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DOE G 420.1-3
9-27-07

IMPLEMENTATION GUIDE FOR DOE FIRE PROTECTION AND EMERGENCY SERVICES PROGRAMS

for Use with DOE O 420.1B, *Facility Safety*

[This Guide describes suggested nonmandatory approaches for meeting requirements. Guides are not requirements documents and are not construed as requirements in any audit or appraisal for compliance with the parent Policy, Order, Notice, or Manual.]

U.S. Department of Energy
Washington, D.C. 20585

AVAILABLE ONLINE AT:
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INITIATED BY:
Office of Health, Safety and Security

FOREWORD

This document replaces Department of Energy (DOE) G 440.1-5, *Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program.*

Comments should be sent to the Office of Nuclear Safety and Environment within the Office of Health, Safety and Security, phone 202-586-5680, or email jim.bisker@hq.doe.gov.

DOE implementation guides are part of the DOE Directives Program and are issued to provide supplemental information regarding the Department's expectations for fulfilling its requirements as contained in rules, Orders, Notices, and regulatory standards.

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1.0 INTRODUCTION

The purpose of this Guide is to facilitate implementation of requirements in Department of Energy (DOE) Order (O) 420.1B, *Facility Safety*, by providing supplementary information that describes an acceptable approach to meet the DOE O 420.1B requirements for Fire Protection Programs. This document also addresses, in part and where appropriate, the relationship of fire protection requirements in DOE O 420.1B and the following DOE documents:

- 10 CFR Part 851, *Worker Safety and Health Program*
- DOE O 440.1B, *Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal Employees*
- DOE Guide (G) 440.1-8, *Implementing Guide for Use with 10 CFR Part 851, Worker Safety and Health Programs*[1]
- DOE G 450.1-4, *Implementation Guide, Wildland Fire Management Program for Use with DOE O 450.1, Environmental Protection Program*
- DOE O 151.1C, *Comprehensive Emergency Management System*
- DOE-STD-1066-99, *Fire Protection Design Criteria*
- DOE-STD-1088-95, *Fire Protection for Relocatable Structures*

These additional documents are available at the DOE Fire Protection Website: (http://www.hss.energy.gov/nuclearsafety/nsea/fire//) and/or at the DOE Directives Website (http://www.directives.doe.gov/) and/or at the DOE Technical Standards Website (http://www.hss.energy.gov/nuclearsafety/techstds/).

2.0 APPLICABILITY

DOE and contractor fire safety programs include all activities pertaining to fire hazards and related perils including: emergency services, operations and maintenance activities such as hot work or combustible material handling or storage; construction activities related to fire safety;

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[1] DOE G 440.1-8 states that "Complete guidance on the development, adoption and maintenance of a fire safety and emergency response program that satisfies the provisions of the Rule can be found in DOE G 440.1-5, *Fire Safety Program for use with DOE O 420.1 and DOE O 440.1*." This Guide (DOE G 420.1-3) is based upon and replaces DOE G 440.1-5 and includes some additional guidance on the development, adoption and maintenance of a fire safety and emergency response program to support implementation of the 10 CFR 851 rule. However, as experienced is gained in implementing 10 CFR 851, further guidance may be determined to be needed to support its implementation; and either DOE G 440.1-8 or DOE G 420.1-3 will be updated as appropriate.

installation and testing of fire protection systems; water supply and distribution systems; fire safety training; assessments; facility and site walk downs; and other fire protection activities that are not explicitly identified here.

This Guide applies to all Departmental Elements and Contractors as delineated in DOE O 420.1B. It provides an acceptable means to implement the fire protection requirements detailed in Chapter II and associated Attachment 2, Contractor Requirements Document (CRD) of DOE O 420.1B.

Implementation of alternate or innovative fire safety configurations and practices that will meet the requirements of DOE O 420.1B and achieve a level of fire protection and emergency response determined to be equal to that attained by conformance with this Guide is allowed according to Sections 4c and 5b(5) of DOE O 420.1B.

3.0 DEFINITIONS

Documented Safety Analysis – An analysis of the extent to which a nuclear facility can be operated safely with respect to workers, the public, and the environment, including a description of the conditions, safe boundaries, and hazard controls that provide the basis for ensuring safety (10 CFR 830.3).

Emergency Services – The performance of activities pertaining to the inherent responsibilities of the site fire department, brigade, or other organization that performs any or all of the following functions:

- Fire Suppression
- Hazardous Material (HAZMAT) Response
- Emergency Medical Services
- Technical Rescue
- Confined Space Entry
- Training
- Off-site Assistance to Other Emergency Services Organizations (Mutual Aid)
- Inspection, Testing and Maintenance of Fire Protection Equipment or Apparatus
- Facility Fire Prevention and Life Safety Inspections

Fire Protection – A broad term which encompasses the aspects of fire and life safety, concerned with minimizing the direct and indirect consequences of fire and other perils, such as explosions and natural phenomenon events as they relate to fire. Aspects of fire protection include, but are not limited

to, fire suppression and detection systems, fire water systems and emergency process safety control systems, building construction and fixed building features such as fire doors, fire walls and barriers, and fire dampers. Also included are the fire department and emergency response forces.

Fire Protection Assessment – A formal documented review conducted by DOE or Contractors in accordance with DOE requirements that examine the essential fire protection elements as they relate to a specific facility or overall fire protection program.

Fire Prevention – The process of managing and regulating potential fire hazards (fuels and heat energy sources) and the mechanisms that bring them together to either eliminate the hazard(s) or reduce the risk associated with the hazard(s) to acceptable levels.

Pre-Incident Plan – A document owned and developed by a fire department which provides information to responding personnel that will help them safely and effectively manage emergencies with available resources at a specific facility or area.

4.0 IMPLEMENTATION INSTRUCTIONS

DOE O 420.1B establishes facility and programmatic safety requirements for a comprehensive fire protection program for DOE sites, facilities, and emergency service organizations to minimize: (1) the potential for occurrence of a fire or related event; (2) fires that cause an unacceptable onsite or offsite release of hazardous or radiological material that could impact the health and safety of employees, the public, or the environment; (3) unacceptable interruption of vital DOE programs as a result of fire and related hazards; (4) property loss from fire exceeding limits established by DOE; and (5) fire damage to critical process controls and safety systems structures and components (as documented by appropriate safety analysis).

Comprehensive fire safety and emergency response programs at DOE sites and facilities include, but are not limited to, appropriate policies, requirements, technical criteria, analyses, administrative procedures, and related documentation. In addition they feature adequately designed, installed and maintained fire safety systems, hardware, structural features, and related devices. These programs include access to fully capable emergency response forces featuring trained personnel and an adequate inventory of apparatus and equipment that enable these forces to respond in a timely and effective manner. Where the local emergency response capability is deemed insufficient, appropriate compensatory measures are implemented to address baseline needs. The professional staff, general worker population, and visiting public at these sites and facilities are appropriately trained on the fire hazards and related conditions that they are likely to encounter.

Additional guidance on how to meet DOE expectations for the above-referenced programs is delineated below. This guidance supplements general industry criteria, and contractual obligations and should be implemented by qualified and experienced fire safety professionals. Where confusion

exists as to their intent or application, it is expected that the Authority Having Jurisdiction[2] (AHJ) be consulted. This additional guidance is referenced to the specific sections of the DOE O 420.1B where additional guidance was deemed warranted by DOE and DOE contractor fire safety professionals.

4.1 Program Objectives

Information in this section pertains to Section 1 of Chapter II in DOE O 420.1B (and the corresponding CRD Section in Attachment 2 of DOE O 420.1B).

The following paragraphs describe in broad terms the approach to achieve the objectives of a DOE fire protection and emergency response program:

1. Contractors can achieve a comprehensive, multi-faceted emergency response capability in a number of ways. They can rely on an on-site emergency services organization, such as what currently exists at many DOE sites; or they can rely completely on off-site fire departments to meet DOE determined response objectives. Contractors can also combine the capabilities of both on-site and off-site emergencies services organizations so as to assure the timely and effective response to the spectrum of emergency conditions (fires, medical emergencies, technical rescue, hazardous material response, etc.) that they may encounter (e.g. mutual aid agreements).

    a. If an on-site fire department will be relied upon to provide complete emergency services, the full scope of its capabilities including: mission responsibilities, personnel, apparatus, equipment, facilities, programs, incident reporting, etc. should be delineated in a Baseline Needs Assessment (BNA) as further explained below. The BNA should address compliance with the National Fire Protection Association (NFPA) codes and standards and other requirements that define the character of its mission and responsibilities. (This does not mean that the BNA has to be written to confirm code conformance on the basis of line-by-line comparisons. A reasonable degree of documentation is expected.) It should also address applicable contract provisions and aid agreements with other contractors on site as well as off-site organizations. The goal is to capture in one document information that will confirm that the fire department is fully capable of meeting emergency response requirements and needs. Note that there is a "model" BNA that can be downloaded and edited, available on the DOE fire protection website at http://www.hss.doe.gov/nuclearsafety/nsea/fire/models/models.html.

[2] The Authority Having Jurisdiction (AHJ) is defined by Section 5.d.10 of DOE O 420.1B and Section 4 of DOE-STD-1066 as the decision making authority in matters concerning fire protection as defined by the National Fire Protection Association Codes and Standards. The DOE head of field organization or designee is the AHJ unless otherwise directed by the Secretarial Officer.

b. If a contractor will rely completely on (non-DOE) off-site emergency services organizations to satisfy the emergency response requirement, then the contractor should first define completely its emergency services needs against the services available by the off-site organization. This can be done via a BNA or comparable document, commensurate with the off-site organization's responsibilities. This document should delineate what is required (capability), why is it required (hazards, accident potential, code requirements, etc), and how this capability is assured by the off-site emergency services organization.

c. If a contractor will rely on a combination of on-site and off-site emergency services organizations, the contractor should comprehensively demonstrate that an adequate emergency response capability exists on the basis of some combination of the efforts described in "a" and "b," above.

2. Contractors can achieve and maintain a comprehensive site and facility fire protection program through implementation of applicable industry codes and standards (principally from the NFPA), as modified by DOE fire safety criteria. Site and facility fire protection programs are characterized by defense-in-depth. This means that adequate safety is assured by reliance on multiple levels of fire protection (fire safety policies, administrative procedures, active fire protection systems, passive fire safety features, trained people, and an adequate emergency response capability, among other possible facets). Additionally, the long-term adequacy of site and facility fire safety programs required routine self-assessments with a corrective action program that facilitates the timely remediation of significant fire protection and emergency response deficiencies. Such programs include appropriate notification, reporting, and tracking and trending of findings.

3. Subcontractors can achieve compliance with DOE fire safety objectives through an established and appropriately documented relationship with a prime contractor's fire protection and emergency response program.

4.2 Highly Protected Risk Status

Information in this section pertains to Section 3a(1) of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

Highly Protected Risk (HPR) is a rating given to property that qualifies for insurance coverage by the Factory Mutual System, the Industrial Risk Insurers, and other industrial insurance companies that limit their insurance underwriting to the best-protected class of industrial risk.

The requirement of the applicable building code and NFPA codes and standards are considered minimum levels of protection and do not necessarily meet the HPR status. DOE facilities are expected to meet or exceed the applicable building code and NFPA codes and standards. DOE facilities may also need to meet criteria in DOE-STD-1066-99 to minimize: 1) unacceptable onsite or offsite release of radiological or hazardous materials, 2) interruptions of vital programs and 3) property damage. A means to achieve HPR status or the best-protected class of industrial risks includes compliance with insurance industry standards such as those published by the Factory Mutual Global (Loss

Prevention Data Sheets and technical advisory bulletins). A graded approach and experience in the application of insurance industry standards is necessary to determine the appropriate HPR provisions for a given facility or process.

4.3 Maintaining Safety Systems

Information in this section pertains to Section 3a(2) of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

Refer to Section 4.21 of this Guide for information related to this topic.

4.4 Program Policy Statements

Information in this section pertains to Section 3b(1) in Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

1. The intent of documenting policy statements is to have the uppermost levels of DOE and Contractor management state in writing their fire protection program expectations. Such policy statements should not conflict with regulatory, DOE, or contractual obligations. For site emergency services organizations, this policy statement should include fundamental statements regarding the level of service that DOE expects and the level of capability that the contractors intend to provide. (For example: "DOE expects that the site fire department will maintain a capability to provide Advanced Life Support, as defined in the State of…" or "…will provide an emergency services capability that fully conforms with the requirements of the State of…, DOE directives, and NFPA codes and standards, unless explicit relief has been granted by DOE.")

2. Section 5d(10) of DOE O 420.1B assigns the responsibilities for the AHJ, in most cases, to the DOE heads of field elements under advisement of a qualified fire protection engineer (as defined in DOE-STD-1066-99) as the subject matter expert (SME). The AHJ may designate a contractor as the site's Fire Marshall to act as his representative for day-to-day activities such as: issuing of permits; reviewing and approving construction documents and shop drawings (new construction, modification, or renovation); approving routine fire protection equipment, materials, installation, and operational procedures (fire system inspection and testing), interpretation of building codes or standards; and other activities that would require formal approval. Fire Marshall activities, inclusive of this authority, should be well documented and available for AHJ review.

4.5 Program Documentation

Information in this section pertains to Section 3b(2) of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

1. The program should be completely documented. This includes a description of applicable fire safety requirements in contracts and leases, where appropriate.

2. Documentation should also include a description of the fire protection organization and its roles and responsibilities in relation to other organizational entities. It is preferable, although not always essential, to have all fire protection-related line activities under a single line manager to avoid unnecessary duplication and costs.

3. Training and qualification records of individuals having fire protection program responsibilities should be readily available and in an auditable form.

4. Appropriate fire protection documentation includes copies of all fire hazard analyses (FHAs) and at least the two most recent facility assessment reports in a continually updated filing system. The FHAs and facility assessment reports may be combined, provided that they address all essential elements as defined below. The DOE Fire Protection Web Site contains copies of "models" of separate and combined FHAs and assessment reports. Facility documentation should also include copies of any exemptions, equivalencies or deviations that have been approved by DOE.

5. Construction projects should feature a file in which all significant decisions and reports concerning fire protection can be found. Supporting documents in this file should be maintained for future reference.

6. The inspection, testing and maintenance (ITM) program for fire protection features, apparatus and equipment should be based on industry standards, such as those established by the NFPA unless an alternative has been approved by the AHJ. The organizations responsible for ITM of fire protection features should maintain system inspection and test records according to Section 11.4 of DOE Administrative Records Schedule 18, “Security, Emergency Planning and Safety Records” or, if not specifically addressed in the Schedule 18 document, for a minimum of three review cycles. In addition, responsible authorities should retain records of all ITM procedures for as long as such equipment remains in service.

7. Site fire departments and other related emergency response organizations (such as brigades or emergency squads) should maintain a current file with all standard operating procedures and fire pre-incident plans, firefighter training and certification programs, and appropriate documentation governing related

activities. The level of documentation should be reasonable and commensurate with the contractor's responsibilities. A program should be in place to ensure that this documentation is updated at appropriate intervals. Pre-incident plans should be developed on the basis of NFPA 1620, *Recommended Practice for Pre-Incident Planning*, with input from the site fire protection engineering staff as well as emergency responders.

8. Emergency response records must conform to DOE reporting requirements in DOE O 231.1A, *Environment, Safety, and Health Reporting,* and should be based on standard fire incident reporting practices, such as the National Fire Incident Reporting System (NFIRS) or NFPA 901, *Standard Classifications for Incident Reporting and Fire Protection Data,* in lieu of state or site-specific reporting formats.

9. Computerized information management techniques for the creation, maintenance and dissemination of relevant documentation pertaining to the fire protection program are acceptable.

10. Access to classified matter during an emergency must be documented after the emergency and individuals who were provided access must complete nondisclosure forms as required by DOE Manual (M) 470.4-4, *Information Security*.

4.6 Fire Hazards Analyses

Information in this section pertains to Section 3b(5) of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

1. A FHA is required for all Hazard Category 1, 2 and 3 nuclear facilities (as defined in DOE Standard 1027), high-hazard facilities (as determined by the AHJ), significant new facilities and facilities that store or process significant quantities of hazardous materials in excess of the allowances described in NFPA 1, *Uniform Fire Code*. These examples include planned facilities as well as significant renovations to existing facilities as determined necessary by the AHJ. NFPA 801 also requires a graded FHA for radiological facilities that exceed the thresholds in 10 CFR Part 30. Examples of facilities not generally requiring an FHA include small utility buildings, trailers, and office buildings.

2. The purpose of an FHA is to conduct a comprehensive, qualitative assessment of the risk from fire within individual fire areas in a DOE facility to ascertain whether the DOE fire safety objectives of DOE O 420.1B are met. This should include an assessment of the risk from fire and related hazards (wildland fire exposure, direct flame impingement, hot gases, smoke migration, fire-fighting water damage, etc.) in relation to existing or proposed fire safety features to ensure that the facility can be safely controlled and stabilized during and after a

fire. In accordance with the "graded approach" concept, the level of detail necessary for an acceptable FHA is directly related to the complexity of the facility and the potential risk to the public and facility operators. The scope and content of an FHA should be limited to only those issues that are significant and relevant to the facility. To facilitate the development of graded fire hazards analyses, "model" FHAs have been developed. These models are located at the following URL:
http://www.hss.energy.gov/nuclearsafety/nsea/fire//models/models.html

3. Analysis of significant planned facilities included in the FHA process should begin early in the design phase to ensure that an acceptable level of protection is being incorporated in the evolving design. This project or preliminary FHA should be updated whenever significant changes occur within an individual fire area and should form the basis for post-construction FHA included in the review and revision schedule per Chapter II, Section 3b(5)(b) and 3b(5)(c) of DOE O 420.1B. The analysis shall also support the conclusions of a preliminary Documented Safety Analysis (DSA) where required. In situations where the AHJ has determined that an FHA is necessary for a significant new facility that is not considered hazardous; then post-construction FHA reviews and revisions are not required.

4. In accordance with DOE O 420.1B, the FHA must be performed under the direction of a qualified fire protection engineer (Reference DOE-STD-1066-99 and DOE-STD-1137-2000, *Fire Protection Engineering Functional Area Qualification Standard*.) This should include directing all of the technical aspects of an FHA's development including support from emergency services, systems, electrical, and mechanical engineers, as well as operations staff as needed.

5. An FHA should contain, but not be limited to, a conservative assessment of the following fire safety issues:

   - Description of construction
   - Description of critical process equipment
   - Description of high-value property
   - Description of fire hazards
   - Description of operations
   - Potential for a toxic, biological and/or radiological incident due to a fire
   - Natural hazards (earthquake, flood, wind, lightning, and wildland fire) impact on fire safety
   - Damage potential: Include both the Maximum Possible Fire Loss (MPFL) as defined in DOE-STD-1066-99 and the DSA of the design basis fire scenario

- Fire protection features
- Protection of essential safety class systems
- Life safety considerations
- Emergency planning
- Fire Department/Brigade response
- Recovery potential
- Security and Safeguards considerations related to fire protection
- Exposure fire potential and the potential for fire spread between two fire areas
- Effect of significant fire safety deficiencies on fire risk
- Environmental impacts from a fire including suppression system run-off considerations

6. The FHA should evaluate the consequences of a single, worst-case automatic fire protection system malfunction; i.e., a detection system that also activates a pre-action type sprinkler system, but fails to transmit an alarm to the site emergency response force. This FHA evaluation may also include the failure of a valve in the underground main that could impair multiple systems, either in the same building or in adjacent buildings evaluated as an exposure.

7. In determining the value of the MPFL, which is used in part to assess the need for fire protection systems, the basic assumption should be that there is no automatic or manual fire suppression. This loss determination should include all direct and indirect costs associated with the fire and clean-up operations. In addition, there may be intangible costs such as mission interruption, erosion of public support, and local economic impact. All of these may need to be considered to ensure that appropriate levels of fire protection are included in a facility. Direct and indirect costs that should be included are:

   a. Replacement cost of building and building systems or contents within the fire area
   b. Replacement cost of contents
   c. Cost of lost time (considered mission interruption costs)
   d. Cost of environmental clean-up
   e. Exposure damage to other buildings, structures and property
   f. Costs for re-establishing operations; e.g., redesign approval and start-up

8. If redundant automatic fire protection systems are provided in the area, only the system that causes the most vulnerable condition is assumed to fail. Passive fire protection features, such as blank fire-rated walls or continuous fire-rated cable wraps,

are assumed to remain viable for their rated fire endurance period to the extent that they are properly constructed and maintained.

9. The focus of the FHA should be the individual fire areas that comprise the facility. A fire area is defined as a location bounded by fire-rated construction, having a minimum fire resistance rating of two hours, with openings protected by equivalently-rated fire doors, dampers or penetration seals. The boundaries of exterior fire areas (yard areas) should be as determined by the AHJ or delegated authority. Where a facility is not subdivided by fire-rated construction, the fire area should be defined by the exterior walls and roof of the facility.

10. An important element of an acceptable FHA for nuclear facilities is an inventory of all safety class and safety significant systems within the fire area that are susceptible to fire damage. This includes those primary and supporting mechanical and electrical systems that must function effectively during and after a fire event to ensure safety. For example, loss of the building ventilation system in a fire (due to damage of power cables) may result in an ambient air temperature rise, which may cause the failure of sensitive electrical components, such as relays. Such safety systems may include, but are not limited to, process monitoring instrumentation, instrument air, hydraulic systems, and emergency lighting systems.

11. All credible fire-related failure modes of safety systems should be considered. For example, it is insufficient to assume that fire will merely cause the loss of function of safety equipment when power cables to that equipment are within the fire area. It is also necessary to consider the potential for spurious signals that may cause the inadvertent operation of such equipment. Similarly, fire-induced electrical faults may trip upstream electrical disconnect devices in such a way as to render inoperable other safety systems that may not even be located within the fire area. In addition, the effects of combustion products, manual fire-fighting efforts, and the activation of automatic fire suppression systems should be assessed.

12. Fire propagation and the potential for fire-induced radiological dispersal through the facility should be considered. These effects should be considered for the normal operating mode of the air distribution system as well as alternate modes, such as shutdown, that may result from the fire.

13. A tool that may be used in the development of an FHA is a fire model, such as those developed by the National Institute of Standards and Technology, as applied by qualified fire protection engineers, and approved for DOE use as a Toolbox code. This includes the CFAST Fire Model and other models in the following web site: http://www.hss.energy.gov/csa/csp/sqa/. All assumptions used in a model should be listed in the FHA and limiting conditions of operation or specific administrative controls established to assure that these assumptions produce reasonably conservative results compared to applicable codes and standards. Also note that small variations in an assumption can have a major impact on the outcome. For example, assuming a door is closed can reduce fire intensity by half, but there is no assurance that the door will remain closed throughout the life of the facility. Because of their potential errors,

model results should be approved by a qualified fire protection engineer who is knowledgeable on the use of the model.

14. Additionally, FHA analysis may include reliance on actual fire testing or historical data on fire events both inside and outside the DOE Complex, provided that adequate documentation of such information is available for the AHJ's review. Alternately, an assumption can be made that all potentially vulnerable systems will be damaged within the fire area. Acceptable exceptions to this assumption are water-filled steel pipes, tanks, and similar components of adequate structural integrity with welded fittings and adequate pressure relief.

15. The quantity and associated hazards of flammable and combustible materials that are often found within the fire area should be factored into the analyses. Consideration should also be given to the presence of transient combustibles associated with storage and maintenance activities. Where a facility is fully protected as required by directives and prescriptive codes and standards, combustibles can usually be characterized in general terms and limited through normal housekeeping programs. However, when conditions prevent employment of normal fire protection features such as automatic sprinklers, noncombustible construction, and fire resistant boundaries, the FHA should quantify fixed combustibles and their locations and determine limits and locations of transient combustibles. These limits are usually enforced through formal combustible loading programs with permits for each combustible material brought into the area. Averaging combustible loading as a means to characterize the fire severity is not considered an acceptable technique over localized combustible loading.

16. FHAs for high-bay locations should consider the effects of smoke/hot gas stratification that may occur at some intermediate point below the roof or ceiling as well as the potential for delayed sprinkler response. Similarly, the effect of smoke movement through doors and dampers held open by fusible links should be addressed.

4.7 FHA Incorporation

Information in this section pertains to Section 3b(6) of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

1. The FHA, including all assumptions, should be documented. When both an FHA and a DSA are developed for a facility, the developmental effort should be coordinated to the maximum extent possible to avoid duplication of effort. It is recognized, however, that because an FHA is based on the premise that a fire will occur and considers fire safety issues (property loss and program discontinuity potential) that are not normally considered in the DSA, the conclusions of the FHA may be more conservative than would normally be developed by a DSA alone. Nevertheless, the FHA and its conclusions should be addressed in the facility DSA in such a manner as to reflect all relevant fire safety objectives as defined in Chapter II, Section 1 of DOE O 420.1B.

2. Information related to emergency response (number of emergency responders, number and types of apparatus, response time, etc.) should be incorporated into the DSA as a

means of clearly establishing a “floor” below which this level of capability should not be reduced.

4.8 Personnel

Information in this section pertains to Section 3b(7) of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

1. A sufficient number of qualified fire safety professionals (fire protection engineers, fire department management personnel and technicians) should be on staff to develop, implement and maintain the fire protection and emergency response program. Staffing levels should be based on a BNA, "work load analysis" or similar analysis that provides a technical basis for the fire safety staff. In those instances where a site is of insufficient size to warrant a fire protection staff or emergency response force, such capability should be achieved by other means, such as reliance on off-site fire departments or fire brigades and fire protection engineering support contractors.

2. Established industry criteria, such as those promulgated by the NFPA, as supplemented by DOE fire safety criteria, should be the basis for site and facility fire safety and emergency response training and qualifications. Emergency services organization officers and personnel may additionally meet the minimum requirements for training and certifications as established by the state or local jurisdiction, as an alternative to DOE directives or applicable NFPA standards, provided those state and local requirements are substantially equivalent and approved by the AHJ. (Although State and local requirements do not apply on Federal reservations, it may be selectively desirable to apply them to facilitate mutual assistance agreements with nearby jurisdictions.)

3. Sites should provide appropriate support personnel for escort or oversight responsibilities when using off-site fire departments, brigades and fire protection engineering support contractors who need to gain access to areas with classified material.

4. An appropriate level of individualized safety and health training is expected to be provided to all workers and emergency responders in accordance with the provisions of 10 CFR Part 851 and the incorporated training requirements of 29 CFR 1910 and 1926. Particular attention is directed at the HAZWOPER training requirements. Such training and familiarization also applies, as appropriate, to managers and decision makers to the extent that they are involved in directing the actions of their subordinates in the face of known fire hazards and in conjunction with hazardous materials incidents and fires.

5. All DOE Federal and contractor employees should be provided with a basic level of fire safety and response to emergency training initially, with refresher training

provided in conjunction with other general federal and contractor training programs. (This can include the distribution of printed matter and public address announcements.)

6. Members of the public, including visiting students and scientists, should be provided with suitable orientation on the fire hazards (if any) that they may encounter while on site and the appropriate personal response if they should find themselves in an emergency situation.

4.9 Baseline Needs Assessment

Information in this section pertains to Section 3b(8) of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

1. DOE site emergency services organizations are considered to be career fire departments in the application of NFPA Standards including the *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (NFPA 1710). Additionally, such organizations are expected to meet the DOE O 420.1B requirement for the completion of a BNA. In developing the BNA, the intent is that this be a coordinated effort involving the AHJ and the representatives of the site emergency services organization. Additional expertise in unique emergency response or fire prevention issues, legal matters, labor-related issues, emergency medical protocols, etc., may be required to assist in the development of the BNA.

2. A BNA is required for each site that maintains a staffed fire department or fire brigade. A BNA or an evaluation in documented form of comparable scope is to be developed by contractors at sites where emergency response is achieved by a capability other than a site fire department or brigade. The intent is to define, for all sites, the minimum capability to achieve a timely and effective response to fires and related events.

3. The BNA should be based on conformance with applicable NFPA standards, promulgated by the NFPA, as well as supplementary requirements and guidance developed by DOE. It should include organizational responsibilities, collateral duties, facility hazards, response time requirements, personnel levels, required apparatus and equipment. In addition, the document should describe the organization's various programs that support its personnel. This should include training, physical fitness, and medical programs relating to emergency responders.

4. In developing a comprehensive needs assessment, the basic assumption should be that there is only one emergency incident (such as a fire) occurring on site, with a casualty requiring emergency medical assistance. However, the document should also describe how the fire department would respond if a second incident occurred

while the first was underway. The second response capability could be based on documented mutual aid agreements and utilization of some percentage of off-duty personnel overtime. To the extent that an insufficient response capability is determined to exist for this second emergency, the BNA should address the required supplemental emergency response resources that would be needed to respond to this event.

5. A critical factor in any such analysis is the minimum response time necessary to begin active intervention (fire suppression, emergency medical, technical rescue, etc.) activities. The determination of a minimally acceptable response time should be based on risk and should reflect categories, such as alarm, call processing, dispatch, response, and turnout times that have been established in NFPA 1710. DOE expects that the response time requirements of NFPA 1710 be the starting point in the determination. Site specific conditions, such as the widespread installation of automatic fire suppression systems, could be used to extend response time to structural fires through the NFPA 1710 accepted equivalency process. Similarly, the provision of localized Automated External Defibrillators (AEDs) and first-aid supplies, along with appropriate employee training, could be used, in part, as a basis for extending Emergency Medical Service response times.

6. The minimum number of trained firefighters necessary to begin interior structural fire-fighting should be five, in line with the longstanding DOE guidelines on NFPA 1500 implementation. (It is recognized that, where lives may be at risk, the Incident Commander has the authority and responsibility to initiate rescue with less than this minimum if, in his judgment, it is safe to do so, for instance, in properties fully protected by automatic sprinkler systems.) Additional emergency response personnel will be necessary where multiple hose lines are required to suppress a fire and to support other fire ground activities such as search and rescue.

   a. The minimum number of personnel required for exterior fire fighting, hazardous material incidents, specialized rescue or other related events should be based on DOE fire protection guidelines, pre-incident fire planning where possible, and the judgment of trained and experienced Incident Commanders.

   b. When no site fire department or brigade exists and when reliance will be placed on off-site fire departments, a plan should be developed that details how such forces will be expected to respond in conjunction with the site emergency plan and how appropriate training and site familiarization will be provided to ensure that the off-site fire departments will be prepared for fires that occur on site. Appropriate drills should be performed periodically to verify the effectiveness of the plan.

c. Training of emergency responders may be based on existing requirements such as those used by the state in which the site is located, those delineated in 29 CFR Parts 1910 and 1926[3], as well as criteria developed by the NFPA. In addition, emergency responders should be provided with sufficient site-specific training and familiarization necessary to effectively respond to the unique conditions that characterize DOE facilities. As part of this effort, regular facility tours should be conducted utilizing current pre-incident fire plans as well as to verify that plans are accurate.

d. Drills and exercises should be structured to emphasize realistic scenarios and feature standard fire department tactical evolutions. Such drills should also be scheduled, as appropriate, during weekends and evening shifts when normal activities are reduced.

7. Emergency radio communication should be compatible with other organizations involved with emergency response and should be designed to be effective in areas subject to structural interference.

8. Fire department apparatus should reflect all site-specific response requirements, including those described in the first paragraph above. Other examples include hazardous material response, heavy rescue, rough terrain rescue, chemical or large flammable liquid spills, and wildland fire response. Reserve apparatus, if utilized, should be properly maintained and equipped to provide its intended response capabilities whenever first-line apparatus is out-of-service. Periodic replacement programs for apparatus should be structured to avoid excessive "down time" and repair costs and should reflect the industry norm of useful life cycles (e.g., 20 years).

9. DOE Site fire stations, where provided, should be designed to provide sufficient capacity for mobile apparatus, including maintenance functions. Living quarters should provide a comfortable, private and safe environment for personnel, consistent with state or NFPA requirements. This includes adequate sleeping quarters where necessary (when personnel are working more than a 12-hour shift), kitchen facilities, training rooms, physical fitness areas, and other ancillary needs. To the extent that related occupancies such as alarm rooms, maintenance rooms, and personnel areas are co-located within the same facility, appropriate fire-rated physical separation, ventilation and exhaust, and other fire protection features should be provided to prevent interference and to ensure the viability of individual areas in the event of a fire. All sleeping quarters should also be protected with automatic sprinklers (quick response), smoke detection and carbon monoxide

[3] Contractors subject to 10 CFR Part 851 must adhere to 29 CFR Parts 1910 and 1926 if these regulations are applicable to the hazards at their covered workplace. See 10 CFR § 851.23 (a)(3) and (7).

(CO) detection that are connected to transmit alarms locally and to the site central reporting location.

10. Fire stations should be "centrally" located to the facilities protected so as to minimize response time. Station location should also reflect prevailing traffic patterns, climatic conditions, railroad tracks and other sources of delay.

11. Consistent with the training needs identified above, adequate facilities should be provided for training. This includes "live fire" training, confined space entry, vehicle extrication, hazardous material response, and other site-specific conditions. Where on-site training facilities are unavailable, arrangements should be made for appropriate training for fire department personnel off-site.

4.10 BNA Incorporation

Information in this section pertains to Section 3b(9) of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

Information related to the site emergency services organization, such as the number of emergency responders, number and types of apparatus, response time, etc. should be incorporated into the site emergency plans, FHAs, and DSAs, as appropriate, to clearly establish a “floor” below, which this level of capability should not be reduced without appropriate compensating safeguards and/or the restriction of hazardous operations. This information can be inserted in summary fashion or the BNA can be incorporated directly into the above-referenced documents.

4.11 Pre-Incident Fire Activities

Information in this section pertains to Section 3b(10) of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

It is expected that pre-incident fire plan documents (or comparable software) be developed in accordance with standard practices within the emergency services community, applicable NFPA standards, and DOE expectations, as reflected in published guidelines. For additional information and to access “model” documents that can be downloaded and edited, refer to the DOE fire protection web site at http://www.hss.energy.gov/nuclearsafety/nsea/fire//models/models.html

4.12 Unique Fire-fighting Activities

Information in this section pertains to Section 3b(11) of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

Procedures on unique fire-fighting activities can be developed and maintained in conjunction with efforts governing fire department procedures in general. DOE and contractor management should be kept routinely informed if fire department emergency operations for these special circumstances represent deviations from the norm. FHAs

and DSAs should reflect unique fire fighting strategies where rapid intervention may not be possible (moderation controlled areas) and where fixed fire protection systems may no longer be applicable, e.g., certain transitional facilities (See Section 4.16 for further information).

4.13 Assessments

Information in this section pertains to Section 3b(13) of Chapter II in DOE O 420.1B (and the corresponding CRD section as well as Section 3b(14) in Attachment 2 of DOE O 420.1B).

1. The principal objective of a fire safety assessment is to identify deficiencies that would prevent the achievement of DOE's fire safety policy objectives.

2. Facility and programmatic assessments should be performed under the supervision of a qualified fire protection engineer as defined by DOE. Personnel conducting such assessments should have an appropriate level of knowledge and experience in the application of fire safety codes and standards to diverse facilities. Assessments should, as a minimum, encompass the following elements of the fire protection program:

   a. Program Related (performed by both DOE and contractors):

      - Comprehensiveness of the fire protection program
      - Procedures for engineering design and review
      - Procedures for maintenance, testing, and inspection of installed fire protection systems and features
      - Fire protection engineering staff (number, qualifications, training)
      - Emergency Services Organizations including the BNAs
      - Management support
      - Exemptions and documented equivalencies or deviations

   b. Facility Related (principally, but not exclusively contractor self-assessments and DOE operational readiness reviews):

      - Fire protection of safety class and safety significant equipment
      - Life safety considerations
      - Fire protection of vital programs
      - Fire protection of high-value property

- Fire suppression equipment
- Water runoff
- Facility fire prevention planning documents (evacuation plan/fire wardens extinguisher training)
- Fire apparatus accessibility
- Completeness of fire hazards analyses
- Fire barrier integrity
- Completeness of fire loss potential (MPFL) determinations
- Fire safety training
- Potential for toxic, biological and /or radiological incident due to fire

c. Combined Aspects (Program and Facility):

- Conformance with applicable Orders, codes and standards
- Inspection, testing, and maintenance reports
- Adequacy of facility appraisal reports
- Tests, inspections, procedures, and records for maintaining fire protection systems and features
- Administrative controls
- Temporary protection and compensatory measures

3. The frequency of assessments should be as follows:

a. Annual fire protection assessments should be made of facilities valued in excess of $100 million, facilities considered a high hazard, or those in which vital programs are involved as defined by DOE.

b. Remaining facilities should be assessed at least every three years or at frequencies determined by the AHJ. (Note: Low and ordinary hazard facility assessments in adjacent areas may be combined.)

c. Comprehensive assessments of fire protection program elements by DOE and by contractors should be made every three years. (These should be staggered in anticipation of contractor-initiated enhancements.)

4. Assessment reports should include a description of what was accomplished during the effort (areas toured, documents reviewed, and people interviewed). It should feature a "baseline" description of the facility, hazards and other occupancy considerations, and fire protection features. In addition, the report should document changes of significance that have occurred within the facility since the last assessment that affect fire safety, and it should list all noted deficiencies, along with a recommendation for remediation and interim compensatory measures, if necessary, pending resolution. A "model" assessment report is available at the following web site: http://www.hss.energy.gov/nuclearsafety/nsea/fire//models/models.html.

5. DOE self-assessments and assessments of contractors are intended to confirm that comprehensive fire protection programs are in place site-wide. They should include a select review of facility and site fire protection features, fire safety policies and procedures, the qualifications of contractor fire safety professionals, the adequacy of self-assessments, fire hazards analyses, and program performance as detailed in this guidance and other DOE Orders/ Manuals such as DOE O 226.1, *Implementation of DOE Oversight Policy*, and Table F-2 (Program Performance Measures) of DOE M 231.1-1A, *Environment, Safety and Health Reporting Manual.*

6. Additionally, it is expected that DOE assessments include the capabilities to respond in a timely and effective manner to site fire emergencies and related events. This assessment responsibility extends to contractors where there is no site fire department or brigade and where effective emergency response is predicated on other resources, such as occupant emergency organizations and offsite fire departments. In other words, the heads of field elements should determine the adequacy of the emergency response capability at all of the sites for which they have responsibility.

4.14 Corrective Action Processes

Information in this section pertains to Section 3b(14) of Chapter II in DOE O 420.1B (and CRD Section 3b(15) in Attachment 2 of DOE O 420.1B).

1. It is expected that the corrective action process will encompass all fire protection "findings"; i.e., all issues requiring action, e.g., facility, program, and emergency response. When modifications that are necessary to correct significant fire safety deficiencies will be delayed beyond one week, it is expected that interim compensatory measures (such as fire watchers) be adopted until the modifications are complete. Compensatory measures should be initiated without delay commensurate with the finding and at the discretion of the AHJ.

2. Significant findings (life threatening or with a serious injury potential) from these assessments will be the basis, in part, for contractor entries into the Noncompliance Tracking System that is a component of the enforcement process required through 10 CFR Part 851.

4.15 Exemptions Variances & Equivalencies (Approved Requirement Relief)

Information in this section pertains to Section 3b(15) of Chapter II in DOE O 420.1B (and CRD Section 3b(16) in Attachment 2 of DOE O 420.1B).

The DOE directives system and the requirements of 10 CFR Part 851 impose a range of explicit direction in the development, review, and approval of exemptions, variances and equivalencies as delineated below. Contractors are advised to consult with the AHJ before proceeding with a request for relief. One goal is to avoid unnecessary duplication of effort and the generation of unnecessary paperwork.

1. DOE M 251.1-1B, *Departmental Directives Program Manual*, states:

> If the Order, Notice, or Manual includes specific provisions for exemptions, equivalencies, or other forms of relief from the requirements in the document, then those provisions must be applied. If the document does not include specific provisions for relief, the process in this chapter [of DOE M 251.1-1B] applies to granting permanent or temporary relief from the applicable requirements in those documents.

With respect to exemptions to the provisions of DOE O 420.1B, paragraph 6a of that Order states:

> Exemptions to this Order (DOE O 420.1B) must follow the process defined for exemptions in DOE M 251.1-1B, *Departmental Directives Program Manual*, except for the approval authority defined in the responsibilities paragraphs of this Order.

DOE O 420.1B assigns the authority to grant exemptions to the provisions of DOE O 420.1B to the Secretarial Officer, unless delegated. Furthermore, a granted exemption to DOE O 420.1B is not considered an exemption from all other DOE directives or statutory requirements, such as 10CFR 851, that may be affected by such relief. Please refer to the DOE directive or statutory requirements for information on exemption processing of the affected document.

With respect to requests for relief from NFPA Code provisions, paragraph 6b of DOE O 420.1B states:

> Exemptions, exclusions, and equivalencies to standards or other documents referenced in this Order should follow the provisions explicitly set forth in those documents; for example: the equivalency, alternative, and modification provisions in the NFPA Code.

Paragraph 5d(10) of DOE O 420.1B assigns the AHJ responsibility, and therefore the authority to approve equivalency decisions in accordance with those provisions, to the head of field elements with a notation to ensure that fire protection SME comments are addressed.

2. The process for requesting and approving variances from the provisions of 10 CFR Part 851 are delineated in the Rule and in supplemental guidance promulgated by DOE. Consult the following web site for this information: http://www.hss.energy.gov/HealthSafety/wshp/rule851/851final.html

3. Most codes and standards of the NFPA are silent on exemptions to their requirements but allow for an equivalent or alternate means of achieving compliance with the code or standard. Where no equivalent or alternate means for achieving compliance is provided, noncompliance to an applicable NFPA code or standard should be processed as an exemption to DOE O 420.1B according to the provisions in DOE O 420.1B for exemptions to that Order, including the referenced provisions in DOE M 251.1-1B.

4. Documented requests for relief should be developed by a qualified fire protection engineer or certified fire department officer and submitted through the AHJ to the appropriate reviewing authority. Documented approvals should be kept on file in an auditable form. Multiple conditions that can be resolved on the basis of such relief can be grouped by individual code or standard, provided that the specific conditions are explicitly identified.

5. The level of documentation necessary to support a request for relief will vary depending on the issue. As a minimum, each request should identify the specific site location or condition at issue and the paragraph/section of the code or standard which addresses the issue; discuss why the requirements of the code or standard that cannot or should not be met; and justify the conclusion that the alternate configuration is acceptable from a safety, environmental, property damage, or program continuity perspective to what is stipulated in the code or standard. All functions should also be addressed. For example, an automatic sprinkler system provides detection, local alarms, fire department notification, and fire suppression. The description of alternatives in an equivalency should address each of these functions. Additionally, relief under one source document is not considered relief from another. All codes and standards with similar requirements should be identified and any differences addressed accordingly. For example, sprinklers may be required for life safety by NFPA 101 and for nuclear safety by NFPA 801.

6. When a positive determination is made in support of relief, then documentation should include signatures of all those involved in the decision, including that of the cognizant DOE fire protection engineer.

7. A change in use or occupancy will require the re-evaluation and approval of all documented requests for relief within the structure to assure that these are valid under the building's new use or occupancy.

8. Regarding FHAs, all approved variances and exemptions to DOE directives and/or equivalencies should be provided or referenced within the FHA document itself along with all supporting information. Documentation related to approved

relief should be reviewed during the FHA update to verify that conditions have not changed and the justifications are still valid. Additionally, such considerations may have other conditions for review according to a specified schedule, which should also be documented in the FHA. If there is no FHA for the facility, appropriate reviews and documentation should be consolidated and maintained with the fire protection staff for review by the AHJ or representative.

9. Regarding BNAs, those responsible for managing site fire protection emergency service programs may decide to request relief from the provisions of NFPA and similar industry standards, provided that the NFPA or industry standards allows the use of an alternative approach and the proposed alternative achieves an equivalent level of safety. Appropriate documentation that justifies the alternative should be submitted to the AHJ for review and approval prior to the implementation of the alternate. If such relief relates to the site's emergency services program, then such documentation should be included within the BNA discussed in Section 4.9 of this Guide.

4.16 Transitional Facilities

Information in this section pertains to Section 3b(16) of Chapter II in DOE O 420.1B (and CRD Section 3b(17) in Attachment 2 of DOE O 420.1B).

1. Transitional facilities are those that have been placed in a safe-shutdown condition and abandoned, or are undergoing decontamination and decommissioning (D&D) work and ultimately demolition or abandonment. The need for fire protection features in these structures is governed by the consequences of a fire to the public, workers, and fire fighters as well as the potential release of hazardous and radiological materials while the facility is in the transition process. Since property protection and program continuity are not always factors to consider in a transitional facility, all fire protection requirements may not be appropriate. Factors, which should be considered, center on the transition itself, such as fire protection equipment removal, and the impact that this transition has upon fire protection features and activities. Such factors are additionally important if the facility possesses a definable value and/or mission as determined by the DOE program office; or, if a fire would significantly increase the cost of the D&D process, such as destroy vital equipment required for D&D activities, delay transition commitments, or undermine public confidence.

2. Fire safety and emergency response for transitional facilities are governed by the requirements contained in 10 CFR Part 851 (including 29 CFR Part 1926) and the provisions of NFPA Standard 241, *Safeguarding Construction, Alteration and Demolition Operations.* (See also Factory Mutual Data Sheet 1-0 *Safeguards During Construction,* and Chapter 8 of NFPA 801, *Fire Protection for Facilities Handling Radioactive.*)

3. Decisions relating to fire safety of such facilities should be made on the basis of the following principles:

a. The evaluation of fire risks imposed by the work in relation to the need for traditional fire safety features. This can be accomplished through a graded transitional facility fire hazard analysis or assessment (TFHA) that has been reviewed and concurred with by the AHJ. Approved relief from normal DOE requirements should be listed on the signature page. All requests for relief should be processed in accordance with DOE procedures. The facility's fire protection assessment or FHA may be utilized where applicable to complete this evaluation.

b. Fire hazards within these facilities may change over time, such as an increase in combustible loading during abatement activities. Fire protection should be adequate to deal with these changes. The TFHA together with updated pre-incident plans should account for this either through a phasing schedule, or be revised as appropriate when significant changes in occupancy or hazard occur that affect fire safety.

c. Fire safety features that have originally been required by DOE may be rendered inoperable or considered no longer needed if justified by the TFHA on the basis that the safety of D&D workers and emergency responders will not be compromised. Such features may be abandoned in place (and properly identified as being out of service) until they are dismantled as part of planned demolition activities.

d. The decision to deactivate automatic fire suppression systems in large facilities should reflect the possibility that the fire department may not be able to safely enter the facility to effect manual fire suppression. A defensive tactical approach, which features exterior fire attack and protection of exposures, should be a part of the BNA described in Section 4.9 of this Guide and written into the fire department's updated pre-incident plan. Such approach necessitates additional emphasis on maintaining communication and cooperation between facility personnel and the fire department so that emergency responders are aware of changes in occupancy and fire protection system status.

e. Retained fire protection features in these facilities are not required to comply with all of the design and installation criteria of the governing NFPA standard if the AHJ concurs that the system will function adequately during a fire in its current design mode. The AHJ concurrence should be documented in accordance with site procedures.

f. Retained fire protection features should be inspected, tested and maintained to ensure that the features will function adequately during fire incidents, based on the mission of the facility.

g. Transitional facilities should be routinely inspected and reviewed by representatives of the fire department and fire protection engineering staffs consistent with established standard operating procedures and fire

protection program criteria. Tours of facilities should also be conducted by the fire department to familiarize them with existing conditions and to revalidate pre-incident plans. Drills and training exercises should also be conducted at these locations at an appropriate frequency commensurate with the fire risks and complexity of the facility.

h. Prior to commencement of work activities in a facility, appropriate procedures should be approved and implemented (including worker training) governing the control of potentially hazardous operations including, but not limited to, cutting and welding, storage and handling of flammable or combustible liquids, transient combustibles, and sources of ignition such as temporary wiring and heating equipment. Smoking areas, when allowed on the premises, should also be established.

i. The fire risks associated with materials and processes used as part of the transition process should be evaluated by a fire protection engineer. Fire protection features should be adequate to limit these risks to an acceptable level.

j. The deactivation of process lines containing hazardous materials as well as flammable or combustible liquids should be preceded by an analysis or performed under a work plan that addresses the methods used to control related hazards during the deactivation process. Appropriate safeguards need to be in place to control and minimize the release of residual materials that may remain in piping and tanks.

k. Safeguards to assure D&D worker and emergency responder safety and health are expected to conform to the requirements in 10 CFR Part 851, and the requirements for buildings under construction or demolition, as provided in NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*, unless relief has been granted by the AHJ. In buildings where regular tours and inspections are conducted, adequate exits and lighting must be provided as a minimum as required by NFPA 101. Compensatory measures should be established whenever routine surveillance is being performed in these facilities. These measures should be approved by the site fire authority. Locked and abandoned facilities where there is no human occupancy do not need to maintain emergency egress features.

l. Where no automatic system exists, an effective means for manually summoning the fire department and for communicating with personnel inside of a building is required. This can take the form of an exterior fire alarm pull station or call box, telephone (fixed or mobile), radio or some combination of the above based on the accessibility of the devices to all personnel and their reliability. However, in accordance with NFPA 101, all egress features must be reviewed once the facility is reopened for actual demolition activities. Stairwells should be inspected on a routine

basis and maintained accessible, clear and dry in the event firefighting activities are required.

m. All retained interior fire protection systems should be maintained operational to the extent possible while interior work activities are taking place. The sequence of removal of these systems should be clearly spelled out in contractor requirement documents and the TFHA. Verification of operable status should include appropriate inspection and testing in accordance with established procedures. Sprinkler systems should be retained until all fixed and transient combustible materials have been removed. Wet sprinkler systems may be converted to dry systems to minimize heating needs. Any temporary deactivation of fire protection features during transition operations should be treated as an impairment, with appropriate interim compensatory measures implemented until the feature is returned to full operational mode pending final demolition.

n. The site and facility fire water distribution system, including hydrants, fire department connections, and interior standpipe systems, should be maintained in an operable mode. Access for mobile apparatus for emergency response should be maintained and verified on a frequent basis. (Refer to fire department pre-incident fire plans.)

o. To the extent that the TFHA validates the need to maintain fire protection features during transition activities, such features should be inspected, tested and maintained, consistent with established procedures, sufficient to ensure that they will function effectively during a fire, based on their intent during transition. This implies that defects or design deficiencies that are not essential to ensure liability and effective performance, as determined by the AHJ, may remain as is.

4. Firefighting procedures may be developed and maintained in conjunction with efforts governing fire department procedures in general. DOE and contractor management should be kept routinely informed if fire department emergency operations for these special circumstances represent deviations from the norm. TFHAs and/or DSAs should reflect unique fire-fighting strategies where rapid intervention may not be possible (moderation controlled areas) and where fixed fire protection systems may no longer be applicable.

4.17 Fire Protection Design

Information in this section pertains to Section 3c of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

1. Design aspects of new DOE facilities as well as modifications to existing facilities must be based on the provisions of the applicable requirements of the Code of Federal Regulations (CFR), DOE directives, the model building codes**,** and the applicable NFPA codes and standards. Refer also to DOE-STD-1066-99 for

supplemental design guidance of DOE facilities. The design process should include appropriate oversight by a qualified fire protection engineer of plans, specifications, and testing of fire protection features.

2. In accordance with DOE O 420.1B, DOE facilities, sites, and activities (including design and construction) must have a level of fire protection that is sufficient to fulfill the requirements of the best protected class of industrial risks (commonly referred to as "Highly Protected Risk " or "Improved Risk") and should be provided protection to achieve "defense-in-depth." This includes meeting the applicable building code and NFPA Codes and Standards, and exceeding them when necessary to meet safety objectives. The applicable codes and standards are those in effect when facility design commences ("code of record"). In accordance with DOE O 420.1B, when significant modifications to a facility occur, as determined by the AHJ, the current edition of the code or standard must apply to the modification.

3. Life safety provisions fall within the jurisdiction of 10 CFR Part 851 and DOE O 440.1B. Refer to DOE G 440.1-8 for additional guidance. Additional or modified exiting requirements for toxic and explosive environments should be as determined by the appropriate authorities defined within the above stated documents. In addition, for explosive environments, exits should reflect the criteria contained in the DOE Explosives Safety Manual (DOE M 440.1-1A).

4. It may be necessary to exceed or supplement the requirements of the applicable NFPA code or standard when designing fire protection systems designated as safety class in the DSA. Such additional design requirements would be required when justified on the basis of the conclusions of the DSA or FHA.

5. Except for systems designated as safety class or safety significant, existing sprinkler systems installed under the 'pipe schedule' rules of NFPA 13, *Standard for the Installation of Sprinkler Systems*, do not require hydraulic verification, provided that: the sprinkler system is adequately maintained; there has been no increase in occupancy hazard classification; there has been no significant degradation in available water supply as determined by the AHJ; it is reliably maintained; and meets the water supply requirements of NFPA 13 for pipe schedule systems. Refer to Section 4.21 for guidance when considering a change in the safety classification of any existing sprinkler system.

4.18 Water Supply

Information in this section pertains Section 3c(1) of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

It is expected that the emergency services organization for DOE sites will be either directly involved with or sent the results of routine water supply tests that are required by NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire*

Protection Systems. Similarly, the emergency services organization for DOE sites should be immediately informed of any water line breaks or other water supply outages that would adversely affect its ability to respond to fires and related events.

4.19 Automatic Fire Suppression

Information in this section pertains to Section 3c(4) of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

1. A fundamental precept of the DOE Fire Protection Program is that all facilities of significance (new and existing), including facilities where a fire could cause unacceptable off-site and/or on-site consequences to health, safety, or the environment should be protected by automatic fire suppression systems (usually sprinkler systems).

2. The need for an automatic fire suppression system may be based on conclusions resulting from an FHA, a DSA, or state or local building codes. The FHA should be predicated on the assumption that a fire will occur. The nature of that fire depends on the hazards present at any given time within the facility. The resulting protection should be designed to ensure that a fire would be successfully controlled until such time that emergency response forces arrive to complete extinguishment.

3. DOE has an obligation to provide protection for its facilities such that a fire will not result in an unacceptable program delay or property loss. Consequently, the Department considers any facility in excess of 5,000 square feet total floor area, or in any facility with a MPFL of $3 million as warranting protection by a supervised automatic fire suppression system. Private sector practice in recent years has expanded sprinkler system use in smaller and less hazardous facilities as well. Additionally, when the MPFL exceeds $50 million, a redundant fire protection system should be provided that, despite the failure of the primary fire protection system, would limit the loss to below $50 million. Redundant protection may be a fire-rated barrier system or a smoke detection system in conjunction with a fully capable fire department, among other options.

4.20 Fire Suppression System Confinement or Containment

Information in this section pertains to Section 3c(10) of Chapter II in DOE O 420.1B (and the corresponding CRD section in Attachment 2 of DOE O 420.1B).

The intent of this requirement is to contain any potentially contaminated fire suppression system water in an area until such time as it can be tested and determined safe to release to the environment. Such containment could include specifically constructed tanks, ponds, or dikes to hold the effluent; or it could consist as emergency response procedures to “build” such a containment system as necessary to prevent an offsite release. The capacity of such a system should be based upon a calculated and reasonable approach to determining water volume,

such as the anticipated flow rate from sprinkler systems and hose streams along with the expected duration necessary to respond, control and extinguish the fire. Additionally, such systems should be configured with overflow capability and established procedures developed to prevent any offsite overflow release

4.21 Fire Protection Systems Classification

Information in this section pertains to Section 3c(5) and 3c(6) of Chapter II in DOE O 420.1B *(and the corresponding CRD section in Attachment 2 of DOE O 420.1B).*

1. Determination of the need for redundant [exceeding what is necessary or normal in the interest of preventing failure of the structure, system, or component (SSC)] fire protection SSCs, rests with the FHA and DSA process described in this Guide. This section addresses cases (for both new and existing fire protection systems) wherein DOE takes credit for fire protection SSCs in meeting mandatory worker and public protection guidelines applicable to a nuclear facility (i.e., 10 CFR 830, *Nuclear Safety Management*; and DOE O 420.1B). In these situations, the DSA may identify the fire protection system either *safety significant* (needed for defense in depth and worker protection) or *safety class* (needed for protection of the public). The objective of this identification might be to reduce the frequency and/or consequences of an analyzed fire. Methods to achieve these calculated objectives might include enhanced reliability of detection and suppression systems, minimization of ignition sources and transient combustible loading, and increased reliance on the integrity of fire barriers, penetrations, and filter plenums.

2. Safety classification is handled according to the methodology prescribed in DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, and DOE Guide 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria Guide for use with DOE O 420.1, Facility Safety*. For new and major modification to existing systems, safety class, or safety significant systems are to meet requirements of DOE O 420.1B Chapter 1, *Nuclear and Explosives Safety Design Criteria*, as well as any further applicable guidance provided in both DOE G 420.1-1 and this Guide.

3. For existing fire protection SSCs, a certain inherent level of reliability is established in the application of the appropriate codes and standards when such systems were originally built. It is, however, the responsibility of the fire protection engineer, system engineer, and the safety analyst to ensure that functional requirements of the DSA are adequately achieved when reclassifying an existing system. Optimally, an existing safety system to be designated as safety class or safety significant should satisfy the criteria for a newly designed system. However, if differences between current standards and an existing

system are significant, designation of the system as safety class or safety significant is still possible if adequate enhancements are implemented.

4. The criteria used to evaluate the ability of existing systems to meet the appropriate conditions to be classified as safety class or safety significant is provided in Chapter 1 of DOE O 420.1B and its accompanying guidance document G 420.1-1. This can also be accomplished by performing a design adequacy review using guidance provided by the Energy Facility Contractors Group (EFCOG) Engineering Practices Working group available at http://efcog.org/wg/ep/docs/archive/Safety%20System%20Design%20Adequacy.pdf.

5. In reviewing the vulnerabilities of the existing system, the responsible fire protection engineer (working with the system engineering manager for the system and the safety analyst) should consider the topics below:

   a. What is actual performance requirement to be imposed on the fire protection system?

      The fire protection engineer should understand exactly how the system must perform to meet the requirements of the DSA. This understanding is acquired by focusing on the performance requirement for the system as described in specific accident scenarios. If the system to be reclassified is a sprinkler system, the fire protection engineer should ask questions such as:

      - What accident scenarios is the sprinkler system to be relied on for mitigation?
      - What range of fires does the system have to control?
      - Is the system expected to control the fire to a theoretical maximum size for a specified period?
      - Does the system have to function for fire control?
      - Is there radiological or other concerns related to inadvertent system actuation?

      If the system at issue is a passive one such as barriers, a sample question might be: If a fire barrier is relied upon to limit the material at risk, is the main concern the fire rating of the barrier, the integrity of penetration seals, or something else? (These questions are intended as examples.)

      The first step in this analysis is complete when the fire protection engineer thoroughly understands (in a qualitative way) the specific performance requirements for the system that would serve as a basis for reclassification to safety class or safety significant.

b. What is the required reliability for the system?

Required safety functions for the system will normally be established in the approved safety basis. This stage of the inquiry is needed to determine whether this level can be substantiated from the performance standpoint. Particularly where safety class designation is sought, adoption of industry benchmarks may not be sufficiently probative of reliability.

Taking as an example the reliability on demand of a sprinkler system, one can find NFPA sprinkler system data from the late 1960s (the last time NFPA published reliability date) suggesting an on-demand reliability of 96 percent.[4] DOE has published study asserting sprinkler system reliabilities as high as 99 percent,[5] while other studies offer figures as low as 85 percent.[6] But a DSA will require that the assumptions used in developing any benchmark be available. It is possible that in some cases the assumptions underlying a study would conflict with the assumptions of the safety analysis.

There is no answer applicable to all cases. Each reliability study should be evaluated on the basis of the assumptions made, the type of data collected, maintenance of the systems studied, etc. The reliability of the system needed to mitigate accident scenarios may not be adequately demonstrated based on available data. In such cases, reclassification of the system cannot proceed without appropriate alternative measures such as system enhancements, reduction of combustibles, or reduction of material at risk.

The second step in this analysis is complete when the fire protection engineer understands the reliability goal established by the DSA and has identified data that does or does not support reliability at that level. Reliability can be increased, but some baseline should first be established in order to quantify the effects of design changes or changes in inspections, tests, and maintenance.

c. What are the limits of the designated fire protection system? What support systems are needed to guarantee its functionality?

This next step is to define the limits of the fire protection system being considered and to identify all support systems needed for the system to function on demand. The system boundary limits should include all SSCs and support systems necessary to guarantee its functionality. With respect

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[4] NFPA, "Automatic Sprinkler Performance Tables, 1970 Edition," *Fire Journal*, July 1970, pp. 35-39.

[5] Maybee, W.W., "Summary of Fire Protection Programs in the U.S. Department of Energy—Calendar Year 1987," U.S. Department of Energy, August 1988.

[6] For a summary of sprinkler reliability studies, see Koffel, W., "Reliability of Automatic Sprinkler Systems," available on the website of the Alliance for Fire Safety: http://www.afscc.org/ReliabilityofSprinklerSystemsRJan2006.html (Checked August 2007).

to a sprinkler system, for example, how far does that system extend? To the base of the riser, the post indicator valve outside the building, the connection to the water supply loop, or the water source and pumps?

Assuming for a moment that the system is being traced all the way back to the fire pumps and if these pumps are electrically powered, is the power supply a required support system? The issue of system boundary can also arise for passive systems. For example, if safety credit is to be taken for a fire-rated wall assembly, does the assembly extend only from the floor to the ceiling of a given area or does it extend through multiple floors? If the barrier is supported by structural steel, could a failure of the structural steel lead to a failure of the fire barrier?

This third step in the analysis is complete when the fire protection engineer is in a position to write out a definition of the system for which safety credit is to be taken, and can identify all support systems that are relied upon for the system to function upon demand.

d. In the accident scenarios of interest, what events or conditions could threaten the ability of the fire protection system to perform its intended function?

An example of this factor is the attempt to rely on a fire protection system to mitigate a design basis fire initiated by an earthquake. In this case, it is possible that a suppression system is expected to survive and remain functional after such a seismic event. Whether credit can be taken for the system in the safety analysis of post-earthquake fire scenarios will be dependent not only on the continued integrity of the in-building system, but on all other supporting components leading back to the water supply.

In general, the fire protection engineer (having already identified the system to be analyzed and having a full understanding of the scenarios in which it might be called upon to function) should proceed in this step to look for the system's vulnerabilities as a result of the initiating event. This investigation should be done in coordination with the assigned system engineer and the safety analyst to ensure that all potential vulnerabilities are identified and their impact on functionality assessed. The outcome might be that safety class or safety significant credit can be taken with the system in as-found condition, or that design changes will be needed to prevent system failure in the scenarios for which safety credit is to be taken.

e. Is the system as designed (or installed in the case of an existing system) adequate to meet the required safety function? Are modifications or upgrades required?

DOE does not specify the design expectations of fire protection systems relied upon in safety analysis documentation, except for the following: (1) seismic requirements on sprinkler systems set forth in Section 7.3 of DOE-STD-1066-99, (2) general infrastructural (Mechanical/Electrical) requirements in Chapter 5 of DOE G 420.1-1; and (3) Chapter II, Section 3c(12) of DOE O 420.1B which states: "Fire protection systems designed such that their inadvertent operation, inactivation, or failure of structural stability will not result in the loss of vital safety functions or inoperability of safety class systems as determined by the DSA." The fire protection engineer will need to assess the overall adequacy of the system to mitigate the fire scenarios of concern. For a new system, this effort may be minimal, such as verifying that the design basis performance characteristics match those described in the safety basis documents. For an existing system, this effort may be more extensive. DOE O 420.1B, Chapter I, Section 3b(7) requires SSCs to be "designed, commensurate with the importance of the safety functions performed, to perform their safety functions when called upon and to meet the quality assurance program requirements of either 10 CFR 830, Subpart A, or DOE O 414.1C, *Quality Assurance*, as applicable."

Useful guidance to perform this design adequacy review has been provided by the EFCOG. For example, hydraulic calculations, in lieu of scheduled design, may be needed to demonstrate that an installed sprinkler system can deliver the water discharge density required by NFPA 13 and otherwise meets the code's criteria for spacing and obstructions to water discharge. Where the existing system cannot be shown adequate to meet the requirements of the safety analysis, design upgrades may be needed or the system's reliability adjusted downward to reflect the less-than-optimum design.

f. What level of inspection, testing, maintenance and surveillance is appropriate to ensure the required performance of the system?

Meeting the inspection, testing, maintenance and surveillance requirements of NFPA codes applicable to the system in question should be considered a minimum to guarantee the functionality and performance of the system on demand. In most cases, this level of attention should be adequate to justify classifying the fire protection system as safety significant. Where the higher designation of safety class is desired, however, the fire protection engineer may need to consider substantial increases over basic NFPA criteria.

Among the additional steps that might be taken are increased quality assurance (e.g., procurement procedures, 100% pre-installation inspection and documentation of equipment, additional training for installation,

maintenance, and testing personnel) and more frequent intervals for inspections, tests, and maintenance.[7]

g. Is the fire protection system's operability protected by a technical safety requirement (TSR)?

The final step in the analysis, assuming the steps above have shown that a fire protection system may be reclassified as safety class or safety significant, is for the fire protection engineer to develop, in coordination with the system engineer and the safety analyst, a TSR. Such requirement will specify, among other things, required intervals for inspections, tests, and maintenance, a definition of operability for the system, action statements for instances where the system becomes unavailable, and compensatory actions to be taken. In addition, any surveillance testing imposed by TSR should have acceptance criteria for tested parameters supported by calculations or other engineering documents to ensure that design bases assumptions are met.

In addition, the development of the TSR will require the evaluation of systems interactions, i.e., how the failure of other systems could induce a failure in the fire protection system covered by a TSR. For example, the water supply for a safety class sprinkler system may be provided by a site-wide water system. This system may need TSRs to ensure maintenance performed on the underground piping will not inadvertently impact the safety class function. The TSR is a critical factor in ensuring that a fire protection system for which safety analysis credit is taken will perform on demand and as designed.

[7] See safety documentation developed by Westinghouse Savannah River Company in connection with the Tritium Consolidation Project, described in letter and attached report, John Conway to Ernest Moniz, March 18, 1999.

NFPA CODES AND STANDARDS

1. As a minimum, all of the following NFPA codes and standards (or their current equivalents) are likely to be applicable to all DOE elements and contractors that have responsibility for fire safety programs per the requirements of CFR 851 and DOE O 420.1B:

NFPA 1	Uniform Fire Code
NFPA 10	Standard for Portable Fire Extinguishers
NFPA 13	Standard for the Installation of Sprinkler Systems
NFPA 30	Flammable and Combustible Liquids Code
NFPA 51B	Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 55	Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks
NFPA 70	National Electrical Code
NFPA 70E	Standard for Electrical Safety in the Workplace
NFPA 72	National Fire Alarm Code
NFPA 80	Standard for Fire Doors and Other Operating Protectives
NFPA 90A	Standard for the Installation of Air-Conditioning and Ventilating Systems
NFPA 101	Life Safety Code
NFPA 101B	Code for Means of Egress for Buildings and Structures
NFPA 241	Standard for Safeguarding Construction, Alteration, and Demolition Operations
NFPA 780	Standard for the Installation of Lightning Protection Systems
NFPA 801	Standard for Fire Protection for Facilities Handling Radioactive Materials
NFPA 1144	Standard for Reducing Structure Ignition Hazards from Wildfire

2. As a minimum, the following NFPA codes and standards (or their current equivalents) are likely to be applicable to contractors that have responsibility for site emergency response programs (fire department, fire brigade, etc.):

NFPA 1000	Standard for Fire Service Professional Qualifications Accreditation and Certification Systems
NFPA 1001	Standard for Fire Fighter Professional Qualifications

NFPA 1002	Standard on Fire Apparatus Driver/Operator Professional Qualifications
NFPA 1005	Standard on Professional Qualifications for Marine Fire Fighting for Land-Based Fire Fighters
NFPA 1006	Standard for Rescue Technician Professional Qualifications
NFPA 1021	Standard for Fire Officer Professional Qualifications
NFPA 1037	Standard for Professional Qualifications for Fire Marshals
NFPA 1041	Standard for Fire Service Instructor Professional Qualifications
NFPA 1051	Standard for Wildland Fire Fighter Professional Qualifications
NFPA 1061	Standard for Professional Qualifications for Public Safety Telecommunicator
NFPA 1071	Standard for Emergency Vehicle Technician Professional Qualifications
NFPA 1081	Standard for Industrial Fire Brigade Member Professional Qualifications
NFPA 1141	Standard for Fire Protection Infrastructure for Land Development in Suburban and Rural Areas
NFPA 1142	Standard on Water Supplies for Suburban and Rural Fire Fighting
NFPA 1143	Standard for Wildland Fire Management
NFPA 1221	Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems
NFPA 1403	Standard on Live Fire Training Evolutions
NFPA 1404	Standard for Fire Service Respiratory Protection Training
NFPA 1410	Standard on Training for Initial Emergency Scene Operations
NFPA 1451	Standard for a Fire Service Vehicle Operations Training Program
NFPA 1500	Standard on Fire Department Occupational Safety and Health Program
NFPA 1521	Standard for Fire Department Safety Officer
NFPA 1561	Standard on Emergency Services Incident Management System
NFPA 1581	Standard on Fire Department Infection Control Program
NFPA 1582	Standard on Comprehensive Occupational Medical Program for Fire Departments
NFPA 1583	Standard on Health-Related Fitness Programs for Fire Department Members
NFPA 1600	Standard on Disaster/Emergency Management and Business Continuity Programs

NFPA 1670	Standard on Operations and Training for Technical Search and Rescue Incidents
NFPA 1710	Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments
NFPA 1851	Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural and Proximity Fire Fighting
NFPA 1852	Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA)
NFPA 1901	Standard for Automotive Fire Apparatus
NFPA 1906	Standard for Wildland Fire Apparatus
NFPA 1911	Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus
NFPA 1912	Standard for Fire Apparatus Refurbishing
NFPA 1931	Standard for Manufacturer's Design of Fire Department Ground Ladders
NFPA 1932	Standard on Use, Maintenance, and Service Testing of In-Service Fire Department Ground Ladders
NFPA 1936	Standard on Powered Rescue Tools
NFPA 1951	Standard on Protective Ensembles Technical Rescue Incidents
NFPA 1961	Standard on Fire Hose
NFPA 1962	Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose
NFPA 1963	Standard for Fire Hose Connections
NFPA 1964	Standard for Spray Nozzles
NFPA 1965	Standard for Fire Hose Appliances
NFPA 1971	Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting
NFPA 1975	Standard on Station/Work Uniforms for Fire and Emergency Services
NFPA 1976	Standard on Protective Ensemble for Proximity Fire Fighting
NFPA 1977	Standard on Protective Clothing and Equipment for Wildland Fire Fighting
NFPA 1981	Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services
NFPA 1982	Standard on Personal Alert Safety Systems (PASS)
NFPA 1983	Standard on Life Safety Rope and Equipment for Emergency Services

NFPA 1989	Standard on Breathing Air Quality for Fire and Emergency Services Respiratory Protection
NFPA 1991	Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies
NFPA 1992	Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies
NFPA 1994	Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents
NFPA 1999	Standard on Protective Clothing for Emergency Medical Operations
NFPA 2113	Standard on Selection, Care, Use, and Maintenance of Flame-Resistant Garments for Protection of Industrial Personnel against Flash Fire

3. Individual NFPA codes and standards from the list below may be applicable to DOE and its contractors based on their respective responsibilities and scope of work:

NFPA 11	Standard for Low-, Medium-, and High-Expansion Foam
NFPA 12	Standard on Carbon Dioxide Extinguishing Systems
NFPA 12A	Standard on Halon 1301 Fire Extinguishing Systems
NFPA 14	Standard for the Installation of Standpipe and Hose Systems
NFPA 15	Standard for Water Spray Fixed Systems for Fire Protection
NFPA 16	Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems
NFPA 17	Standard for Dry Chemical Extinguishing Systems
NFPA 17A	Standard for Wet Chemical Extinguishing Systems
NFPA 20	Standard for the Installation of Stationary Pumps for Fire Protection
NFPA 22	Standard for Water Tanks for Private Fire Protection
NFPA 24	Standard for the Installation of Private Fire Service Mains and Their Appurtenances
NFPA 25	Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
NFPA 30A	Code for Motor Fuel Dispensing Facilities and Repair Garages
NFPA 31	Standard for the Installation of Oil-Burning Equipment
NFPA 33	Standard for Spray Application Using Flammable or Combustible Materials
NFPA 37	Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
NFPA 45	Standard on Fire Protection for Laboratories Using Chemicals

NFPA 51	Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes
NFPA 52	Vehicular Fuel Systems Code
NFPA 54	National Fuel Gas Code
NFPA 58	Liquefied Petroleum Gas Code
NFPA 59	Utility LP-Gas Plant Code
NFPA 59A	Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)
NFPA 68	Standard on Explosion Protection by Deflagration Venting
NFPA 69	Standard on Explosion Prevention Systems
NFPA 75	Standard for the Protection of Information Technology Equipment
NFPA 82	Standard on Incinerators and Waste and Linen Handling Systems and Equipment
NFPA 85	Boiler and Combustion Systems Hazards Code
NFPA 86	Standard for Ovens and Furnaces
NFPA 88A	Standard for Parking Structures
NFPA 90B	Standard for the Installation of Warm Air Heating and Air-Conditioning Systems
NFPA 91	Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids
NFPA 96	Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
NFPA 99	Standard for Health Care Facilities
NFPA 99C	Standard on Gas and Vacuum Systems
NFPA 102	Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures
NFPA 105	Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives
NFPA 110	Standard for Emergency and Standby Power Systems
NFPA 111	Standard on Stored Electrical Energy Emergency and Standby Power Systems
NFPA 115	Standard for Laser Fire Protection
NFPA 204	Standard for Smoke and Heat Venting
NFPA 211	Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances

NFPA 214	Standard on Water-Cooling Towers
NFPA 220	Standard on Types of Building Construction
NFPA 221	Standard for High Challenge Fire Walls, Fire Walls and Fire Barrier Walls
NFPA 232	Standard for the Protection of Records
NFPA 318	Standard for the Protection of Semiconductor Fabrication Facilities
NFPA 326	Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair
NFPA 385	Standard for Tank Vehicles for Flammable and Combustible Liquids
NFPA 407	Standard for Aircraft Fuel Servicing
NFPA 408	Standard for Aircraft Hand Portable Fire Extinguishers
NFPA 409	Standard on Aircraft Hangars
NFPA 415	Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways
NFPA 418	Standard for Heliports
NFPA 430	Code for the Storage of Liquid and Solid Oxidizers
NFPA 432	Code for the Storage of Organic Peroxide Formulations
NFPA 434	Code for the Storage of Pesticides
NFPA 472	Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents
NFPA 473	Standard for Competencies for EMS Personnel Responding to Hazardous Materials/WMD Incidents
NFPA 484	Standard for Combustible Metals
NFPA 490	Code for the Storage of Ammonium Nitrate
NFPA 495	Explosive Materials Code
NFPA 496	Standard for Purged and Pressurized Enclosures for Electrical Equipment
NFPA 497	Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
NFPA 498	Standard for Safe Havens and Interchange Lots for Vehicles Transporting Explosives
NFPA 502	Standard for Road Tunnels, Bridges, and Other Limited Access Highways

NFPA 505	Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations
NFPA 520	Standard on Subterranean Spaces
NFPA 560	Standard for the Storage, Handling, and Use of Ethylene Oxide for Sterilization and Fumigation
NFPA 600	Standard on Industrial Fire Brigades
NFPA 601	Standard for Security Services in Fire Loss Prevention
NFPA 654	Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
NFPA 655	Standard for Prevention of Sulfur Fires and Explosions
NFPA 664	Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities
NFPA 701	Standard Methods of Fire Tests for Flame Propagation of Textiles and Films
NFPA 703	Standard for Fire-Retardant Treated Wood and Fire Retardant Coatings for Building Materials
NFPA 704	Standard System for the Identification of the Hazards of Materials for Emergency Response
NFPA 750	Standard on Water Mist Fire Protection Systems
NFPA 820	Standard for Fire Protection in Wastewater Treatment and Collection Facilities
NFPA 853	Standard for the Installation of Stationary Fuel Cell Power Systems
NFPA 909	Code for the Protection of Cultural Resources Properties – Museums, Libraries, and Places of Worship
NFPA 914	Code for Fire Protection of Historic Structures
NFPA 2001	Standard on Clean Agent Fire Extinguishing Systems
NFPA 5000	Building Construction and Safety Code