Docket file

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

November 24, 1980

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US NRC
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Docket No. 50-344
Plant Name: Trojan Nuclear Plant

TO ALL POWER REACTOR LICENSEES WITH PLANTS
LICENSED PRIOR TO JANUARY 1, 1979

The Commission published on November 19, 1980 (45 FR 76602), a revised Section 10 CFR 50.48 and a new Appendix R to 10 CFR 50 regarding fire protection features of nuclear power plants. The revised Section 50.48 and Appendix R will become effective February 17, 1981, which is 90 days after publication. A copy of the Federal Register Notice is enclosed (Enclosure 1).

The provisions of Appendix R that are applicable to the fire protection features of your facility can be divided into two categories. The first category consists of those provisions of the Appendix that are required to be backfit in their entirety by the new rule, regardless of whether or not alternatives to the specific requirements of these Sections have been previously approved by the NRC staff. These requirements are set forth in Sections III.G, Fire Protection of Safe Shutdown Capability; III-J, Emergency Lighting; and III-O, Oil Collection Systems for Reactor Coolant Pump. The fire protection features of your facility must satisfy the specific requirements of these three Sections by the dates established by Paragraph 50.48(c), unless an exemption from the Appendix R requirements is approved by the Commission. You should note the provisions for tolling the time for completing the modifications required by these three Sections of Appendix R set forth in Paragraph 50.48(c)(6).

The second category of Appendix R provisions applicable to the fire protection features of your facility consists of requirements concerning the "open" items of previous NRC staff fire protection reviews of your facility. An open item is defined as a fire protection feature that has not been previously approved by the NRC staff as satisfying the provisions of Appendix A to Branch Technical Position BTP PCSB 9.5-1, as reflected in a staff fire protection safety evaluation report. The fire protection features of your facility that are in this category must satisfy the specific requirements of Appendix R by the dates established by Paragraph 50.48(c), unless an exemption from the Appendix R requirements on those features is approved by the Commission.

Enclosure 2 is a summary listing of the open items concerning the fire protection features of your facility based on a review of our records. Also included is our position on the specific requirements that must be satisfied in order to resolve these open items. If you have any questions or disagreements with this enclosure, please advise us within 30 days of your receipt of this letter.

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With regard to the fire protection modifications that have been previously approved by the NRC staff, Paragraph 50.48(d) specifies a new schedule for their completion. This paragraph, when it becomes effective, will supersede the currently effective section of the regulations that temporarily suspends completion dates for previously approved fire protection modifications that are given in facility license conditions (45 FR 71569, October 29, 1980). The Commission expects that all such modifications will be completed in accordance with this new schedule, unless an extension has been requested and granted by the Director of the Office of Nuclear Reactor Regulation [see Paragraph 50.48(d)], or an exemption has been requested and granted by the Commission pursuant to Section 50.12 of the Commission's regulations.

If you have previously requested extensions of dates for completion of modifications that are required by license conditions for your facility which were not approved, and you have determined that these extensions are still necessary and justifiable, it will be necessary for you to reapply for any such extensions in accordance with the provisions of Paragraph 50.48(d).

All requests for Commission action resulting from this rule are subject to the schedule of fees specified in 10 CFR 170.21. If you have any questions concerning the subject matters of this letter, please contact the NRC Project Manager for your facility.

Sincerely,

for Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation

Enclosures:
1. Notice - Fire Protection Rule
2. Summary of Staff Requirements to Resolve Open Items

cc w/enclosures:
See next page

Portland General Electric Company

cc: Mr. J. W. Durham, Esquire
Vice President and Corporate Counsel
Portland General Electric Company
121 S.W. Salmon Street
Portland, Oregon 97204

Donald W. Godard, Supervisor
Siting and Regulation
Oregon Department of Energy
Labor and Industries Building
Room 111
Salem, Oregon 97310

Columbia County Courthouse
Law Library, Circuit Court Room
St. Helens, Oregon 97501

Michael Malmros, Resident Inspector
U. S. Nuclear Regulatory Commission
Trojan Nuclear Plant
P. O. Box 0
Rainier, Oregon 97048

Robert M. Hunt, Chairman
Board of County Commissioners
Columbia County
St. Helens, Oregon 97051

Director, Criteria and Standards Division
Office of Radiation Programs (ANR-460)
U.S. Environmental Protection Agency
Washington, D.C. 20460

Enclosure 1

federal register

Wednesday
November 19, 1980

Part II

Nuclear Regulatory Commission

Fire Protection Program for Operating Nuclear Power Plants

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

Fire Protection Program for Operating Nuclear Power Plants

AGENCY: Nuclear Regulatory Commission.

ACTION: Final rule.

SUMMARY: The Nuclear Regulatory Commission is amending its regulations to require certain provisions for fire protection in operating nuclear power plants. This action is being taken to upgrade fire protection at nuclear power plants licensed to operate prior to January 1, 1979, by requiring resolution of certain contested generic issues in fire protection safety evaluation reports.

EFFECTIVE DATE: February 19, 1981.

Note.—The Nuclear Regulatory Commission has submitted this rule to the Comptroller General for review as may be appropriate under the Federal Reports Act, as amended (44 U.S.C. 3512). The date on which the reporting requirement of this rule becomes effective, unless advised to the contrary, reflects inclusion of the 45-day period that statute allows for such review (44 U.S.C. 3512(c)(2)).

FOR FURTHER INFORMATION CONTACT: David P. Notley, Office of Standards Development, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, phone 301-443-5921 or Robert L. Ferguson, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, phone 301-492-7096.

SUPPLEMENTARY INFORMATION: On May 29, 1980, the Nuclear Regulatory Commission published in the **Federal Register** (45 FR 36082) a notice of proposed rulemaking inviting written suggestions or comments on the proposed rule by June 30, 1980. The notice concerned proposed amendments to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," which would require certain minimum provisions for fire protection in nuclear power plants operating prior to January 1, 1979. Fifty-one comment letters were received regarding the proposed amendments. A number of comments pertained to specific requirements in the proposed Appendix R, and these will be dealt with below. However, there were three substantive contentions which were raised by many of the commenters. These three comments are summarized as follows:

1. Most commenters stated that the 30 day comment period was too short to permit adequate detailed response and that the comment period should have been extended.

The Commission does not agree. The NRC has been developing fire protection requirements since 1975. The NRC published comprehensive fire protection guidelines, Branch Technical Position BTP APCSB 9.5-1, and its Appendix A in 1976. Licensees have compared their fire protection programs against these guidelines and have discussed their deviations from these guidelines with the NRC staff for the past four years during the NRC's fire protection reviews of operating reactors. A Safety Evaluation Report and, in most cases, supplements to the Safety Evaluation Report, have been issued for each operating reactor. These reports describe fire protection alternatives that have been proposed by the licensee and found acceptable by the staff as well as unresolved fire protection issues remaining between the staff and the licensee. Proposed Appendix R provided the Commission's requirements for resolving those issues. Thus, it concerns only a limited number of issues derived from the use of the earlier guides. The Commission believes that a 30-day comment period was adequate under these circumstances.

2. Many licensees questioned the need for backfitting all the requirements of Appendix R. They commented that they had previously complied with staff fire protection recommendations in "good faith" and have committed to or completed certain modifications. They contend that the staff has properly determined that these modifications provide at least the level of fire protection described by the guidance contained in Appendix A to Branch Technical Position BTP APCSB 9.5-1. They also contend that these modifications provide a level of protection at least equivalent to that contained in the proposed rule. They express the concern that the proposed rule was written in such specific language that fire protection issues that were thought closed would be reopened and new, but not necessarily better, modifications would be required. These modifications could be accomplished only by the expenditure of considerable engineering, design, and construction effort and at great undue expense. The commenters request that the requirements in the proposed rule be rewritten to specify only the general requirements of what needs to be accomplished.

These comments raise three related issues. The first relates to the need for specific requirements. The general requirements relating to fire protection are already set forth in General Design Criterion 3 of Appendix A to 10 CFR Part 50 and in the NRC guidance documents. These general provisions gave rise to a number of disputes over whether specific methods adequately accomplished the intended goal. The proposed rule is intended to provide sufficient specific guidance to ensure satisfactory resolution of these issues. Thus, reverting to generalized guidance would not accomplish the intended purpose of the proposed rule.

The second issue involved some instances in which the specific wording used resulted in unnecessary and unintended restrictions. For example, the proposed rule called for a "fresh water" supply. For firefighting purposes, brackish water is satisfactory and a "fresh" water supply is unnecessary. Similarly, the proposed rule called for an "underground" yard fire main loop. Often portions of a fire main loop run above ground in and as they enter structures. The Commission had not intended to prohibit running portions of a fire main loop above ground. Other similar changes are discussed in Section III. "Specific Requirements," of this preamble.

The third issue relates to imposition of requirements on plants with presently installed or with existing commitments to install fire protection features previously determined by the staff to satisfy the guidance of Appendix A to BTP APCSB 9.5-1. The Commission generally agrees that, except for three sections that will be back fitted, Appendix R should not be retroactively applied to features that have been previously approved by the NRC staff as satisfying the provisions of Appendix A to BTP APCSB 9.5-1.

The NRC staff had intended, in its original proposal for Appendix R, that the requirements be applicable only for the resolution of unresolved disputed fire protection features. Thus, the staff had not intended the provisions of Appendix R to require modification of previously approved features. This was not clearly described in the proposed rule as published for comment. In fact, the Supplementary Information published with the proposed arule explicitly indicated that "[a]ll licensees will be expected to meet the requirements of this rule, in its effective form, including whatever changes result from public comments."

In determining whether the specific requirements of Appendix R should be imposed on licensees with presently installed or existing commitments to install fire protection features previously determined to satisfy Appendix A to Branch Technical Position BTP APCSB

9.5-1. It is important to recognize that Appendix R addresses only a portion of the specific items contained in the more comprehensive document, Branch Technical Position BTP APCSB 9.5-1 and its Appendix A. Appendix A to BTP APCSB 9.5-1 has been the basic fire protection guidance used by the staff in their fire protection reviews conducted for all operating plants during the past several years. For many plants, licensees proposed systems and features that satisfactorily achieved the fire protection criteria set forth in Appendix A to BTP APCSB 9.5-1 and began to promptly implement such features and systems.

Satisfactory features and systems are already in place and in operation in many plants. There is a reasonable degree of uniformity among most of these approved features for all facilities since they were reviewed against the same criteria of Appendix A to BTP APCSB 9.5-1. In general, the features previously approved by the NRC staff in its reviews of fire protection using the criteria of Appendix A to BTP APCSB 9.5-1 provide an equivalent level of fire protection safety to that provided under the specific provisions of Appendix R. Thus, the further benefit that might be provided by requiring that previously approved features be modified to conform to the specific language set forth in Appendix R is outweighed by the overall benefit of the early implementation of such previously approved features, which in many cases are currently being installed.

Nevertheless, as a result of its continuing review of fire protection matters, the NRC staff has indicated to the Commission that there are requirements in three sections in which the protection afforded by Appendix R over and above that previously accepted, may be desirable. The Commission has decided that these requirements should be retroactively applied to all facilities. This decision is not meant to reflect adversely on previous licensee or staff evaluations; rather its purpose is to take fully into account the increased knowledge and experience developed on fire protection matters over the last several years.

The first of these sections is related to fire protection features for ensuring that systems and associated circuits used to achieve and maintain safe shutdown are free from fire damage. Appendix A to DTP APCSB 9.51 permits a combination of fire-retardant coatings and fire detection and supression systems without specifying a physical separation distance to protection redundant systems (Appendix A, D.1(2)), and such arrangements were accepted in some early fire protection reviews. As a result of some separate effects tests, the staff changed its position on this configuration, and subsequent plans have been required to provide additional protection in the form of fire barriers or substantial physical separation for safe shutdown systems. No credit for such coatings as fire barriers is allowed by Section III.G of Appendix R. Appendix A to Branch Technical Position BTP APCSB 9.5.1 and the proposed Appendix R recognized that there were plant-unique configurations that required fire protection features that are not identical to those listed in Section III.G of Appendix R. For these cases, fire protection features were developed by the licensee and described in a fire hazards analysis. Some of these arrangements were accepted by the staff as providing equivalent protection to the requirements of Section III.G to Appendix R.

Requirements that account for all of the parameters that are important to fire protection and consistent with safety requirements for all plant-unique configurations have not been developed. In light of the experience gained in fire protection evaluations over the past four years, the Commission believes that the licensees should reexamine those previously approved configurations of fire protection that do not meet the requirements as specified in Section III.G to Appendix R. Based on this reexamination the licensee must either meet the requirements of Section III.G of Appendix R or apply for an exemption that justifies alternatives by a fire hazard analysis. However, based on present information, the Commission does not expect to be able to approve exemptions for fire-retardant coatings used as fire barriers.

The second relates to emergency lighting. Section III.J of Appendix R calls for 8-hour emergency lighting, whereas in some cases less than 8-hour emergency lighting has been accepted as satisfying Appendix A to BTP APCSB 9.5-1. While an adequate level of safety may be provided by less than an 8-hour supply, an 8-hour system would provide added protection and would generally involve only a small cost. The Commission therefore believes that licensees should upgrade the previously approved facilities to satisfy the 8-hour lighting requirement of Appendix R.

The third relates to protection against fires in noninerted containments involving reactor coolant pump lubrication oil (Section III.O of Appendix R). The proposed rule permitted either an oil collection system or a fire suppression system. The staff has also accepted an automatic fire suppression system as an acceptable method of fire protection for this application. The Commission has concluded that fire suppression systems do not give adequate protection for fires that may be induced by seismic events. The Commission therefore believes that previously approved suppression systems should be replaced with oil collection systems that can withstand seismic events.

The technical basis on which these three sections are based are further discussed in Section III, "Specific Requirements," of this preamble.

3. Most commenters stated that the implementation schedule contained in the proposed rule is impossible to meet for any of the operating plants. The commenters further stated that if the implementation schedule in the effective rule is the same as that in the proposed rule, the Commission must be prepared to either shutdown each operating nuclear power plant, or process exemption requests.

The commenters then concluded that the implementation schedule should be rewritten to allow an adequate time priod for compliance. The proposed rule stated that "all fire protection and modifications identified by the staff as necessary to satisfy Criterion 3 of Appendix A to this part, whether contained in Appendix R to this part or in other staff fire protection guidance (except for alternate or dedicated shutdown capability) shall be completed by November 1, 1980 unless, for good cause shown, the Commission approves an extension," (proposed paragraph 50.48 1.(c)). The Commission went on to state its intention in the Statement of Consideration to the rule that ". . . no plant would be allowed to continue to operate after November 1, 1980, or beyond an extended date approved by the Comission, unless all modifications (except for alternate or dedicated shutdown capability) have been implemented."

The Commission has reconsidered the implementation schedule and has determined that it should be modified for the following reasons:

- After reviewing the comments and the information developed as a result of completion of fire reviews over the past 6 months, the staff has informed the Commission that the date of November 1, 1980, is not possible because the effective date of the rule will be after that date.
- The staff has informed the Commission that it would expect virtually all licensees to request

exemptions if the new implementation dates do not provide an appropriate period of time for complying with the requirements of Appendix R. The time and manpower resources needed by the licensees to prepare such requests and by the staff to formulate recommendations on these requests is not warranted from the standpoint of timely fire protection improvement.

• The revised implementation schedule provides a careful balance of these considerations, calling for the remaining fire protection modifications to be implemented and installed on a phased schedule that is as prompt as can be reasonably achieved.

The revised schedules distinguish between requirements imposed for the first time on the licensee by Appendix R and those requirements already imposed in license conditions or Technical Specifications issued prior to the effective date of the rule. For requirements imposed by Appendix R, including the items "backfit" to all plants, the schedule provides a reasonable time after publication of the rule for completion of required modifications. For requirements already imposed by license conditions providing for implemention after November 1, 1980, the Commission has reviewed these schedules and has found that in some instances the allotted time for completion of the required modifications may be excessive. Thus, for fire protection features other than those covered by Appendix R, although the Commission has extended the compliance dates beyond the November 1, 1980, date in the proposed rule, the Commission has added a requirement that limits the compliance schedule in existing licenses if such schedules extend beyond what we now believe should have been a reasonable schedule initially. Relief from such limitation may be granted by the Director of Nuclear Reactor Regulation upon a showing that there is good cause for extending such date and that public health and safety is not adversely affected by such extension.

It should also be noted that for licensees whose license conditions imposed a schedule with a compliance date of November 1, 1980, or other date prior to the effective date of § 50.48, the Commission has suspended such compliance dates by promulgating on October 29, 1980, a temporary rule § 50.48 (45 FR 71569), which will be superseded by this rule.

To better understand the nature of the public comments received and the staff's resolution of these comments, the following section will consider each section of Appendix R to this part. In Section III, we provide a summary of the Technical Basis for each requirement, followed by a summary of the public comments and a statement of the staff's disposition of those comments.

Section I. Introduction and Scope

This section has been revised as a result of comments to include a discussion of the importance of safe shutdown capability and the distinction between requirements for "safety-related" equipment and equipment needed for "safe shutdown."

Section II. General Requirements

This section has been substantially rewritten as a result of comments to provide a concise summary of general requirements. The specific requirements were consolidated with the appropriate parts of Section III, "Specific Requirements," except that the credit given for 50-foot separation has been dropped.

Section III. Specific Requirements

The requirements in this rule are based upon principles long accepted within that portion of American industry that has been classified by their insurance carriers as "Improved Risk" or "Highly Protected Risk". In each of these cases, the Commission has decided that the overall interest of public safety is best served by establishing some conservative level of fire protection and ensuring that level of compliance exists at all plants. The following is a list of the specific technical bases and resolution of public comments for each of the specific requirements in Appendix R.

A. *Water Supplies for Fire Suppression Systems Technical Basis.* One of the basic fire protection requirements for a modern industrial site in the United States is a separate water distribution system for fire protection with dual water supplies. Duplicate water supplies are required to ensure uninterrupted fire suppression capability allowing for single failures and periodic maintenance and repair of vital portions of the systems. Duplicate water supplies may consist of separate suctions for fire pumps from a large body of water such as lake, river, or pond or from two water storage tanks.

For nuclear power plants, the distribution system is required to consist of a loop around the plant with suitable valves for isolating portions of the system for maintenance or repair without interrupting the water supply to the various fire suppression systems in the plant. Thus, with dual supplies and a loop concept, an adequate water supply can be ensured to each manual or automatic water suppression system throughout the plant.

An ensured minimum volume of water is set aside and dedicated for fire protection uses to be available at all times regardless of other simultaneous water uses in the plant. This water volume is dedicated for fire service by means of separate storage tanks or separate pump suctions from a large body of water. When common tankage is employed for fire service needs and other water services, the fire pump suctions must be at the bottom of the tank and other water supply suctions must be located at a higher level to ensure that the minimum dedicated water volume is set aside for fire protection needs. Administrative controls by themselves, such as locked valves to ensure adequate water supply for fire fighting needs, are deemed unacceptable at nuclear power plants.

Comment Resolution

Many commenters stated that we were being too restrictive by stipulating an underground yard fire main loop and fresh water supplies. Our intent was only that a yard fire main loop be furnished. We have deleted the specification for an underground loop since special conditions may dictate that part of the loop be above ground or inside safety-related buildings. Such arrangements are acceptable.

With regard to the specification for a fresh water supply, the staff was attempting to avoid potential plant problems that are not associated with fire protection. From a fire protection standpoint, salt or brackish water is acceptable for fire suppression provided the fire protection system is designed and maintained for salt or brackish water. The requirement for fresh water supplies is therefore dropped. Other operational problems unrelated to fire protection that may result from the use of salt or brackish water for fire suppression activities are outside the scope of this regulation.

Several commenters took issue with the requirement for two separate redundant suctions, stating that some plants use a single large intake structure on a lake or a river for all water requirements. The requirement for separate intake structures was not intended and the rule has been clarified.

Several comments called for deleting the requirements for dedicated tanks or use of vertical standpipe for other water services when storage tanks are used for combined service-water/fire-water uses, on the basis that this is overly restrictive and other ways are available to ensure a dedicated supply such as weirs, suction location, etc. Two separate but

related issues are involved here. The first is the requirement for dedicated water storage tanks for fire fighting purposes. The suggestion that the requirement for dedicated tanks be deleted was rejected for the reasons stated in the preceding Technical Basis.

The other point deals with ensuring minimum water storage capacity for fire suppression activities when storage tanks are used for combined service-water/fire-water uses. The term "vertical standpipe for other water service" simply means that the suction for other water uses in common storage tanks will be located sufficiently high to ensure the minimum water volume needs for fire suppression activities. If the commenters were assuming that "vertical standpipe" referred only to pipes inside the tank, this is not the case. In fact a standpipe exterior to the storage tank is more desirable since any leakage would be immediately evident. On an internal standpipe a leak in the pipe could actually allow depletion of the water otherwise to be reserved for fire uses. The rule has been clarified to allow physical alternatives for water supply dedication but to preclude exclusive use of administrative controls for this purpose.

Some commenters objected to the requirement that other water systems used as a backup water supply for fire protection should be permanently connected to the fire main system and suggested that it would be sufficient to provide a water supply capable of being connected to the fire main system within ten minutes of the loss of normal water supply or pumps. The rule does not address backup water supplies. The requirement means that, if another water system is used as one of the redundant water supplies, it must satisfy all of the requirements of the fire protection water supplies. Additional backup supplies need not meet these requirements.

One commenter asked why only a two-hour water supply is required when the Browns Ferry Fire lasted well over two hours. All of the investigations of the Browns Ferry Fire clearly show that if water had been used immediately, the fire would have been extinguished much earlier. Indeed once the manual fire fighting activities were started with the use of only one fire hose stream, the fire was extinguished within one-half hour. The staff would find unacceptable any condition in which a postulated fire that could threaten safe shutdown capability could not be controlled and extinguished within two hours with any combination of manual and automatic fire suppression activities. Therefore, a two-hour water supply is considered adequate. It should also be noted that this minimum dedicated water volume is based on maximum flow rates. Since most fires are controlled and extinguished with much smaller flow rates, this requirement realistically represents a dedicated water volume far in excess of two hours.

B. *Sectional Isolation Valves.*

C. *Hydrant Isolation Valves Technical Basis.* These two requirements are similar and can be treated together. Proper valving is required to isolate portions of the water distribution system for maintenance or repair without interrupting the water supply to manual or automatic fire suppression systems inside the plant. Valves are similarly required to permit isolation of outside yard hydrants from the water distribution system for maintenance or repair without interrupting water supply to fire suppression systems inside the plant. Visually indicating valves such as post indicator valves are preferred so that the position of the valve can be readily determined. However, key-operated valves (commonly known as curb valves) are acceptable for these purposes where plant-specific conditions warrant their use.

B. *Section Control Valves—Comment Resolution.* Many commenters stated that the requirement for "approved visually indicating" sectional control valves was overly restrictive, unnecessary, and not specific with respect to who should give the approval. The Commission has accepted this suggestion; the rule now requires that sectional control valves shall be provided to isolate portions of the fire main for maintenance or repair without shutting off the entire system. Post indicator or key-operated valves are mentioned as two examples of acceptable valves.

C. *Hydrant Block Valves—Comment Resolution.* A number of commenters made suggestions for rewording this section. This section has been clarified to state the requirement for capability to isolate hydrants from the fire main without disrupting 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.

One commenter suggested that this requirement be dropped in its entirety since it "is a new requirement which has not been subjected to the peer review process." This suggestion was rejected on the basis that Appendix A to BTP APCSB 9.5-1 contains the following sentence: "The lateral to each hydrant from the yard main should be controlled by a visually indicating or key-operated (curb) valve," and there was an opportunity to comment on this document.

D. *Manual Fire Suppression Technical Basis.* Considerable reliance is placed on automatic fire suppression systems throughout a nuclear power plant. However, manual fire fighting activities often can control and extinguish slowly developing fires before an automatic fire suppression system is actuated. In addition, fires that are controlled or extinguished by automatic systems require a certain amount of manual response. Also, some areas of the plant do not warrant the installation of automatic fire suppression systems. Manual response is the only fire suppression available for these areas; thus, it is important that manual fire fighting capability be present in all areas of the plant, and that standpipe and hose stations be located throughout the plant. The standpipe and hose stations are to be located so that at least one effective hose stream can be brought to bear at any location in the plant containing or presenting a hazard to structures, systems, or components important to safety. They are to be supplied from the fire water supply system except for those inside containment, which may be connected to other reliable water supplies if a separate penetration into containment cannot be made for fire water service needs.

Comment Resolution

Several commenters suggested adding a sentence reading "Standpipe and hose stations are not required if sufficient justification can be provided that adequate fire protection features have been provided to account for a given fire area." This suggestion was rejected. The staff has taken the position that the minimum requirements are that at least one effective hose stream that will be able to reach any location that contains or could present an exposure fire hazard to the safety-related equipment. The Commission concluded that no analyses can identify hazards so carefully that this minimum requirement can be further reduced.

E. *Hydrostatic Hose Test Technical Basis.* Fire hoses should be hydrostatically tested periodically to ensure that they will not rupture during use. The requirement for a minimum test pressure of 300 psi comes from NFPA No. 196 (National Fire Protection Association Standard No. 196—Standard for Fire Hose), a nationally recognized consensus standard. This standard contains other guidance for the

use and care of fire hose that most industries find useful.

Comment Resolution

Many commenters pointed out the erroneous usage of the term "service pressure" rather than "operating pressure" in this requirement. The intended meaning for this requirement is that all hoses would be tested at a pressure greater than the maximum pressure found in the fire protection water distribution systems. The correct terminology is "operating pressure." The rule has been so changed. In addition, the staff added a specific minimum test pressure requirement of 300 psi to meet the NFPA standard.

One commenter also pointed out that hoses should be inspected for mildew, rot, cuts, or other damage. Although this is a valid comment, it is not an unresolved issue with any licensee so it need not be covered by this rule. In addition, such inspections are already being performed in accordance with the plant's Technical Specificaitons.

F. *Automatic Fire Detection Technical Basis.* The requirement that automatic fire detection systems be installed in all areas that contain safe shutdown or safety-related systems or components follows generally accepted fire protection practice. Installation of such fire detection capability is independent of any requirements for automatic or manual fire suppression capability in an area. The purpose of these detection systems is to give early warning of fire conditions in an area so that the fire brigade can initiate prompt actions to minimize fire damage within the plant.

Comment Resolution

Many commenters suggested that the words "automatic fire detection capability" be substituted for "automatic fire detection systems" on the basis that, as worded, the requirements are too limiting. They stated that an automatic sprinkler system with appropriate alarm check valves and central alarm features provides acceptable detection/alarming capability. Several commenters claimed that a separate detection system is not needed in areas covered by sprinkler systems equipped with fusible link sprinkler heads. A fusible link has a time delay before it actuates. However, more importantly, a smoldering localized fire that could do damage may not generate enough heat to melt the fusible link. While we do not disagree that the alarm from an automatic fire suppression system serves as notification that a fire exists, we concluded that the minimum requirement for a separate fire detection system in all such areas should be retained. The fire hazards analysis may call for a separate suppression system, but this would be in addition to the fire detection system.

G. *Protection of Safe Shutdown Capability Technical Basis.* The objective for the protection of safe shutdown capability is to ensure that at least one means of achieving and maintaining safe shutdown conditions will remain available during and after any postulated fire in the plant. Because it is not possible to predict the specific conditions under which fires may occur and propagate, the design basis protective features are specified rather than the design basis fire. Three different means for protecting the safe shutdown capability outside of containment are acceptable. The first means is separation of redundant safe shutdown trains and associated circuits by means of 3-hour fire rated barriers. The second means is a combination of separation of redundant safe shutdown trains and associated circuits by a 1-hour fire rated barrier and automatic fire suppression and detection capability for both redundant trains. The third means, which may be used only when redundant trains and associated circuits are separated by 20 feet or more of clear space, requires automatic fire suppression and detection systems in the area. An alternative or dedicated safe shutdown capability independent of the fire area is required if fire protection for safe shutdown capability cannot be provided as outlined above. For cables and equipment needed for safe shutdown located inside of noninerted containments, a lesser degree of fire protection is permitted because transient exposure fires are less likely inside containment during plant operation. Section III.M, "Fire Barriers," discusses the technical basis for the 3-hour barrier, and Section III.L, "Alternative and Dedicated Shutdown Capability," discusses the technical basis for safe shutdown capability.

Comment Resolution

Many commenters suggested that the first paragraph be changed slightly and the rest of this section deleted. The basis for their contention is that the rule should state simply the requirement to protect cables or equipment of systems necessary for safe shutdown of the plant and leave specific implementation details in some other type of document.

We have modified this section by removing the listing of considerations, deleting Table I, and revising the wording to provide clarification.

H. *Fire Brigade.*

I. *Fire Brigade Training Technical Basis.* Most modern industrial plants with replacement cost values approaching those of a modern nuclear powered electric generating station have a full-time fully equipped fire department, including motorized fire apparatus. Because of the reduced severity of fire hazards in a nuclear generating station as compared to a manufacturing plant, the Commission believes that it is not necessary to mandate a fully staffed fire department. However, manual fire response capability is required at a nuclear plant and a properly equipped and fully trained fire brigade will satisfy this need. The Commission has determined that a brigade of five persons constitutes the minimum size sufficient to perform the actions that may be required by the brigade during the fire and to provide some margin for unanticipated events.[1] Similarly, the training requirements listed are considered the minimum needed to ensure that the fire brigade will be able to function effectively during a fire emergency.

The proposed rule required emergency breathing apparatus without specifying the number of such pieces of apparatus. The rule has been modified to specify the personnel for whom such apparatus is to be provided and to specify reserve air requirements.

H. *Fire Brigade—Comment Resolution.* Many commenters suggested changing this requirement to a simple statement that a trained and equipped, nominal size, site fire brigade of five persons be provided on each shift unless a lesser number is justified. This recommended change was rejected by the Commission for the reasons stated in the Technical Basis.

Some commenters objected to the exclusion of the shift supervisor from the fire brigade. The commenters felt that the shift supervisor should go to the fire and provide the benefit of his expertise and authority. The rule would not prevent this. However, the shift supervisor may have to go elsewhere during the course of a fire that adversely affects plant operation. The fire brigade leader must stay with the fire brigade and be assigned no other responsibilities during a fire emergency, therefore, the shift supervisor must be excluded from membership on the fire brigade.

I. *Fire Brigade Training—Comment Resolution.* Many commenters have

[1] This is discussed at length in the NRC staff's "Evaluation of Minimum Fire Brigade Shift Size", dated June 8, 1979; copies are available from David P. Notley, Office of Standards Development, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

stated that NRC used unnecessary detail in spelling out specific requirements for classroom instruction, fire fighting practice, and fire drills. Some commenters felt that these requirements were more detailed than anything the Commission has published with regard to operator training. The Commission here points out that most of the investigations of the TMI accident identified inadequately trained operators as an important factor and that work is now being done in this area. The fact is not that the training requirements spelled out here for the fire brigade members are excessive when compared to training requirements for reactor operators, but that fire brigade training is further along in development, and training parameters that are essential to a comprehensive program have been identified.

J. *Emergency Lighting Technical Basis.* Emergency lighting is required in all nuclear power plants. Battery-powered lights with capacities of 1½ to 2 hours is usually sufficient for emergency egress. However, the postfire emergency lighting requirements in a nuclear power plant are of a different kind. The need is for lighting that aids the access to equipment and components that must be manually operated by plant personnel to effect safe plant shutdown during plant emergencies. Because such activities may extend over a considerable period of time both during and after the fire, it is prudent to provide 8-hour battery emergency lighting capability to allow sufficient time for normal lighting to be restored with a margin for unanticipated events.

Comment Resolution

Many commenters stated that the requirement for emergency lighting is overly restrictive in three specifics: first, that emergency lighting is unnecessary in many of the designated areas; second, that the requirement for sealed beam or fluorescent units is overly restrictive; third, that the requirement for individual 8-hour battery power supply is excessive. Three commenters recommended a 2-hour battery power supply; five commenters recommended a plant-specific power supply; and one commenter recommended that there be no permanent installation.

These suggestions have been accepted in part. Lighting units with 8-hour battery supplies are to be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto. The reasoning behind the requirement for an 8-hour battery power supply is that there can be a great deal of other activity during a fire emergency and operators involved in safe plant shutdown should not also have to be concerned with lighting in the area. The small cost differential between 2-hour supply and the substantial additional protection afforded by the 8-hour supply does not warrant reducing this requirement. The Commission has decided to require an 8-hour battery power supply in all areas needed for operation of safe shutdown equipment and in access and egress routes.

K. *Administrative Controls Technical Basis.* The fire protection program uses administrative controls for fire prevention and prefire planning. The items listed in this section are generally accepted within the fire protection community as minimum requirements for an effective administration of the fire protection program. Controls are placed on the storage and use of combustible materials to reduce the fire loading in safety-related areas and on ignition sources to avoid careless operations. Procedures are used to control actions to be taken by individuals who discover a fire and by the fire brigade for the development of preplanned fire fighting strategies and actual fire fighting techniques.

Comment Resolution

Many commenters stated that this requirement was much too detailed for a regulation. Some stated that the requirements should apply only to those areas having safe shutdown equipment. Other commenters stated that a simple statement that administrative procedures should be established to control the various fire hazards throughout the plant was sufficient, and that the details could be spelled out in a regulatory guide or some other similar document.

Minor changes have been made in the wording of this requirement for clarification.

L. *Alternative and Dedicated Shutdown Capability.*

Technical Basis. In some locations (such as the cable spreading room) within operating nuclear power plants, it is not always possible or practicable to protect redundant safe shutdown systems against adverse effects of fire or fire suppression activities only through the use of fire protection features because the redundant safe shutdown systems in a given fire area are too close to each other. Alternative shutdown capability has usually been required to be independent of the control room, cable spreading room, switchgear rooms and cable riser areas because redundant systems in these areas are not adequately separated. When plant modifications to provide alternative shutdown systems are extensive, a dedicated system that is essentially a minimum capability safe shutdown train and is independent of those already existing may be provided. This minimum capability is required to maintain the process variables within those values predicted for a loss of offsite power. The case of loss of offsite power is assumed because fires in certain circumstances (e.g., electrical distribution systems) could cause or be related to such a loss. Fire damage to cold shutdown capability is limited to damage that can be repaired within 72 hours to provide a margin in achieving cold shutdown conditions. Consideration is given to associated circuits because most plants were not designed with this concept in mind. Should either the alternative or dedicated capability be required to function because of a fire, it must not be disabled by fire damage to associated circuits. Also, this capability does not have to meet the single failure criterion because it is only one of several levels of defense. Seismic Category I criteria is not imposed because fires that would require the installation of alternative or dedicated shutdown capability are not seismically induced.

Comment Resolution

Many of the commenters stated that this requirement exceeded the scope of Appendix R by defining alternative shutdown requirements. They stated that the time requirements are excessive and should be dropped. They also contend that this regulation does not take into account the many plant reviews being conducted under the Systematic Evaluation Program (SEP).

It is generally understood that cold shutdown is the ultimate safe shutdown condition and that, for each fire area, different means may be used and may be necessary to achieve cold shutdown. Because a fire in certain areas at some plants would have the capability of disabling systems required to achieve both hot and cold shutdown, it is necessary to specify the minimum capability and time requirement for each condition necessary to achieve safe shutdown. We agree that evaluations being made under the Systematic Evaluation Program (SEP) may also call for alternative or dedicated shutdown capability for reasons other than fire protection. For example, seismic, flooding, or emergency core cooling requirements resulting from the SEP may require additional modifications. Each licensee should be aware of the status of the SEP so that the requirements resulting from SEP can be effectively integrated with those relating to fire

protection to the extent possible. However, the Commission has decided that the modifications required to complete the fire protection program should not be deferred until the SEP review is completed.

M. *Fire Barriers.*

Technical Basis. The best fire protection for redundant trains of safe shutdown systems is separation by unpierced fire barriers—walls and ceiling-floor assemblies. Because these barriers are passive fire protection features, they are inherently reliable provided they are properly installed and maintained. Fire barriers have been used successfully for many years to subdivide large potential fire losses into smaller, more acceptable risks. Even fire barriers with openings have successfully interrupted the progress of many fires provided the openings were properly protected by fire doors or other acceptable means.

Fire barriers are "rated" for fire resistance by being exposed to a "standard test fire". This standard test fire is defined by the American Society for Testing and Materials in ASTN E-119, "Standard for Fire Resistance of Building Materials." Fire barriers are commonly rated as having a fire resistance of from 1 to 8 hours. Most "Improved Risk" or "Highly Protected Risk" (as classified by insurance carriers) industrial properties in the United States require fire barriers to have a resistance rating of 2 to 4 hours.

While a nuclear power plant has a low fire load, the potential consequences of fire are serious. Therefore, the Commission has selected 3 hours has been as an acceptable minimum fire resistance rating for fire barriers separating redundant trains for safe shutdown systems. This will give ample time for automatic and manual fire suppression activities to control any potential fire and for safe shutdown activities to properly control the reactor. Many operating plants, or plants that are already built but that are not yet operating, have both trains of safe shutdown equipment located in close proximity and a single fire could damage or destroy the functional capability of both redundant trains. If specific plant conditions preclude the installation of a 3-hour fire barrier to separate the redundant trains, a 1-hour fire barrier and automatic fire suppression system for each redundant train will be considered the equivalent of 3-hour barrier.

If the 1-hour fire barrier and automatic fire suppression for each redundant train cannot be provided because of plant-specific conditions, alternative or dedicated shutdowns capability will be required to ensure safe shutdown capability. The use of a 1-hour barrier in conjunction with automatic fire suppression and detection capability for each redundant train of safe shutdown equipment is based on the following considerations. Automatic suppression is required to ensure prompt, effective application of suppressant to a fire that could endanger safe shutdown capability. The activation of an automatic fire detection or suppression system does not occur until sufficient smoke or heat has been developed by the fire. Therefore, the Commission is requiring a 1-hour barrier to ensure that fire damage will be limited to one train until the fire is extinguished.

These requirements have now been incorporated in Section III.G, "Fire Protection of Safety Functions."

Comment Resolution

Several commenters made a number of suggestions of an editorial nature. One suggestion was to add "or unless other fire protection features have been provided to ensure equivalent protection" in the first paragraph, where three-hour rated fire barriers were stipulated unless a lower rating was justified by the fire hazards analysis. The Commission feels that this adds nothing in the way of clarification and the suggestion was not adopted. The second paragraph requires that structural steel forming a part of or supporting any fire barrier have a fire resistance equivalent to that required of the barrier. An example was given of metal lath and plaster covering as being one means of providing equivalent protection. Several commenters stated that they thought this was too narrow and would be interpreted by some people as the only acceptable method permitted. Since the example seemed to be confusing, a decision has been made to eliminate it. Other comments to the effect that the requirement was excessively restrictive with regard to fire barrier penetrations, including fire doors and their associated frames and hardware, and ventilation systems have been acted upon by the staff and the requirement, as it had affected these items, was deleted.

N. *Fire Barrier Cable Penetration Seal Qualification.*

Technical Basis. Unpierced fire barriers offer the best protection for separating redundant trains of safety-related or safe shutdown equipment. However, these barriers must be pierced for both control and power cables. These penetrations must be sealed to achieve a degree of fire resistance equivalent to that required of the barrier that is pierced. ASTM Standard E-119 is the national consensus standard used for testing and rating these cable penetration seals. Since the cables conduct the heat through the barrier, and since the cable insulation is combustible, the acceptance criteria of the ASTM Standard E-119 relating to temperature on the unexposed side must be appropriately modified.

Comment Resolution

Some commenters suggested that this entire section be deleted and replaced with the following two sentences: "Penetration seals shall provide the equivalent protection which is required of the fire barrier. Evaluation of the penetration seals based upon a design review and relevant test data or qualification tests may be made." The commenters felt that sufficient test data are available to permit evaluation of design requirements without full-scale mockup testing and that many of the items spelled out in the regulation, such as the water hose stream test, were too detailed and did not belong in the regulation. The Commission has reconsidered this issue and revised the rule to (a) require the use of noncombustible materials only in the construction of fire barrier penetration seals, (b) require fire barrier penetration seals to be qualified by test; and (c) require such tests to satisfy certain acceptance criteria.

O. *Fire Doors.*

Technical Basis. Door openings in fire walls constitute another breach that must be protected. Fire doors that have been tested and rated for certain fire exposures are installed to protect these openings. Fire doors frequently fail to protect the openings in which they are installed because they are not fully closed. Various methods are available to licensees to ensure that fire doors are in proper operating condition and that they will be closed during a fire. These options are listed in Appendix R.

Comment Resolution

Many commenters stated that this requirement is too detailed and should be deleted. Minor editorial changes have been made in order to more clearly state the requirements.

P. *Reactor Coolant Pump Lubrication System.*

Technical Basis. Each reactor coolant pump motor assembly typically contains 140 to 220 gallons of lube oil. Oil leaking from some portions of the lube oil system may come in contact with surfaces that are hot enough to ignite the oil. The resulting fire could be large, and access to the fire would be delayed because of the time required to enter the containment. Containent air temperature

would increase, severe localized environments would develop in the area of the fire, and a large amount of smoke would be generated. These conditions could affect operability of safety-related equipment inside containment. Therefore, an oil collection system is necessary to confine any oil discharged due to leadkage or failure of the lubrication system and to prevent it from becoming a fire hazard by draining it to a safe location. These occurrences could be random or could be seismically induced because the existing lube oil system piping and oil collection systems may not be designed to withstand a design basis seimic event.

Appendix A to BTP APCSB 9.5-1 states that for operating plants, "postulated fires or fire protection system failures need not be considered concurrent with other plant accidents or the most severe natural phenomena." The basis for that statement is two fold. First, nuclear power plants are massive structures, and essential services are designed to withstand earthquakes and other natural phenomena. Second, the history of many fires associated with recent earthquakes have been evaluated. These evaluations showed that such fires usually are due to failure of piping or tanks of flammable gasses or liquids such as municipal natural gas distribution systems or gasoline storage and/or dispensing stations. Where such potential fire hazards exist in nuclear power plants (e.g., hydrogen for generator cooling, or oil fuel for the emergency diesel generator or station space heating boilers) they are designed and installed to withstand the damaging effects of various natural phenomena, and other special fire protection features are provided as necessary. However, General Design Criterion 2 *Design Bases for Protection Against Natural Phenomena* requires that structures, systems, and components important to safety be designed to withstand the effects of earthquakes without loss of capability to perform their safety function. Regulatory Guide 1.29, "Seismic Design Classification," describes an acceptable method for identifying and classifying those features of light-water-cooled nuclear power plants that should be designed to withstand the effects of the Safe Shutdown Earthquake. In this guide, paragraph C.1 applies to systems that are required to remain functional to ensure heat removal capability; paragraph C.2 applies to systems that do not have to remain frunctional for that purpose, but whose failure could reduce the functioning of those systems covered by paragraph C.1. The reactor coolant pump oil collection system is covered by paragraph C.2 because its function is required to protect safety-related systems rather than to perform a safety function. Because the failure of the oil collection system for a seismically induced oil fire should not prevent a safety-related system from performing its safety function (Regulatory Guide 1.29, "Seismic Design Classification," paragraph C.2), the oil collection system should be designed, engineered, and installed so that its failure will not lead to a fire affecting safety-related equipment as a result of an earthquake.

The proposed rule permitted two alternatives—an oil collection system or an automatic fire suppression system. We have deleted the alternative of the suppression system because unacceptable damage may result to the safety-related systems from the burning of oil before the suppression system is actuated and because the fire water supply system is not designed to withstand seismic events. In addition, these pumps are located within the biological shield inside containment, therefore, timely fire brigade action would be difficult if the suppression system malfunctions. Further, if the suppression system becomes inoperable during operation, a fire watch or patrol cannot enter the area during operation.

Comment Resolution

A number of commenters suggested that this section is too detailed and should be substantially modified. This requirement was changed to delete the option of protecting the reactor coolant pump lubrication system with an automatic fire suppression system. We have modified the rule to indicate that the requirement that the oil collection system be designed to provide reasonable assurance that it will withstand the Safe Shutdown Earthquake can be met by satisfying paragraph C.2. of Regulatory Guide 1.29, "Seismic Design Classification," as described above.

Q. *Associated Circuits.*

Technical Basis. When considering the consequences of a fire in a given fire area during the evaluation of safe shutdown capabilities of a plant, the staff must be able to conclude that one train of equipment that can be used immediately to bring the reactor to a hot shutdown condition remains unaffected by that fire. The staff must also be able to conclude that damage to one train of equipment used for achieving cold shutdown will be limited so that the equipment can be returned to an operable condition within 72 hours. (See Technical Basis for Section III.G, "Protection of Safe Shutdown Capability.") In the fire hazards analysis for a plant, the equipment relied upon to perform both functions must be identified for each fire area. It follows that any associated non-safety circuits in the fire area that could adversely affect the identified shutdown equipment by feeding back potentially disabling conditions (e.g., hot shorts or shorts to ground) to the power supplies or control circuits of that equipment must also be evaluated. Of course such disabling conditions must be prevented to provide assurance that the identified safe shutdown equipment will function as designed. These requirements have now been incorporated in Section III.L, "Alternative and Dedicated Shutdown Capability."

Comment Resolution

Many commenters stated that this requirement should be deleted because many older plant designs did not consider associated circuits and this is, therefore, a new design requirement. The commenters felt that the analysis that will be required to satisfy this requirement will be both long and complicated and the requirement should therefore be deleted.

The Commission rejected these suggestions for the following reasons.

1. Virtually all of the fire protection modifications made to date have been required to correct deficiencies that resulted from lack of consideration of certain specific items during initial design and construction.

2. The Browns Ferry fire showed the necessity of divisional separation of the associated circuit of the control cables to prevent the disabling of safety systems by a single fire. This has been discussed with licensees during evaluations of alternative and dedicated shutdown capability and is necessary to ensure that safe shutdown systems will be able to function properly in the event of fire.

3. The staff considers incomplete any fire hazard analysis that does not consider the effects of fire damage to circuits that are associated with safe shutdown systems.

As indicated above, as a result of the comments received on this issue, it is unclear that associated circuits have in fact been adequately considered by licensees in their reviews using the guidance of Appendix A to BTP APCSB 9.5-1. To ensure that the associated circuits are considered, all operating nuclear power plants will be required to meet the requirements of Section III.G of Appendix R.

General Comments Resolution:

Several commenters contended that Commission regulations mandate that an adjudicatory hearing be conducted prior to a final decision. One commenter labeled the regulation an "order" within the meaning of the Administrative Procedure Act (5 U.S.C. 551(6)) (APA) and asserted that 10 CFR 2.204 of the Commission's regulations, "Order for Modification of License," applies to this rulemaking proceeding.

The Commission disagrees with these comments. A "rule" is defined in the APA to mean "the whole or a part of an agency statement of general or particular applicability and future effect designed to implement * * * or prescribe law or policy * * *" (5 U.S.C. 551(4)). The agency action questioned here is clearly one that treats similarly situated licensees equally and that prescribes future conduct or requirements. For those licensees who have not already provided an equivalent level of fire protection, certain specific fire protection features are required. Various of these requirements would apply to approximately 40 facilities. The commenter's characterization of the rule as an order, along with the assertion that 10 CFR 2.204 mandates a hearing before the rule becomes final is incorrect. On its face, that regulation (which does grant a hearing right) applies only to Commission orders that modify a license.[2] It does not apply to requirements promulgated through a rulemaking action conducted in accordance with the requirements of applicable law.

Several commenters contended that the environmental impact had not been adequately addressed. One commenter, citing the requirements in Section III.A of Appendix R for two water supplies and two separate redundant sections as examples of requirements involving environmental issues, contended that the Commission relied upon its staff's "unsupported determination that, pursuant to 10 CFR § 51.5(d), an environmental impact statement, appraisal, or negative declaration is not required." The Commission has considered Section III.A and has further considered the remaining requirements of Appendix R and remains convinced that the regulations are not substantive and are insignificant from the standpoint of environmental impact.

One commenter suggested that all plants be required to install dedicated shutdown capability. The Commission does not agree. We believe that the Commission's overall fire protection program involving extensive plant-specific fire protection modifications that are based on guidance set forth in Branch Technical Position BTP APCSB 9.5–1 and its Appendix A and the specific requirements of Appendix R to resolve disputed issues provide adequate fire protection.

One commenter stated that the ambiguity of the proposed regulation with regard to critical items requires that it be renoticed. The commenter referenced three portions of the proposed Appendix R as examples of such ambiguity. They were Section III.G, Section III.N, and Section III.Q. We have reviewed these examples.

In reference to the first example, the commenter stated that the first paragraph of Section III.G identifies alternative shutdown capability as an optional protective feature and that paragraph III.G.2.c then identifies alternative shutdown capability as a minimum fire protection feature. We do not agree with this statement. The first paragraph of Section III.G identifies alternative shutdown capability as one option in a combination of fire protection features for a specific fire area. Paragraph III.G.3 indicates when this option should be used.

In reference to the second example, the commenter stated that Section III.N requires a pressure differential across the test specimen during the testing of fire barrier penetration seals but fails to define the pressure differential. This comment is incorrect. The pressure differential called for by the proposed provision was the maximum pressure differential that the barrier would experience in the specific plant installation. In any event, the requirement for pressure differential during such testing has been deleted since only noncombustible material is now being used for such seals.

In reference to the third example, the commenter stated that Section III.Q is totally lacking in definition. We do not agree. Footnote 6 references Regulatory Guide 1.75 and IEEE Std 384–1974. The latter document is a commonly used industry standard that defines associated circuits and provides guidance for ensuring that such circuits do not compromise the independence of the shutdown circuits they are associated with.

Based on the above examples and our review of the other provisions of the proposed rule, we do not believe that the rule as proposed was ambiguous so as to require renoticing. Moreover, it should be noted that, based on other comments received on the proposed regulations, other commenters demonstrated a thorough understanding of the proposed requirements.

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and Sections 552 and 553 of Title 5 of the United States Code, notice is hereby given that the following amendments to Title 10, Chapter I, Code of Federal Regulations, Part 50, are published as a document subject to codification.

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

§ 50.48 Fire Protection.

(a) Each operating nuclear power plant shall have a fire protection plan that satisfies Criterion 3 of Appendix A to this part. This fire protection plan shall describe the overall fire protection program for the facility, identify the various positions within the licensee's organization that are responsibile 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. The plan shall 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.[3]

(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

[2] It should also be noted that § 2.204 is codified in Subpart B of 10 CFR Part 2. The scope of Subpart B is specifically limited to "cases initiated by the staff * * * to impose requirements by *order* on a licensee" (10 CFR 2.200(a)). (Emphasis supplied.)

[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 or under various stages of design or construction before July 1, 1976, dated August 23, 1976.

Also see Note 4.

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.

(c) All fire protection modifications require 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.

(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 review 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 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 an 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 date 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.

(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.

2. A new Appendix R is added to 10 CFR Part 50 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 applies to licensed nuclear power electric generating stations that were operating prior to January 1, 1979, except to the extent set forth in paragraph 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.[5]

[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.

[5] See footnote 4.

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."

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 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 R as applying to both hot and cold shutdown functions.

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.[1]
Cold Shutdown	Both trains of equipment necessary to achieve cold shutdown may be damaged by a single fire, including an exposure fire, but damage must be limited so that at least one train can be repaired or made operable within 72 hours using onsite capability.
Design Basis Accidents.	Both trains of equipment necessary for mitigation of consequences following design basis accidents may be damaged by a single exposure fire.

[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 other 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. 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

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.

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-debth 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 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.

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.

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.

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.

3. Fire detection systems, portable extinguishers, and standpipe and hose stations shall be installed.

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.

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.

III. Specific Requirements

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.

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.

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. 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.

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.

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.

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.

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.

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 with adequate lengths of hose to reach any location inside the dry well with an effective hose stream.

E. *Hydrostatic Hose Tests*

Fire hose shall be hydrostatically tested at a pressure of 300 psi or 50 psi above maximum fire main operating pressure, whichever is greater. 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 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.

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. 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.

2. Except as provided for 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, or 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 a 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;

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;

Inside noninerted 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 noncombustible radiant energy shield.

3. Alternative or dedicated shutdown capability and its associated circuits,[6] independent of cables, systems or components in the area, room or zone under consideration, shall be provided:

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.

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. The fire brigade shall be at least five members 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. The qualification of fire brigade members shall include an annual physical examination to determine their ability to perform stenuous 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 safety-related systems.

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. 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 two extra air bottles shall be located on site for each self-contained breathing unit. In addition, an onsite 6-hour supply of reserve air shall be provided and arranged to permit quick and complete replenishment of exhausted supply air bottles as they are returned. If compressors are used as a source of breathing air, only units approved for breathing air shall be used; 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.

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, 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.

(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.

(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,

[6] Alternative shutdown capability is provided by rerouting, relocating or modificating of existing systems; dedicated shutdown capability is provided by installing new structures and systems for the function of post-fire shutdown.

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 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.

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 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. Unsatisfactory drill performance shall be followed by a repeat drill within 30 days.

d. At 3-year intervals, a randomly selected unannounced drill shall be critiqued by qualified individuals independent of the licensee's staff. A copy of the written report from such individuals shall be available for NRC review.

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. 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.

(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*

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.

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 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.

4. Designate the onsite staff member responsible for the inplant 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. 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.

7. Maintain the periodic housekeeping inspections to ensure continued compliance with these administrative controls.

8. Control 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 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.

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 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.

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 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 prefire 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.

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).

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.

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.

i. Operations requiring control room and shift engineer coordination or authorization.

j. Instructions for plant operators and general plant personnel during fire.

L. *Alternative and Dedicated Shutdown Capability*

1. Alternative or dedicated shutdown capability provided for a specific fire area shall be able to achieve and maintain subcritical reactivity conditions in the reactor, maintain reactor coolant inventory achieve and maintain hot standby [7] conditions for a PWR (hot shutdown [7] for a BWR) and achieve cold shutdown [7] conditions within 72 hours and maintain cold shutdown conditions thereafter. During the postfire 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 or any primary coolant boundary, or rupture of the containment boundary.

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.

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.

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. In either case, the alternative shutdown capability shall be independent of the specific fire area(s) and shall accommodate postfire 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.

4. 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. If such equipment and systems 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. 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.

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 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 independnet onsite power system shall be provided. Equipment and systems used after 72 hours may be powered by offsite power only.

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.

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 shorts, open circuits, or shorts to ground in the associated circuits will not prevent operation of the safe shutdown equipment. 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, 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. [8]

M. *Fire Barrier Cable Penetration Seal Qualification*

Penetration seal designs shall utilize only 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:

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

3. The fire barrier penetration seal remains intact and does not allow projection of water beyond the unexposed surface during the hose stream test.

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.

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 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 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.

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*

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

[7] As defined in the Standard Technical Specifications.

[8] 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.

there is reasonable assurance that the system will withstand the Safe Shutdown Earthquake [9]

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. 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.

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

Dated at Washington, D.C., this 17th day of November 1980.

For the Nuclear Regulatory Commission.

Samuel J. Chilk,

Secretary of the Commission.

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[9] See Regulatory Guide 1.29—"Seismic Design Classification" Paragraph C.2.

SUMMARY OF STAFF REQUIREMENTS TO RESOLVE OPEN ITEMS TROJAN NUCLEAR PLANT DOCKET NO. 50-344

No open items.