

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

February 13, 1980

SECY-80-88

CONSENT CALENDAR ITEM

For: The Commissioners

From: Robert B. Minogue, Director
 Office of Standards Development

Thru: Executive Director for Operations *TAR for W. J. D.*

Subject: FIRE PROTECTION ACTIONS

Purpose: To obtain Commission approval for publication of the Proposed Fire Protection Rule in the Federal Register for public comment.

Category: This paper covers a minor policy question.

Issue: Whether rulemaking or orders should be used to enforce minimum fire protection requirements on operating nuclear power plants so that all fire protection modifications will be implemented by November 1, 1980.

Decision
Criteria:

1. Does the alternative resolve the contentions existing between the staff and licensees?
2. Does the alternative provide timely resolution so that fire protection modifications for operating nuclear power plants can be made by November 1, 1980?

Alternatives:

1. Publish for comment a proposed rule delineating the minimum fire protection requirements to be completed by November 1, 1980, at operating nuclear power facilities, and prohibit startup after that date of such facilities which do not comply.
2. Issue orders to each licensee as required to achieve compliance with NRC guidance on specific fire protection issues by November 1, 1980.

Discussion:

Two of the recommendations made by the Special Review Group that investigated the March 22, 1975, fire at the Browns Ferry Nuclear Power Plant pertained to assurance that the fire protection program at operating nuclear power plants conform to General Design Criterion 3 - Fire Protection of Appendix A of 10 CFR Part 50. The first recommendation was that NRC should develop additional specific guidance for implementation of GDC 3 requirements. The second recommendation was that NRC should make a detailed review of the fire protection program at each operating plant comparing it to the guidance developed in accord with the first recommendation.

Contact:
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In response to the first recommendation, NRR developed Branch Technical Position Auxiliary Power Conversion Systems Branch 9.5-1, "Guidelines for Fire Protection For Nuclear Power Plants" (BTP 9.5-1), in May 1976.

In order to solicit broad public comment the substance of Branch Technical Position 9.5-1 was then issued in the form of a regulatory guide as Regulatory Guide 1.120, "Fire Protection Guidelines for Nuclear Power Plants," which was published for comment in June 1976. In addition to noticing in the Federal Register and the regular distribution of almost 3600 this received as a Division 1 Guide, Regulatory Guide 1.120 was sent to many interested parties such as insurance carriers, trade groups, and professional societies and organizations. More than 50 comment letters were received and all were evaluated by the staff and its fire protection consultants.

The staff discussed the provisions of Regulatory Guide 1.120 several times with the full ACRS and the ACRS Fire Protection Working Group. On May 4, 1977, the staff met with the Working Group in an open meeting to again discuss the guide, and as a result of that meeting additional public comments were solicited. Nineteen more letters were received and evaluated by the staff as a result of that solicitation. Most of these additional comments duplicated comments previously received and already evaluated by the staff.

Because of the many changes made in the guide as a result of the first comment period, Regulatory Guide 1.120 was reissued for an extended comment period of one year starting in November 1977. About 25 comment letters were received with a total of over 300 specific comments. Again, most of these comments duplicated earlier comments received and evaluated by the staff.

The fire protection guidance contained in BTP 9.5-1 was developed for new plants to provide capability for safe shutdown and means to limit and control release of radioactive material during a fire. The staff recognized early on, however, that all of the guidance in BTP 9.5-1 would not be directly applicable to a particular operating plant or a plant in advanced stages of design and construction. Therefore, concurrently with development of Regulatory Guide 1.120 the staff issued in July 1976, Appendix A to BTP 9.5-1, "Guidelines for Fire Protection in Nuclear Power Plants Docketed Prior to July 1, 1976." Appendix A to BTP 9.5-1 was developed to provide for plants already docketed the same capability for safe shutdown and means to limit and control release of radioactive material during a fire, that the BTP 9.5-1 provided for new plants. It provides acceptable fire protection alternatives for areas where, depending on the construction or operational status of a given plant, the guidance of BTP 9.5-1 would be difficult or impossible to apply without major design or construction changes.

In response to the second recommendation, the NRC requested each operating plant to submit a revised Fire Hazard Analysis. The staff has reviewed each of the licensee's analysis, in conjunction with a site visit, against the guidance contained in Appendix A to the BTP 9.5-1 and has requested that modifications needed to comply with the guidance be implemented by the end of October 1980, or, for good cause shown, the first refueling outage thereafter.

Early in 1977, the staff considered various methods for enforcing compliance with the revised fire protection guidelines by November 1, 1980, i.e., (a) adopting a policy of not permitting startup after that date if certain fire protection modifications are not complete, (b) setting a schedule for completion by license conditions, (c) ordering compliance under the provisions of 10 CFR 2.202 or 10 CFR 2.204, and (d) rulemaking. At that time, the majority of licensees were proposing modifications which would bring their facilities into compliance with the staff guidelines by the end of October 1980. Therefore, the staff decided to issue Safety Evaluation Reports to set the schedule for completing such modifications as license conditions. Most Safety Evaluations contained open items that were to be resolved on a schedule consistent with that set by the license conditions. In August 1979, the staff again reminded all licensees of its intention to have all fire protection modifications completed by November 1, 1980. See Enclosure "G".

Most licensees, when they completed their Fire Hazards Analysis, proposed modifications to conform with the NRC guidelines. Usually, however, the staff made additional strong recommendations after each site visit. And the licensees usually agreed to implement the recommendations. When a licensee did not adopt particular staff recommendations, each issue was identified as an incomplete item in the staff's safety evaluation. In some cases, licensees agreed to further consider the need for recommended modifications and have since (1) adopted the recommendations, (2) proposed alternatives, or (3) continued to disagree with the staff recommendations and refuse to adopt them. The staff has decided most of these issues on a generic basis and licensees are being notified. If any licensee again declines these recommendations, a rule or orders must be issued to gain compliance.

In December 1978, the staff initiated an action to order compliance on the specific issue related to fire brigade shift size. When this action was processed through OELD, they expressed the view that rulemaking was a more appropriate way to resolve this issue. See Enclosure "C".

On August 9, 1979, the Division of Operating Reactors requested the Division of Engineering Standards to initiate rulemaking for five-man fire brigade at operating reactors. In its memo DOR asked DES to "initiate actions to expeditiously develop an amendment to the regulations which will state this requirement for all operating plant sites." The entire memo request and support is shown as Enclosure "D".

NRR identified several staff members to be responsible for assisting SD in developing the rule. Those involved agreed that the scope of the proposed rule should not be limited to the single issue of fire brigade size. A number of other fire protection issues which were also open items between the staff and at least one licensee were, therefore, included. Additional Historical Background information is also included in Enclosures "E" and "F".

Four major fire protection issues are stated in this proposed rule.

- (1) The minimum fire protection requirement for redundant systems or components important to safety that are located in the same fire area.
- (2) The different minimum requirements for systems and components associated with shutdown as opposed to loss-of-coolant accidents.
- (3) The minimum shutdown capability required following a major fire that is not controlled by the automatic and manual fire protection features.
- (4) All modifications related to fire protection shall be completed by a specified date.

The requirements specified in the proposed rule are stated in or derived from the NRC guidelines which have been in the public record and have been subject to public comment since 1976. Appendix A to BTP 9.5-1 was published on August 23, 1976, and has been used as the basis for evaluating the fire protection program at each operating nuclear power facility. These fire protection requirements were also considered during the staff's review of the UCS Petition for Emergency and Remedial Action and the UCS petition for reconsideration. The Commission's Memorandum and Order concerning the UCS Petition dated April 13, 1978, ordered the staff to use its best efforts to maintain current schedules for implementation of the Fire Protection Action Plan. Those schedules had the goal of implementing all modifications by November 1, 1980, or, for good cause shown, the first refueling outage thereafter. The staff intends that the November 1, 1980, implementation date

should apply to all of the requirements of the proposed rule except for alternate shutdown capability. In the case of alternate shutdown capability, the licensee shall prepare a schedule to be acceptable to and approved by the staff. Prompt action is required on this rule if that goal is to be achieved.

Because all operating plants have already implemented most of the requirements of Appendix A to BTP 9.5-1, there is no "threat" to public health and safety in proceeding with a proposed rule. The rule is necessary primarily to complete approximately 50 generic-type open issues scattered throughout the operating plants. The staff believes that, with concerted effort to promptly (1) publish the proposed rule and (2) review and analyze public comments, the final rule can be published about the middle of June 1980. Considering the guidance given licensees since early 1976, we deem November 1, 1980, to be a realistic date for implementation of all requirements in Enclosure "A" except for cases where good cause is shown for (1) implementing the modifications at the first refueling outage thereafter or (2) coordinating the fire protection modification with other modifications required by our Systematic Evaluation Program.

Evaluations of the alternative approaches follow:

Alternative 1. Publish for comment a proposed rule delineating the minimum fire protection requirements to be completed by November 1, 1980, at operating nuclear power facilities, and prohibit startup after that date of such facilities which do not comply.

- Pro: (1) Would avoid the need for separate hearings with several licensees as might be required in the case of issuing orders.
- (2) Would permit full public review and comment on the rule with the possibility of more desirable options and/or solutions being proposed.
- (3) Would assure uniform application of NRC fire protection requirements for the issues covered by the rule.
- Con: (1) May delay final implementation if an effective rule is not published promptly because a proposed rule is not legally enforceable.
- (2) Some site-specific issues may come up in the future which are not covered by this proposed rule.

Resource Estimates:

Approximately 3 man-months of effort each by SD and NRR.

Alternative 2. Issue orders to each licensee as required to achieve compliance with NRC guidance on specific fire protection issues by November 1, 1980.

Pro: (1) Would allow quick resolution of those issues accepted by the licensees.

Con: (1) Would increase the workload of the NRC staff by necessitating legal and technical arguments with individual licensees. If hearings are requested by the licensees on specific fire protection items, this increase would be substantial.

(2) Would substantially delay implementation of fire protection issues involved in such hearings.

Resource Estimate:

Between 5 and 50 orders would be required if this alternative is chosen. The lower number (5) represents those licensees who have said they would not accept the staff's recommendation on fire brigade size. The larger number (50) represents our estimate of the number of licensees who may refuse to accept one or more of the staff's other recommendations for fire protection.

We estimate that approximately four man-months of effort will be required by the staff to prepare each order issued. There is little reason to believe that a licensee will accept an order without requesting a hearing if an issue between the licensee and the staff has reached that point without resolution, but no estimate is available as to the manpower required to participate in such hearings.

The staff also considered two other alternatives: (1) combining a proposed rule with orders and (2) an immediately effective rule. The alternative of a proposed rule with orders was rejected for the reasons given in the OELD memo of April 24, 1979 (Enclosure "C"), particularly because the probable adjudication of issues in a hearing offered in an order would substantially delay completing the implementation of the provisions for fire protection. The alternative for an immediately effective rule was rejected in the absence of sufficient grounds for a finding that public comment would be impractical, unnecessary, or contrary to the public interest under the Administrative Procedure Act (5 U.S.C. 553).

Recommendation: That the Commission:

1. Approve publication of proposed amendments delineating the minimum fire protection requirements at nuclear power facilities as set forth in Enclosure "A". (Alternative 1).
2. State its intention to issue orders under 10 CFR 2.204 for any future site specific fire protection issues not covered by this proposed rule.
3. Note:
 - (a) That the notice of proposed rule making in Enclosure "A" will be published in the Federal Register allowing 30 days for public comment. Owing to the nature of this rule and the fact that the positions of the staff and the licensees are documented and well known, no extension of the comment period will be granted.
 - (b) That, if after expiration of the comment period no significant adverse comments or significant questions have been received and no substantial changes in the text of the rule are indicated, the Executive Director for Operations will arrange for publication of the amendment in final form.
 - (c) That pursuant to § 51.5(d) of Part 51 of the Commission's regulations neither an environmental impact statement nor a negative declaration need be prepared in connection with the amendment, since the amendment is non-substantive and insignificant from the standpoint of environmental impact.
 - (d) That the Subcommittee on Nuclear Regulation of the Senate Committee on Environment and Public Works, the Subcommittee on Energy and the Environment of the House Committee on Interior and Insular Affairs, the Subcommittee on Energy and Power of the House Committee on Interstate and Foreign Commerce, and the Subcommittee on Environment, Energy and Natural Resources of the House Committee on Government Operations will be informed.
 - (e) That a public announcement will be issued (Enclosure "H").
 - (f) That a letter will be sent to each licensee affected by the rule informing it of the requirements of the rule by _____.

- Coordination: The Office of the Executive Legal Director has no legal objection. The Offices of Nuclear Reactor Regulation and Inspection and Enforcement have concurred. The Office of Public Affairs prepared the public announcement.
- Sunshine Act: Recommend affirmation at an open meeting.

Robert B. Minogue

Robert B. Minogue, Director
Office of Standards Development

Enclosures:

- "A" - Notice of Proposed Rule Making
- "B" - Value/Impact Assessment of Fire Protection Rule
- "C" - Memo from Murray to Stello dated April 24, 1979
- "D" - Memo from Eisenhut to Arlotto dated August 9, 1979, with Attachment
- "E" - Historical Background
- "F" - Memo from Denton to Minogue dated October 9, 1979
- "G" - Letter Eisenhut to Mathews dated August 17, 1979
- "H" - Draft of Public Announcement

Commissioners' comments or consent should be provided directly to the Office of the Secretary by c.o.b. Friday, February 29, 1980.

Commission Staff Office comments, if any, should be submitted to the Commissioners NLT February 22, 1980, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

This paper is tentatively scheduled for affirmation at an Open Meeting during the Week of March 10, 1980. Please refer to the appropriate Weekly Commission Schedule, when published, for a specific date and time.

DISTRIBUTION

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U. S. NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

Fire Protection Program for Nuclear Power Plants

Operating Prior to January 1, 1979

AGENCY: U. S. Nuclear Regulatory Commission

ACTION: Proposed Rule

SUMMARY: The Nuclear Regulatory Commission (NRC) is proposing to amend its regulations to require certain minimum provisions for fire protection in operating nuclear power plants.

DATES: Comment period expires (30 days after publication). The position of the staff and the licensees regarding the provisions of this rule is documented and well known. In addition, the public has been afforded several opportunities to comment on the provisions of the rule during two extensive comment periods and in open meetings with the ACRS in which a regulatory guide on fire protection was considered. For these reasons no extension of the comment period will be granted.

ADDRESSES: Written comments should be submitted to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

FOR FURTHER INFORMATION CONTACT: David P. Notley, Office of Standards Development, U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, phone 301-443-5921.

SUPPLEMENTARY INFORMATION: On March 22, 1975, the Browns Ferry Nuclear Power Plant, owned and operated by the Tennessee Valley Authority, had the worst fire to date in an operating commercial nuclear power plant. The fire was eventually controlled, there was no release of radioactive material to the environment, and the reactor was safely shut down. However, many of the systems relied on for shutdown of the reactor under both normal and emergency conditions were not available because of extensive damage to control cabling of redundant systems. Although this fire was not a particularly large or serious fire in terms of insurance underwriting loss, it was very serious in terms of the type of equipment that was rendered inoperative. Also of concern following this fire was the attitude and belief among those responsible for managing the fire that water should not be used on burning electrical cables because the resultant electrical faults would be worse than the fire damage. As a consequence, the fire was allowed to burn for more than seven hours before it was extinguished with water.

Two recommendations made by the Special Review Group that investigated the Browns Ferry fire pertained to assurance that the fire protection programs at operating nuclear power plants conform to General Design Criterion 3, Fire Protection, contained in Appendix A to this part (GDC 3). One of the recommendations was that NRC should develop additional specific guidance for implementation of GDC 3 requirements. The other was that NRC should make a detailed review of the fire protection program at each operating plant comparing it to the guidance developed per the above recommendation.

In response to the first recommendation, NRR developed Branch Technical Position Auxiliary Power Conversion Systems Branch 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants" (BTP 9.5-1), and Appendix A to BTP 9.5-1, "Guidelines for Fire Protection For Nuclear Power Plants Docketed Prior to July 1, 1976".¹ The guidance contained in BTP 9.5-1 was published for public comment in June 1976 as Regulatory Guide 1.120, "Fire Protection Guidelines for Nuclear Power Plants." As a result of public comments received, the staff proposed extensive changes to the guide and presented the proposed changes to the ACRS in an open meeting in May 1977. Additional written comments were solicited from the public following that meeting. Nineteen additional comment letters were received and they were also considered in Revision 1 of Regulatory Guide 1.120, which was published for a new one-year public comment period in November 1977. Comments received on Revision 1 of Regulatory Guide 1.120 were generally restatements of comments received during earlier comment periods and had already been considered and evaluated by the staff.

The guidelines in both the BTP 9.5-1 and Appendix A to BTP 9.5-1 were developed to provide a fire protection program that has two basic objectives:

1. to identify and distinguish between those consequences of fire that are acceptable and those consequences that are not.
2. to provide necessary means to minimize all consequences of fire and to prevent unacceptable consequences from occurring.

¹Branch Technical Position 9.5-1 and its Appendix A are available from David P. Notley, Office of Standards Development.

With respect to the first objective, the phenomenon of fire is believed to be sufficiently well understood to permit evaluation of existing and potential fire hazards and probable extent of damage should a fire occur. Such evaluations are useful in assessing the possible consequences of fire in a given area. However, the phenomenon of fire is so unpredictable in occurrence and development that measures to prevent unacceptable consequences may not be omitted on the basis of low probability of occurrence. The minimum fire protection requirements for nuclear power plants must be established not only to identify fire hazards but also to protect against unacceptable consequences of fire.

In response to the second recommendation of the Special Review Group, the NRC requested every operating plant to (1) compare its fire protection program with the above guidelines and (2) analyze the consequences of fire in each plant area. The NRC then reviewed the licensee's analysis against the guidance contained in Appendix A to BTP 9.5-1 and visited each plant to examine the relationship of the structures, systems, and components important to safety with both in situ and transient fire hazards, the potential consequences of fire, and the associated fire protection features.

Appendix A to BTP 9.5-1 has been used by the staff as a basis for evaluating the adequacy of fire protection provided at all of the presently operating nuclear power plants in the United States. Most of the licensees have accepted most of the staff positions and interpretations of this Appendix A. However, 17 generic issues exist in the fire protection safety analysis reports for 32 plants where agreement has not been reached between the staff and some licensees. In each case the disagreement turns on how to satisfy the basic protection requirement. For

instance, all agree on the need for a fire brigade on all shifts. The disagreement is "how large?" The staff says that five should be the minimum size permitted while some licensees say that a brigade of only three or four will be adequate. Similar disagreements exist with each of the basic requirements covered by this proposed rule.

The issues are not new, either for the staff or for the licensees involved. This proposed rule and its Appendix R address only those issues that are generic in nature; no plant-specific issues are included.

Because of these differences between the staff and the licensees in the interpretation of the staff's guidelines, it is timely and necessary for the Commission to state what the minimum fire protection requirements will be in each of these contested areas of concern.

This proposed rule and its Appendix R have been developed to establish those acceptable minimum fire protection requirements for nuclear power plants operating prior to January 1, 1979. These regulations state those fire protection requirements for nuclear power facilities that are considered minimum generic requirements to satisfy General Design Criterion No. 3 of Appendix A to 10 CFR 50. The proposed Appendix R specifies both general and specific requirements of an acceptable fire protection program. All modifications (except for alternate shutdown capability) would be required to be implemented by November 1, 1980, or, for good cause shown, by the end of the first refueling outage thereafter. In the case of alternate shutdown capability, the licensee would be required to prepare a schedule to be acceptable to and approved by the staff. No plant would be permitted to start up after that date unless all modifications have been implemented.

A brief description of the major parts of the proposed rule, including the need for each of the specific requirements, follows.

I. Introduction and Scope

This section states that the basic objective of the proposed Appendix R is to specify the minimum fire protection requirements for nuclear power plants operating prior to January 1, 1979. It limits application to commercial nuclear power electric generating stations and also states that the proposed Appendix R does not rescind any requirements set forth in any Safety Evaluation Report for any nuclear power facility.

II. General Requirements

This section states in general terms the need for a comprehensive fire protection program at each nuclear power plant.

A. Fire Protection Program

The concept of defense in depth is here extended to fire protection (1) to prevent fires from starting, (2) to rapidly detect, control, and promptly extinguish those fires that do occur, and (3) to arrange the structures, systems, and components important to safety so that a fire that starts in spite of the fire prevention activities and that is not promptly extinguished by the fixed automatic or manual fire suppression activities will not prevent the safe shutdown of the plant.

B. Loss of Offsite Power

This section requires that any fire detection or suppression system protecting systems necessary to achieve and maintain safe plant shutdown be capable of functioning with or without offsite power.

C. Manual Fire Fighting

This section requires that manual fire fighting capability (a fire brigade) be provided in all areas containing or presenting a fire hazard to structures, systems, or components important to safety.

D. Access for Manual Fire Fighting

This section requires that access for effective functioning of the fire brigade be provided in all areas containing or presenting a fire hazard to structures, systems, or components important to safety.

E. Fire Hazard Analysis

This section requires that the adequacy of fire protection provided in any area to ensure the ability (1) to safely shut down the plant or (2) to minimize and control the release of radioactivity to the environment be determined by analysis of the effects of fires on structures, systems, or components important to safety in the area.

III. Specific Requirement

Each of the 17 specific fire protection requirements in the proposed Appendix R is described below.

A. Fire Water Distribution System

Two of the lessons learned from the Browns Ferry Fire are (1) that water is the best extinguishing agent available for most potential fires in nuclear power plants and (2) that the sooner a fire is extinguished, the less total damage results. These two statements recognize that extenuating circumstances in operating plants may preclude the indiscriminate use of water to fight fires in particular locations; however, such circumstances are exceptions. In practical terms, this means

that fires in electrical equipment (which may be subject to water damage) should be extinguished as quickly as possible. Water may not be excluded from an area as a fire extinguishant only on the basis of potential water damage to safe shutdown equipment. If such water damage hazard is severe, other protective measures such as shields for equipment or alternate shutdown capability would be required.

A separate fire water distribution system would be required at each plant to ensure the necessary water supply with adequate pressure and volume for any combination of automatic and manual fire suppression demands.

A looped fire main with appropriate isolation valves provides a higher reliability of furnishing this necessary water supply to fire suppression systems by providing alternate directions of flow during maintenance or repair on part of the system.

Similarly, at least two water sources--tanks and pumps or pumps alone from a large body of water such as a lake or a river--are necessary to ensure continuity of water supply. In the case of two intakes from a single large body of water, the intakes must be separated from each other so as to really ensure two separate sources.

B. Sectional Control Valves

This item requires that valves installed in the yard fire main to permit isolation of part of the main for maintenance or repair without shutting off the entire system be visually indicating.

C. Hydrant Block Valves

This item requires block valves to be installed in hydrant laterals if necessary to isolate a hydrant from the yard main without

interrupting fire water supply to areas containing safety-related or safe shutdown equipment.

D. Manual Fire Suppression

This item requires that a standpipe system with an adequate number of hose stations located throughout the plant to ensure that all areas containing safety-related cabling and equipment can be reached with at least one effective hose stream. The staff has relied on physical separation of safety-related cables and equipment and has made extensive use of automatic fire detection and suppression systems for additional protection of safety-related cabling and equipment. The staff recognizes, however, the limits of automatic fire protection systems, and that such automatic protection, especially coupled with physical separation, is not always feasible in operating plants. Prudence therefore dictates that manual firefighting capability be available throughout the plant to increase the overall reliability of fire suppression capability.

E. Hydrostatic Hose Tests

This item describes the frequency and severity of hydrostatic tests to which all plant fire hose must be subjected in order to have reasonable assurance that it will function properly without rupture when needed during a fire.

F. Automatic Fire Detection

This item requires automatic fire detection systems for in areas containing combustibles and safe shutdown or safety-related systems or components in order to provide prompt notification and alarm in the event of fire in these areas. This will permit prompt response by the fire brigade to enable speedy extinguishment in those areas not protected by

automatic fire suppression systems and may enable the brigade to control fires in areas that are so protected before the automatic systems operate.

G. Protection of Safe Shutdown Capability

A wide spectrum of fire hazards and shutdown equipment subject to fire damage exists in operating nuclear power plants. This item lists several parameters (the combination of fire hazards, the susceptibility of safe shutdown equipment to damage from both fire and fire suppression activities, fire suppression means available, and availability of alternate shutdown capability) that must be considered in evaluating the effectiveness of fire protection in areas containing safe shutdown equipment. Table 1 gives a summary of various conditions that mandate installation of manual or automatic fixed fire suppression systems.

H. Fire Brigade

The need for manual firefighting capability as backup to automatic fire detection and fixed fire suppression systems is established in Item D, which requires that a standpipe and hose system be installed to provide at least one effective hose stream in each area of the plant containing safety-related or safe shutdown equipment. This item specifies the minimum shift fire brigade size necessary to give reasonable assurance of effective manual firefighting capability. It requires that at least five persons be assigned to the fire brigade on each shift and that these persons have no duties during a fire except those directly related to manual firefighting. It further requires that the brigade leader and at least two brigade members be operations personnel, and that the brigade leader be competent to assess potential safety consequences of a fire and advise control room personnel. It also states some of the equipment that is to be provided for the brigade members.

I. Fire Brigade Training

This item requires that training be provided for each individual brigade member and each shift brigade as a team in order to ensure the necessary high degree of proficiency required of a fire brigade during emergency response to an actual fire. The type and frequency of such training (classroom instruction, hands on practice sessions, and simulated drills) is specified.

J. Emergency Lighting

This item requires that emergency lighting from individual eight-hour battery-powered units be provided in those areas needed for operation of safe shutdown equipment and access routes to safety-related areas. Fire may damage normal lighting in areas other than the area of the fire. Such other areas may contain equipment or controls necessary for safe shutdown of the reactor. Emergency lighting is to be installed in all such areas in order to facilitate operation of such equipment by operations personnel other than the fire brigade in the event of loss of normal lighting due to fire.

K. Administrative Controls

The first goal of a fire protection program is fire prevention. Therefore, this item specifies a number of administrative controls in an effort to control the more common types of hazards. In addition, certain responses to fire by the plant fire brigade and other plant (operations) personnel are also specified.

L. Alternate Shutdown Systems

This item requires that an alternate means of bringing the reactor to a safe shutdown be provided if the provision of other fire protection does not give assurance that safe shutdown capability will survive a fire.

M. Fire Barriers

This item discusses the need for fire barriers and the need to seal or close openings through fire barriers using fire doors, dampers, or penetration sealants depending on the type of opening. It discusses the need to close such openings in order to maintain the required fire resistance rating of the barrier.

N. Fire Barrier Penetration Seal Qualification

Openings are frequently required in fire barriers to permit passage of cable trays and conduits from one area to another. Such openings are degradations of the barrier and, per the requirements of Item M, are to be sealed with material that has fire retardant properties at least equal to that required of the unpierced barrier. This item describes the testing procedures that must be used to verify adequacy of a given penetration seal design.

O. Fire Doors

Personnel access openings in fire barriers require fire door closures with fire retardant properties at least equal to that required of the unpierced barrier. This item describes acceptable alternative methods to ensure that fire doors will be closed in the event of fire.

P. Reactor Coolant Pump Lubrication System

The lubrication system for the reactor coolant pumps represents the largest single fire hazard inside containment. This item describes the arrangement of automatic fire suppression or oil collection systems that are to be provided for protection of this hazard.

Q. Associated Circuits

This item specifies the level of fire protection to be provided for electrical circuits that are not themselves safety circuits but that are associated with safety circuits.

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and section 553 of title 5 of the United States Code, notice is hereby given that adoption of the following amendments to 10 CFR Part 50 is contemplated.

PART 50 - DOMESTIC LICENSING OF
PRODUCTION AND UTILIZATION FACILITIES

1. A new Section 50.48 is added to read as follows:

§ 50.48 Fire Protection: Operating nuclear power facilities that commenced operation prior to January 1, 1979, shall meet the requirements of Criterion 3 of Appendix A to this part by satisfying the requirements contained in Appendix K to this part. The implementation of the requirements contained in Appendix R to this part (except for alternate shutdown capability) shall be completed by November 1, 1980, or for good cause shown, the first refueling outage thereafter. In the case of alternate shutdown capability, the licensee shall prepare a schedule to be acceptable to and approved by the staff.

2. A new Appendix R to 10 CFR Part 50 is added to read as follows:

APPENDIX R - FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES
OPERATING PRIOR TO JANUARY 1, 1979

I. INTRODUCTION AND SCOPE

This Appendix sets forth the minimum fire protection requirements needed for nuclear power facilities to satisfy Criterion 3 of Appendix A to this part.

This Appendix applies only to licensed commercial nuclear power electric generating stations operating prior to January 1, 1979; it does

not apply to production reactors, test reactors, research reactors, or other licensed or unlicensed reactors used for other than electric power production.

This Appendix does not rescind any requirements set forth in any Safety Evaluation Report for any nuclear power facility.

II. GENERAL REQUIREMENTS

A. Fire Protection Program

A fire protection program shall be established at each 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.

The fire protection program shall be under the direction of an individual who has been delegated authority commensurate with the responsibilities of the position. The individual shall be knowledgeable in both fire protection and nuclear safety.

The fire protection program shall extend the concept of defense in depth to fire protection with the following objectives:

1. to prevent fires from starting;
2. to detect rapidly, control, and extinguish promptly those fires that do occur;
3. to arrange the structures, systems, and components important to safety so that a fire that starts in spite of the fire prevention activities and that is not promptly extinguished by the fixed automatic or manual fire suppression activities will not prevent the safe shutdown of the plant.

The fire protection program shall consist of an integrated effort of procedures, equipment, and personnel necessary to carry out the three-part defense-in-depth concept for each fire area containing combustibles and containing or presenting a fire hazard to structures, systems, and components important to safety. For each such area, measures for (1) fire prevention; (2) fire detection, suppression and containment; and (3) alternate shutdown capability shall be provided as follows:

1. Fire Prevention

- a. In situ fire hazards shall be minimized by design and plant arrangement.
- b. Transient fire hazards associated with normal operation, maintenance, repair, or modification activities shall be identified and minimized. Those transient fire hazards that can not be eliminated shall be controlled.

2. Fire Detection, Suppression, and Containment

- a. Fire detection systems shall be installed.
- b. Portable extinguishers and standpipe and hose stations shall be installed.
- c. Manually actuated fixed suppression systems shall be installed where fire hazards of grouped electrical cables are large or access for the fire brigade is restricted.
- d. A site fire brigade shall be established, trained, and equipped.
- e. Automatic suppression systems shall be provided to cover large fire hazards or to protect redundant systems or components important to safe shutdown.

- f. Fire retardants, heat shields, or local fire barriers shall be provided where physical separation between redundant safe shutdown systems and components or between such systems and fire hazards is not adequate to ensure that automatic and manual fire suppression can limit the fire damage to one division of shutdown systems.
- g. Fire barriers surrounding each fire area shall have a 3-hour fire rating unless the fire hazards analysis demonstrates that a lesser rating exceeds the duration of the in situ fire load by at least one-half hour.
- h. Fire detection and suppression systems shall be designed, installed, maintained and tested by personnel properly qualified by experience and training in fire protection systems.
- i. Surveillance procedures shall be established to ensure that fire barriers and automatic and manual fire suppression systems and components are operable.

3. Alternate Shutdown Capability

Alternate shutdown capability shall be provided when safe shutdown cannot be ensured by barriers and detection and suppression systems, because of the exposure of redundant safe shutdown equipment, cabling, or components in a single fire area to an exposure fire, fire suppression activities, or rupture or inadvertant operation of fire suppression systems.

B. Loss of Offsite Power

Fire detection and suppression systems protecting systems necessary to achieve and maintain safe plant shutdown shall be capable of functioning with or without offsite power.

C. Manual Fire Fighting

Manual fire fighting capability shall be provided in all areas containing or presenting a fire hazard to structures, systems, or components important to safety.

D. Access for Manual Fire Fighting

Access shall be provided to all areas containing or presenting a fire hazard to structures, systems, or components important to safety to permit effective functioning of the fire brigade.

E. Fire Hazard Analysis

The adequacy of fire protection for any particular plant area shall be determined by analysis of the effects of postulated exposure fires involving both in situ and transient combustibles on the ability to safely shut down the reactor, or the ability to minimize and control the release of radioactivity to the environment. Separation of redundant systems and components by three-hour rated fire barriers or at least 50 feet both horizontal and vertical of clear air space shall be deemed adequate. Lesser ratings or distances shall be justified by analysis or test.

III. SPECIFIC REQUIREMENTS

A. Fire Water Distribution System

An underground yard fire main loop shall distribute fire protection water from the fire water supplies to the automatic and manual suppression systems. Two fresh water supplies shall be provided to furnish necessary water volume and pressure to the yard fire main loop. Each supply shall consist of a storage tank, pump, piping, and appropriate isolation

and control valves. These supplies shall be separated so that a failure of one supply will not result in a failure of the other supply.

Two separate redundant suction from a large body of fresh water will satisfy the requirement for two separated water storage tanks.

Each supply of the fire water distribution system shall be capable of providing for a period of two 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.

Minimum fire water storage shall be ensured by means of dedicated tanks or by means of a vertical standpipe for other water service when storage tanks are used for combined service-water/fire-water uses.

Other water systems used as a fire water supply 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.

B. Sectional Control Valves

Approved visually indicating sectional control valves such as Post Indicator Valves shall be provided to isolate portions of the fire main for maintenance or repair without shutting off the entire system.

C. Hydrant Block Valves

Block valves shall be installed in hydrant laterals if necessary to permit isolation of outside hydrants from the yard fire main

without interrupting the fire water supply to any area containing or presenting a fire hazard to safety-related or safe shutdown equipment.

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 could present an exposure fire hazard to safety-related equipment. Standpipe and hose stations shall be inside PWR containments and large BWR containments that are not inerted. For BWR drywells, standpipe and hose stations shall be placed outside the drywell with adequate lengths of hose to reach any location inside the drywell with an effective hose stream.

E. Hydrostatic Hose Tests

Fire hose shall be hydrostatically tested at a pressure 50 psi above maximum service pressure. Hose stored in outside hose houses shall be tested annually. Interior standpipe hose shall be tested every three years.

F. Automatic Fire Detection

Automatic fire detection systems shall be installed in all areas of the plant that contain combustibles and safe shutdown or safety-related systems or components.

G. Protection of Safe Shutdown Capability

Protective features shall be provided for fire areas that contain cables or equipment of redundant systems important to achieving and maintaining safe shutdown conditions to ensure that at least one means of achieving said conditions survives postulated fires. The protective

features may consist of a combination of automatic and manual fire suppression capability, fire propagation retardants, physical separation, partial fire barriers, or alternate shutdown capability independent of the fire area.

The design of the protective features shall consider:

1. The zone of influence of postulated fires and the fire extinguishing system used in the fire area.
2. The access for manual firefighting.
3. The potential disabling effects of water on shutdown capability.
4. The limitations of fixed suppression systems.
5. The separation between redundant divisions.
6. The in situ and transient combustibles.
7. The propagation rate of fire in the configuration.
8. The availability of shutdown capability independent of the fire area.
9. That all organic cable insulation and jacket material is combustible.
10. That metal conduit, covered cable trays, or solid bottom cable trays retard fire propagation but do not by themselves serve as a fire barrier to prevent the loss of function of the cables.
11. That fire retardant coatings retard fire propagation but do not prevent organic cable insulation and jacket materials from burning.
12. That oxygen is available to support combustion.
13. The failure of automatic fire suppression systems.
14. That the response of the fire brigade may be delayed.
15. That room air coolers do not provide adequate protection for shutdown systems by removing heat generated by a fire.

The following minimum fire protective features shall be provided:

1. An early warning fire detection system.
2. Manual fire suppression capability.
3. Fixed fire suppression systems and alternate shutdown capability as shown on Table 1.¹

H. Fire Brigade

A site fire brigade trained and equipped for firefighting shall be established to ensure adequate manual firefighting capability for all areas of the plant containing structures, systems, or components important to safety. The minimum size of the fire brigade shall be at least five members on each shift. The brigade leader and at least two brigade members shall be operations personnel or have equivalent knowledge of plant safety systems. The fire brigade members qualification shall include an annual physical examination for performing strenuous firefighting activity. 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 safety systems. Equipment provided for the brigade will consist of at least the following:

1. Personal protective equipment such as turnout coats, boots, gloves, hard hat, and pressure demand full-vision self-contained breathing apparatus with a

¹A fire hazards analysis acceptable to the staff shall be used to determine whether the plant can be shut down from the Control Room and whether access for manual firefighting is good.

TABLE 1

FIRE PROTECTION FEATURES FOR SAFE SHUTDOWN CAPABILITIES

FIRE	Fire/Water Disables Normal Shutdown Capability	Shutdown from Control Room Available	Shutdown from Alternate Panel Required	Access for Manual Fire Fighting	Fixed Suppression Systems Required
IN-SITU	NO	YES	NO	GOOD POOR	NO YES - MANUAL
	YES	NO	YES ^{2/}	GOOD POOR	YES - AUTOMATIC ^{1/} YES - AUTOMATIC
EXPOSURE	NO	YES	NO	GOOD POOR	NO YES - MANUAL
	YES	NO	YES ^{2/}	GOOD POOR	YES - AUTOMATIC ^{1/} YES - AUTOMATIC

Note 1 - Requirement for fixed suppression may be waived if (1) only in-situ combustible is cable insulation, (2) measures are provided to retard propagation, and (3) separation between redundant systems is at least ten feet horizontal and vertical of clear air space.

Note 2 - When the alternate shutdown capability is provided by an independent system dedicated to achieving and maintaining safe shutdown conditions, manually actuated fixed water systems or automatic gas suppression systems shall be provided for large concentrations of grouped electrical cables.

minimum one-half hour rated capacity and approved by National Institute of Occupational Safety and Health (NIOSH) for firefighting purposes.

2. Manual suppression equipment such as portable extinguishers and standpipe and hose with nozzles suitable for the location.
3. Other systems and equipment necessary for efficient utilization of the brigade, such as emergency lighting in access routes to areas containing safety-related systems or components, and emergency communication capability throughout the plant that is independent of the normal communication systems. Emergency communication equipment shall not interfere with other plant equipment or controls.

I. Fire Brigade Training

The fire brigade training program shall ensure that the capability to fight potential fires is established and maintained. The program shall consist of an initial classroom instruction program followed by periodic classroom instruction, practice in firefighting, and fire drills:

1. Instruction
 - a. The initial classroom instruction shall include:
 - (1) Indoctrination of the plant firefighting plan with specific coverage of each individual's responsibilities.

- (2) Identification of the fire hazards and associated types of fires that could occur in the plant and an identification of the location of such hazards.
- (3) The toxic 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.
- (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 electrical fires, fires in cables and cable trays, hydrogen fires, fires involving flammable and combustible liquids or hazardous process chemicals, construction fires, 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.
- (8) The direction and coordination of the firefighting activities (fire brigade leaders only).
- (9) Detailed review of firefighting strategies and procedures.

- (10) Review of the latest plant modifications and corresponding changes in firefighting plans.

Note: Items (9) and (10) may be deleted from the training of 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.
- 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 firefighting. 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 firefighting readiness of the plant fire brigade, brigade leader, and fire protection systems and equipment. Persons planning and authorizing an unannounced drill shall assure that the responding shift fire brigade members are not aware of the time or location of the drill 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 preplanned 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 security. Performance deficiencies of a fire brigade or of individual fire brigade members shall be remedied by scheduling additional training for the brigade or members. Unsatisfactory drill performance shall be followed by a repeat drill within 30 days.
- d. At three-year intervals, drills shall be critiqued by qualified individuals independent of the licensee's staff. A copy of the written report from such individuals shall be submitted to NRC for evaluation.
- 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 firefighting strategies.
 - (2) Assess each brigade member's knowledge of his role in the firefighting strategy for the area assumed to contain the fire. Assess the brigade

member's conformance with established plant fire-fighting procedures and use of firefighting equipment, including self-contained emergency breathing apparatus, communication equipment, and ventilation equipment, to the extent practicable.

- (3) The simulated use of firefighting 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 be varied such that brigade members are trained in fighting fires in all safety related areas. The situation selected should simulate the size and arrangement of a fire which 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.
- (4) Assessment of brigade leader's direction of the firefighting 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 four years to ensure that each member receives training in all parts of the training program.

These records of training shall be available for 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

Emergency lighting consisting of either lighting not damaged by fire in a given area or fixed sealed beam or fluorescent units with an individual 8-hour minimum battery power supply shall be provided in all areas needed for operation of safe shutdown equipment and in access routes to all safety-related areas and other areas presenting a fire hazard to safety-related areas.

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:

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.
2. Prohibit the storage of combustibles in safety-related areas or establish designated storage areas and fire protection therefor.
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 maintenance, modification, or refueling operations.

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 means of a flame permit system that controls welding, flame cutting, brazing, or soldering operations. A separate permit shall be issued for each area where work is to be done, and if work continues over more than one shift, the permit shall be valid for not more than 24 hours.
6. Govern 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. Govern the periodic housekeeping inspections to ensure continued compliance with these administrative controls.
8. Govern the use of specific combustibles in safety-related areas. All wood used in safety-related areas during maintenance, modification, or refueling operations (such as lay-down blocks or scaffolding) shall be flame-retardant.

treated. 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. Combustible material shall not be left unattended during lunch breaks, shift changes, or other similar periods. Loose combustible packing material such as wood or paper excelsior shall be placed in metal containers with tight-fitting self-closing metal covers.

9. Govern actions to be taken by individual discovering the fire, such as notification of control room, attempt to extinguish fire, and actuation of local fire suppression systems.
10. Govern actions to be taken by the control room operator and the need for brigade assistance upon report of a fire or receipt of alarm on control room annunciator panel, such as 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.
11. Govern actions to be taken by the fire brigade after notification by the control room operator of a fire, including location to assemble, directions given by fire brigade leader, and responsibilities of brigade members such as

selection of fire fighting equipment and transportation to fire location, selection of protective equipment, use of fire suppression systems operating instructions, and use of preplanned 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 fire fighting procedures.
 - b. Fire extinguishants best suited for controlling the fires associated with the fire hazards in that area and the nearest location of these extinguishants.
 - 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 fire free, 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; 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).

- e. Vital heat-sensitive system components that need to be kept cool while fighting a local fire. Particularly hazardous combustibles should be designated to receive cooling.
- f. Organization of firefighting 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. Radiological and toxic hazards in fire zones.
- h. Ventilation system operation that ensures desired plant pressure distribution when the ventilation flow is modified for fire containment or smoke clearing operations.
- i. Operations requiring control room and shift engineer coordination or authorization.
- j. Instructions for plant operators and general plant personnel during fire.

L. Alternate Shutdown Capability

If the combination of fire protection features required for safe shutdown includes alternate shutdown capability independent of a specific fire area, both of the following design conditions shall be accommodated: (1) offsite power is available and (2) offsite power is not available.

If there are several such areas, the combinations of systems that provide the shutdown capability may be unique for each critical area. However, the shutdown capability provided for each such area shall be able to achieve and maintain subcritical reactivity conditions in the reactor, maintain reactor coolant inventory, achieve and maintain hot standby* conditions for a PWR (hot shutdown* for a BWR) for at least 72 hours, achieve cold shutdown* conditions within 72 hours and maintain cold shutdown conditions thereafter. The reactor coolant system process variables shall be maintained within those predicted for a loss of normal ac power. 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.

The performance goals for the shutdown functions shall be:

1. The reactivity control function shall be capable of achieving and maintaining cold shutdown reactivity conditions.
2. The reactor coolant makeup function shall be capable of maintaining the reactor coolant level above the top of the core for BWRs and in the pressurizer for PWRs.

* As defined in the Standard Technical Specifications.

3. The reactor heat removal function shall be capable of achieving and maintaining decay heat removal.
4. The process monitoring function shall be capable of providing direct readings of the process variables necessary to perform and control the above functions.
5. 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.

The equipment and systems used to achieve and maintain hot standby conditions (hot shutdown for a BWR) shall be (1) free of fire damage, (2) capable of maintaining such conditions for at least 72 hours if the equipment required to achieve and maintain cold shutdown is not available because of fire damage, and (3) capable of being powered by both onsite and offsite electric power systems or by onsite power systems that are independent of the onsite and offsite electric power systems. The number of operating shift personnel, exclusive of fire brigade members, required to operate the equipment and systems shall be onsite at all times.

The equipment and systems used to achieve and maintain cold shutdown conditions shall be free of fire damage, or the fire damage to such systems shall be limited such that repairs can be made and cold shutdown conditions achieved within 72 hours. Materials for such repairs shall be readily available onsite and procedures shall be in effect to implement such repairs. Equipment and systems used prior to 72 hours

after the fire shall be capable of being powered by both onsite and off-site electric power systems or by onsite power systems that are independent of the onsite and offsite electric power systems; equipment and systems used after 72 hours may be powered by offsite power.

These shutdown systems need not be designed to (1) seismic Category I criteria; (2) single failure criteria; or (3) cope with other plant accidents such as pipe breaks or stuck valves except where required for other reasons, e.g., because of interface with or impact on existing safety systems.

M. Fire Barriers

Fire barriers (floors, walls, ceilings, or other enclosures) separating (1) fire areas or (2) equipment or components of redundant systems important to safe shutdown within an area shall have a fire rating of three hours unless a lower rating is justified by the fire hazard analysis.

Structural steel forming a part of or supporting such fire barriers shall have fire resistance equivalent to that required of the barrier. Such fire resistance shall be provided by protection equivalent to metal lath and plaster covering.

Penetrations in these fire barriers, including conduits, cable trays, and piping, shall be sealed or closed to provide fire resistance rating equivalent to that required of the barrier. Door openings shall be protected with equivalent rated doors, frames, and hardware that have been tested and approved by a nationally recognized testing laboratory.

Penetrations for ventilation systems shall be protected by a standard "fire door damper."

N. Fire Barrier Penetration Seal Qualification

Penetration seal designs shall be qualified by an independent testing laboratory in accordance with ASTM E-119 and the following conditions:

1. The cables used in the test shall be of the same type of construction as those used in the facility.
2. The test arrangement shall be representative of the worst-case configuration of cable loading, cable tray arrangement, anchoring, and penetration fire barrier size and design. The test sample shall also be representative of the cable sizes in the facility. Testing of the penetration fire barrier in the floor configuration will qualify the fire stop for use in the wall configuration also.
3. Cables penetrating the fire barrier shall extend at least three feet on the unexposed side and at least one foot on the exposed side.
4. The fire barrier shall be tested in both directions unless the fire barrier is symmetrical.
5. The fire barrier shall be tested with a pressure differential across it (higher pressure on the exposed side) that is equivalent to the maximum pressure differential a fire barrier in the plant is expected to experience unless such pressure differentials are shown to have no effect on the performance of the penetration seal.

6. The temperature levels of the cable insulation, cable conductor, cable tray, conduit, and fire stop material shall be recorded for the unexposed side of the fire barrier.
7. As an alternative to the standard straight-stream hose test stipulated in Section 9.4 and 9.5 of ASTM E119, either of the following tests may be used:
 - a. Two identical test specimens are exposed to the standard fire. After one hour, one specimen is subjected to the standard straight-stream hose test stipulated in ASTM E119, while the other continues to be exposed to the standard fire for the full three hours; or
 - b. The single test specimen, immediately after the 3-hour standard fire exposure, is subjected to a water fog test using a high-velocity fog nozzle having an included angle of spray no larger than 30° and supplied by a hose no smaller than 1½ inches at a pressure of at least 75 psig measured at the base of the nozzle for an application time of at least 2½ minutes per 100 sq ft of test specimen.
8. Acceptance Criteria - The test is successful if:
 - a. The cable penetration fire barrier has withstood the fire endurance test without passage of flame or ignition of cables on the unexposed side for a period of three hours,

- b. 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
- c. The fire barrier remains intact and does not allow projection of water beyond the unexposed surface during the hose stream test.

0. 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 kept closed unless provided with automatic hold-open, release, and closing mechanisms.

One of the following measures shall also be provided.

- 1. Fire doors shall be electrically supervised at a continuously manned location; or
- 2. Fire doors shall be locked closed and inspected weekly to verify that the doors are in the closed position; 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 commander 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.

P. Reactor Coolant Pump Lubrication System

The Reactor Coolant Pump lubrication system shall be protected by either an oil collection system or an automatic fire suppression system.

Oil collection systems shall be capable of collecting lube oil from all potential pressurized and unpressurized leakage sites in the reactor coolant pumps' lube oil systems and draining the oil to a vented closed container. A flame arrestor is required in the vent if the flash point characteristics of the oil present the hazard of fire flash back. 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. Leakage shall be collected and drained to a closed container that can hold the entire lube oil system inventory. The drain line shall be large enough to accommodate the largest potential oil leak.

To provide adequate protection for a design basis Safe Shutdown Earthquake (SSE), one of the following should be provided:

1. The lube oil system components whose failure could result in leakage should be designed to withstand an SSE without leakage and the dropping of oil collection system components during an SSE should not cause loss of operability of safety-related equipment; or

2. The oil collection system should be designed to withstand an SSE and continue to be able to collect and drain leakage that may occur during an SSE. In this case the oil collection system should be adequate to collect oil from any external lube oil piping not designed to withstand an SSE in addition to leakage from points identified above.

If an automatic fire suppression system is selected, either the automatic and manual fire suppression system or the lube oil system components whose failure could result in leakage should be designed to withstand the SSE.

Q. Associated Circuits

Associated circuits shall be electrically isolated from safety equipment so that hot shorts, open circuits, or shorts to ground in the associated circuit will not prevent operation of the safety equipment.

If associated circuits are not known to be so electrically isolated, they shall be considered safe shutdown circuits. The separation and barriers between trays and conduits containing associated circuits of one safe shutdown division and trays and conduits containing associated circuits or safe shutdown cables from the redundant division shall be such that a postulated fire involving associated circuits will not prevent safe shutdown.¹

¹An acceptable method of complying with this alternative would be to meet Regulatory Guide 1.75 position 4 related to associated circuits and IEEE 384-1974 (Section 4.5) where trays from redundant safety divisions are so protected that postulated fires affect trays from only one safety division.

All interested persons who desire to submit written comments or suggestions concerning the proposed rulemaking should send their comments to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch, on or before _____.* Copies of comments received on the proposed amendments may be examined in the Commission's Public Document Room at 1717 H Street, N.W., Washington, D.C.

(Sec. 161b, Pub. Law 83-703, 68 Stat. 948, Sec. 201, Pub. Law 93-438, 88 Stat. 1242 (42 U.S.C. 2201(b), 5841).)

Dated at _____ this _____ day of _____ 198__.

For the Nuclear Regulatory Commission.

Samuel C. Chilk
Secretary of the Commission

* _____
30 days after publication in the Federal Register.