UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

JAN 03 1994

MEMORANDUM FOR: Distribution

FROM: Moni Dey, Senior Task Manager
Engineering Issues Branch
Division of Safety Issue Resolution
Office of Nuclear Regulatory Research

SUBJECT: MINUTES OF NRC/NUMARC MEETINGS ON PROPOSED PERFORMANCE-BASED FIRE PROTECTION REQUIREMENTS

Meetings were held on October 28 and November 10, 1993 between NRC and NUMARC staff to discuss industry efforts and proposed performance-based fire protection requirements. Meeting notices were issued on October 14 and November 2, 1993, and placed in the PDR for interested members of the public. These meetings were pre-filing discussions requested with the NRC staff by the potential petitioner, NUMARC.

Meeting on October 28, 1993

On October 28, 1993 NUMARC presented (Enclosure A) their efforts towards developing a petition for rulemaking to make NRC fire protection requirements less prescriptive and more performance-based. Specific contents of the petitions and the bases for the revisions were presented. EPRI briefly discussed their efforts over the last six years to develop a fire events data base and Fire PRA Requantification Studies. The following are some highlights of the discussion:

- The quality of PRAs are limited by the data bases used in the analyses, however, sufficient data may exist related to fire events.
- Industry stated that NRC sponsored fire PRAs are conservative, and the contribution of fire to overall total public risk has been over estimated.
- A risk-based approach to regulation should maintain a proper balance between risk-based and deterministic requirements.
- The impact of administrative controls on assumptions in PRAs needs to be evaluated.

The Office of Nuclear Reactor Regulation described the staff efforts in the program for Reassessment of NRC Fire Protection Requirements, and indicated that there may be issues resulting from that program that should be addressed in industry proposals along with other potential modifications. NUMARC stated that their proposal is responsive to the NRC's framework resulting from its program for Elimination of Requirements Marginal to Safety and does not address other potential emerging issues. Industry indicated that the rulemaking proposed in the "Marginal to Safety" program should proceed on its own merit and should not be put on hold to address issues from other programs. NRC and NUMARC agreed that this policy issue that needs to addressed and

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resolved to provide guidance to the rulemaking effort. RES agreed to take the lead and pursue resolution.

At the conclusion of the meeting NUMARC provided the NRC staff with material (Enclosures B and C) outlining the revisions to fire protection requirements they plan to include in their petition.

Meeting on November 10, 1993

On November 10, 1993, the staff provided the following initial feedback to NUMARC on the elements of their potential petition:

- A cost/benefit analysis including examples of how the revised rule would be implemented to increase regulatory efficiency with marginal or no impact on safety is essential towards judging the merits of proposed revisions.

- Licensees currently have commitments in the fire protection area that go beyond the requirements in Appendix R of 10 CFR Part 50, therefore, is it appropriate for the proposed revision to Appendix R to address and allow changes in those areas.

- Section III G needs to be supplemented with some acceptance criteria that would provide a benchmark as to whether modified designs would continue to meet regulatory safety objectives.

In response, NUMARC described progress of their efforts for developing examples for the cost/benefit analyses, and agreed to present further details at the next meeting. It also indicated its position that regulations should establish requirements and licensee commitments beyond the regulations should be examined by licensees for potential elimination. In response to staff comments on Section III G, NUMARC indicated it would develop functional safety objectives for inclusion in the petition.

Moni Dey

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Division of Safety Issue Resolution
Office of Nuclear Regulatory Research

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Attendees of NRC/NUMARC
Meeting on Development
of Performance-Based Fire
Protection Requirements
Oct 28, 1993

	Name	Organization	Phone No.
1.	Hon. Dey	NRC/RES	(301) 492-3736
	Warren Minners	NRC/RES	301 492-3900
	Alex Marion	NUMARC	(202) 872-1280
	Norris Schreim	NUMARC	"
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	Doug Brandes	Duke Power Co	704-382-3922
	Theresa Weitenhemer	Bechtel	301-417-8818
	N. Prasad Kadambi	NRC/RES	301-492-3935
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	Patrick Madden	NRC/NRR	301-504-2854
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NRC/NUMARC Meeting on Performance-Based Fire Protection Regulation
November 10, 1993

Name	Organization	Phone No.
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Morris Schrum	NUMARC	"
K.S. West	NRC/NRR	301-504-1220
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Warren Minners	NRC/RES/DSIE	301 492 3900
Frank Cherny	NRC/RES/EIB	301-492-3945
Conrad McCracken	NRR/SPLB	301-504-2873
Patrick Madden	NRR/SPLB	301-504-2854
Richard C. Paul	NRC/OI	708/790-5686
Joseph M. Ulie	NRC/OI	708-790-5686
Mike Scheppman	Florida Power & Light	301-652-2500
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ENCLOSURE A

10 CFR 50 APPENDIX R RULEMAKING MEETING

October 28, 1993

INTRODUCTION

- Chronology
- Meetings
- Rulemaking

CHRONOLOGY

- March 1992
  - Comments submitted on Special Review of NRC Regulations
- May 1992
  - Comments on Elimination of Requirements Marginal to Safety
- June 1992
  - Chairman Selin challenge to industry
- October 1992
  - NUMARC Ad Hoc Advisory Committee (AHAC) formed
- November 1992
  - Federal Register notice of NRC rulemaking initiation

CHRONOLOGY (cont.)

- December 1992
  - NUMARC reponse to Chairman Selin
- March 1993
  - AHAC drafts proposed regulation
- April 1993
  - NRC Elimination of Requirements Marginal to Safety Workshop
- August 1993
  - Internal NUMARC reviews

MEETINGS

- Intent of Appendix R
- Proposed regulation structure
- Regulation content overview
- NRC studies

RULEMAKING ACTIVITIES

- NUMARC legal preparation
- Petition

AHAC ACTIVITIES

- Membership
  - Utility Representatives
  - EPRI
  - Winston & Strawn
- Approach
  - Intent of regulation
  - Reflect exemption requests
  - Performanced-based
  - Maintain existing Appendix R structure

AHAC REVIEWS

- Regulations
  - 10 CFR 50.48
  - 10 CFR 50 Appendix R
- Statements of Consideration
- SECY-83-269
- Generic Letter 86-10
- NUREG 0800

REGULATION INTENT

- 10 CFR 50 Appendix R
  - Satisfy 10 CFR 50 Appendix A - GDC 3
  - Safe plant shutdown
    - » Prevent
    - » Detect
    - » Protect
- 10 CFR 50.48
  - Instructional
  - Schedular

PROPOSED REGULATION

- Structure
  - 10 CFR 50.48
  - 10 CFR 50 Appendix R
    - » Option A: Existing regulation
    - » Option B
      - Structure
      - Performance based
- Supplements
  - Guidance
    - » Prescriptiveness
    - » Alternatives
  - Considerations

PROPOSED 10 CFR 50.48

- Presents options
- Removes schedular information
- Removes Fire Protection from Tech Specs (GL 88-12)
- Applies to all licensees
- Requires program change documentation

PROPOSED 10 CFR 50 APPENDIX R

- Section I
  - Provides link to 10 CFR 50.48
  - States intent
  - Demonstrate hot S/D until cold S/D path available
  - Diversified methods of S/D
    - » Repairs
    - » Replacements
  - Exposure/direct fires

PROPOSED 10 CFR 50 APPENDIX R (cont.)

- Section II
  - Removes details duplicative to Section III
  - Alternative & dedicated equipment replaced by diverse & redundant methods

PROPOSED 10 CFR 50 APPENDIX R (cont.)

- Section III
  - A. Water systems
    - » Generalized terminology
    - » 2 hour requirement
  - B/C. Isolation valves
    - » Essentially unchanged
  - D/E. Manual suppression & hose stations
    - » Hose testing in guidance document
    - » Hose test modernized
    - » NUREG 0800
  - F. Automatic fire detection
    - » Essentially unchanged
    - » Added guidance consistent with NFPA 72D,E

PROPOSED 10 CFR 50 APPENDIX R (cont.)

- Section III (cont.)
  - G. Safe shutdown capability
    - » Use engineering analysis/PSA for technical understanding of hazards
    - » Use appropriate combinations of barriers, suppression, separation, manual actions, repairs, administrative controls, etc.
    - » Guide: FIVE, Fire PSA, GL 86-10
    - » Maintain consideration of inadvertant suppression
  - H/I. Fire brigade
    - » Prescriptive training record retention maintained
    - » Moved to guidance document
    - » NUREG 0800

PROPOSED 10 CFR 50 APPENDIX R (cont.)

- Section III (cont.)
  - J. Emergency lighting
    - » Assure manual SSD actions can be performed
    - » Ensure access/egress
    - » Guide: Timeline calculations or conservative SBO timelines
  - K. Administrative controls
    - » Details to guidance document
    - » NUREG 0800
  - L. Shutdown path capability
    - » Scenario specific assessment based on anticipated LOOP time
      - Available equipment
      - Available power sources
    - » Use of EOPs - power/level/pressure/DHR control

PROPOSED 10 CFR 50 APPENDIX R (cont.)

- Section III (cont.)
  - M. Penetration seals
    - » Seal ratings comparable to barrier ratings
    - » Guide
      - No flame pass or cable ignition
      - evaluation of adequacy for actual hazards
  - N. Fire doors
    - » Prescriptiveness to guidance document
  - O. Associated scenarios
    - » Fire not concurrent with other postulated plant accidents
    - » SSE review for RCP from statements of considerations & exemptions

ENCLOSURE B

Code of Federal Regulations Section 50.48 Fire protection.	Code of Federal Regulations Section 50.48 Fire protection. (Proposed Revision)	Change Summary
(a) Each operating nuclear power plant must have a fire protection plan that satisfies Criterion 3 of Appendix A of this part. This fire protection plan must describe the overall fire protection program for the facility, identify the various positions within the licensee's organization that are responsible for the program, state the authorities that are delegated to each of these positions to implement those responsibilities, and outline the plans for fire protection, fire detection and suppression capability, and limitation of fire damage.	(a) Each operating nuclear power plant must have a fire protection plan that satisfies Criterion 3 of Appendix A of this part. This fire protection plan must describe the overall fire protection program for the facility, identify the various positions within the licensee's organization that are responsible for the program, state the authorities that are delegated to each of these positions to implement those responsibilities, and outline the plans for fire protection, fire detection and suppression capability, and limitation of fire damage.	Schedular information in original regulation subsections (c), (d), and (e) has been removed. Proposed revision sets forth provision for licensees to adopt 10 CFR 50 Appendix R - Option B.
The plan must also describe specific features necessary to implement the program described above, such as administrative controls and personnel requirements for fire prevention and manual fire suppression activities, automatic and manually operated fire detection and suppression systems, and the means to limit fire damage to structures, systems, or components important to safety so that the capability to safely shut down the plant is ensured.	The plan must also describe specific features necessary to implement the program described above, such as administrative controls and personnel requirements for fire prevention and manual fire suppression activities, automatic and manually operated fire detection and suppression systems, and the means to limit fire damage to structures, systems, or components important to safety so that the capability to safely shut down the plant is ensured.	Revision allows removal of fire protection program from licensee's Technical Specifications as denoted in Generic Letter 88-12
3-/ The licensee shall retain the fire protection plan and each change to the plan as a record until the Commission terminates the reactor license and shall retain each superseded revision of the procedures for three years from the date it was superseded.	3-/ The licensee shall retain the fire protection plan and each change to the plan as a record until the Commission terminates the reactor license and shall retain each superseded revision of the procedures for three years from the date it was superseded.	

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3-/ Basic fire protection guidance for nuclear power plants is contained in two NRC documents:
• Branch Technical Position Auxiliary Power Conversion System Branch BTP APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants, "for new plants docketed after July 1, 1976, dated May 1976. • Appendix A to BTP APCSB 9.5-1, Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976, "for plants that were operating under various stages of design or construction before July 1, 1976, dated August 23, 1976. Also see Note 4.

(b) Appendix R to this part establishes fire protection features required to satisfy Criterion 3 of Appendix A to this part with respect to certain generic issues for nuclear power plants licensed to operate prior to January 1, 1979.

Except for the requirements of Sections III.G, III.J, and III.O, the provisions of Appendix R to this part shall not be applicable to nuclear power plants licensed to operate prior to January 1, 1979, to the extent that fire protection features proposed or implemented by the licensee have been accepted by the NRC staff as satisfying the provisions of Appendix A to Branch Technical Position BTP APCSB 9.5-1.

3-/ Basic fire protection guidance for nuclear power plants is contained in two NRC documents:
• Branch Technical Position Auxiliary Power Conversion System Branch BTP APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants, "for new plants docketed after July 1, 1976, dated May 1976. • Appendix A to BTP APCSB 9.5-1, Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976, "for plants that were operating under various stages of design or construction before July 1, 1976, dated August 23, 1976. Also see Note 4.

(b) Appendix R - ***Option A*** to this part establishes fire protection features required to satisfy Criterion 3 of Appendix A to this part with respect to certain generic issues for nuclear power plants licensed to operate prior to January 1, 1979.

Except for the requirements of Sections III.G, III.J, and III.O, the provisions of Appendix R - ***Option A*** to this part shall not be applicable to nuclear power plants licensed to operate prior to January 1, 1979, to the extent that fire protection features proposed or implemented by the licensee have been accepted by the NRC staff as satisfying the provisions of Appendix A to Branch Technical Position BTP APCSB 9.5-1.

4-/ reflected in staff fire protection safety evaluation reports issued prior to the effective date of this rule, or to the extent that fire protection features were accepted by the staff in comprehensive fire protection safety evaluation reports issued before Appendix A to Branch Technical Position BTP APCSB 9.5-1 was published in August 1976. With respect to all other fire protection features covered by Appendix R, all nuclear power plants licensed to operate prior to January 1, 1979, shall satisfy the applicable requirements of Appendix R to this part, including specifically the requirements of Sections III.G, III.J, and III.O.

4-/ Clarification and guidance with respect to permissible alternatives to satisfy Appendix A to BTP APCSB 9.5-1 has been provided in four other NRC documents. "Supplementary Guidance on Information Needed for Fire Protection Evaluation, "dated October 21, 1976.

"Sample Technical Specification, "dated May 12, 1977. "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Control and Quality Assurance, "dated June 14, 1977.

"Manpower Requirements for Operating Reactors, "dated May 11, 1978.

.4-/ reflected in staff fire protection safety evaluation reports issued prior to the effective date of this rule, or to the extent that fire protection features were accepted by the staff in comprehensive fire protection safety evaluation reports issued before Appendix A to Branch Technical Position BTP APCSB 9.5-1 was published in August 1976. With respect to all other fire protection features covered by Appendix R, all nuclear power plants licensed to operate prior to January 1, 1979, shall satisfy the applicable requirements of Appendix R - *Option A* to this part, including specifically the requirements of Sections III.G, III.J, and III.O.

4-/ Clarification and guidance with respect to permissible alternatives to satisfy Appendix A to BTP APCSB 9.5-1 has been provided in four other NRC documents. "Supplementary Guidance on Information Needed for Fire Protection Evaluation, "dated October 21, 1976.

"Sample Technical Specification, "dated May 12, 1977. "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Control and Quality Assurance, "dated June 14, 1977.

"Manpower Requirements for Operating Reactors, "dated May 11, 1978.

A Fire Protection Safety Evaluation Report that has been issued for each operating plant states how these guidelines were applied to each facility and identifies open fire protection issues that will be resolved when the facility satisfies the appropriate requirements of Appendix R to this part.

(c) All fire protection modifications required to satisfy the provisions of Appendix R to this part or directly affected by such requirements shall be completed on the following schedule: (1) Those fire protection features that involve revisions of administrative controls, manpower changes, and training, shall be implemented within 30 days after the effective date of this section and Appendix R to this part.
(2) Those fire protection features that involve installation of modifications that do not require prior NRC approval or plant shutdown shall be implemented within 9 months after the effective date of this section and Appendix R to this part.

(c) Nuclear power plants licensed to operate after January 1, 1979, meet the intent of Appendix R - Option A and satisfy Criterion 3 of Appendix A to this part.

(3) Those fire protection features, except for those requiring prior NRC approval by paragraph (c)(5) of this section, that involve installation of modifications that do require plant shutdown, the need for which is justified in the plans and schedules required by the provisions of paragraph (c)(5) of this section, shall be implemented before startup after the earliest of the following events commencing 180 days or more after the effective date of this section and Appendix R to this part: (i) The first refueling outage; (ii) Another planned outage that lasts for at least 60 days; or (iii) an unplanned outage that lasts for at least 120 days.

(4) Those fire protection features that require prior NRC approval by paragraph (c)(5) of this section, shall be implemented within the following schedule: Dedicated shutdown systems-30 months after NRC approval; modifications requiring plant shutdown before startup after the earliest of the events given in paragraph (c)(3) commencing 180 days after NRC approval; modifications not requiring plant shutdown-6 months after NRC approval.

(5)Licensees shall make any modifications necessary to comply with these requirements in accordance with the above schedule without prior preview and approval by NRC except for modifications required by Section III.G.3 of Appendix R to this part.

Licensees shall submit plans and schedules for meeting the provisions of paragraphs (c)(2), (c)(3), and (c)(4) within 30 days after the effective date of this section and Appendix R to this part.

Licensees shall submit design descriptions of modifications needed to satisfy Section III.G.3 of Appendix R to this part within 30 days after the effective date of this section and Appendix R to this part.

(6) In the event that a request for exemption from a requirement to comply with one or more of the provisions of Appendix R filed within 30 days of the effective date of this rule is based on a n assertion by the licensee that such required modifications would not enhance fire protection safety in the facility or that such modifications may be detrimental to overall facility safety, the schedule requirements of paragraph (c) shall be tolled until final Commission action on the exemption request upon a determination by the Director of Nuclear Reactor Regulation that the licensee has provided a sound technical basis for such assertion that warrants further staff review of the request.

(d) Fire protection features accepted by the NRC staff in Fire Protection Safety Evaluation Reports referred to in paragraph (b) of this section and supplements to such reports, other than features covered by paragraph (c), shall be completed as soon as practicable but no later than the completion data currently specified in license conditions or technical specifications for such facility, or the date determined by paragraphs (d)(1) through (d)(4) of this section, whichever is sooner, unless the Director of Nuclear Reactor Regulation determines, upon a showing by the licensee, that there is good cause for extending such date and that the public health and safety is not adversely affected by such extension. Extensions of such date shall not exceed the dates determined by paragraphs (c)(1) through (c)(4) of this section.

(1) Those fire protection features that involve revisions of administrative controls, manpower changes, and training shall be implemented within 4 months after the date of the NRC staff Fire Protection Evaluation Report accepting or requiring such features.

(2) Those fire protection features involving installation of modifications not requiring prior approval or plant shutdown shall be implemented within 12 months after the date of the NRC staff Fire Protection Safety Evaluation Report accepting or requiring such features.

(d) Appendix R - Option B to this part is provided as an alternative performance based rule. This option may be substituted in whole or in part for any issue for which there is a corresponding specific topic in the licensee's fire protection program. This substitution option is applicable to all licensees regardless of issuance date of license to operate. Any alteration of a plant's existing fire protection program pursuant to this regulation shall be documented to demonstrate that the changes adopted do not alter the overall intent of the fire protection program to provide the capability to safely shutdown the plant in the event of a single fire. The licensee shall document adoption of Option B, where applicable, in the licensee's fire protection program documentation packages. All exemptions to 10 CFR 50 Appendix R previously granted to licensees apply in full to 10 CFR 50 Appendix R - Option A.

(3) Those fire protection features, including alternative shutdown capability, involving installation of modifications requiring plant shutdown shall be implemented before the startup after the earliest of the following events commencing 9 months or more after the date of the NRC staff Fire Protection Safety Evaluation Report accepting or requiring such features: (i) The first refueling outage; (ii) Another planned outage that lasts for at least 60 days; or (iii) An unplanned outage that lasts for at least 120 days.
(4) Those fire protection features involving dedicated shutdown capability requiring new buildings and systems shall be implemented within 30 months of NRC approval. Other modifications requiring NRC approval prior to installation shall be implemented within 6 months after NRC approval.

(e) Nuclear power plants licensed to operate after January 1, 1979, shall complete all fire protection modifications needed to satisfy Criterion 3 of Appendix A to this part in accordance with the provisions of their licenses. [45 FR 76610, Nov. 19, 1980, as amended at 53 FR 19250, May 27, 1988.]

(e) If a licensee's fire protection program is contained in the plant's Technical Specifications, the licensee may remove that fire protection program to the plant's Final Safety Analysis Report and add to the plant's license condition the standard fire protection license condition in Generic Letter 88-12.

ENCLOSURE C

Code of Federal Regulations
APPENDIX R -- FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES

OPTION A -- PLANTS LICENSED TO OPERATE PRIOR TO JANUARY 1, 1979

Code of Federal Regulations
APPENDIX R -- FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES

OPTION B -- ALL LICENSEES

10 CFR 50 APPENDIX R -- OPTION B GUIDANCE DOCUMENT

CHANGE SUMMARY DOCUMENT

DRAFT

This document provides guidance for those licensees selecting to adopt 10 CFR 50 Appendix R - Option B for their fire protection program as set forth in 10 CFR 50.48.
This guidance provides recommended options in meeting the performance based regulation in Option B.
It must be recognized that this document presents only guidance and that other methods may also be employed to satisfy GDC 3 of 10 CFR 50 Appendix A.
It is the responsibility of the licensee to document acceptability of methods used to meet the regulations.
The guidance provided below corresponds to the indicated subsections of the rule.

This document outlines major enhancements to the fire protection regulation inherent in 10 CFR 50 Appendix R - Option B and major differences between Option A and B.

Code of Federal Regulations APPENDIX R – FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES	Code of Federal Regulations APPENDIX R – FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES	10 CFR 50 APPENDIX R – OPTION B GUIDANCE DOCUMENT	CHANGE SUMMARY DOCUMENT
OPTION A – PLANTS LICENSED TO OPERATE PRIOR TO JANUARY 1, 1979	OPTION B – ALL LICENSEES		
I. INTRODUCTION AND SCOPE	I. INTRODUCTION AND SCOPE	I. INTRODUCTION AND SCOPE	I. INTRODUCTION AND SCOPE
This appendix option applies to licensed nuclear power electric generating stations that were operating prior to January 1, 1979, except to the extent set forth in Section 50.48(b) of this part. With respect to certain generic issues for such facilities it sets forth fire protection features required to satisfy Criterion 3 of Appendix A to this part. 1-/	This appendix option applies to all licensed nuclear power electric generating stations as set forth in Section 50.48 to this part. This appendix option sets forth the performance based objectives and criteria which constitute a fire protection program adequate for meeting General Design Criteria ("GDC") 3 of Appendix A to this part.	The plant's fire protection plan shall be placed in the plant's FSAR or the plant's Fire Hazards Analysis (FHA) and referenced in the FSAR.	The introduction to Option B indicates that this regulation is performance based and clarifies that it is adequate for meeting 10 CFR 50 Appendix A, General Design Criteria 3. The wording provided reflects the overall intent of Generic Letter (GL) 86-10 and Appendix R exemptions requiring the licensee's assurance that the plant could be safely shutdown in the event of a single fire.
Criterion 3 of Appendix A to this part specifies that "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."	Criterion 3 of Appendix A to this part specifies that "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."	All fires are being considered for this regulation. Therefore there is no distinction between direct and exposure fires.	This action could be achieved through any recognized means available, by providing for redundancy or diversity of methods. The Design Basis Accident wording removed from the original regulation is redundant to other sections of the regulation.

Code of Federal Regulations APPENDIX R – FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES	Code of Federal Regulations APPENDIX R – FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES	10 CFR 50 APPENDIX R – OPTION B GUIDANCE DOCUMENT	CHANGE SUMMARY DOCUMENT
OPTION A – PLANTS LICENSED TO OPERATE PRIOR TO JANUARY 1, 1979	**OPTION B -- ALL LICENSEES**		
1-/ Clarification and guidance with respect to permissible alternatives to satisfy Appendix A to BTP APCSB 9.5-1 has been provided in four other NRC documents: "Supplementary Guidance on Information Needed for Fire Protection Evaluation," dated October 21, 1976; "Sample Technical Specification," dated May 12, 1977; "Manpower Requirements for Operating Reactors," dated May 11, 1978.	When considering the effects of fire, those systems associated with achieving and maintaining safe shutdown conditions assume major importance to safety because damage to them can lead to core damage resulting from loss of coolant through boiloff. The phrase "important to safety," or "safety-related," will be used throughout this regulation as applying to all safety functions as necessary to achieve and maintain safe plant shutdown in the event of a single fire in the plant.		The reference to achieving cold shutdown in 72 hours has no documented basis in either the original regulation or any of the exemptions granted. Therefore, this requirement was removed. Option B emphasizes controlled performance based actions in assuring safe shutdown is achieved and maintained.
A Fire Protection Safety Evaluation Report that has been issued for each operating plant states how these guidelines were applied to each facility and identifies open fire protection issues that will be resolved when the facility satisfies the appropriate requirements of Appendix R to Part 50.	The phrase "safe shutdown" will be used throughout this appendix as applying to both hot and cold shutdown functions.		No distinction is set forth between direct or exposure fires. All fires must be addressed in a prudent manner to assure safe plant shutdown.

Code of Federal Regulations APPENDIX R -- FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES	Code of Federal Regulations APPENDIX R -- FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES	10 CFR 50 APPENDIX R -- OPTION B GUIDANCE DOCUMENT	CHANGE SUMMARY DOCUMENT
OPTION A -- PLANTS LICENSED TO OPERATE PRIOR TO JANUARY 1, 1979	OPTION B -- ALL LICENSEES		
When considering the effects of fire, those systems associated with achieving and maintaining safe shutdown conditions assume major importance to safety because damage to them can lead to core damage resulting from loss of coolant through boiloff.	Because fire may affect safe shutdown systems and because the loss of function of systems used to mitigate the consequences of design basis accidents under post-fire conditions does not per se impact public safety, the need to limit fire damage to systems required to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents.		
---	The licensee shall ensure that a redundant path is or can be made available to bring the plant to cold shutdown in the event one of the paths is damaged by any single fire. If a cold shutdown condition cannot be reached, it must be demonstrated that hot shutdown can be achieved and maintained until a cold shutdown path is available.		
The phrases "important to safety," or "safety-related," will be used throughout this Appendix R as applying to all safety functions. The phrase "safe shutdown" will be used throughout this appendix as applying to both hot and cold shutdown functions.			

Code of Federal Regulations APPENDIX R -- FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES	Code of Federal Regulations APPENDIX R -- FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES	10 CFR 50 APPENDIX R -- OPTION B GUIDANCE DOCUMENT	CHANGE SUMMARY DOCUMENT
OPTION A -- PLANTS LICENSED TO OPERATE PRIOR TO JANUARY 1, 1979	**OPTION B -- ALL LICENSEES**		
Because fire may affect safe shutdown systems and because the loss of function of systems used to mitigate the consequences of design basis accidents under postfire conditions does not per se impact public safety, the need to limit fire damage to systems required to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents. Three levels of fire damage limits are established according to the safety functions of the structure, system, or component: Safety function...Fire damage limits Hot shutdown...One train of equipment necessary to achieve hot shutdown from either the control room or emergency control station(s) must be maintained free of fire damage by a single fire, including an exposure fire.	The terms "trains" and "paths" will be used throughout this regulation to signify any redundant or diversified methods of shutdown. Repairs/replacements may be instituted to either hot or cold shutdown paths as long as it can be demonstrated through procedures that such repairs/replacements can be conducted within a time frame commensurate with assuring safe shutdown of the plant. Redundant systems used to mitigate the consequences of design basis accidents but not necessary for safe shutdown may be lost to a single fire.		

Code of Federal Regulations
APPENDIX R – FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES

OPTION A – PLANTS LICENSED TO OPERATE PRIOR TO JANUARY 1, 1979

1-/ Exposure Fire. An exposure fire is a fire in a given area that involves either in situ or transient combustibles and is external to any structures, systems, or components located in or adjacent to that same area.

The effects of such fire (e.g., smoke, heat, or ignition) can adversely affect those structures, systems, or components important to safety. Thus, a fire involving one train of safe shutdown equipment may constitute an exposure fire for the redundant train located in the same area, and a fire involving combustibles the than either redundant train may constitute an exposure fire to both redundant trains located in the same area.

The most stringent fire damage limit shall apply for those systems that fall into more than one category.

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Redundant systems used to mitigate the consequences of other design basis accidents but not necessary for safe shutdown may be lost to a single exposure fire. However, protection shall be provided so that a fire within only one such system will not damage the redundant system.			
II. GENERAL REQUIREMENTS	II. GENERAL REQUIREMENTS	II. GENERAL REQUIREMENTS	II. GENERAL REQUIREMENTS
A. Fire protection program	A. Fire protection program		
A fire protection program shall be established at each nuclear power plant. The program shall establish the fire protection policy for the protection of structures, systems, and components important to safety at each plant and the procedures, equipment, and personnel required to implement the program at the plant site.	A fire protection program shall be established at each nuclear power plant. The program shall establish the fire protection policy for the protection of structures, systems, and components important to safety at each plant, as necessary to achieve and maintain safe shutdown in the event of a single fire, and the procedures, equipment, and personnel required to implement the program at the plant site.		

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The fire protection program shall be under the direction of an individual who has been delegated authority commensurate with the responsibilities of the position and who has available staff personnel knowledgeable in both fire protection and nuclear safety.	The fire protection program shall be under the direction of an individual who has been delegated authority commensurate with the responsibilities of the position and who has available staff personnel knowledgeable in both fire protection and nuclear safety.		
The fire protection program shall extend the concept of defense-in-depth to fire protection in fire areas important to safety, with the following objectives:	The fire protection program shall extend the concept of defense-in-depth to fire protection in fire areas important to safety, with the following objectives:		
* To prevent fires from starting;	* To prevent fires from starting;		
* To detect rapidly, control, and extinguish promptly those fires that do occur;	* To detect rapidly, control, and extinguish promptly those fires that do occur;		
* To provide protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant.	* To provide protection for structures, systems, and components, needed for safe shutdown so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant.		

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B. Fire hazards analysis	B. Fire hazards analysis		B. Fire hazards analysis
A fire hazards analysis shall be performed by qualified fire protection and reactor systems engineers to (1) consider potential in situ and transient fire hazards; (2) determine the consequences of fire in any location in the plant on the ability to safely shut down the reactor or on the ability to minimize and control the release of radioactivity to the environment; and (3) specify measures for fire prevention, fire detection, fire suppression, and fire containment and alternative shutdown capability as required for each fire area containing structures, systems, and components important to safety in accordance with NRC guidelines and regulations.	A fire hazards analysis shall be performed by qualified fire protection and reactor systems engineers to (1) consider potential in situ and transient fire hazards; (2) determine the consequences of fire in any location in the plant on the ability to safely shut down the reactor or on the ability to minimize and control the release of radioactivity to the environment; and (3) specify measures for fire prevention, fire detection, fire suppression, and fire containment and shutdown capability as required for each fire area containing structures, systems, and components necessary to achieve and maintain safe shutdown.		"Alternative shutdown" references were removed since the overall intent to provide redundancy or diversity in shutdown methods is reflected throughout Option B. The generic statement regarding compliance to NRC guidelines and regulations in the original Appendix R was removed since it is non-specific.

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C. Fire prevention features	C. Fire prevention features		C. Fire prevention features
Fire protection features shall meet the following general requirements for all fire areas that contain or present a fire hazard to structures, systems, or components important to safety.	Fire protection features shall meet the following general requirements for all fire areas that contain or present a fire hazard to structures, systems, or components important to safety, as necessary, to assure safe plant shutdown in the event of a fire is achieved and maintained.		General sections at this regulation covered in much more detail in Section III have been deleted to avoid redundancy. The intent of assuring safe plant shutdown in the event of a fire has been highlighted in Option B.
1. In situ fire hazards shall be identified and suitable protection provided	1. In situ fire hazards shall be identified and suitable protection provided.		
2. Transient fire hazards associated with normal operation, maintenance, repair, or modification activities shall be identified and eliminated where possible. Those transient fire hazards that can not be eliminated shall be controlled and suitable protection provided.	2. Transient fire hazards associated with normal operation, maintenance, repair, or modification activities shall be identified and eliminated where possible. Those transient fire hazards that can not be eliminated shall be controlled and suitable protection provided.		

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3. Fire detection systems, portable extinguishers, and standpipe and hose stations shall be installed.	3. Surveillance procedures shall be established to ensure that fire barriers are in place and that fire suppression systems are capable of performing their intended functions.		
4. Fire barriers or automatic suppression systems or both shall be installed as necessary to protect redundant systems or components necessary for safe shutdown.			
5. A site fire brigade shall be established, trained, and equipped and shall be on site at all times.			
6. Fire detection and suppression systems shall be designed, installed, maintained, and tested by personnel properly qualified by experience and training in fire protection systems.			

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7. Surveillance procedures shall be established to ensure that fire barriers are in place and that fire suppression systems and components are operable.			
D. Alternative or dedicated shutdown capability			
In areas where the fire protection features cannot ensure safe shutdown capability in the event of a fire in that area, alternative or dedicated safe shutdown capability shall be provided.			

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III. SPECIFIC REQUIREMENTS	III. SPECIFIC REQUIREMENTS	III. SPECIFIC REQUIREMENTS	III. SPECIFIC REQUIREMENTS
A. Water supplies for fire suppression systems	A. water supplies for fire suppression systems	A. Water supplies for fire suppression systems	A. Water supplies for fire suppression systems
Two separate water supplies shall be provided to furnish necessary water volume and pressure to the fire main loop. Each supply shall consist of a storage tank, pump, piping, and appropriate isolation and control valves. Two separate redundant suctions in one or more intake structures from a large body of water (river, lake, etc.) will satisfy the requirement for two separated water storage tanks. These supplies shall be separated so that a failure of one supply will not result in a failure of the other supply.	Two redundant water supplies shall be provided to furnish necessary water volume and pressure to the fire main system. Either redundant suctions from a single large body of water or redundant water storage tanks may be employed in meeting this requirement. These supplies shall be situated such that a failure of one supply will not result in a failure of the other supply. Each supply of the fire water distribution system shall be capable of providing the maximum expected water demands as justified by an assessment of the fire hazards in the area.	Each supply shall consist of a storage tank, pump, piping, and appropriate isolation and control valves. Two separate redundant suctions in one or more intake structures from a large body of water (lake, river, etc.) will satisfy the requirement for two separated water storage tanks.	Time requirements for water supplies must reflect actual anticipated fire hazards. General terminology was used to allow latitude in design to comply with the water supply redundancy requirement. System design specifics have been included in the guidance document.

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Each supply of the fire water distribution system shall be capable of providing for a period of 2 hours the maximum expected water demands as determined by the fire hazards analysis for safety-related areas or other areas that present a fire exposure hazard to safety-related areas.	Other water systems used as one of the two fire water supplies shall be permanently connected to the fire main system and shall be capable of automatic alignment to the fire main system. Pumps, controls, and power supplies in these systems shall satisfy the requirements for the main fire pumps.		
When storage tanks are used for combined service-water/fire-water uses the minimum volume for fire uses shall be ensured by means of dedicated tanks or by some physical means such as a vertical standpipe for other water service.	The use of other water systems for fire protection shall not be incompatible with their functions required for safe plant shutdown. Failure of the other system shall not degrade the fire main system.		

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Administrative controls, including locks for tank outlet valves, are unacceptable as the only means to ensure minimum water volume. Other water systems used as one of the two fire water supplies shall be permanently connected to the fire main system and shall be capable of automatic alignment to the fire main system. Pumps, controls, and power supplies in these systems shall satisfy the requirements for the main fire pumps. The use of other water systems for fire protection shall not be incompatible with their functions required for safe plant shutdown. Failure of the other system shall not degrade the fire main system.			

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B. Sectional isolation valves	B. Sectional isolation valves		
Sectional isolation valves such as post indicator valves or key operated valves shall be installed in the fire main loop to permit isolation of portions of the fire main loop for maintenance or repair without interrupting the entire water supply.	Sectional isolation valves such as post indicator valves or key operated valves shall be installed in the fire main loop to permit isolation of portions of the fire main loop for maintenance or repair without interrupting the entire water supply.		
C. Hydrant isolation valves	C. Hydrant isolation valves		
Valves shall be installed to permit isolation of outside hydrants from the fire main for maintenance or repair without interrupting the water supply to automatic or manual fire suppression systems in any area containing or presenting a fire hazard to safety-related or safe shutdown equipment.	Valves shall be installed to permit isolation of external plant hydrants from the fire main for maintenance or repair without interrupting the water supply to automatic or manual fire suppression systems in any area containing or presenting a fire hazard to safe shutdown equipment.		

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D. Manual fire suppression	D. Manual fire suppression	D. Manual fire suppression	D. Manual fire suppression
Standpipe and hose systems shall be installed so that at least one effective hose stream will be able to reach any location that contains or presents an exposure fire hazard to structures, systems, or components important to safety.	Standpipe and hose systems shall be installed and maintained so that at least one effective hose stream will be able to reach any location that contains or presents a fire hazard to structures, systems, or components important to safety as necessary to ensure safe plant shutdown.	Since hoses are available that are not prone to deterioration or rupture during use, these guidelines provide test frequencies consistent with hydrostatic test frequencies for all water based suppression systems (NFPA 25).	Wording regarding standpipes and hose stations inside containment has been removed. Regulation as written is performance based and allows for an evaluation to determine suitable locations of supply taps. Maintenance of hoses has been included in this subsection. Guidance from NUREG 0800 has been included in the Option B guidance document.
Access to permit effective functioning of the fire brigade shall be provided to all areas that contain or present an exposure fire hazard to structures, systems, or components important to safety	Access to permit effective functioning of the fire brigade shall be provided to all areas that contain or present a fire hazard to structures, systems, or components important to safety that could impact successful safe plant shutdown.	The following test criteria shall be implemented to ensure hoses are maintained to perform as indicated in this subsection. Cotton jacketed lined rubber hoses: fire hose shall be hydrostatically tested at a pressure of 150 psi or 50 psi above maximum fire main pressure, whichever is greater.	

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Standpipe and hose stations shall be inside PWR containments and BWR containments that are not inerted. Standpipe and hose stations inside containment may be connected to a high quality water supply of sufficient quantity and pressure other than the fire main loop if plant-specific features prevent extending the fire main supply inside containment. For BWR drywells, standpipe and hose stations shall be placed outside the dry well adequate lengths of hose to reach any location inside the dry well with an effective hose stream.		Hose stored in outside hose houses shall be tested annually. Interior standpipe hose shall be tested every three years All other hoses: fire hose shall be hydrostatically tested at a pressure of 150 psi or 50 psi above maximum fire main pressure, whichever is greater, 10 years after the original installation and every 5 years thereafter; or, vendor recommended test frequency. Sprinkler systems and manual hose station standpipes should have connections to the plant underground water main so that a single active failure or a crack in a moderate energy line cannot impair both the primary and backup fire suppression systems.	

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		Alternatively, headers fed from each end are permitted inside buildings to supply both sprinkler and standpipe systems, provided steel piping and fittings meeting the requirements of ANSI B31.1, "Power Piping," are used for the headers up to and including the first valve supplying the sprinkler systems where such headers are part of the seismically analyzed hose standpipe system. When provided, such headers are considered an extension of the yard main system. Each sprinkler and standpipe system should be equipped with OS&Y (outside screw and yoke) gate valve or other UL or FM approved shut-off valve and waterflow alarm. Safety-related equipment that does not itself require sprinkler water fire protection but is subject to unacceptable damage if sprayed or wetted by sprinkler water discharge should be protected by water shields or baffles	

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		Control and sectionalizing valves in the fire water systems should be electrically supervised or administratively controlled. The electrical supervision signal should indicate in the control room. All valves in the fire protection system should be periodically checked to verify position (see NFPA 26, "Supervision of Valves"). Fixed water extinguishing systems should conform to requirements of appropriate standards such as NFPA 13, "Standard for the Installation of Sprinkler Systems," and NFPA 15, "Standard for Water Spray Fixed Systems."	

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		Interior plant manual hoses should be able to reach any location that contains, or could present a fire exposure hazard to, safe shutdown equipment with at least one effective hose stream. To accomplish this, standpipes with hose connections equipped with a maximum of 100 feet of 1-1/2-inch woven-jacket, lined fire hose and suitable nozzles should be provided in all buildings on all floors, as needed to assure availability of equipment necessary for safe plant shutdown in the event of a fire.	

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		Individual standpipes should be at least 4 inches in diameter for multiple hose connections and 2-1/2 inches in diameter for single hose connections. These systems should conform to the requirements of NFPA 14, "Standpipe and Hose Systems," for sizing, spacing, and pipe support requirements. Hose stations should be located as dictated by the fire hazard analysis to facilitate access and use for fire fighting operations. Alternative hose stations should be provided for an area if the fire hazard could block access to a single hose station serving that area.	

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		Provisions should be made to supply water at least to standpipes and hose connections for manual fire fighting in areas containing equipment required for safe plant shutdown in the event of a safe shutdown earthquake. The piping system serving such hose stations should be analyzed for SSE loading and should be provided with supports to ensure system pressure integrity. The piping and valves for the portion of hose standpipe system affected by this functional requirement should, at a minimum, satisfy ANSI B31.1, "Power Piping."	

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		The water supply for this condition may be obtained by manual operator actuation of valves in a connection to the hose standpipe header from a normal seismic Category I water system such as the essential service water system. The cross connection should be (a) capable of providing flow to at least two hose stations (approximately 75 gpm per hose station), and (b) designed to the same standards as the seismic Category I water system; it should not degrade the performance of the seismic Category I water system. The proper type of hose nozzle to be supplied to each area should be based on the fire hazard analysis.	

The usual combination spray/straight-stream nozzle should not be used in areas where the straight stream can cause unacceptable mechanical damage. Fixed fog nozzles should be provided at locations where high-voltage shock hazards exist. All hose nozzles should have shut-off capability. (Guidance on safe distances for water application to live electrical equipment may be found in the "NFPA Fire Protection Handbook.")

Certain fires, such as those involving flammable liquids, respond well to foam suppression. Consideration should be given to use of mechanical low-expansion foam systems, high-expansion foam generators, or aqueous film-forming foam (AFFF) systems, including the AFFF deluge system. These systems should comply with the requirements of NFPA 11, NFPA 11A, NFPA 11B, and NFPA 16, as applicable.

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E. Hydrostatic hose tests Fire hose shall be hydrostatically tested at a pressure of 150 psi or 50 psi above maximum fire main operating pressure, whichever is greater. Hose stored in outside those houses shall be tested annually. Interior standpipe hose shall be tested every three years.	E. Intentionally left blank		E. Hydrostatic hose tests Hose maintenance goals are included in III.D of Option B. Prescriptiveness of maintenance activities is included in III.D of the guidance document. Specific test requirements are found in the guidance document and have been updated to reflect new developments in hose design.
F. Automatic fire detection Automatic fire detection systems shall be installed in all areas of the plant that contain or present an exposure fire hazard to safe shutdown or safety-related systems or components. These fire detection systems shall be capable of operating with or without offsite power.	F. Automatic fire detection Automatic fire detection capability shall be installed in areas of the plant that contain or present any fire hazard to safe shutdown systems or components, as determined by fire safety analyses of these areas. These fire detection capabilities shall be capable of operating with or without offsite power.	F. Automatic fire detection Fire detection systems should comply with the requirements of Class A systems as defined in NFPA 72D, "Standard for the Installation, Maintenance, and Use of Proprietary Protective Signaling Systems," and Class I circuits as defined in NFPA 70, "National Electrical Code." Fire detectors should be selected and installed in accordance with NFPA 72E, "Automatic Fire Detectors."	F. Automatic fire detection Detection requirements are maintained in those areas of the plant that are needed to assure safe plant shutdown in the event of a fire.

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		Pre-operational and periodic testing of pulsed line-type heat detectors should demonstrate that the frequencies used will not affect the actuation of protective relays in other plant systems. Fire detection systems should give audible and visual alarm and annunciation in the control room. Where zoned detection systems are used in a given fire area, local means should be provided to identify which detector zone has actuated. Local audible alarms should sound in the fire area. Fire alarms should be distinct and unique so they will not be confused with any other plant system alarms. Primary and secondary power supplies should be provided for the fire detection system and for electrically operated valves for automatic suppression systems.	

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		Such primary and secondary power supplies should satisfy provisions of Section 2220 of NFPA 72D.	
G. Fire protection of safe shutdown capability	G. Fire protection of safe shutdown capability	G. Fire protection of safe shutdown capability	G. Fire protection of safe shutdown capability
1. Fire protection features shall be provided for structures, systems, and components important to safe shutdown. These features shall be capable of limiting fire damage so that:	A fire protection program shall be instituted to ensure the availability of sufficient equipment to provide for safe shutdown in the event of a fire.	Provide engineering analysis or engineering safety analysis utilizing any combination of the methods indicated below, as appropriate, such that the level of any of the fire protection variables/methods listed in III.G applied appropriately addresses the fire hazard of concern for a given fire area.	All prescriptiveness has been removed from the original regulation. Option B focuses on performance based considerations to ensure safe shutdown by assessments utilizing effective combination of the fire protection variables identified in the new regulation.

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a. One train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage; and b. systems necessary to achieve and maintain cold shutdown from either the control room or emergency control station(s) can be repaired within 72 hours.	Engineering analysis or engineering and probabilistic safety assessment should be used to provide a technical understanding of fire hazards in a particular fire area and to determine appropriate combinations of fire barriers, physical separation, fire detection, fixed or automatic fire suppression, manual actions, repairs/replacements, and administrative controls necessary to ensure the availability of this equipment.	A. "Fire Induced Vulnerability Evaluation (FIVE) Methodology", EPRI TR-100370, April 1992 (in whole or in part).	This change captures the philosophies inherent in GL 86-10 and the Appendix R exemptions granted.

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2. Except as provided for in paragraph G.3 of this section, where cables or equipment, including associated non-safety circuits that could prevent operation or cause maloperation due to hot shorts, open circuits, or shorts to ground, of redundant trains of systems necessary to achieve and maintain hot shutdown conditions are located within the same fire area outside of primary containment, one of the following means of ensuring that one of the redundant trains is free of fire damage shall be provided: a. Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier;	Redundant shutdown paths shall be chosen with consideration for the effects of damage from fire suppression activities or rupture or inadvertent operation of fire suppression systems.	B. Fire PSA C. Generic Letter 86-10	

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b. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustible or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area; or c. Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area;			

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Inside non-inerted containments one of the fire protection means specified above or one of the following fire protection means shall be provided: d. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards; e. Installation of fire detectors and an automatic fire suppression system in the fire area; or f. Separation of cables and equipment and associated non-safety circuits of redundant trains by a non-combustible radiant energy shield. 3. Alternative or dedicated shutdown capability and its associated circuits, 2-/ independent of cables, systems or components in the area, room or zone under consideration, shall be provided:			

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a. Where the protection of systems whose function is required for hot shutdown does not satisfy the requirement of paragraph G.2 of this section; or

b. Where redundant trains of systems required for hot shutdown located in the same fire area may be subject to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems.

In addition, fire detection and a fixed fire suppression system shall be installed in the area, room, or zone under consideration.

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H. Fire brigade	H. Fire brigade	H. Fire brigade	H. Fire brigade
A site fire brigade trained and equipped for fire fighting shall be established to ensure adequate manual fire fighting capability for all areas of the plant containing structures, systems, or components important to safety.	A site fire brigade trained and equipped for fire fighting shall be established to ensure adequate manual fire fighting capability for all areas of the plant containing structures, systems, or components important to safety, as necessary, to assure safe plant shutdown in the event of a fire. Training shall include initial and routine practical training, drills, and demonstration to fight live fires. Training records shall be maintained by the licensee for at least 3 years.	The fire brigade shall be comprised of at least five members on the site on each shift. The brigade leader and at least two brigade members shall have sufficient training in or knowledge of plant safety-related systems to understand the effects of fire and fire suppressants on safe shutdown capability.	Prescriptiveness was removed to the guidance document. Training requirements were added to this subsection, with specifics from the original Appendix R added to the guidance document.
The fire brigade shall be at least five members on each shift. The brigade leader and at least tow brigade members shall have sufficient training in or knowledge of plant safety-related systems to understand the effects of fire and fire suppressants on safe shutdown capability.		The qualification of fire brigade members shall include an annual physical examination to determine their ability to perform strenuous fire fighting activities. The shift supervisor shall not be a member of the fire brigade. The brigade leader shall be competent to assess the potential safety consequences of a fire and advise control room personnel.	Record maintenance retention requirement is judged to be important in allowing NRC to assure themselves that training program employed is adequate. Relative guidance from NUREG 0800 regarding fire protection programs has been added to the guidance document.

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The qualification of fire brigade members shall include an annual physical examination to determine their ability to perform strenuous fire fighting activities. The shift supervisor shall not be a member of the fire brigade. The brigade leader shall be competent to assess the potential safety consequences of a fire and advise control room personnel.		Such competence by the brigade leader may be evidenced by possession of an operator's license or equivalent knowledge of plant safe shutdown systems for plant fires. The minimum equipment provided for the brigade shall consist of personal protective equipment such as turnout coats, boots, gloves, hard hats, emergency communications equipment, portable lights, portable ventilation equipment, and portable extinguishers. Self contained breathing apparatus using full-face positive-pressure masks approved by NIOSH (National Institute for Occupational Safety and Health -- approval formerly given by the U.S. Bureau of Mines) shall be provided for fire brigade, damage control, and control room personnel.	
Such competence by the brigade leader may be evidenced by possession of an operator's license or equivalent knowledge of plant safety-related systems.			

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The minimum equipment provided for the brigade shall consist of personal protective equipment such as turnout coats, boots, gloves, hard hats, emergency communications equipment, portable lights, portable ventilation equipment, and portable extinguishers. Self-contained breathing apparatus using full-face positive-pressure masks approved by NIOSH (National Institute for Occupational Safety and Health -- approval formerly given by the U.S. Bureau of Mines) shall be provided for fire brigade, damage control, and control room personnel. At least 10 masks shall be available for fire brigade personnel.		At least 10 masks shall be available for fire brigade personnel. Control room personnel may be furnished breathing air by a manifold system piped from a storage reservoir if practical. Service or rated operating life shall be a minimum of one-half hour for the self-contained units. At least a 1-hour supply for breathing air in extra bottles shall be located on the plant site for each unit of self-contained breathing apparatus. In addition, an onsite 6-hour supply of reserve air shall be provided and arranged to permit quick and complete replenishment of exhausted air supply bottles as they are returned. If compressors are used as a source of breathing air, only units approved for breathing air shall be used.	

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Control room personnel may be furnished breathing air by a manifold system piped from a storage reservoir if practical. Service or rated operating life shall be a minimum of one-half hour for the self-contained units. At least a 1-hour supply of breathing air in extra bottles shall be located on the plant site for each unit of self-contained breathing apparatus. In addition, an onsite 6-hour supply of reserve air shall be provided and arranged to permit quick and complete --- 2-/ Alternative shutdown capability is provided by re-routing, relocating or modification of existing systems; dedicated shutdown capability is provided by installing new structures and systems for the function of post-fire shutdown. ---		Special care must be taken to locate the compressor in areas free of dust and contaminants. The plant fire brigade positions should be responsible for fighting fires. The authority and responsibility of each fire brigade position relative to fire protection should be clearly defined. The responsibilities of each fire brigade position should correspond with the actions required by the fire fighting procedures. The responsibilities of the fire brigade members under normal plant conditions should not conflict with their responsibilities during a fire emergency. Fire brigade training. The fire brigade training program shall ensure that the capability to fight potential fires is established and maintained.	

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replenishment of exhausted air supply bottles as they are returned. If compressors are used as a source of breathing air, only units approved for breathing air shall be used and the compressors shall be operable assuming a loss of offsite power. Special care must be taken to locate the compressor in areas free of dust and contaminants.		The program shall consist of an initial classroom instruction program followed by periodic classroom instruction, fire fighting practice, and fire drills: 1. Instruction a. The initial classroom instruction shall include: (1) Indoctrination of the plant fire fighting plan with specific identification of each individual's responsibilities as a fire brigade member. (2)Identification of the type and location of fire hazards and associated types of fires that could occur in the plant. (3) The toxic and corrosive characteristics of expected products of combustion that may be encountered during plant fire fighting conducted to ensure safe shutdown.	

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		(4) Identification of the location of fire fighting equipment for each fire area and familiarization with the layout of the plant, including access and egress routes to each area. (5) The proper use of available fire fighting equipment and the correct method of fighting each type of fire. The types of fires covered should include fires in energized electrical equipment, fires in cables and cable trays, hydrogen fires, fires involving flammable and combustible liquids or hazardous process chemicals, fires resulting from construction or modifications (welding), and record file fires. (6) The proper use of communication, lighting, ventilation, and emergency breathing equipment. (7) The proper method for fighting fires inside buildings and confined spaces.	

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		(8) The direction and coordination of the fire fighting activities (fire brigade leaders only). (9) Detailed review of fire fighting strategies and procedures. (10) Review of the latest plant modifications and corresponding changes in fire fighting plans. NOTE: Items (9) and (10) may be deleted from the training of no more than two of the non-operations personnel who may be assigned to the fire brigade. b. The instruction shall be provided by qualified individuals who are knowledgeable, experienced, and suitably trained in fighting the types of fires that could occur in the plant and in using the types of equipment available in the nuclear power plant.	

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		c. Instruction shall be provided to all fire brigade members and fire brigade leaders. d. Quarterly meetings shall be held for all brigade members to review changes in the fire protection program and other subjects as necessary. e. Periodic refresher training sessions shall be held to repeat the classroom instruction program for all brigade members over a two-year period. These sessions may be concurrent with the regular planned meetings. 2. Practice Practice sessions shall be held for each shift fire brigade on the proper method of fighting the various types of fires that could occur in a nuclear power plant. These sessions shall provide brigade members with experience in actual fire extinguishment and the use of emergency breathing apparatus under strenuous conditions encountered in fire fighting.	

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		These practice sessions shall be provided at least once per year for each fire brigade member. 3. Drills a. Fire brigade drills shall be performed in the plant so that the fire brigade can practice as a team. b. Quarterly drills shall be performed for each shift fire brigade. Each fire brigade member should participate in each drill, but must participate in at least two drills per year. A sufficient number of these drills, but not less than one for each shift fire brigade per year, shall be unannounced to determine the fire fighting readiness of the plant fire brigade, brigade leader, and fire protection systems and equipment.	

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		Persons planning and authorizing an announced drill shall ensure that the responding shift fire brigade members are not aware that a drill is being planned until it is begun. At least one drill per year shall be performed on a "back shift" for each shift fire brigade. c. The drills shall be pre-planned to establish the training objectives of the drill and shall be critiqued to determine how weli the training objective have been met. Unannounced drills shall be planned and critiqued by members of the management staff responsible for plant safety and fire protection. Performance deficiencies of a fire brigade or of individual fire brigade members shall be remedied by scheduling additional training for the brigade or members.	

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		Unsatisfactory drill performance shall be followed by a repeat drill within 30 days. d. At 3-year intervals, a randomly selected unannounced drill must be critiqued by qualified individuals independent of the licensee's staff. A copy of the written report from these individuals must be available for NRC review and shall be retained as a record. e. Drills shall as a minimum include the following: (1) Assessment of fire alarm effectiveness, time required to notify and assemble fire brigade, and selection, placement and use of equipment, and fire fighting strategies. (2) Assessment of each brigade member's knowledge of his or her role in fire fighting strategy for the area assumed to contain the fire.	

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		Assessment of the brigade member's conformance with established plant fire fighting procedures and use of fire fighting equipment, including self-contained emergency breathing apparatus, communication equipment, to the extent practicable. (3) The simulated use of fire fighting equipment required to cope with the situation and type of fire selected for the drill. The area and type of fire chosen for the drill should differ from those used in the previous drill so that brigade members are trained in fighting fires in various plant areas. The situation selected should simulate the size and arrangement of a fire that could reasonably occur in the area selected, allowing for fire development due to the time required to respond, to obtain equipment, and organize for the fire, assuming loss of automatic suppression capability.	

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		(4) Assessment of brigade leader's direction of the fire fighting effort as to thoroughness, accuracy, and effectiveness. 4. Records Individual records of training provided to each fire brigade member, including drill critiques, shall be maintained for at least 3 years to ensure that each member receives training in all parts of the training program. These records of training shall be available for NRC review. Retraining or broadened training for fire fighting within buildings shall be scheduled for all those brigade members whose performance records show deficiencies.	
I. Fire brigade training The fire brigade training program shall ensure that the capability to fight potential fires is established and maintained.	I. Intentionally left blank.		I. Fire brigade training Requirement to train the brigade and associated goals is included in III.H of Option B. Prescriptiveness of training activities is included in III.H of the guidance document.

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The program shall consist of an initial classroom instruction program followed by periodic classroom instruction, fire fighting practice, and fire drills: 1. Instruction a. The initial classroom instruction shall include: (1) Indoctrination of the plant fire fighting plan with specific identification of each individual's responsibilities. (2) Identification of the type and location of fire hazards and associated types of fires that could occur in the plant. (3) The toxic and corrosive characteristics of expected products of combustion. (4) Identification of the location of fire fighting equipment for each fire area and familiarization with the layout of the plant, including access and egress routes to each area.			

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(5) The proper use of available fire fighting equipment and the correct method of fighting each type of fire. The types of fires covered should include fires in energized electrical equipment, fires in cables and cable trays, hydrogen fires, fires involving flammable and combustible liquids or hazardous process chemicals, fires resulting f room construction or modifications (welding), and record file fires. (6) The proper use of communication, lighting, ventilation, an emergency breathing equipment. (7)The proper method for fighting fires inside buildings and confined spaces. (8) The direction and coordination of the fire fighting activities (fire brigade leaders only). (9) Detailed review of fire fighting strategies and procedures. (10) Review of the latest plant modifications and corresponding changes in fire fighting plans.			

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NOTE: Items (9) and (10) may be deleted from the training of no more than two of the non-operations personnel who may be assigned to the fire brigade.
b. The instruction shall be provided by qualified individuals who are knowledgeable, experienced, and suitably trained in fighting the types of fires that could occur in the plant and in using the types of equipment available in the nuclear power plant.
c. Instruction shall be provided to all fire brigade members and fire brigade leaders.
d. Regular planned meetings shall be held at least every 3 months for all brigade members to review changes in the fire protection program and other subjects as necessary.

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e. Periodic refresher training sessions shall be held to repeat the classroom instruction program for all brigade members over a two-year period. These sessions may be concurrent with the regular planned meetings.

2. Practice

Practice sessions shall be held for each shift fire brigade on the proper method of fighting the various types of fires that could occur in a nuclear power plant.

These sessions shall provide brigade members with experience in actual fire extinguishment and the use of emergency breathing apparatus under strenuous conditions encountered in fire fighting. These practice sessions shall be provided at least once per year for each fire brigade member.

3. Drills

a. Fire brigade drills shall be performed in the plant so that the fire brigade can practice as a team.

b. Drills shall be performed at regular intervals not to exceed 3 months for each shift fire brigade. Each fire brigade member should participate in each drill, but must participate in at least two drills per year.
A sufficient number of these drills, but not less than one for each shift fire brigade per year, shall be unannounced to determine the fire fighting readiness of the plant fire brigade, brigade leader, and fire protection systems and equipment. Persons planning and authorizing an unannounced drill shall ensure that the responding shift fire brigade members are not aware that a drill is being planned until it is begun. Unannounced drills shall not be scheduled closer than four weeks.

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At least one drill per year shall be performed on a "back shift" for each shift fire brigade. c. The drills shall be pre-planned to establish the training objectives of the drill and shall be critiqued to determine how well the training objectives have been met. Unannounced drills shall be planned and critiqued by members of the management staff responsible for plant safety and fire protection. Performance deficiencies of a fire brigade or of individual fire brigade members shall be remedied by scheduling additional training for the brigade of members. Unsatisfactory drill performance shall be followed by a repeat drill within 30 days.			

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d. At 3-year intervals, a randomly selected unannounced drill must be critiqued by qualified individuals independent of the licensee's staff. A copy of the written report from these individuals must be available for NRC review and shall be retained as a record as specified in section III.L.4 of this appendix.
e. Drills shall as a minimum include the following:
(1) Assessment of fire alarm effectiveness, time required to notify and assemble fire brigade and selection, placement and use of equipment, and fire fighting strategies.
(2) Assessment of each brigade member's knowledge of his or her role in the fire fighting strategy for the area assumed to contain the fire.

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Assessment of the brigade member's conformance with established plant fire fighting procedures and use of fire fighting equipment, including self-contained emergency breathing apparatus, communication equipment, and ventilation equipment, to the extent practicable. (3) The simulated use of fire fighting equipment required to cope with the situation and type of fire selected for the drill. The area and type of fire chosen for the drill should differ from those used in the previous drill so that brigade members are trained in fighting fires in various plant areas. The situation selected should simulate the size and arrangement of a fire that could reasonably occur in the area selected, allowing for fire development due to the time required to respond, to obtain equipment, and organize for the fire, assuming loss of automatic suppression capability.			

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(4) Assessment of brigade leader's direction of the fire fighting effort as to thoroughness, accuracy and effectiveness.			
4. Records Individual records of training provided to each fire brigade member, including drill critiques, shall be maintained for at least 3 years to ensure that each member receives training in all parts of the training program. These records of training shall be available for NRC review. Retraining or broadened training for fire fighting within buildings shall be scheduled for all those brigade members whose performance records show deficiencies.			
J. Emergency lighting	J. Emergency lighting	J. Emergency lighting	J. Emergency lighting

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Emergency lighting units with at least an 8-hour battery power supply shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.	Emergency lighting units shall be provided with sufficient capacity to allow for any necessary manual operation of safe shutdown equipment and for access and egress routes thereto, where the postulated fire may result in the loss of normal and essential lighting.	Emergency lighting units assessed to be required by the licensee shall have available power sources for the time period actions need to be taken to satisfy this subsection of the regulation.	Prescriptiveness was replaced with performance based wording, allowing licensee to assess fire hazards and associated loss of lighting scenarios.
		In lieu of timeline calculations, the licensee may conservatively assume loss of normal and essential lighting will not exceed the plant's Station Blackout (SBO) timeline. Lighting intensities shall be such that operators can perform required functions to achieve and maintain hot shutdown as demonstrated by using either fixed or portable lighting units. Lighting units shall be appropriately maintained to ensure availability when needed for the durations required, as documented in the plant's fire protection program documentation packages.	Option B guidance document sets a bounding time limit to a LOOP to conservatively reflect plant specific Station Blackout evaluation in lieu of detailed fire hazards evaluation.

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		Operators shall be trained as to the location and amount of portable lighting units necessary to conduct required manual actions. Credit may be taken for normal lighting sources if it can be demonstrated by analysis that circuits will not be lost as a result of a fire.	
K. Administrative controls Administrative controls shall be established to minimize fire hazards in areas containing structures, systems, and components important to safety. These controls shall establish procedures to:	K. Administrative controls Administrative controls shall be established to minimize fire hazards in areas containing structures, systems, and components necessary to achieve and maintain safe shutdown in the event of a fire.	K. Administrative controls These controls shall establish procedures to:	K. Administrative controls Prescriptiveness removed to guidance document. Relevant NUREG 0800 guidance regarding fire protection programs has been included in the guidance document.

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1. Govern the handling and limitation of the use of ordinary combustible materials, combustible and flammable gases and liquids, high efficiency particulate air and charcoal filters, dry ion exchange resins, or other combustible supplies in safety-related areas.	Measures shall be established to govern the use, storage, and disposal of in situ and transient combustible and flammable materials, control the use of ignition sources, review proposed work activities to identify potential fire hazards and assure appropriate fire prevention is applied, perform periodic fire prevention inspections, and plan for fire emergencies.	1. Govern the handling and limitation of the use of ordinary combustible materials, combustible and flammable gases and liquids, high efficiency particulate air and charcoal filters, dry ion exchange resins, or other combustible supplies in areas containing safe shutdown equipment.	
2. Prohibit the storage of combustibles in safety-related areas or establish designated storage areas with appropriate fire protection.		2. Prohibit the storage of combustibles in areas containing safe shutdown equipment or establish designated storage areas with appropriate fire protection.	
3. Govern the handling of and limit transient fire loads such as combustible and flammable liquids, wood and plastic products, or other combustible materials in buildings containing safety-related systems or equipment during all phases of operating, and especially during maintenance, modification, or refueling operations.		3. Govern the handling of and limit transient fire loads such as combustible and flammable liquids, wood and plastic products, or other combustible materials in buildings containing safe shutdown systems or equipment during all phases of operating, and especially during maintenance, modification, or refueling operations.	

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4. Designate the onsite staff member responsible for the in-plant fire protection review of proposed work activities to identify potential transient fire hazards and specify required additional fire protection in the work activity procedure.		4. Designate the onsite staff member responsible for the in-plant fire protection review of proposed work activities to identify potential transient fire hazards and specify required additional fire protection in the work activity procedure.	
5. Govern the use of ignition sources by use of a flame permit system to control welding, flame cutting, brazing, or soldering operations. A separate permit shall be issued for each area where work is to be done.		5. Govern the use of ignition sources by use of a flame permit system to control welding, flame cutting, brazing, or soldering operations. A separate permit shall be issued for each area where work is to be done. If work continues over more than one shift, the permit shall be valid for not more than 24 hours when the plant is operating or for the duration of a particular job during plant shutdown.	
If work continues over more than one shift, the permit shall be valid for not more than 24 hours when the plant is operating or for the duration of a particular job during plant shutdown.		6. Control the removal from the area of all waste, debris, scrap, oil spills, or other combustibles resulting from the work activity immediately following completion of the activity, or at the end of each work shift, whichever comes first.	

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6. Control the removal from the area of all waste, debris, scrap, oil spills, or other combustibles resulting from the work activity immediately following completion of the activity, or at the end of each work shift, whichever comes first.		7. Maintain the periodic housekeeping inspections to ensure continued compliance with these administrative controls.	
7. Maintain the periodic housekeeping inspections to ensure continued compliance with these administrative controls.		8. Control the use of specific combustibles in areas where safe shutdown can be impaired. All wood used in areas where safe shutdown can be impaired during maintenance, modification, or refueling operations (such as lay-down blocks or scaffolding) shall be treated with a flame retardant.	

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8. Control the use of specific combustibles in safety-related areas during maintenance, modification, or refueling operations (such as lay-down blocks or scaffolding) shall be treated with a flame retardant. Equipment or supplies (such as new fuel) shipped in untreated combustible packing containers may be unpacked in safety-related areas if required for valid operating reasons. However, all combustible materials shall be removed from the area immediately following the unpacking. Such transient combustible material, unless stored in approved containers, shall not be left unattended during lunch breaks, shift changes, or other similar periods. Loose combustible packing material such as wood or paper excelsior, or polyethylene sheeting shall be placed in metal containers with tight-fitting self-closing metal covers.		Equipment or supplies (such as new fuel) shipped in untreated combustible packing containers may be unpacked in areas where safe shutdown can be impaired if required for valid operating reasons. However, all combustible materials shall be removed from the area immediately following the unpacking. Such transient combustible material, unless stored in approved containers, shall not be left unattended during lunch breaks, shift changes, or other similar periods. Loose combustible packing material such as wood or paper excelsior, or polyethylene sheeting shall be placed in metal containers with tight-fitting self-closing metal covers.	

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9. Control actions taken by an individual discovering a fire, for example, notification of control room, attempt to extinguish fire, and actuation of local fire suppression systems.		9. Control actions to be taken by an individual discovering a fire, for example, notification of control room, attempt to extinguish fire, and actuation of local fire suppression systems.	
10. Control actions to be taken by the control room operator to determine the need for brigade assistance upon report of a fire or receipt of alarm on control room enunciator panel, for example, announcing location of fire over PA system, sounding fire alarms, and notifying the shift supervisor and the fire brigade leader of the type, size, and location of the fire.		10. Control actions to be taken by the control room operator to determine the need for brigade assistance upon report of a fire or receipt of alarm on control room annunciator panel, for example, announcing location of fire over PA system, sounding fire alarms, and notifying the shift supervisor and the fire brigade leader of the type, size, and location of the fire.	

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11. Control actions to be taken by the fire brigade after notification by the control room operator of a fire, for example, assembling in a designated location, receiving directions from the fire brigade leader, and discharging specific fire fighting responsibilities including selection and transportation of fire fighting equipment to fire location, selection of protective equipment, operating instructions for use of fire suppression systems, and use of pre-planned strategies for fighting fires in specific areas.
12. Define the strategies for fighting fires in all safety-related areas and areas presenting a hazard to safety-related equipment. These strategies shall designate:
a. Fire hazards in each area covered by the specific pre-fire plans.
b. Fire extinguishants best suited for controlling the fires associated with the fire hazards in that area and the nearest location of these extinguishants.

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11. Control actions to be taken by the fire brigade after notification by the control room operator of a fire, for example, assembling in a designated location, receiving directions from the fire brigade leader, and discharging specific fire fighting responsibilities including selection and transportation of fire fighting equipment to fire location, selection of protective equipment, operating instructions for use of fire suppression systems, and use of pre-planned strategies for fighting fires in specific areas.
12. Define the strategies for fighting fires in all areas presenting a hazard to equipment needed for safe shutdown in the event of a fire. These strategies shall designate:
a. Fire hazards in each area covered by the specific pre-fire plans.
b. Fire extinguishants best suited for controlling the fires associated with the fire hazards in that area and the nearest location of these extinguishants.

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c. Most favorable direction from which to attack a fire in each area in view of the ventilation direction, access hallways, stairs, and doors that are most likely to be free of fire, and the best station or elevation for fighting the fire.		c. Most favorable direction from which to attack a fire in each area in view of the ventilation direction, access hallways, stairs, and doors that are most likely to be free of fire, and the best station or elevation for fighting the fire. All access and egress routes that involve locked doors should be specifically identified in the procedure with the appropriate precautions and methods for access specified.	
d. Plant systems that should be managed to reduce the damage potential during a local fire and the location of local and remote controls for such management (e.g., any hydraulic or electrical systems in the zone covered by the specific fire fighting procedure that could increase the hazards in the area because of overpressurization or electrical hazards).		d. Plant systems that should be managed to reduce the damage potential during a local fire and the location of local and remote controls for such management (e.g., any hydraulic or electrical systems in the zone covered by the specific fire fighting procedure that could increase the hazards in the area because of overpressurization or electrical hazards).	

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e. Vital heat-sensitive system components that need to be kept cool while fighting a local fire. Particularly hazardous combustibles that need cooling should be designated.		e. Vital heat-sensitive system components that need to be kept cool while fighting a local fire. Particularly hazardous combustibles that need cooling should be designated.	
f. Organization of fire fighting brigades and the assignment of special duties according to job title so that all fire fighting functions are covered by any complete shift personnel complement. These duties include command control of the brigade, transporting fire suppression and support equipment to the fire scenes, applying the extinguishant to the fire, communication with the control room, and coordination with outside fire departments.		f. Organization of fire fighting brigades and the assignment of special duties according to job title so that all fire fighting functions are covered by any complete shift personnel complement. These duties include command control of the brigade, transporting fire suppression and support equipment to the fire scenes, applying the extinguishant to the fire, communication with the control room, and coordination with outside fire departments.	
g. Potential radiological and toxic hazards in fire zones.		g. Potential radiological and toxic hazards in fire zones.	
h. Ventilation system operation that ensures desired plant air distribution when the ventilation flow is modified for fire containment or smoke clearing operations.		h. Ventilation system operation that ensures desired plant air distribution when the ventilation flow is modified for fire containment or smoke clearing operations.	

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i. Operations requiring control room and shift engineer coordination or authorization.		i. Operations requiring control room and shift engineer coordination or authorization.	
j. Instructions for plant operators and general plant personnel during fire.		j. Instructions for plant operators and general plant personnel during fire. The fire protection program at each nuclear power plant should establish the fire protection policy for the protection of structures, systems, and components necessary for safe shutdown at each plant and the procedures, equipment, and personnel required to implement the program at the plant site.	
		(1) The fire protection program should be under the direction of an individual who has been delegated authority commensurate with the responsibilities of the position and who has available staff personnel knowledgeable in both fire protection and nuclear safety.	

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		(2) The fire protection program should extend the concept of defense-in-depth to fire protection in fire areas important to safety, with the following objectives: * to prevent fires from starting; * to detect rapidly, control, and extinguish promptly those fires that do occur; * to provide protection for structures, systems, and components needed for safe shutdown so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant. (3) Responsibility for the overall fire protection program should be assigned to a person who has management control over all organizations involved in fire protection activities.	

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		Formulation and assurance of program implementation may be delegated to a staff composed of personnel prepared by training and experience in fire protection and personnel prepared by obtaining and experience in nuclear plant safety to provide a balanced approach in directing the fire protection program for the nuclear power plant. The staff should be responsible for: (a) Fire protection program requirements, including consideration of potential hazards associated with postulated fires, with knowledge of building layout and systems design. (b) Post-fire shutdown capability. (c) Design, maintenance, surveillance, and quality assurance of all fire protection features (e.g., detection systems, suppression systems, barriers, dampers, doors, penetration seals, and fire brigade equipment).	

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		(d) Fire prevention activities (administrative controls and training). (e) Fire brigade organization and training. (f) Pre-fire planning. (4) The organization responsibilities and lines of communication pertaining to fire protection should be defined between the various positions through the use of organizational charts and functional descriptions of each position's responsibilities. The following positions/organizations should be designated: (a) The upper level offsite management position which has management responsibility for the formulation, implementation, and assessment of the effectiveness of the nuclear plant fire protection program.	

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		(b) The offsite management position(s) directly responsible for formulating, implementing, and periodically assessing the effectiveness of the fire protection program for the licensee's nuclear power plant including fire drills and training conducted by the fire brigade and plant personnel. The results of these assessments should be reported to the upper level management position responsible for fire protection with recommendations for improvements or corrective actions as deemed necessary. (c) The onsite management position responsible for the overall administration of the plant operations and emergency plans which include the fire protection and prevention program and which provide a single point of control and contact for all contingencies.	

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		(d) The onsite position(s) which: i. Implements periodic inspections to: minimize the amount of combustibles in safe shutdown areas; determine the effectiveness of housekeeping practices; assure the availability and acceptable condition of all fire protection systems/equipment, emergency breathing apparatus, emergency lighting, communication equipment, fire stops, penetration seals, and fire retardant coatings; and assures the prompt and effective corrective actions are taken to correct conditions adverse to fire protection and preclude their recurrence. ii. Is responsible for the fire fighting training for operating plant personnel and the plant's fire brigade; design and selection of equipment; periodic inspection and testing of fire protection systems and equipment in accordance with established procedures, and evaluate test results and determine the acceptability of the systems under test.	

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		iii. Assists in the critique of all fire drills to determine how well the training objectives have been met. iv. Reviews and evaluates proposed work activities to identify potential transient fire loads. v. Implements a program for indoctrination of all plant contractor personnel in appropriate administrative procedures which implement the fire protection program, and the emergency procedures relative to fire protection. vi. Implements a program for instruction of personnel on the proper handling of accidental events such as leaks or spills of flammable materials that are related to fire protection.	

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		(e) The onsite position responsible for fire protection quality assurance. This position should be responsible for assuring the effective implementation of the fire protection program by planned inspections, scheduled audits, and verification that the results of these inspections of audits are promptly reported to cognizant management personnel. (f) The positions which are part of the plant fire brigade.	

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		(5) Personnel Qualification (a) The position responsible for formulation and implementation of the fire protection program should have within his organization or as a consultant a fire protection engineer who is a graduate of an engineering curriculum of accepted standing and shall have completed not less than 6 years of engineering attainment indicative of growth in engineering competency and achievement, 3 years of which shall have been in responsible charge of fire protection engineering work. These requirements are the eligibility requirements as a Member in the Society of Fire Protection Engineers. (b) The personnel responsible for the maintenance and testing of the fire protection systems should be qualified by training and experience for such work.	

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		(6) The following NFPA publications should be used for guidance to develop the fire protection program: No. 4 - "Organization for Fire Services" No. 4A - "Organization of a Fire Department" No. 6- "Industrial Fire Loss Prevention" No. 7 - "Management of Fire Emergencies" No. 8 - "Management Responsibilities for Effects of Fire on Operations" No. 27 - "Private Fire Brigades" (7) On sites where there is an operating reactor and construction or modification of other units is underway, the superintendent of the operating plant should have the lead responsibility for site fire protection.	

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L. Alternative and dedicated shutdown capability	L. Shutdown path capability	L. Shutdown path capability	L. Shutdown path capability
1. Alternative or dedicated shutdown capability provided for a specific fire area shall be able to (a) achieve and maintain subcritical reactivity conditions in the reactor; (b) maintain reactor coolant inventory; (c) achieve and maintain hot standby 3-/ conditions for a PWR (hot shutdown 3-/ for a BWR); (d) achieve cold shutdown conditions within 72 hours; and (e) maintain cold shutdown conditions thereafter.	1. Shutdown path equipment shall be able to (a) achieve and maintain subcritical reactivity conditions in the reactor; (b) maintain reactor coolant inventory; (c) achieve and maintain hot standby conditions for a PWR or hot shutdown conditions for a BWR, as defined in the plant's Technical Specifications, until cold shutdown path equipment can be made available; (d) achieve cold shutdown conditions; and (e) maintain cold shutdown conditions thereafter.	Certain fire scenarios will not cause or be caused by a loss of offsite power (LOOP). Assessments of such scenarios shall be documented in the plant's Fire Hazards Analysis (FHA).	The terms "alternative" and "dedicated" were removed and are now reflected by consideration of available redundant or diverse methods as set forth in the definition of "shutdown path" in Section I. Removed reference to postulated 72 hours loss of offsite power (LOOP) and replaced with performance based allowance to conduct scenario specific evaluations to determine anticipated LOOP time.

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During the post-fire shutdown, the reactor coolant system process variables shall be maintained within those predicted for a loss of normal a.c. power , and the fission product boundary integrity shall not be affected; i.e., there shall be no fuel clad damage, rupture of any primary coolant boundary, of rupture of the containment boundary.	During the postfire shutdown, the reactor coolant system process variables shall be controlled commensurate with parameters in the plant's emergency operating procedures, and the fission product boundary integrity shall not be affected; i.e., there shall be no fuel clad damage, rupture of any primary coolant boundary, or rupture of the containment boundary. Support equipment necessary to assure control of these capabilities shall also be addressed in the plant's safe shutdown analysis.		If a LOOP cannot be caused by a specific fire for a given scenario, the two events are not considered to occur simultaneously since they are mutually exclusive. Hot standby/hot shutdown definitions were related to plant specific Technical Specifications.

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2. The performance goals for the shutdown functions shall be: a. The reactivity control function shall be capable of achieving and maintaining cold shutdown reactivity conditions.	2. The shutdown capability shall be demonstrated to provide its required function and shall accommodate anticipated postfire conditions. Where fire in the area may cause interruption of the offsite power supply, safe shutdown capability shall be demonstrated using onsite power not affected by the fire in the area. Procedures shall be in effect to implement this capability.		Delineation of safe shutdown parameters has been replaced with the general requirement to adhere to NRC accepted plant specific emergency operator procedures.
b. The reactor coolant makeup function shall be capable of maintaining the reactor coolant level above the top of the core for BWRs and be within the level indication in the pressurizer for PWRs. c. The reactor heat removal function shall be capable of achieving and maintaining decay heat removal. d. The process monitoring function shall be capable of providing direct readings of the process variables necessary to perform and control the above functions.			Plant manning requirements offered in Option B reflect plant specific site emergency plans accepted by NRC for all events.

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e. The supporting functions shall be capable of providing the process cooling, lubrication, etc., necessary to permit the operation of the equipment used for safe shutdown functions.			
3. The shutdown capability for specific fire areas may be unique for each such area, or it may be one unique combination of systems for all such areas.	3. If the capability to achieve and maintain cold shutdown will not be available because of fire damage, the equipment and systems comprising the means to achieve and maintain the hot standby or hot shutdown condition shall be capable of maintaining such conditions until cold shutdown can be achieved.		
In either case, the alternative shutdown capability shall be independent of the specific fire area(s) and shall accommodate post-fire conditions where offsite power is available and where offsite power is not available for 72 hours. Procedures shall be in effect to implement this capability.	If such equipment and systems will not be capable of being powered by either onsite or offsite electric power systems, as deemed necessary by the specific scenarios considered, because of fire damage, an independent onsite power system shall be provided.		

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	The number of operating shift personnel, exclusive of fire brigade members, required to operate such equipment and systems shall be available in accordance with the site emergency plan.		
4. If the capability to achieve and maintain cold shutdown will not be available because of fire damage, the equipment and ----------	4. Equipment and systems comprising the means to achieve and maintain cold shutdown conditions shall not be damaged by fire; or the fire damage to such equipment and systems shall be limited so that the systems can be made operable and cold shutdown can be achieved. Materials for such repairs shall be readily available and procedures shall be in effect to implement such repairs. If such equipment and systems used after the fire will not be capable of being powered by either onsite (when conditions warrant) or offsite electric power systems because of fire damage, an independent onsite power system shall be provided.		

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3-/ As defined in the Standard Technical Specifications.

systems comprising the means to achieve and maintain the hot standby or hot shutdown condition shall be capable of maintaining such conditions until cold shutdown can be achieved. If such equipment and systems will not be capable of being powered by both onsite and offsite electrical power systems because of fire damage, an independent onsite power system shall be provided. The number of operating shift personnel, exclusive of fire brigade members, required to operate such equipment and systems shall be on site at all times.

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5. Equipment and systems comprising the means to achieve and maintain cold shutdown conditions shall not be damaged by fire, or the fire damage to such equipment and systems shall be limited so that the systems can be made operable and cold shutdown can be achieved within 72 hours. Materials for such repairs shall be readily available on site and procedures shall be in effect to implement such repairs. If such equipment and systems used prior to 72 hours after the fire will not be capable of being powered by both onsite and offsite electric power systems because of fire damage, an independent onsite power system shall be provided. Equipment and systems used after 72 hours may be powered by offsite power only.	5. Shutdown systems installed to ensure postfire shutdown capability need not be designed to meet seismic Category I criteria, single failure criteria, or other design basis accident criteria, except where required for other reasons, e.g., because of interface with or impact on existing safety systems.		

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6. Shutdown systems installed to ensure postfire shutdown capability need not be designed to meet seismic Category I criteria, single failure criteria, or other design basis accident criteria, except where required for other reasons, e g., because of interface with or impact on existing safety systems, or because of adverse valve actions due to fire damage.	6. The safe shutdown equipment and systems for each fire area shall be known to be isolated from associated circuits in the fire area so that credible hot shorts, open circuits, or shorts to ground in the associated circuits will not prevent operation of the safe shutdown equipment.		
7. The safe shutdown equipment and systems for each fire area shall be known to be isolated from associated non-safety circuits in the fire area so that hot sorts, open circuits, or shorts to ground in the associated circuits will not prevent operation of the safe shutdown equipment. 4-/	The separation and barriers between trays and conduits containing associated circuits of one safe shutdown path and trays and conduits containing associated circuits or safe shutdown cables from the redundant path, or the isolation of these associated circuits from the safe shutdown equipment, shall be such that a postulated fire involving associated circuits will not prevent safe shutdown.		

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The separation and barriers between trays and conduits containing associated circuits of one safe shutdown division and trays and conduits containing associated circuits containing associated circuits or safe shutdown cables from the redundant division, or the isolation of these associated circuits from the safe shutdown equipment, shall be such that a postulated fire involving associated circuits will not prevent safe shutdown.			
	7. For those fire scenarios that do not result in or from a loss of offsite power (LOOP), plant shutdown may rely on available offsite power sources. Since a relationship could be defined between fire scenarios and a LOOP, the LOOP time duration would reflect appropriate repair/replacement times associated with the scenario.		
M. Fire barrier cable penetration seal qualification	M. Fire barrier cable penetration seal qualification	M. Fire barrier cable penetration seal qualification	M. Fire barrier cable penetration seal qualification

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Penetration seal designs shall utilize any noncombustible materials and shall be qualified by tests that are comparable to tests used to rate fire barriers. The acceptance criteria for the test shall include:	Penetration seals, when deemed necessary for installation, shall have fire resistance duration ratings comparable to that of the fire barriers they penetrate or adequate to withstand the fire hazards in the area as determined by engineering analysis.	Either of the following methods identified herein are acceptable for penetration seal qualifications.	Prescriptiveness was removed to the guidance document and reflects assessment guidelines in GL 86-10.
1. The cable fire barrier penetration seal has withstood the fire endurance test without passage of flame or ignition of cables on the unexposed side for a period of time equivalent to the fire resistance rating required of the barrier; 2. The temperature levels recorded for the unexposed side are analyzed and demonstrate that the maximum temperature is sufficiently below the cable insulation ignition temperature; and		Method A. Designs shall be qualified by tests that are comparable to tests used to rate fire barriers. The acceptance criteria for the test shall include: 1. The cable fire barrier penetration seal has withstood the fire endurance test without passage of flame or ignition of cables on the unexposed side for a period of time equivalent to the fire resistance rating required of the barrier;	

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3. The fire barrier penetration seals remains intact and does not allow projection water beyond the unexposed surface during the hose stream test.		2. The temperature levels recorded for the unexposed side are analyzed and demonstrate that the maximum temperature is sufficiently below the cable insulation ignition temperature; and 3. The fire barrier penetration seal remains intact and does not allow projection of water beyond the unexposed surface during the hose stream test. Method B Fire area boundaries need not be completely sealed floor-to-ceiling, wall-to-wall boundaries. However, all unsealed openings should be identified and considered in evaluating the effectiveness of the overall barrier.	

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		Where fire area boundaries are not wall-to-wall, floor-to-ceiling boundaries with all penetrations sealed to the fire rating required of the boundaries, licensees must perform an evaluation to assess the adequacy of fire boundaries in their plants to determine if the boundaries will withstand the hazards associated with the area. This analysis must be performed by at least a fire protection engineer and, if required, a systems engineer.	
N. Fire doors	N. Fire doors	N. Fire doors	N. Fire doors
Fire doors shall be self-closing or provided with closing mechanisms and shall be inspected semiannually to verify that automatic hold-open, release, and closing mechanisms and latches are operable.	Fire doors shall be self-closing or provided with closing mechanisms and shall be inspected periodically and maintained accordingly to ensure proper operation.	One of the following measures shall be provided to ensure they will protect the opening as required in case of fire: 1. Fire doors shall be kept closed and electronically supervised at a continuously manned location; 2. Fire doors shall be locked closed and inspected weekly to verify that the doors are in the closed position;	Prescriptiveness removed from the regulation to the guidance document.

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One of the following measures shall be provided to ensure they will protect the openings required in case of fire: 1. Fire doors shall be kept closed and electrically supervised at a continuously manned location; 2. Fire doors shall be locked closed and inspected weekly to verify that the doors are in the closed position; 3. Fire doors shall be provided with automatic hold-open and release mechanisms and inspected daily to verify that doorways are free of obstruction; or		3. Fire doors shall be provided with automatic hold-open and release mechanisms and inspected daily to verify that doorways are free of obstructions; or	
4. Fire doors shall be kept closed and inspected daily to verify that they are in the closed position. The fire brigade leader shall have ready access to keys for any locked fire doors.		4. Fire doors shall be kept closed and inspected daily to verify that they are in the closed position. The fire brigade leader shall have ready access to keys for any locked fire doors. Areas protected by automatic total flooding gas suppression systems shall have electrically supervised self-closing fire doors or shall satisfy Option 1 above.	

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Areas protected by automatic total flooding gas suppression systems shall have electrically supervised self-closing fire doors or shall satisfy Option 1 above.			
O. Oil collection system for reactor coolant pump	O. Associated scenarios		O. Associated scenarios
The reactor coolant pump shall be equipped with an oil collection system if the containment is not inerted during normal operation. The oil collection system shall be so designed, engineered, and installed that failure will not lead to fire during normal or design basis accident conditions and that there is reasonable assurance that the system will withstand the Safe Shutdown Earthquake. 5-/ ----------	Postulated fires or fire protection system failures need not be considered concurrent with other plant accidents or the most severe natural phenomena. However, the effects of a Safe Shutdown Earthquake (SSE) on the reactor coolant pump in a containment that is not inerted during normal plant operation shall be addressed in accordance with Option B - Subsection III.G of this appendix to this regulation.		Replaced regulation with allowance for performance assessment as delineated in Original Appendix R Statements of Consideration and exemptions granted by NRC.

4-/ An acceptable method of complying with this alternative would be to meet Regulatory Guide 1.75 position 4 related to associated circuits and IEEE Std 384-1974 (Section 4.5) where trays from redundant safety divisions are so protected that postulated fires affect trays from only one safety division.
5-/ See Regulatory Guide 1.29 -- "Seismic Design Classification" paragraph C.2.

Such collection systems shall be capable of collecting lube oil from all potential pressurized and unpressurized leakage sites in the reactor coolant pump lube oil systems.
Leakage shall be collected and drained to a vented closed container that can hold the entire lube oil system inventory.

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A flame arrester is required in the vent if the flash point characteristics of the oil present the hazard of fire flashback.

Leakage points to be protected shall include lift pump and piping, overflow lines, lube oil cooler, oil fill and drain lines and plugs, flanged connections on oil lines, and lube oil reservoirs where such features exist on the reactor coolant pumps.

The drain line shall be large enough to accommodate the largest potential oil leak.

[45 FR 76611, Nov. 19, 1980; 46 FR 44735, Sept. 8, 1981, as amended at 53 FR 19251, May 27, 1988]

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