occupancy exception for height and area limits, for hazard category 1, 2, and 3 nuclear facilities?
   - Is NFPA 70, *National Electrical Code*, correctly selected as the applicable code for electrical requirements?
   - Are conflicts between applicable NFPA requirements and the building code requirements resolved by the head of the field element?

3. FPP Programmatic Elements. A documented FPP exists as required by applicable safety criteria and includes the elements and requirements for design and operations, emergency response, fire analysis and assessments, wildland fire, and site-specific fire protection criteria. (10 CFR Part 830; 10 CFR Part 851; DOE O 420.1C, Attachment 2, Chapter II)
   - Are the elements of the fire protection engineering program established in a fire protection program manual (or equivalent documents)?
   - Is there documented evidence of training and exercises to verify mutual aid functionality?
   - Does the FPP identify approved equivalencies along with references providing the bases for such equivalencies?
   - Do safety basis accident analyses clearly identify and describe the fire protection system's credited functional requirements and are they consistent with the FHA?
   - Are procedures to implement the FHA/DSA controls adequately written, reviewed, approved, controlled, maintained, and fully performed?
   - Are documented reviews of plans, specifications, procedures, and acceptance tests conducted by a fire protection engineer?
   - Are record retention requirements to support the FPP identified and adequately implemented?
   - Is the process for developing and requesting DOE approval of fire protection equivalencies and exemptions to fire protection requirements documented and effectively implemented?
   - If the fire protection authority having jurisdiction (AHJ) is delegated to the contractor, is the level of authority documented in the FPP?
   - Where criticality safety restrictions apply, is the technical justification for the use of water for fire suppression when no alternative exists fully documented and implemented?

4. Fire Hazards Analyses (FHA) and Building Fire Protection Assessments.
   A. FHAs have been prepared for each nuclear facility and reviewed every 3 years by a fire protection engineer (FPE) and revised as appropriate. (DOE O 420.1C, Attachment 2, Chapter II)

B. FHAs have been adequately revised to accommodate changes to the facility, processes (operations), occupancy, safety basis, or BNA; or when new fire safety risks are introduced. (DOE O 420.1C, Attachment 2, Chapter II)

C. The results of the FHA have been coordinated with and integrated into the DSA. (10 CFR Part 851; DOE O 420.1C, Attachment 2, Chapter II; NFPA 801)
   - Is the fire analysis formalized and quantitative for identifying safety class and safety significant controls to prevent unmitigated dose?
   - Have safety basis credited structures, systems, and components (SSCs) been identified as preventive and/or mitigative controls, and are the performance requirements and supporting analysis documented?
   - Have controls (e.g. ventilation, containment, or drainage systems) necessary for mitigating contaminant spread or release been identified and credited appropriate to their safety level (safety class, safety significant or defense-in-depth) and functional requirements?
   - Are approved equivalencies and exemptions, along with supporting information, provided or referenced in the FHA?
   - Is the documented basis supporting equivalencies and exemptions reviewed during each FHA update to verify conditions have not changed and that the justifications remain valid?

D. Fire and related safety hazards on site (or within the facility) have been identified and evaluated in conjunction with current and comprehensive FHAs and building FPP assessments. (DOE O 420.1C, Attachment 2, Chapter II)
   - Does the FHA identify all facility radiological, biological, and chemical hazards?
   - Does the FHA specify adequate mitigation strategies including isolation, segregation, or special fire control systems?
   - Does the FHA analyze the spread paths and impacts (radiological, toxic, or biological) where smoke or contamination spread may be a special concern for the safety of the workers?
   - Have all credible fire-related failure modes been evaluated in the FHA for safety equipment, including the potential for spurious signals and fire-induced electrical faults that may cause equipment to operate in an unintended manner or trip upstream electrical equipment and are they consistent with the DSA?
   - Do the FHAs address all essential elements for a complete analysis of fire hazards as delineated in DOE O 420.1C?

E. Building Fire Protection Assessments. Facility fire protection assessments are conducted annually for facilities valued over $100 million dollars, facilities considered a high hazard, or those with vital programs; or at least every three years for low and ordinary hazard facilities; or at a frequency with appropriate justification approved by the DOE head of field element. (DOE O 420.1C, Attachment 2, Chapter II)
   - Are facility/building fire protection assessments conducted at the appropriate frequency for all high, low, and ordinary hazard facilities?
   - Are facility/building fire protection assessments performed under the supervision of a FPE?
   - Do facility/building fire protection assessments aid in the improvement of the facility FPP through adequate identification and correction of deficiencies and effective communication of lessons learned from the assessments?

5. Baseline Needs Assessment. The site emergency response capabilities meet site needs as established in the baseline needs assessment (BNA), safety basis requirements, and applicable regulations, codes and standards. (DOE O 420.1C, Attachment 2, Chapter II; applicable codes and standards from the site-specific contract; site FPP description document; site emergency preparedness program)

- Are roles and responsibilities, command and control, and communications protocols for site emergency services and the fire department (or fire brigade) comprehensively defined, documented, understood, and implemented?
- Does the BNA specify minimum fire department staffing, apparatus, equipment and procedures?
- Is the mobile apparatus inventory sufficient and maintained for operability for anticipated site emergencies, with appropriate reserve capability?
- Does the BNA establish capabilities to provide an effective response to extinguish fires, provide emergency medical services, perform rescues and contain hazardous materials, including minimum staffing, apparatus, facilities, equipment, training, pre-incident plans, mutual aid, and procedures?
- Are off-site emergency response obligations defined in a document, such as approved "mutual aid" agreements that includes roles and responsibilities, command and control systems, and communications protocols for off-site response organizations?
- Does the BNA establish applicable NFPA codes and standards and DOE direction for emergency response organizations?
- Is the BNA adequately reviewed at least every three years or whenever a significant new hazard that is not covered by the current BNA is introduced, and updated as appropriate? (Note: If no update is necessary, this result must be documented following the review.)
- Is the BNA adequately reviewed and approved by the DOE field element?
- Is the BNA incorporated into site emergency plans, fire hazard analysis (FHAs), and safety basis documentation?
- Are drills and exercises conducted with training to assure adequate response capabilities?

6. Pre-Incident Plans. Pre-incident strategies, plans, and standard operating procedures have been established to enhance the effectiveness of emergency response activities. (DOE O 420.1C, Attachment 2, Chapter II)
   - Do site facilities have established pre-incident strategies, plans, and standard operating procedures for emergency medical, firefighting, and HAZMAT operations to manage site emergencies effectively?
   - Do pre-incident plans identify external fire exposures and the evaluation of potential fire and smoke spread from one fire area to another within the selected facility?
   - Is the physical access and appropriate equipment for manual firefighting listed in pre-incident plans?
   - Do pre-incident plans include input from the fire protection engineering staff, facility subject matter experts, and emergency responders?
   - Are pre-incident plans and standard operating procedures that govern the use of firefighting water in moderator-controlled areas reviewed by the criticality safety staff?

7. Wildland Fire. Consistent with the *Federal Wildland Fire Management Policy*, the site contractor has an integrated site-wide wildland fire management plan that has been established and implemented in accordance with relevant portions of NFPA 1143, *Standards for Wildland Fire Management*. (DOE O 420.1C, Attachment 2, Chapter II)

4.2 Fire Prevention and Protection SSCs and Design Requirements

FP.2: Engineering design documents and analyses are technically adequate and implement the requirements of the DSA such that adequate protection of the public, the workers, and the environment from fires and other hazards is demonstrated. (10 CFR 830.122; DOE O 420.1C, Attachment 2, Chapter II, *Fire Protection*)

Criteria:

1. Design Requirements. Fire protection design requirements are documented and incorporated into plans and specifications, including protection thresholds that are consistent with the safety authorization basis and FHAs. (10 CFR Part 851; DOE O 420.1C, Attachment 2, Chapter II; site DSA; site and facility FHAs; applicable NFPA codes and standards from the site-specific contract)
   - Are fire protection design criteria for new construction and modifications to existing facilities based on either a fire protection design analysis or FHA?
   - Are fire protection design criteria developed under the direction of FPE?
   - Are applicable regulations, DOE directives, and industry standards (such as applicable National Fire Protection Association codes and standards) incorporated into the design program?
   - Is NFPA 801, *Standard for Fire Protection for Facilities Handling Radiological Materials*, used as the design basis for hazard category 2 and 3 nuclear facilities in accordance with DOE-STD-1066-2016?
   - Are fire protection engineered SSCs and processes designed using sound engineering/scientific principles and appropriate standards? (10 CFR 830.122, Criterion 6)
   - Are operation and system alignments consistent with fire protection design basis assumptions?
   - Are hydraulically designed sprinkler systems designed for a supply pressure of at least 10 percent, but not less than 10 psi, below the water supply curve?
   - Is a fire suppression water containment system, capable of collecting fire suppression water for a minimum of thirty minutes, included with the design for facilities that will have surface contamination?
   - Are redundant water supplies (storage tanks and pumping systems) determined to be necessary when either a fire protection water supply is classified as SC, or when the maximum possible fire loss exceeds $350 million ($390 million in 2016 dollars) in any site facility? (Refer to DOE O 420.1C and DOE STD-1066-2016, section 4.2.7)
   - Are multiple fire protection approaches, such as a fire suppression system and fire detection and alarm system, required for property protection areas where the MPFL exceeds $150 million ($167 million in 2016 dollars)?
   - Are facilities adequately subdivided as required into separate fire areas so the MPFL for each fire area does not exceed $350 million ($390 million in 2016 dollars)?
   - Do new facility designs adequately implement the requirement for automatic fire detection and an automatic means of notification of facility occupants and emergency responders in accordance with NFPA 72, *National Fire Alarm and Signaling Code*?
   - Do electrical transformers that will be installed inside buildings adequately implement the requirement to be of a dry type, with no combustible dielectric fluids?
   - Does the design process include NFPA 780, *Standard for the Installation of Lightning Protection Systems*, for determining the need for and installation of lightning protection systems?
   - Is monitoring performed to assure that potential degradation is prevented and that equipment qualification is suitable for the environment expected under all conditions?

2. Design Basis Documentation. Key design documents, including design basis and supporting documents, are established to support facility safety basis development and implementation. (10 CFR Part 851; DOE O 420.1C, Attachment 2, Chapter II; applicable NFPA codes and standards from the site-specific contract)
   - Do safety basis accident analyses clearly identify and describe the fire protection system's credited functional requirements and are they consistent with the FHA?
   - Has safety basis credited structures, systems, and components (SSCs) been identified as preventive and/or mitigative controls, and are the performance requirements and supporting analysis documented?

- Have controls (e.g. ventilation, containment, or drainage systems) necessary for mitigating contaminant spread or release been identified and credited appropriate to their safety level (safety class, safety significant or defense-in-depth) and functional requirements?
- Does the safety basis identify all facility radiological, biological, and chemical hazards and are they consistent with the FHA?
- Does the DSA analyze the spread paths and impacts (radiological, toxic, or biological) where smoke or contamination spread may be a special concern for the safety of the workers and are they consistent with the FHA?
- Have all credible fire-related failure modes been considered within the DSA for safety equipment, including the potential for spurious signals and fire-induced electrical faults that may cause equipment to operate in an unintended manner or trip upstream electrical equipment, respectively?

3. Engineering. Engineered SSCs and processes are designed using sound engineering/scientific principles and appropriate standards. (10 CFR 830.122, Criterion 6)
   - Have fire protection design bases and design assumptions identified in the safety analysis been appropriately translated into design calculations?
   - When a building is seismically designed, is sway bracing for seismic supports of sprinkler piping based on the site-specific acceleration criteria?
   - Do the bases for technical safety requirements (TSRs) for the fire protection system appropriately reflect facility configuration and required performance of safety functions, operational parameters, and key programmatic elements?
   - Are acceptance criteria for tested parameters supported by calculations or other engineering documents to ensure that fire protection design bases assumptions are met?

4. Design Verification and Validation. The adequacy of the fire protection design is verified or validated by individuals or groups other than those who performed the work. Verification and validation of the fire protection design is completed before approval and implementation of the design. (10 CFR 830.122, Criterion 6)
   - Have the completed designs been recorded in design output documents, such as drawings, specifications, test/inspection plans, maintenance requirements, and reports?

4.3 Operations, Surveillance, Testing and Maintenance

FP.3: Installation and operation of fire protection SSCs, and implementation of the FPP controls and procedures ensures the safety systems are available to perform their intended safety functions when required. (DOE O 420.1C)

FP.4: Inspections, testing, and maintenance activities are properly planned, scheduled, and performed to ensure that fire protection systems can reliably perform their intended safety functions when required. (DOE O 420.1C)

Criteria:

1. Fire Safety Systems Installation, Operation, Testing and Maintenance.
   A. A complete spectrum of fire prevention controls and procedures have been developed and implemented as required by applicable fire safety criteria. (DOE O 420.1C, Attachment 2, Chapter II; applicable NFPA codes and standards from the site-specific contract)
      - Is there adequately documented fire prevention criteria and procedures to implement the following DOE O 420.1C requirements?

- Site-specific requirements
- staff organization, resources, training, and roles and responsibilities
- inspection, testing, and maintenance of fire protection systems
- use and storage of combustible, flammable, radioactive, and hazardous materials
- hot work control program
- identification and tracking of fire protection system impairments
- fire prevention measures (combustible loading, ignition sources)
- facility and FHA assessment programs
- design and construction oversight
- equivalencies, exemptions, modifications, and variance processes

- Is fire safety "defense-in-depth" adequately applied across the site?
- Does the FPP encompass all significant facilities and activities for which fires and related hazards represent a credible threat?
- Have worker qualification requirements been established in accordance with applicable industry standards and have these requirements been met?

B. All fixed fire protection features (e.g., appropriate construction types, fire barriers, fire alarm and signaling systems, manual and automatic fire suppression systems), that are required by authorization basis documents and FHAs, have been installed and are tested and maintained, as required by applicable fire safety criteria. (DOE O 420.1C, Attachment 2, Chapter II; applicable NFPA codes and standards from the site-specific contract)
   - Have required fire safety features (including those associated with emergency notification and egress) been confirmed in accordance with authorization basis documents, FHAs, DOE directives, and NFPA standards?
   - Are fire and related hazards that are unique to DOE and not addressed by industry standards protected by isolation, segregation, or special fire control systems (e.g., inert gas, explosion suppression)?
   - Do fire protection system inspection, testing, and maintenance programs (scope and frequencies) conform to NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, and NFPA 72?
   - Are appropriate fire safety systems and features maintained operable for facilities undergoing decontamination and decommissioning? If not, are compensatory measures being adequately implemented?
   - Is an effective corrective maintenance program established to ensure the timely repair of defective systems, support systems, and equipment?
   - Is an effective preventive maintenance program in place to ensure the reliability of systems and equipment?
   - Are system or equipment outages for maintenance, testing, or special operations appropriately approved and communicated to impacted groups?
   - Are compensatory measures implemented as needed, and restored to normal operations in a timely manner?
   - Are fire impairments, including compensatory actions, for planned, unplanned and emergency impairments clearly identified and communicated?
   - Is post maintenance or repair testing effectively utilized to assure the adequacy of preventive or corrective maintenance and the operability of the system or equipment? Is the testing appropriately performed and documented to satisfy NFPA standards and quality assurance requirements?

2. Surveillance and testing of the fire protection system demonstrates that the system is capable of accomplishing its safety functions and continues to meet applicable system requirements and

performance criteria. (DOE O 420.1C, Attachment 2, Chapter II; applicable NFPA codes and standards from the site-specific contract)

- Are surveillance tests adequately performed to demonstrate the safety-related performance requirements of all fire protection SSCs?
- Is safety basis TSR surveillance testing performed in the SSC's as found condition and separately from testing required by NFPA 25 to assure the SSC being tested is not preconditioned?
- Does the fire protection system design include provisions necessary for conducting the tests?
- Is there a clear association between test acceptance criteria and the safety documentation?
- Does maintenance for fire protection systems satisfy system requirements and performance criteria in safety basis documents and FPP requirements?
- Does maintenance address age-related system degradation and component aging that could affect system reliability or performance?
- Are conditions that require component replacement identified?
- Have systems been evaluated for potential inclusion of suspect/counterfeit parts?
- Are maintenance source documents such as vendor manuals, NFPA codes and standards, DOE orders, and other requirements used as technical bases for development of system maintenance work packages?
- Are vendor recommended preventive and predictive maintenance requirements for SSCs included in the inspection, testing, and maintenance program?
- Are preventive and predictive maintenance activities adequately completed as scheduled?
- Is the system adequately inspected periodically according to maintenance requirements and are deficient conditions evaluated and/or corrected?
- Are acceptance criteria defined and used for system modification, repair, maintenance and test activities?
- Are predictive maintenance results used to identify and schedule maintenance prior to SSC failure?
- Are excessive component failure rates identified?
- Are failure rates used in establishing priorities and schedules for maintenance or system improvement proposals?
- Has preventive maintenance been performed as prescribed?
- Is the corrective maintenance backlog being effectively managed?
- Is there an accurate maintenance history that compiles maintenance, resource, and cost data in a system which is retrievable and capable of entering required-maintenance costs, actual maintenance costs, and availability data and failure rates for mission-critical and safety systems into the DOE Facility Information Management System?

3. Surveillance and test procedures confirm that key operating parameters for the overall fire protection system and its major components remain within safety basis, NFPA, and applicable consensus standards operating limits. (DOE O 420.1C, Attachment 2, Chapter II; applicable NFPA codes and standards from the site-specific contract)
   - Do results of testing demonstrate that adequate safety margins are maintained?
   - Are appropriate data recording provisions included or referenced and used to record results?
   - Do fire protection test procedures include provisions for listing discrepancies?
   - Is there an effective identification and tracking system for fire protection impairments?
   - Do fire protection test procedures require timely notification to facility management on any failure or discrepancy that could impact operability?
   - Are acceptance criteria capable of confirming that safety/operability requirements are satisfied?

4. The acceptance criteria from the surveillance tests used to confirm fire protection system operability are consistent with the safety basis. (DOE O 420.1C, Attachment 2, Chapter II)
   - Can parameters that demonstrate compliance with the safety basis and applicable NFPA codes and standards be measured or physically verified?

5. Instrumentation and test equipment for the fire protection system are calibrated and maintained. (DOE O 420.1C, Attachment 2, Chapter II; applicable NFPA codes and standards from the site-specific contract)
   - Was the test equipment used for surveillance and testing activities calibrated?

4.4 Contractor Self-Assessment Program

FP.5: A documented comprehensive self-assessment of the fire protection program is performed by the site contractor at least every 3 years, or at a frequency with appropriate justification approved by the DOE head of field element. (DOE O 420.1C, Attachment 2, Chapter II)

Criteria:

1. Triennial Fire Protection Assessment. The site contractor conducts a triennial FPP assessment (or a series of more frequent assessments that when combined, are equivalent to the triennial assessment) that evaluates the full scope of the program. (DOE O 420.1C, Attachment 2, Chapter II)
   - Does the contractor conduct self-assessments of the FPP at least every 3 years, or at an approved frequency?
   - Are programmatic self-assessments performed under the supervision of a fire protection engineer?
   - Does the contractor FPP self-assessment evaluate all elements of the program, such as those established in DOE-STD-1066-2016, *Fire Protection*?
   - Do the self-assessments affectively identify program element performance weaknesses?

4.5 Configuration Management

FP.6: Configuration management programs and processes are adequate to ensure fire protection systems designated as safety systems continue to meet safety basis requirements and changes are properly controlled. (DOE O 420.1C, Attachment 2, Chapter II; 10 CFR 830.122; 10 CFR 830.203)

Criteria:

1. Configuration Management and Integration.
   A. The configuration management process adequately integrates the elements of fire protection system requirements and performance criteria, system assessments, change control, work control, and documentation control. (DOE O 420.1C, Attachment 2, Chapter II)
      - Are fire protection system documents affected by facility changes appropriately identified and revised as necessary?
      - Are materials and installation of fire protection system components consistent with the requirements and performance criteria for the system, including quality controls and quality assurance and, as appropriate, fire alarm software quality assurance?
      - Are fire protection system installation instructions and post-modification testing instructions and acceptance criteria appropriately specified?
      - Are new fire protection design calculations, tests, or procedures required to support facility changes and modifications appropriately developed and implemented?

B. Configuration management is used to develop and maintain consistency among system requirements and performance criteria, documentation, and physical configuration for the SSCs within the scope of the fire protection program. (DOE O 420.1C, Attachment 2, Chapter II)
   - Are the latest approved fire protection piping and instrumentation diagrams available for operators and support personnel as necessary for day-to-day operations?
   - Are fire protection system components properly labeled to assure proper configuration and operation?
   - Do facility FPP procedures ensure that changes to the system requirements, documents, and installed components are adequately integrated and coordinated with those organizations affected by the change?
   - Is there adequate evidence that the cognizant system engineer and fire protection engineer have reviewed and concurred with design changes and the associated system modification work package?
   - Are engineering (including the design authority and technical disciplines), operations, and maintenance organizations made aware of fire protection system changes that affect them and appropriately involved in the change process in a timely manner?

2. Change Control.
   A. Fire protection system design basis documentation and supporting documents are kept current using formal change control and work control processes. (DOE O 420.1C, Attachment 2, Chapter II)
      - Have as-built drawings and shop drawings for fire protection systems been maintained after installation to show actual configuration?
      - Are FPP safety basis and design documents affected by the change revised and kept current using formal change control and work control processes?

   B. Changes to fire protection system requirements, documents, and installed components are formally designed, reviewed, approved, implemented, tested, and documented. (DOE O 420.1C, Attachment 2, Chapter II; applicable NFPA codes and standards from the site specific contract)
      - Are design changes impacting fire protection accurately described and reviewed and approved, as appropriate?
      - Are fire protection SSCs affected by changes identified by facility management, users, operators or others affected by the changes?
      - Are changes to the fire protection systems reviewed by a fire protection engineer 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 intended safety function?
      - Are other organizations affected by the change (e.g., training, document control, hazard analysis/safety basis, fire protection), integrated into the change process?

3. Unreviewed Safety Question (USQ). An unreviewed safety question process has been established and is being appropriately implemented to control changes to fire protection safety systems. (10 CFR 830.203)
   - Have fire protection design changes been appropriately evaluated using the unreviewed safety question process?

REVIEW APPROACH

Record Review:

- Documented Safety Analysis
- Technical Safety Requirements
- Calculations, reports, and other supporting documentation pertaining to fire protection systems performance criteria
- FPP description documents, site-wide and for selected facilities
- Organizational chart
- List B of contract
- Site-specific requirements and procedures
- Facility-specific administrative procedures for fire protection and life safety systems
- Fire protection design program
- System descriptions and drawings for fire water supply and distribution systems
- Facility FPP variances, exemptions, equivalencies, and modifications
- Facility FHAs and fire protection building assessments
- Records of TSR required surveillance activities for fire protection systems (e.g., sprinkler systems, fire alarms, fire barriers, valve inspections)
- Schedules, Procedures, work orders and records for inspections, tests and maintenance of fire protection systems,
- fire water distribution systems, fire pumps, and control valves (last 12 months)
- Records of fire hydrant flow tests (last completed test)
- Pump performance curves from vendor
- Fire protection system impairment program
- FPP impairment tracking system
- Records of compensatory measures for impaired systems (last 6 months)
- Records of maintenance performed on fire protection systems (last 6 months)
- USQ procedure and evaluations for recent fire protection system changes (last 6 months)
- Configuration management program for fire protection systems
- Records of monthly combustible control inspections (last 6 months)
- Life safety program
- Program for inspection and test of emergency lighting and exit sign systems
- Training and qualification records for FPE and personnel performing inspections, tests, and maintenance.
- Surveillance and assessment reports related to FPP, including triennial self-assessment (last 3 years)
- Sample of assessment findings - tracking system printout, causal analysis, corrective action plan, close-out and approval
- Combustible and flammable control program
- Hot work program
- AHJ authorization documentation and procedure for approval of exemptions and equivalencies
- Fire department BNA and DOE approval letter
- Pre-incident plans
- Documentation and justification on restrictions for the use of water for fire suppression
- Fire department annual report
- Wildland fire management plan

<u>Interviews:</u>

- Manager of the fire protection program
- Fire chief
- Fire marshal
- AHJ(s)

- Fire protection engineer(s)
- Fire protection coordinator(s)
- Facility manager(s)
- Fire protection system engineer(s)
- Maintenance manager
- Inspection, testing, and maintenance personnel
- Engineering manager
- DOE oversight manager
- DOE fire protection engineer
- DOE safety system oversight personnel (or subject matter experts)
- DOE facility representative(s)

Observations:
- TSR surveillance activities (e.g., main drain test, inspectors test valve test, water flow tests, etc.)
- Facility walkthroughs for life safety, combustible loading, and general review of fire protection systems, panels and alarms
- Daily rounds for surveillances and inspections of fire protection SSCs
- Fire department walkthroughs
- Fire department hose evolutions (e.g., establishing minimum flow for master streams and supply lines)
- Tabletop exercises demonstrating use of pre-incident plans
- Inspections, tests and maintenance activities involving a fire protection system or support system
- Hot work activity
- Demonstration of tracking system for status of fire protection related issues and corrective action plan
- Plan of day/plan of week meetings