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The Secretary of Energy
Washington, DC 20585

July 23, 2008

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The Honorable A. J. Eggenberger
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004-2941

OFFICE OF THE CHAIRMAN

Dear Mr. Chairman:

Enclosed is the Department of Energy's (DOE) Implementation Plan (Plan) for the Defense Nuclear Facilities Safety Board's (Board) Recommendation 2008-1, *Safety Classification of Fire Protection Systems*.

This Plan provides the Department's approach for evaluating the design of fire protection systems used in nuclear safety and other critical applications and to develop additional design and operational criteria for these systems for incorporation into DOE directives as appropriate.

DOE appreciates the support provided by the Board and its staff during the development of this Plan. We will keep you and your staff informed of our progress in implementing the Plan.

We have assigned Mr. Andrew Lawrence, Director, Office of Nuclear Safety, Quality Assurance and Environment, as the Department's responsible manager for ensuring the Plan's successful completion. If you have any questions on this matter, please contact Mr. Lawrence, at (202) 586-6740.

Sincerely,

A handwritten signature in cursive script that reads "Samuel W. Bodman".

Samuel W. Bodman

Enclosure

U. S. Department of Energy

**Implementation Plan
for
Defense Nuclear Facilities Safety Board
Recommendation 2008-1**

*Safety Classification of
Fire Protection Systems*



Washington, DC 20585

June 2008

Executive Summary

The Defense Nuclear Facilities Safety Board (Board or DNFSB) stated in Recommendation 2008-1, *Safety Classification of Fire Protection Systems*, that there is a need for standards applicable to the design and operation of fire protection systems being relied upon as a primary means of protecting the public and workers from radiological hazards at the Department of Energy's (DOE) defense nuclear facilities.

The basis for the DNFSB Recommendation was that DOE's fire protection guidance documents do not include specific design and operational criteria for fire protection systems designated as safety class or safety significant. The Board believes that this lack of guidance makes design of new facilities and the assessment of proposed enhancements to fire protection systems in existing facilities more difficult and time consuming.

The Department has established general design criteria for safety class and safety-significant systems in DOE Order 420.1B, *Facility Safety*, and guidance on application of these general design criteria for fire protection systems in DOE Guide 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosive Safety Criteria Guide for use with DOE O 420.1, Facility Safety*; and DOE Guide 420.1-3, *Implementation Guide for DOE Fire Protection and Emergency Services Programs for Use with DOE O 420.1B, Facility Safety*. However, the Department recognizes that further criteria and guidance on design and operational criteria for these systems would be beneficial.

The Department's plans for developing these criteria and guidance are to:

- Identify and evaluate current design and operational requirements for fire protection systems based upon DOE and industry practices;
- Develop additional specific design and operational criteria for fire protection systems as appropriate;
- Incorporate the specific design and operational criteria and implementing guidance into the Department's planned revision to DOE Standard 1066, *Fire Protection Design Criteria*; and
- As necessary, modify DOE Guide 420.1-1, DOE Guide 420.1-3, and other affected DOE directives to ensure compatibility with the new criteria used and guidance for fire protection systems.

Since several high hazard DOE projects currently in the design phase are planning on using a sprinkler system for safety-significant or safety class applications, DOE will focus its attention on this area in the near term.

As suggested in Recommendation 2008-1, the Department anticipates that the guidance developed will leave room for engineering judgment and innovative approaches to meet the fundamental safety class and safety-significant design criteria as well as system performance criteria identified in the facility-specific safety analysis.

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1.0 BACKGROUND

The Defense Nuclear Facilities Safety Board (Board or DNFSB) issued Recommendation 2008-1, *Safety Classification of Fire Protection Systems*, on January 29, 2008, which identified “the need for standards applicable to design and operation of fire protection systems being relied upon as primary means of protecting the public and workers from radiological hazards at the Department of Energy’s (DOE) defense nuclear facilities.”

The Board stated in Recommendation 2008-1 that, “although we can support reliance on fire protection systems as primary safety measures, we are no longer comfortable with such widespread reliance in the continued absence of specific criteria for the design and operation of such systems.” The Board noted that “DOE's fire protection guidance documents do not provide design and operational criteria for fire protection systems designated as safety class or safety-significant and that this lack of guidance makes design of new facilities more difficult and time-consuming and the assessment of proposed enhancements to fire protection systems in existing facilities also more difficult.”

DOE Directives (e.g., DOE Order 420.1B, *Facility Safety*) require national standards be used for design of fire protection systems. For example, National Fire Protection Association (NFPA) Standard 13, *Standard for the Installation of Sprinkler Systems*, which provides detailed requirements for design, construction, quality assurance, component testing, acceptance testing, factory inspection of vendors, and operation of sprinkler systems, is often used by DOE facilities. Furthermore, DOE facilities use NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, which specifies detailed requirements for periodic inspections and tests as well as maintenance of sprinkler systems and support systems, such as water supplies. However, these standards do not identify characteristics of fire protection systems that are “safety class” or “safety significant” since these terms are unique to DOE. Furthermore, DOE directives do not identify the differences, if any, between systems meeting national standards and those that meet DOE needs for “safety class” and “safety-significant” applications.

For all of its safety class and safety-significant systems (fire protection, ventilation, process, etc.), DOE utilizes general design criteria that are specified in DOE Order 420.1B and supporting DOE Guide 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria*. In 2007, DOE provided new guidance for design and operation (e.g., inspection and testing) of safety class and safety-significant fire protection systems in DOE Guide 420.1-3, *Implementation Guide for DOE Fire Protection and Emergency Services Programs for Use with DOE O 420. 1B, Facility Safety*. This guidance is general in nature and does not prescribe design and operating requirements for specific fire protection system types.

DOE recognizes that specific design and operational criteria may be beneficial and accepted the Board's Recommendation on March 19, 2008, to develop such criteria and implementing guidance. However, as suggested in Recommendation 2008-1, the Department anticipates that the guidance developed will leave room for engineering judgment and innovative approaches to meet the fundamental safety class and safety-significant design criteria as well as system performance criteria identified in the facility-specific safety analysis.

2.0 UNDERLYING CAUSES

When DOE developed its safety requirements for nuclear facilities, it did not establish detailed design and operational requirements for each specific system that could be utilized in a safety class or safety-significant application. Instead, DOE developed general criteria; e.g., criteria related to safety system redundancy or to quality assurance, and identified national recognized standards to support the systems' designs. DOE designs safety class and safety-significant systems on a case-by-case basis, utilizing the general criteria discussed above as well as the functionality and reliability requirements specified in the facility's safety basis.

Several new nuclear projects have chosen to utilize fire protection systems, such as sprinkler systems, as safety class or safety-significant systems. In that this may be the case for future projects, DOE will develop additional specific design and operational criteria for safety class and safety-significant fire protection systems in new facilities where warranted.

3.0 BASELINE PARAMETERS

The baseline parameters that govern implementation of the DNFSB Recommendation 2008-1 are:

- The new criteria will apply to new defense nuclear Hazard Category 1, 2, and 3 facilities, which use safety class and safety-significant fire protection systems as part of the facility safety design.
- The new criteria may also apply to situations where DOE decides to modify the safety basis for an existing defense nuclear Hazard Category 1, 2, or 3 facility such that an existing fire protection system is reclassified to perform a safety class or safety-significant function.
- Newly developed specific design criteria will be consistent with the general design criteria for safety class and safety-significant systems in DOE O 420.1B (and its associated implementing guide DOE G 420.1-1) and will address design aspects, such as single-point failures, reliability including the need for redundancy in certain areas, e.g., water supplies, and seismic protection.

- Newly developed specific operational criteria will be consistent with DOE O 420.1B and DOE O 433.1A, *Maintenance Management Program for DOE Nuclear Facilities*, as well as DOE G 423.1-1, *Implementation Guide For Use In Developing Technical Safety Requirements*. Operational aspects that impact system reliability (e.g., technical safety requirements, maintenance, and inspection and testing) will be addressed.
- New design and associated operational criteria will be developed only for the few types of fire protection systems anticipated to be used in safety class and safety-significant applications at multiple sites.
- The new design and associated operational criteria will allow for engineering judgment and flexibility.

4.0 NEAR-TERM ACTIONS

DOE Program and Field Elements have discussed the DNFSB recommendation and formed a team to develop this implementation plan. Since no current operational safety issues were identified in the recommendation, no immediate or near-term actions are needed to ensure safety at DOE facilities.

5.0 ISSUE RESOLUTION

This section is organized around the areas listed below. While the Office of Health, Safety and Security (HSS) will have lead responsibility for most of the commitments described, as discussed in Section 6.0, it will work collaboratively with affected Program and Field Elements to work on the following:

- Identification of types of safety class and safety-significant fire protection systems in use and planned.
- Identification of the state of the practice for design of safety class and safety-significant systems in DOE facilities and for critical fire protection systems in other agencies' facilities and the private sector.
- Development of additional specific design and operational criteria for safety class and safety-significant fire protection systems, as necessary.
- Incorporation of changes to applicable DOE directives.

5.1 Identify Fire Protection Systems Commonly Used (or Anticipated to be Used) in Safety Class and Safety-Significant Applications

DOE will survey its Field Elements to identify fire protection systems utilized in safety class and safety-significant applications (for both existing and planned facilities). DOE

will utilize this information to identify those systems for which specific design and operational criteria are appropriate. DOE anticipates choosing two or more systems to develop specific design criteria. Limiting the number of systems will allow appropriate resources to be applied for the timely development of criteria for the systems. Lessons learned from the development and application of these criteria may be applied to additional systems in the future. Since several high hazard DOE projects currently in the design phase are planning to use a sprinkler system for safety-significant or safety class applications, DOE will focus its attention on such systems in the near term. The survey will serve as useful information to determine whether criteria and guidance for other fire protection systems should be developed.

Milestone 5.1.1: Survey Site Offices to identify fire protection systems.

Lead Responsibility: Office of Environmental Management (EM), Office of Nuclear Energy (NE), and the National Nuclear Security Administration (NNSA)

Deliverable: A listing and description of fire protection systems utilized in safety class and safety-significant applications (for both existing and planned facilities) delivered to HSS.

Due Date: July 2008

5.2 Identification of State of the Practice

DOE will review current practice within the Department related to the design of safety class and safety-significant systems (for both fire protection systems and other systems). In addition, DOE will identify industry codes and standards such as those of the Nuclear Regulatory Commission (NRC), Factory Mutual Global, International Code Council, etc., applicable to fire protection sprinkler systems in critical (e.g., high hazard or high value) facilities/applications. The design and operational criteria from each of the sources will be analyzed as to how they relate to the general design criteria for safety class and safety-significant systems.

Milestone 5.2.1: Review current design practices for DOE safety class and safety-significant systems and industrial design and operational criteria used for fire protection sprinkler systems in other critical applications.

Lead Responsibility: HSS

Deliverable: Report on current design practices for DOE safety class and safety-significant systems and Government and industrial design and operational criteria used for sprinkler systems in other critical applications.

Due Date: July 2008

5.3 Develop Additional Specific Design and Operational Criteria for Sprinkler Systems

Based upon work done under Section 5.2, develop specific design and operational criteria for fire protection sprinkler systems. Interim guidance will be provided to support new facility design activities for sprinkler systems that will be issued by the Program Secretarial Offices to support current projects that are or will be designing safety class or safety-significant fire protection systems.

Milestone 5.3.1: Draft Design and Operational Criteria for Sprinkler Systems.

Lead Responsibility: HSS

Deliverable: Draft design and operational criteria for fire protection sprinkler systems used in safety class and safety-significant applications.

Due Date: Three months after completion of Milestone 5.2.1 (anticipate October 2008)

Milestone 5.3.2: Issue Interim Guidance on Design and Operational Criteria for Sprinkler Systems.

Lead Responsibility: HSS, NNSA, and EM

Deliverable: Interim Guidance issued by Program Secretarial Offices to Field Organizations with current projects which utilize safety class or safety-significant fire protection systems.

Due Date: Two months after completion of Milestone 5.3.1 (anticipate December 2008).

5.4 Develop Specific Design and Operational Criteria for Additional Fire Protection Systems

Based upon work done under Sections 5.1 and 5.2, develop specific design and operational criteria for other selected fire protection sprinkler systems as appropriate.

Milestone 5.4.1: Identify the types of fire protection systems (in addition to sprinkler systems) for which DOE will establish specific design and operating criteria.

Lead Responsibility: HSS

Deliverable: A list of the types of fire protection systems (beyond the sprinkler systems) for which specific design and operating criteria will be developed.

Due Date: November 2008

Milestone 5.4.2: Draft Design and Operational Criteria for Selected Fire Protection Systems.

Lead Responsibility: HSS

Deliverable: Draft design and operational criteria for fire protection systems (other than sprinkler systems) in safety class and safety-significant applications.

Due Date: Three months after completion of milestone 5.4.1 (anticipate February 2009)

5.5 Revise DOE Standard 1066

Based upon work done under Sections 5.3 and 5.4, incorporate specific design and operational criteria for sprinkler and other selected fire protection systems as appropriate.

Milestone 5.5.1: Revise DOE Standard 1066 to include new design and operational criteria.

Lead Responsibility: HSS

Deliverable: Draft revision of DOE Standard 1066 (submitted into RevCom).

Due Date: Two months after completion of Milestone 5.4.2 (anticipate April 2009).

Milestone 5.5.2: Revised DOE Standard 1066 finalized and issued.

Lead Responsibility: HSS

Deliverable: Issuance of DOE Standard 1066.

Due Date: Nine months after submittal to RevCom (anticipate January 2010).

5.6 Incorporate changes to applicable DOE directives

Milestone 5.6.1: Draft changes to other impacted DOE directives (e.g., DOE G 420.1-1 and G 420.1-3).

Lead Responsibility: HSS

Deliverable: Draft revision of impacted DOE Directives (submitted into RevCom).

Due Date: Two months after completion of Milestone 5.4.2 (anticipate April 2009).

Milestone 5.6.2: Revised directives finalized and issued.

Lead Responsibility: HSS

Deliverable: Issuance of affected DOE Directives.

Due Date: Nine months after submittal to RevCom (anticipate January 2010).

6.0 ORGANIZATION AND MANAGEMENT

Overall execution of this IP is the responsibility of the Director of the Office of Nuclear Safety, Quality Assurance, and Environment. An Implementation Plan Core Team of staff and managers assigned by EM, NNSA, NE, and HSS will be established to develop the technical products committed to in the plan. The IP Core Team will be led by the Director of the Office of Nuclear Safety Policy and Assistance.

6.1 Roles and Responsibilities

The 2008-1 Implementation Plan Core Team has the following responsibilities:

- Coordinate overall implementation of the Department's 2008-1 implementation plan.
- Complete designated milestones, working with affected organizations and obtaining necessary concurrences from affected program offices.
- Monitor plan milestones and provide assistance and feedback to keep plan milestones on schedule and consistent with the planned objectives.
- Review all 2008-1 Implementation Plan deliverables for completeness and consistency and provide input and recommendations to the IP Core Team lead.

- Communicate regularly with affected Program and Field Elements regarding the status of plan activities and expectations for near-term activities in support of plan implementation.
- Keep DOE's executive leadership informed of overall plan performance and any issues that need senior management attention and direction.

6.2 Change Control

Complex, long-range plans require sufficient flexibility to accommodate changes in commitments, actions, or completion dates that may be necessary due to additional information, improvements, or changes in baseline assumptions. The Department's policy is to: (1) provide prior written notification to the Board on the status of any IP milestone that will not be completed by the planned milestone date; (2) have Secretarial approval of all revisions to the scope and schedule of IP milestones; and (3) clearly identify and describe the revisions and bases for the revisions. Fundamental changes to the IP's strategy, scope, or schedule will be provided to the Board through formal revision and re-issuance of the IP. Other changes to the scope or schedule of planned milestones will be formally provided in appropriate correspondence approved by the Secretary, along with the basis for the changes and appropriate corrective actions.

6.3 Reporting

To ensure the various Department implementing elements and the Board remain informed of the status of plan implementation, the Department's plan is to provide progress reports to the Board and/or Board staff approximately every six months.

Commitment 1: The Department will provide briefings to the Board and Board Staff. These briefings will include updates on the status of completing actions identified in the various reviews indicated in this IP.

Lead Responsibility: HSS

Deliverable: Briefings

Due Date: September 2008 and approximately every six months thereafter until the final deliverable.

Table 1 – Summary of Deliverables

No.	Milestones/Commitment	Deliverable	Anticipated Delivery Date
5.3.2	Issue Interim Guidance on Design and Operational Criteria for Sprinkler Systems.	Interim guidance	December 2008
5.4.1	Identify types of fire protection systems (in addition to sprinkler systems) for which DOE will establish specific design and operating criteria.	List of types of fire protection systems	November 2008
5.4.2	Draft Design and Operational Criteria for Selected Fire Protection Systems.	Draft Criteria	February 2009
5.5.1	Revise DOE-STD-1066 to include new design and operational criteria.	Draft Standard	April 2009
5.5.2	Revise DOE-STD-1066 finalized and issued.	Final Standard	January 2010
5.6.1	Draft changes to other impacted DOE directives.	Draft revision to DOE Directives	April 2009
5.6.2	Revise directives finalized and issued.	Final Directives	January 2010
6.3	Commitment – DOE will provide Board briefings.	Briefings – Semiannually	Starting September 2008