

NRC PDR



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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MEMORANDUM FOR: G. D. Sauter, Technical Assistant to Commissioner Ahearne
FROM: R. L. Ferguson, Section Leader, Plant Systems Branch, DOR
SUBJECT: COMMISSIONER AHEARNE'S QUESTIONS CONCERNING FIRE PROTECTION STANDARDS

During my informal briefing of Commissioner Ahearne concerning fire protection at operating plants on April 30, 1979, Commissioner Ahearne requested information regarding staff actions taken or underway to assure the adequacy of separation guidance for fire protection and the resolution of concerns expressed by the ACRS during its review of draft Regulatory Guide 1.120.

The following subparagraphs present Commissioner Ahearne's questions and the staff's responses to these questions.

1. Separation Guidance

Question:

Do the existing national consensus standards provide adequate separation guidance for fire protection of safety-related equipment and systems?

Response

The existing national consensus standards that contain separation guidance are Generic Requirements for Light Water Nuclear Power Plants Fire Protection (ANSI N 18.10) and IEEE Standard Criteria for Independence of Class IE Equipment and Circuits (IEEE 384-1977). The standards apply to new construction but not operating plants. These standards do not provide adequate separation guidance for fire protection of safety related equipment and systems. The documents are supposed to compliment each other but do not. They contain some contradictory requirements. The basic problem is that they were developed independent of each other and the requirements have not been properly integrated.

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In general, N 18.10 requires that redundant divisions of safety-related systems be separated from each other and from other areas which present an exposure hazard by fire barriers having a fire resistance of three hours unless a barrier of lesser rating can be justified by analysis supported by appropriate data. The weakness in this guidance is that it fails to define the constituents of an acceptable analysis. N 18.10 recognizes that there are areas in any plant where three hour fire barriers cannot be provided due to overriding design features (e.g., the containment and control room), however, no guidance is given for identifying an "overriding design feature." In these areas, N 18.10 requires that safety-related circuits and electrical equipment meet the separation guidance of IEEE 384 but does not specify which of the several guidelines given therein to use. In addition, it requires that a fire hazard analysis be performed to determine additional requirements for fire protection necessary to ensure that nuclear safety functions are maintained in the event of a fire. Here too, there is a lack of guidance as to what is an adequate analysis.

IEEE 384 provides contradictory guidance by permitting physical separation of 3' to 5', 1' to 5' or 1" under certain circumstances and according to the area in the plant. Most guidance is for areas where external fires (i.e., exposure fires) are excluded. It gives no guidance as to the characteristics of such areas. It attempts to define fire hazard areas and to give guidance concerning the separation of these areas from other plant areas and the routing of safety-related cables through these fire hazard areas. However, this guidance does not appear to have an acceptable technical basis, is unclear as to its meaning, and does not deal with all fire hazards found in the plants.

In summary, the present separation guidance in the national consensus standards is not adequately defined for redundant systems and components not separated by a three hour fire barrier. The guidance relies heavily on analytical methods which are not defined and which lack a firm technical basis. They do not specify adequate separation for protection against exposure fires.

The staff guidance for separation is provided in the Branch Technical Position 9.5-1 (R.G. 1.120 contains the same guidance as BTP 9.5-1) for new plants and its Appendix A for operating plants. For new plants BTP 9.5-1 and R.G. 1.120 specify a three hour fire barrier to separate redundant safety systems and

equipment in all areas except the containment and the control room. In these areas because of technical limitations the staff reviews separation and fire protection provided on a case-by-case basis. These evaluations usually result in the combination of physical separation, heat shields, fire retardant coating and active fire suppression and detection to obtain overall adequate fire protection.

In operating plants, three hour fire barrier separation is not attainable in many areas of the plant. Here, the staff determines the adequacy of fire protection for these areas on a case-by-case basis following a fire protection inspection of the plant by the staff and its fire protection consultants with due consideration to the safety consequences of postulated fires in each fire zone.

Question:

If the present national consensus standards do not provide adequate separation guidance, have the groups responsible for these standards been told of the inadequacies, or asked to modify these standards to provide acceptable guidance? If so, what has been their response?

Response:

The groups responsible for developing these standards have been told of the inadequacies, and asked to develop corrective changes to the standards.

The response of the groups responsible for developing these standards was that the standards provide adequate guidance for protecting redundant equipment and cable against exposure fires and that the separation criteria and analysis requirements included are adequate when applied by engineers knowledgeable in fire protection.

An attempt was made by the group tasked with the development of ANSI N 18.10 to better define the guidance for developing a fire protection program, and specifically a fire hazard analysis. This effort culminated in the inclusion of an Appendix A to ANSI N 18.10 entitled, "Fire Hazard Evaluation Guidelines." These guidelines are too general in nature and provide little in the way of specific guidance for the development of a fire hazard analysis.

At present, the separation that is adequate for protection against fire is highly judgemental. The difference of opinion between us and the standard groups will not be resolved until more analyses, experience and test data are developed. Until this matter is resolved, we will continue to treat areas of the plant that present difficult fire protection problems on a case-by-case basis and develop solutions based upon onsite inspections

of these areas. We do not believe that analytical techniques are available which can substitute for onsite multi-discipline team inspections. Part of the problem in getting early resolution of this matter is that until our initiation of fire protection evaluations, little fire hazard analysis was being done.

2. ACRS Concerns

Question:

During the review of Regulatory Guide 1.120, the ACRS expressed concern regarding the adequacy of the fire protection guidance given in R.G. 1.120 and asked the staff to investigate alternative approaches to fire protection of nuclear power plants. What are the ACRS concerns and what has been done to resolve the ACRS concerns? What new information has been developed regarding alternative approaches?

Response:

The ACRS expressed two principal concerns with R.G. 1.120:

First, R.G. 1.120 places too much reliance on the NFPA standards which in turn state guidance in the form of nonmandatory recommendations rather than definite requirements. Certain members of the ACRS and their consultants were of the opinion that a level of fire protection could result which was not sufficient to assure plant safety.

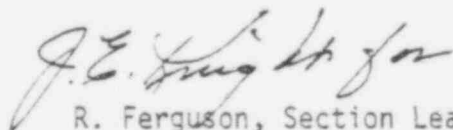
Second, R.G. 1.120 focuses too much attention on fire protection systems and not enough on the consequences, or different methods available, for maintaining safe shutdown condition during and following a fire. As one method of addressing this concern, the ACRS suggested that the staff evaluate the desirability of a dedicated or bunkered safe shutdown system. Such a dedicated system, being equipped with independent power supply, instrumentation, and control capability, would be capable of safe plant shutdown in the event the main control room, cable spreading room, auxiliary shutdown panels or other areas where fire could adversely affect safe plant shutdown are unavailable for any reason. The ACRS suggested that installed fire protection required by R.G. 1.120 could be substantially reduced if a dedicated shutdown system was available, since most postulated fires could then be allowed to "burn out" without fear for safety of the plant.

With regard to the concern with the adequacy of NFPA standards, we agree with the ACRS that a number of NFPA standards referenced in R.G. 1.120 contain recommendations and not firm requirements. However, in our fire protection review of plants we have treated these recommendations as requirements and have made it clear to each licensee that his commitment to adhere to a standard imposes a responsibility to adhere to the applicable portions of both the recommendations and the requirements of the standard. In cases where we consider NFPA guidance inadequate, we have imposed additional requirements. For example, in some cases, we have required in-situ testing of fire detectors because the present NFPA guidance is not adequate to assure correctly positioned early warning fire detectors in all areas of the plant.

With regard to the lack of emphasis on shutdown methods, we agree with the ACRS. We have required licensees of certain operating plants and a number of plants under construction, to provide methods of safe shutdown which are independent of a particular area where the challenge to the fire protection system is great. Therefore, to this extent, we have applied the concept recommended by the ACRS; however, we do not agree that the elimination of fire protection features, because of the provision of an alternative shutdown method, is prudent. To permit an area of the plant to "burn out" could adversely affect safety in spite of a shutdown capability independent of the fire area because of such problems associated with the toxic and corrosive characteristics of smoke and with spurious operation of equipment remote from the fire area due to system interactions and therefore, we have, in addition to the alternative shutdown capability required fire detection and suppression capability for these areas.

The Office of Nuclear Regulatory Research was asked in February 1978 to initiate an evaluation and value impact assessment of alternative provisions for assuring safe shutdown and cooldown functions of future reactor plants considering a variety of emergency conditions including the "bunkered" system concept suggested by the ACRS. Recently, funds have been committed for Sandia Lab to undertake this evaluation.

Let me know if I can be of further assistance.



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cc: See next page

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