5.5 Basis for Proposed Modifications

The objective of the fire hazard analysis presented in this report is to demonstrate the ability of the existing facility to meet likely fire hazards, and to show that safety would not be enhanced by installing one of the alternatives stipulated in the rule. While the focus of this quantitative analysis is on the efficacy of passive protection, it must be recognized that combination of active measures including control of combustible material, personnel training, fire detection systems and fire suppression systems, can provide a defense in depth which is effective, despite the difficulties associated with treating them deterministically. Combined with the specific analysis presented in Section 6, it is demonstrated that a combination of such protective measures provides protection equivalent to that afforded by one of the Commission's three stipulated methods.

In the course of this fire hazards analysis effort the need may be identified for additional protective measures beyond that which may currently exist. When this occurs, appropriate modifications are proposed so as to achieve a level of protection equivalent to that of the provisions of Section III.G. The types of measures generally proposed are passive in nature due primarily to their reliability and proven effectiveness. Section 5.4 highlights important aspects of such devices. This section provides a description of the basis and extent for determining the modifications proposed for any given area.

5.5.1 The Issue of Likely Fire Hazards

The fundamental issue in the fire protection of the safe shutdown capability is that of determining the location and magnitude of the initial fire. This is essential to understanding the nature of the separation criteria used in protecting safe shutdown components. Whether explicitly stated, as was done in the 1977 Appendix A analyses, or implicitly treated in the specification of separation criteria; the size and growth scenario of the postulated fire cannot be ignored.

As has been previously discussed, licenses have previously performed an analysis of the effects of fire on plant systems by taking into account the fixed and likely transient combustible loadings within a fire area. The objective of this analysis was to ensure that a fire, developing from these likely fire hazards, could not propagate from one general plant area to another. Once it was demonstrated that propagation could be inhibited through the use of barriers, stops, or water curtains; licensees and Staff turned their attention to control and suppression in the early stages of a fire. Modifications directed towards controlling this part of the fire scenario focused on the use of flame retardant coatings, the installation of suppression and detection systems and the institution of a combustible material control program.

This Appendix A approach described above which involved the stipulation of fire protection measures as defined by analysis was retained in the proposed Appendix R and regulatory continuity was

preserved. The proposed Appendix R required protection of the redundant shutdown capacity by reference to a number of factors considered relevent to specifying protective measures. These factors included the likely area within which a fire might spread, the fire extinguishing system used in the area, the accessibility of the area to fire fighters and equipment, the relative fire danger in the area, the availibility of alternative methods for shutting down the unit safety, and the fire retardant capacity of protective devices such as fire retardant coatings. The objective of this analysis was to define specific plant needs based upon the efficacy of the overall program.

While the proposed fire protection rule explicitly followed an analytical approach, the final version of Appendix R formally rejected that process in favor of stipulating separation criteria and providing for an exemption procedure. While this final version appeared to be a repudiation of the analytical approach, the practical effect of the exemption procedure was functionally the same giving utilities a fourth alternative for protection. If a licensee could prove that another method works as well as one of the three provided by the NRC, in the light of the identified fire hazards at its plant, the Commission would allow that method to be used.

This characterization of the exemption process based upon analysis of "likely fire hazards" has been provided by the Staff's Office of General Counsel (OGC) and is considered to be Commission

policy. As such, Appendix R continues to maintain its links with previous regulatory standards in requiring licensees to base the design of protective measures on those hazards which are likely to be encountered. Moreover, such designs may also be taken into account as elements in the overall fire protection program in demonstrating the concept of equivalent protection in specific plant areas.

It should be noted that Appendix R departs from previous activities in explicitly addressing the issue of exposure fires in the overall consideration of likely fire hazards. Carolina Power and Light Company acknowledges this new requirement and explicitly factors this issue in the anaysis through the use of liquid hydrocarbon fuels in the analysis of transient combustible fires and the demonstration of the efficacy of fire protection measures.

Following the classical approach to fire hazards analysis this analysis takes the view that the effects of fires must be evaluated on an area-by-area basis for those plant locations which contain components from redundant safe shutdown divisions. The basic criteria used is that of Section III.G which requires that at least one train of hot shutdown systems be free of fire damage. The approach taken in this report however, is especially conservative in that Carolina Power and Light Company applies a harsher standard than that provided by Appendix R. That harsher criteria requires the protection of at least one entire division in any fire area irrespective of whether its redundancy is located in the same area.

In examining each area using this criteria, the general approach taken is to postulate that a fire could occur at any location in that area and determine the extent of modifications necessary to ensure that all components of at least one division would be able to function. In this context, the phrase "free of fire damage" is defined to mean capable of performing its intended function. The approach utilized focuses on the concept of protection against "likely fire hazards" in accordance with Commission policy. To be clear, likely fire hazards are defined as those hazards which may be expected to exist or develop in the course of normal operations. Such hazards include trash, liquid hydrocarbons, cellulosic material, and cable insulation. Embracing the Appendix R concern for exposure fires, a floor-based transient combustible fire is taken as a representative hazard. Primarily for reasons discussed earlier in this section, the likely fuel type is a liquid hydrocarbon although, clearly, the fuel selected is not especially important.

In specifying the quantity of fuel to be considered, it was recognized that some uncertainty may exist in the Commission's mind as to the magnitude of the likely fire hazard. Whereas a search of the record for Appendix R failed to indicate a threshold for the level of this concern, attention was turned towards that which may credibly be introduced. This appeared to be an appropriate direction to follow since Staff concerns emanating from discussions with other licensees and fire tests at Sandia National Laboratories seemed to focus on less than five gallons of liquid or that amount which a maintenance man might reasonably be postulated to be able

to carry into an area. Recognizing the need for safety margins to accommodate for conservatism, this analysis is based on a fire involving an even larger amount of fuel that a single man could carry. Hence, the quantity of 10 gallons of heptane was selected.

It should be emphasized in analyzing the effects of a 10 gallon heptane fire that Carolina Power and Light Company does not suggest that such a fire is "likely" to occur at Brunswick Steam Electric Plant. Administrative procedures effectively control the introduction of combustible materials into a power plant. Heptane, in particular, has no practical usage for any maintenance activities inside buildings required for safe shutdown. However, its combustion properties are generally more severe than those of liquid hydrocarbons likely to be found thereby providing some additional measure of conservatism.

Should such combustible materials be inadvertently introduced, spilled, and ignited, detection and suppression systems are available to preclude the total combustion of a quantity of fuel of this magnitude. Thus, the scenario postulated herein whereby passive protective measures alone must protect against the effects of the total combustion of 10 gallon of heptane involves a considerable suspension of disbelief. However, for the purpose of presenting bounding results of a conservative analysis of the effects of fires involving "likely fire hazards", such an approach appears appropriate as an aid to the Staff reviewer.

5.5.2 The Database Management Approach

Section 5.3 discusses the general combustible properties of fuels and, in particular, liquid hydrocarbons. These considerations were employed with the modeling techniques described in the appendices to determine those regions within a fire area which may be capable of withstanding a floor based 10 gallon heptane fire. Given the large number of conduits and trays requiring protection the approach utilized in this analysis incorporates aspects of database management systems (DBMS) which is described in this section.

The DBMS concept is a method for storing and sorting files on a computer. Each file contains records which describe a physical or information system such as cable routings and regions of influence about a fire. In this analysis, records of interest include conduit or tray names, their color (safe shutdown division), their physical routing scheme including floor or ceiling penetrations, area geometry, the extent of existing fire protection, and the proximity of conduits or trays of the opposite color. Other records of interest include descriptions of the effects determined by analysis of a variety of postulated fires on different cables located at different horizontal and vertical positions.

Utilizing the DBMS approach, large numbers of fire areas containing a wide variety and configuration may be quickly analyzed in a consistent manner allowing for ready identification of those areas requiring modifications. The concept utilizes a computer

generation of the fire area in question and the "overlay" of a fire involving a specified quantity of fuel, which, in this case, is heptane. This fire overlay is, itself, a composite mapping of the superpositioned convective and radiative heat flux values emanating from the spectrum of circular fuel geometries for a given quantity. The mapping defines those points in space in which some fire involving the specified quantity of fuel may create conditions which would exceed the cable failure criterion as "failure points" for any cable at any time and, therefore, requiring modification. Clearly, cables in those regions which are not "failure points" are not expected to suffer a loss of function, irrespective of fuel geometry, and modifications are not deemed necessary.

The steps involved in creating and utilizing the database begin with the specification of redundant safe shutdown conduits and trays as defined in Section 4. Each conduit and tray so identified is entered into the database together with information relating to the fire zone geometry. The database is then updated to include the results of a site visit. This update consists of a complete as-built description of elevational and horizontal routing of identified conduits and trays including the nature of existing protection (e.g., extent and location of baffles or coatings) and the proximity of any conduits or trays of the redundant division. Data checks and validation procedures are incorporated throughout

this proess to ensure accuracy of the data and resolution of inconsistencies. With this description of the plant complete, fire overlays are generated for each fire area and compared with the existing separation and protection. Redundant conduits and trays falling within the "failure zone" of the 10-gallon heptane fire are marked as requiring modifications and listed separately.

5.5.3 Modification Criteria

The criteria for modifications proposed in this report are based upon a quantitative analysis of the effects of fires while relying solely upon those aspects of the overall fire protection program which provide passive protection. When combined with other features in the overall fire protection program these measures are considered to offer an equivalent level of protection to that of Appendix R against those hazards which are likely to occur at some time in the Brunswick Steam Electric Plant. This section presents the criteria used for determining modifications necessary to ensure that this protection may be available.

The discussion in the previous sections outline the methodology for analyzing fires presented in this report while calling particular attention to conservative treatments of those areas where uncertainty in fire modeling is traditionly considered to exist. Carolina Power and Light Company's focus on protection against "likely fire hazards" in accordance with Commission policy is also presented including the use of a 10 gallon heptane pool fire to bound the effects of such likely hazards. Finally, the use of database management techniques as a methodology to examine the effects of this

fire in all plant areas is highlighted presenting results which lead to the specification of modifications. This section provides the criteria for these modifications.

The first step to defining criteria for fire protection modifications requires a brief review of the regions of influence created by a fire. It may be recalled that a conservative analysis of the effects of pool fires within enclosures produces several such regions. Three regions in particular are dictated by the physical characteristics of the fire to exist:

(1) Plume impingement - where the combined effects of radiation and convective heat transfer are dominant. Mixing diffusion tends to mitigate these effects somewhat as the plume rises;

(2) Radiation outside the plume where physical separation controls the amount of energy;

(3) Stratification - close to the enclosure's ceiling radiative and convective heat transfer are felt. This effect is driven primarily be elevation of the point of interest and the ceiling height.

While the shapes of these regions of influence are generally similar for different fires in the pre-flashover stage, variance may be introduced through selection of fuel type, quantity, geometry and room configuration. As the postulated fire is moved about the room, the potential for damage as a result of exposure to a given size fire involving a specified fuel geometry also varies thereby further complicating the problem.

In attempting to treat this issue in a coherent fashion, that which is definable in a unified structure and that which is complex must both be recognized and separated. The first step in developing the state of knowledge to the point where analysis can assist in determining the extent of modifications is to recognize where additional considerations may resolve uncertainties. For example, the imposition of an energy based criteria for cable damage allows for the screening of locations on the basis of the energy flux produced by a fire of a specified size, geometry, and location. Specifying the fire size leaves only geometry and locations as independent variables which must be treated.

Determining the maximum energy flux produced at any given point relative to the fire's center as a function of geometry variations allows the use of these maximum values to further bound the problem leaving only location as a variable. Finally, allowing the fire to freely move about the enclosure in the interest of energy flux maximization provides another dimension to bounding. It should be noted that this process for dealing with traditional fire modeling uncertainties does not involve generating any new information but rather transfers the uncertainty from one domain to another in the interest of achieving the objective of resolving the problem. Specifically, uncertainties associated with the details of fire growth and propogation inhibition and the sensitivities to variation in a large number of parameters are deliberately transferred through the use of bounding calculations to those areas where such uncertainties are manageable. For example, the act of allowing a

fire to freely move the center of initiation to any location in an enclosure in the interest of maximizing the damage potential clearly is not necessarily a realistic representative of the most likely location of a fire. Yet, if as a result of this action, a bounding and conservative estimate of the effects of a fire at any point in the room is obtained thereby allowing one to understand something about the limits of the potential damage, then something of value has been obtained.

This philosophy is central to the methodology used in this report to analyze fires and specify modifications. The assumptions used in this analysis are directed at treating uncertainties through a bounding analysis which manages the effects of unknowns in a consistent and conservative manner. For purposes discussed previously in Section 5 and other parts of this report, the principal assumptions used in identifying modifications are:

(1) Fire Size - 10 gallons of heptane in the worst configuration relative to damaging either a single conduit or tray or combination of cables.

(2) Fire Location - whatever location will maximize the damage potential irrespective of equipment location with may otherwise preclude certain postulate fire locations.

(3) Fire Damage Criteria - loss of circuit integrity

Through the use of database management techniques, the movement and analysis of the effects of exposure fires subject to these assumptions is performed by computer. The locus of points defining fire damage results for each fire area are organized in three general damage potential zones as described below:

Damage Potential Zone	Cable Routing Examples
Stratification Region -near the ceiling	o Vertical ceiling penetrations o cables routed near the ceiling ("High Pass")
Safe Region -below the stratification layer -above the threshold for damage from a fire located directly beneath and on the cable centerline	o Moderately elevated cables
Impingement Region -below the safe region where fire damage criteria is exceeded due to direct impingement	o Vertical floor penetrations o Cables routed low including crossovers and "close passes"

Each Damage Potential Zone requires a unique set of modifications, if any, based on the mechanism for involvement in the postulated fire for that area. Cables in the Safe Region, for example, would not require modifications to protect against the "likely fire hazard" to the extent they are in that region. Should the routine scheme indicate that cables exist outside the Safe Region at any time, appropriate modifications would be identified.

Conduits and trays of the division to be protected which traverse or enter the Stratification Region would require protection while they are in that region. Since the effects of stratification are felt irrespective of horizontal separation, no credit for protection is taken for any such separation between redundant divisions.

Rather, all conduits and trays of the division to be protected which enter or pass through the Stratification Region are identified as requiring enclosure within an appropriately rated device to provide thermal insulation to the extent they are in that region.

Those conduits and trays which enter or traverse the Impingent Region are identified as requiring modifications on the basis of additional analysis of the unique circumstance. The objective of the analysis is to ensure that conduits and trays of at least one division are free of fire damage from a likely fire hazard in any geometry. Three circumstances are identified for cable configurations:

- Conduit/tray crossover
- Vertical floor penetration
- Close pass involving redundant divisions.

The protection for each circumstance is different for conduits and trays.

All electrical cables located in trays which enter or traverse a fire area's Impingement Region are considered susceptible for involvement in a 10-gallon heptane fire. In order to reduce the potential for fire propagation, unless otherwise protected by fire barriers, all such cables shall be treated with a flame retardant coating while in the Impingement Region to both enhance their fire resistance, reduce their own combustible heat release rate, and minimize the rate and extent of potential propagation. Cables routed in conduits are considered to be protected against propagation by the conduits themselves.

Focusing on the first instance, i.e., floor penetrations, all conduits and trays which are vertical risers shall be enclosed within an appropriate fire barrier to provide thermal insulation up to the elevation where direct involvement in a 10-gallon heptane fire does not exceed the Fire Damage criteria. For coated cross-linked polyethylene cables, this is determined by analysis to be 12.8 ft. Conduits are treated as bare cable and are to be enclosed up to an elevation of 19 ft.

Conduits and cable trays of the division to be protected which enter or traverse the Impingement Region and which either cross cables of the opposite division or approach within 8 ft. of another division absent intervening combustibles shall be provided with additional protection based on the results of bounding analysis of the 10 gallon heptane fire. This analysis indicated that the region of influence within which any 10 gallon fire will exceed the fire damage criteria for the cable of interest in this report does not exceed 8 ft. irrespective of elevation. Clearly, at higher elevations, the effects of mixing, diffusion, and distance from the radiant areas of the fire would allow a closer separation between cables. However, no credit is taken for the separation less than 8 ft. which may be suggested for these elevations. On this basis, for coated tray sections of the division to be protected which enter or traverse the Impingement Region below 12.8 ft. and which cross cables of the opposite division, a plume impingement baffle at least the width of the tray and composed of noncombustible material characterized by a high heat capacity shall

be installed beneath the protected tray until 8 ft. of horizontal separation between opposite divisions is achieved. From the results of boundary layer analysis of the wake effects of such baffles on diffusion plumes, baffles shall be installed beneath other trays in the Impingement Region which are directly in the wake of and separated from the lowest baffle by a vertical distance of at least 4 times the baffle width. For an 18-inch wide baffle, this would require a second baffle beneath trays which are 72-inches above the lowest protected tray. Conduit sections of the division to be protected which enter or traverse the Impingement Region shall substitute an appropriately rated barrier to provide thermal insulation until 8 ft. of horizontal separation between opposite divisions is achieved.

The protection described above for crossovers of conduits and trays within the Impingement Region may be extended to "close pass" situations as well. The fundamental criteria which is retained is that at no point does the zone of influence, defining the potential for fire damage, exceed 4 ft. in any direction from the center of any 10 gallon heptane pool fire. Again, no credit is taken for vertical separation although, clearly, such separation would allow for a less stringent criteria. Thus, for example, if cables categorized as being from opposite divisions irrespective of any functional redundancies approach within 6 ft. of each other, protection of the other 1 ft. of radial distance would be necessary.

Such protection would be baffles for coated cable tray sections below 12.8 ft. in elevation in accordance with the criteria for crossovers and barriers for conduits sections in the Impingement Region.

It must be emphasized that this modification criteria should be viewed as providing an alternative to the separation criteria of Appendix R when considered as elements in the overall fire protection program. While the bounding nature of the analysis indicates that the potential for damage as a result of fires involving likely hazards is minimal while relying upon these features above, the additional protection afforded by combustible material control procedures, an effective fire brigade, and automatic detection should not be overlooked. Taken as a whole, an equivalent level of protection is provided which meets the criteria for exemption from the criteria of Appendix R.

5.6 The Limitations of Automatic Suppression

5.6.1 Design Basis

The requirements of Section III.G.2 of Appendix R provide for the installation of an automatic suppression system where redundant safe shutdown equipment is separated either by a one-hour fire barrier, or twenty feet of horizontal separation free of intervening combustibles. This method of protection traces its origin to BTP 9.5.1 Appendix A which specified the use of automatic suppression under selected circumstances. Appendix A also required that licensees ensure that careful consideration be given in design and installation in order to protect against potentially adverse effects of inadvertent operation. This section reiterates these considerations as addressed in the Appendix A analysis and highlights the inherent capabilities and limitations of automatic suppression. The objective of this discussion is to present information in support of those areas for which an exemption from suppression is requested.

Automatic water suppression systems have a long history primarily in protecting residential and commercial structures against fire damage. In these environments, sprinklers serve a two-fold objective. The first involves offsetting deficiencies in existing buildings, thereby ensuring the ability to warn and rapidly evacuate the people inside. A second objective is the protection against property loss in areas of buildings involving a high density of combustible material. These objectives are implemented through

A summary of the staff's objectives and criteria is provided below:

OBJECTIVE	CRITERIA	BTP 9.5-1 SECTION
Wet down electrical cables to preclude damage or ignition	Where Regulatory Guide 1.75 separation does not exist	D.3(c) F.3(a) F.3(b)
Inhibit fire propagation	Where rated fire barriers are not feasible	D.1(e) D.1(h) F.3(b)
Early suppression of secondary fires involving combustible material	Where combustible material is not isolated	D.2(a) F.1(a) F.7 F.8 F.9 F.10 F.11
Inadvertent operation does not cause adverse system interactions	Where operation could affect other systems or equipment	A.4 D1(i) E.3(a)

These objectives for automatic water suppression systems provided in BPT 9.5.1 are reiterated in another regulatory document applicable to new plants and issued for comment during the same period, Regulatory Guide 1.120, and, therefore, may be considered to be a clear statement of the Staff's issues.

With this perspective, it is useful to examine the state of knowledge concerning automatic sprinkler effectiveness, clearly separating out their obvious beneficial uses in residential structures or warehouses, and to focus on their application to the concrete and steel structure of a nuclear power plant. This brief examination is primarily based on research funded by three institutions:

fire codes and standards, most especially NFPA 101, "Life Safety Code," and NFPA 13, "Standard for the Installation of Sprinkler Systems." For nuclear power plant fire protection, these objectives and configurations are provided in regulatory documents.

The reliance on fire codes to define the design features of automatic suppression systems implicitly addresses questions concerning the criteria for their effectiveness. Given the limited objectives of those systems for non-nuclear applications and the severity of fires against which protection is desired, these codes have been adequate. Yet, in nuclear power plants, such raging infernos are considered to be rare events and the issue sprinkler system design objectives is less clear. To the extent where sprinklers are being installed to serve objectives or configurations which diverge from considerations in the applicable design standards, the questions concerning effectiveness are especially relevant and are the subject of a brief discussion.

For plants operating at the time of the Browns Ferry fire, regulatory guidelines for the installation of automatic water suppression are provided in Branch Technical Position 9.5.1 Appendix A. A review of these guidelines indicate that the Staff envisioned several objectives for automatic water suppression systems which may not be achievable by systems designed in accordance with NFPA standards with life safety and warehouse fire protection in mind.

(1) National Fire Protection Association;

(2) Nuclear Regulatory Commission; and

(3) Electric Power Research Institute.

5.6.2 National Fire Protection Association

The design of the modern automatic water suppression system owes much to the pioneering work of the National Fire Protection Association (NFPA) and their cognizance over the evolving sprinkler standard, NFPA 13. In addition to development and maintenance of standards, NFPA also serves as a central distributing point for knowledge on fire protection matters including the capabilities and limitations of automatic water suppression. While much has been generated on this subject, two publications of particular interest in this regard are noted: "The Fire Protection Handbook" (NFPA [1981]) and "Fire Behavior and Sprinklers," (Thompson [1964]).

NFPA (1981) presents a good summary of the role of sprinklers in controlling fires in office buildings, residential structures, and warehouses where time to warn and evacuate people is necessary, and suppression of fires involving high concentrations of easily combustible material is desired to control the extent of losses. The limits of such systems are also outlined especially in terms of the relatively low fuel loadings of nuclear power plants. On this and related issues NFPA (1981) in particular notes the following:

Issue: Early suppression of floor-based spills of volatile liquids

Fires in flammable liquids with a low flash point that are not water soluble, and which have a specific gravity greater than water cannot, as a rule, be extinguished by water, because the relationship between flash point and water temperatures precludes adequate cooling.

(p. 17-6, op. cit.)

Issue: Sprinkler Delay Time

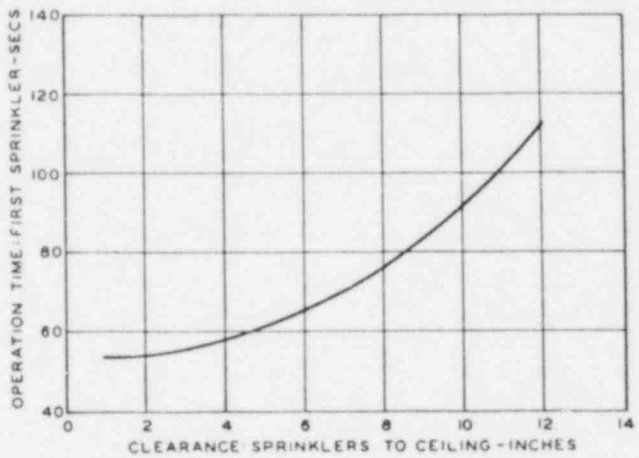

Fig. 17-1D. Effect of clearance between ceiling and sprinklers on operating time of sprinklers.

Fig. 17-ID. Effect of clearance between ceiling and sprinklers on operating time of sprinklers.

Discussion

This figure reproduced from NFPA (1981) highlights the sensitivity of sprinkler operating time to ceiling separation and illustrates the fact that delay times inherent in sprinkler design may well preclude their use in protecting cables from fire damage. Thompson (1964) offers a more substantive discussion of many of the issues and serves as an important reference for the Fire Protection Handbook.

Issue: Early suppression of floor-based spills of volatile liquids

> As a general rule though fires in combustible gases, or the more volatile flammable liquids cannot be extinguished by water - only the surroundings can be protected from the exposing fire.
>
> (p. 3, op. cit., emphasis added)

> Some fires, such as those in volatile flammable liquids or in some other hazardous materials, cannot be extinguished by sprinklers, so that effective action would be limited to protecting materials and bulding elements exposed to the fire.
>
> (p. 84, op. cit., emphasis added)

Issue: Sprinkler Delay Time

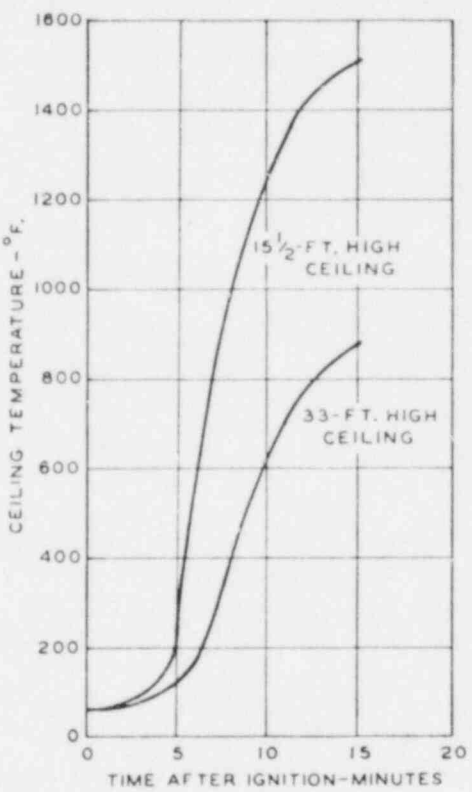

Figure 17. Effect of Ceiling Height on Sprinkler Operating Times

Test fires identical double 8-foot stacks of wooden pallets - ceiling temperatures recorded 7 feet laterally from center of fire.

Discussion:

Thompson discusses the test data in the context of sprinkler response time. Even with this severe fire, characteristic of a warehouse situation, Thompson predicts the fire would open the first sprinkler head at about 5-1/2 minutes in a low-ceilinged room and possibly greater than 7-1/2 minutes in a high-ceilinged room.

A review of source information of this type leads to the following conclusions:

(1) The reliance on automatic water suppresssion for the purpose of early suppression of small exposure fires prior to growth into a more developed fire is not strongly supported for cellulosic material and is unsupported for fires involving most volatile liquids in larger quantities;

(2) For especially severe and developed fires, automatic water suppression may be effective only in inhibiting propagation.

While the data is sketchy, these points appear to be supported by research funded by the Nuclear Regulatory Commission.

5.6.3 Nuclear Regulatory Commission Research

Previous NRC-funded research in the area of fire protection focused on the margin of safety in the spatial separation distances of Regulatory Guide 1.75 and the efficacy of additional protective measures. Much of this research utilized phenomological experiments to examine the performance of such protective measures as spacing, a variety of flame-retardant coatings, and barriers. One of these tests, in particular, examined the value of suppression and ceramic fiber blankets in protecting cables exposed to an open heptane pool fire while in a vertical tray configuration (Klamerus [1981]).

In the test, three open-headed sprinklers were mounted 12 inches below the ceiling and connected to a manually operated water supply. Near each of these three open heads were mounted three dummy heads which were monitored to determine when their fusible links activated. Temperatures were recorded over the test duration. The configuration was located within a pan containing several gallons of heptane. Following ignition, the fire was allowed to burn to self-extinguishment over approxiately a one-half hour period and eventually led to barrier failure. Results of the tests indicated that only two of the six 165°F-links used in the test activated in the course of the fire. The two that activated were adjacent to the trays and required approximately one minute of direct exposure to the flames prior to operation with thermocouple temperatures recorded of over 200°F. While similar temperatures were experienced at the second location also adjacent to the trays, no link activation was ever indicated. Temperatures at the third location also peaked in the vicinity of 200°F, again well in excess of the 165°F-link rating, yet failed to activate any of the three links at any time.

The conclusion to be derived from this testing is, again, that automatic water suppression may not provide early suppression of intensive floor-based heptane pool fires even when the sprinkler heads are directly exposed to the effects of the flames. Combined with the general state of knowledge concerning sprinkler systems, the Sandia testing contributes further to the state of knowledge

that the capabilities of such systems are limited and should be extended beyond the application for which they were designed only were supported by valid and consistent data.

5.6.4 Electric Power Research Institute

Following the fire at Brown's Ferry, Electric Power Research Institute embarked on a research program to provide an improved quantitative understanding of the fire-related characteristics of electrical cables installed in grouped cable trays. The work was performed at Factory Mutual Research Corporation and resulted in a significant contribution in the area of nuclear power plant fire protection in such diverse areas as detection systems, suppression systems, fire hazards, and the effects of ceiling stratification. Two reports in particular focus on the efficacy of automatic water suppression and are the subject of this review. The first report, (Newman and Hill-[1981]) discusses several topics including the value of automatic suppression in early fire suppression and in preventing fire damage of electrical cables. The second work, (Sumitra-[1981]) assumes a priori the existence of fire damage in the burning of a stack of cable trays and examines the effectiveness of water suppression to extinguish a fully developed cable tray fire without any assistance from the fire brigade.

Newman and Hill assessed the exposure fire hazards of flammable liquid spills to cable trays in utility environments. In the test series, fifteen tests were performed to examine the effectiveness of sprinklers and impingement baffles. The first ten of this series focused on the early supression of exposure fires while the remaining five addressed the ability of water suppression systems to prevent damage to cable immersed in an exposure fire.

In the early suppression tests, 71°C and 138°C sprinklers were mounted in accordance with NFPA standards approximately 6 inches below a 20-ft high ceiling and directly above a pan up to approx mately 5-ft in diameter. In each test, liquid hydrocarbons including methanol, No. 2 Fuel Oil, heptane, or Pennzoil, were used as the source fuel with quantities ranging from approximately 5 gallons up to almost 25 gallons. From the results of these tests, Newman and Hill conclude the following:

> "As a result of those tests, it was learned that only the heptane exposure fire (a somewhat unlikely candidate for a real-life exposure fire) could automatically fuse the sprinkler link (138°C rated). More importantly, however, when the sprinkler was activated manually, only heavy lubricating-oil exposure fires could be extinguished. Since a reasonably large exposure fire (preferably a 1.2 m dia pool fire) that could automatically fuse a sprinkler was required, an additional test having a 71°C (160°F) rated sprinkler was necessary. After an examination of ceiling gas temperatures from the previous tests, a 1.2 m dia pan of No. 2 fuel oil was selected as the simulated exposure fire. (Ed. Note: Approximately 17 gallons were used in this test.) As shown in Figure 3.3, flame heights in excess of 4.3-m (14 ft) were recorded prior to sprinkler activation. At approximately 90 sec after ignition, the sprinkler activated automatically and flame heights decreased to 3.3-m (11 ft). Although extinguishment as such did not occur, this particular exposure fire scenario was selected as the standard fire for all subsequent tests involving assessment of cable tray protection."
>
> (pp. 3-13 - 3-14, op. cit.)

In the remaining five tests, single and multiple tray configurations were used. Recorded sprinkler activation times ranged from 100 to 117 seconds. Following activation, the suppression system's only effect was to lower slightly the maximum flame heights from approximately 4-m to 3-m (about 12 ft). Nevertheless, trays exposed to such fires and protected by sprinklers suffered severe fire damage in the form of insulation charring. Electrical integrity was maintained, however.

The early suppression work by Newman and Hill highlighted the limitations of water suppression in preventing the onset of fire-induced cable tray fires. Continuing from this stage in the research, Sumitra (1982) allowed the fires to develop to cable involvement and reported on the ability of automatic suppression to extinguish well-developed fires in grouped cable trays. It is noted that the objectives had changed at this point from early suppression of the exposure fire to minimizing further cable damage and inhibiting propagation once the fire involves the cables. The results of the 17 tests performed in this series indicated that water applied to the top of a stack of trays readily penetrated to lower trays and successfully extinguished the cable tray fires. This conclusion and other results highlight the effectiveness of water as an extinguishing agent and in inhibiting propagation.

5.6.4 Experience

While this research is of obvious benefit, it fails to highlight the relative contribution of automatic suppression to nuclear power plant fire protection. The best source for this information is actual plant experience. In research performed on behalf of the Nuclear Regulatory Commission, Hockenbury and Yeater (1980) report on such experience and identified and evaluated important fire potential parameters in nuclear power plants primarily based on fire records. In particular, they examined 235 recorded fire events affecting nuclear facilities including fuel fabrication plants, research and educational reactors, and commercial plants. Of these fires, only a third involved commercial light water reactors in an operational or shutdown mode and, as such, are of special interest.

Examining the frequency of extinguishment of the remaining fires by agent and method, Hockenbury and Yeater report that automatic water suppression systems collectively extinguished less than 10 percent of analyzed fires. The detection and extinguishment by plant personnel using hand extinguishers clearly dominated fire-fighting activities. Such data conclusively demonstrates the fact that automatic water suppression systems are not major contributors to overall fire-fighting activities.

5.6.5 Conclusions

This brief review of the state of knowledge concerning the capabilities of automatic water suppression highlights several conclusions:

(1) Automatic water suppression contributes little to early suppression of exposure fires.

(2) Automatic water suppression is relatively ineffective in preventing electrical cable fire damage in the form of charring and is decidedly inferior in this regard relative to fire impingement baffles alone.

(3) Automatic water suppression is effective in inhibiting propagation of well-developed tray fires where the effects of delay in-link activation are unimportant. However, experience indicates that such fires are rare events, and their severity and development time would ensure the presence of the fire brigade making the need for automatic suppression moot.

(4) Automatic suppression fails to contribute towards protecting against the small smoldering fires which make up the majority of such events in nuclear power plants. These events are currently handled successfully by plant personnel using portable equipment.

5.7 Fire Potential in Nuclear Power Plants

This analysis of the efficacy of passive protection focuses on fire as a non-mechanistic process. That is, each area is evaluated in terms of susceptibility to damage from a floor-based exposure fire without reference to the potential for such a fire as determined either by experience or induction. While the information presented by such an analysis is useful in the context of describing the utility of various passive protection measures, it must be recognized that this type of analysis tends to overlook the issue of fire as a risk contributor. As such, non-mechanistic, deterministic analysis may unintentionally lead the reviewer well down a path of reasoning which overlooks the likelihood of the scenario itself and the relationship of the scenario to other risk scenarios. Since the issue related to the granting of exemptions is protection against "likely fire hazards," this recognition of fire as only one of many contributors to risk and the sensitivities of fire to such factors as plant age, postulated fire location, and suppression response is important to the overall review process.

The development of the tools for risk analysis is an important goal in the regulatory process and is currently involving the commitment of a significant amount of resources by both the NRC and the industry. Many reports and papers have appeared recently in the literature describing activities ongoing in this area. In the particular area of fire risk analysis, three such works describing NRC-sponsored research are worthy of note. The most recent is "PRA

Procedures Guide," NUREG/CR-2300, prepared by the American Nuclear Society and the Institute of Electrical and Electronics Engineers (ANS [1980]) which offers a guide to the performance of nuclear power plant risk assessments and includes a section on fire risk analysis. ANS [1980] cites several methodologies for use in fire risk analysis including two other NRC-sponsored reports which contribute to the state of knowledge concerning fire risk analysis. One of these, "Fire Risk Analysis for Nuclear Power Plants," NUREG/CR-2258, (Kazarians and Apostolakis, [1980]) draws heavily on earlier work by Hockenbury and Yeater ("Development and Testing of a Model for Fire Potential in Nuclear Power Plants," NUREG/CR-1819, 1980), while emphasizing the benefits of Bayesian analysis in areas where data is limited. This discussion focuses on the work of Hockenbury and Yeater and the data presented therein describing the actual fire experience at nuclear power plants and the relative sensitivities.

As stated by Hockenbury and Yeater, the objectives of NUREG/CR-1819 are threefold:

(1) identify and evaluate important fire potential parameters in nuclear power plants based on fire records;

(2) perform preliminary analysis of selected fire scenarios; and

(3) estimate the potential risk of nuclear accidents due to fires.

The approach followed by the authors combines classical statistical analysis with the inductive reasoning of event trees and logic diagrams to construct a paradigm for treating the effects of

fires. The analysis of fire data is especially useful in this discussion in providing the frame of reference necessary in evaluating the efficacy of alternative measures in protecting against likely fire hazards.

Hockenbury and Yeater separate reported fire events into several categories for the purposes of analysis. Among these categories include plant status at the time of fire, fire location, extinguishing agent, and combustible material. Significantly, the authors also conclude that only a minority of fires reported at commercial nuclear power plant sites occurred while the plant was actually operational, while the majority of reported fires are associated with construction activities1/. In this regard, the authors report that the "dominant factor" in the detection and extinguishment of operational plant fires was plant personnel using hand extinguishers, overwhelmingly dominating all other mechanisms for suppression. The importance of plant personnel in rapidly identifying and suppressing fires should not be surprising to those closely familiar with nuclear power plant fire protection activities.

As interesting as these statistics may be, data in other areas reported in NUREG/CR-1819 is especially valuable in establishing the context for assessing the risk of fires. In particular, Hockenbury and Yeater develop a statistical model for determining the time dependence of fires during the operational phase of a commercial light water reactor. This dependence is presented in the form of

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1/ These operational plant fires reported include off-site forest fires which made their way into the statistics and are eight percent of the operational segment of the fire records.

a non-homogeneous Poisson process with a Weibull occurrence rate and is used to present the expected rate of occurrence of fires as a function of plant age. The model is based upon an analysis to 90 percent confidence of the data available through 1978, and is measured over all plants to ensure a representative approach is followed.

The conclusion presented by Hockenbury and Yeater is that:

> "...the occurrence rate (of fires) decreases with time as plants mature. This decrease in fires can be due to several factors including a decrease in hazardous activities (welding, construction activities), a decrease in human traffic related to non-power production activities and improvements in fire prevention."
>
> (p. 37, op.cit., author's emphasis)

Later in the report, the authors note that the "rapid decrease" seems to occur following start-up. The magnitude of this decrease cannot be over emphasized with a 90 percent reduction of reported fires appearing by the third and fourth year of operation.

A secondary cause for the reduction in fire occurrence rate experienced through 1978 cited by the authors has been the improvements in fire prevention implemented through 1978. Such data can only reinforce the contention that the Appendix A process in effect through that period had succeeded in achieving the goals it set out for in reducing the risk of fires. This positive experience only highlights the need for caution in attempting to force additional modifications and clearly indicates that, in many cases, the existing configuration already addresses the likely fire hazard issue.

Focusing on the three principal contributors to this reduction in fire occurrence, it should be noted that they are especially relevant in the context of an exemption request. The issue of Appendix R is protection against "likely fire hazards" which Section III.G of the rule attempts to implement through inhibition of propagation. Actual plant fire experience, however, seems to indicate that most fires are closely related to welding and construction activities and that a reduction in or minimization of such activities would achieve this goal most effectively. Implementation of the prescriptive measures of Section III (G.2), however, would only result in a noticeable increase in such construction activities and reverse the trend experienced through 1978 towards a decline in such hazardous processes on site. These arguments are by no means speculative, for as Hockenbury and Yeater note:

> "The single greatest cause of fire [during construction] was welding and cutting operations, followed closely by personnel errors and electrical failures of various kinds."
>
> (p. 73, op.cit.)

Such large-scale construction activities are clearly detrimental to facility safety. Yet, a significant reintroduction of such activities into the Brunswick Steam Electric Plant must be accepted with the implementation modifications of the type mandated by Appendix R. It is this issue of a balancing of risks that is so fundamental to the exemption process.

While this discussion outlines in a general sense the issues of risk management associated with fire protection, it is especially beneficial in defining a background and overall perspective to the analysis. Some exemption requests may highlight some aspects of these considerations to illustrate how combinations of measures may be effective in protecting against fire. While of interest, such cases are also important in demonstrating the potential fire hazards associated with large-scale plant modifications and the need for caution in altering previously approved configurations that go beyond fire protection and serve the needs of overall reactor safety.

5.8 Summary of the Fire Hazards Analysis

The objective of the fire hazards analysis is to determine the minimum quantity and associated requisite geometry of liquid hydrocarbon spill which, if ignited and allowed to burn unmitigated to self-extinguishment, would exceed the damage criterion for electrical cables of interest. This objective is accomplished in the following manner:

(1) Identify the electrical cables of interest, their specifications, geometry, and the dimensions of the plant area of interest.

(2) Specify the fixed and transient liquid hydrocarbon material of concern.

(3) Calculate the minimum quantity of the fuels of interest and the associated spill geometry (location, area, and depth) necessary to permit a fire which will exceed the damageability criterion for the identified electrical cable, through the following mechanisms:

    (a) stratification

    (b) radiation

    (c) buoyant diffusion plume impingement

    For the purposes of analysis, ignore the mitigating effects of actual room geometry, floor slope and equipment layout, and assume the presence of a perfectly horizontal floor free of fire-inhibiting equipment. Also ignore the mitigating effects of pipes and ventilation systems in diverting the flow of hot gases, absorbing incident heat flux, or blocking the free incidence of radiation on the cables of interest.

The objective of this process is to demonstrate that protection of the public health and safety equivalent to the requirements of Appendix R, Section III.G.2 may be provided using alternate

means and that verbatim compliance with Section III.G.2 will not enhance the fire protection capabilities of BSEP beyond that which is already provided by existing or planned features.

6.0 REQUESTS FOR EXEMPTION AND ANALYSIS OF SPECIFIC FIRE AREAS

6.1 Introduction

Section 6.0 identifies the exemptions requested which were referenced in Table 1-1, Fire Zone Conformance Summary, of Section 1.0.

The request for exemption is based on light fire zone loading and a strict administrative control of transient combustibles.

In addition, the information requested by SECY letter 81-13, dated January 11, 1982, is provided for each fire zone for which an exemption is requested.

Section 7.0 describes those modifications which would be required to meet the specific requirements of III.G.2 and for which the following exemptions are requested.

As part of our verification process, we will consider additional zones for which an exemption is reque ed and where it appears that some limited modifications would enhance our exemption requests; they will be provided as supplementary information for your use in reviewing our exemption requests.

For a number of selected fire zones, fire hazard analyses were performed. In performing these analyses, for conservatism, certain modifications which are less extensive than those described in Section 7.0 and which would further enhance fire protection are proposed and CP&L would consider making in the event the exemption is granted. For the selected fire zones, these sections describe the approach

used to demonstrate the equivalency of alternative measures for protection of safe shutdown systems despite the occurrence of a postulated fire.

The discussion in this section outlines the methods of the fire hazards analysis, including the conservatisms associated with the assumptions and the calculational techniques. With regard to the specific application of these methods to the Brunswick Steam Electric Plant, additional assumptions are made concerning the effects of exposure fires on cables which are highlighted in the respective area analyses. These assumptions include:

(1) Cable Failure Criterion: Defined as the initiation of electrical failure of any two electrical cables for redundant divisions within area.

(2) The postulated exposure fire is always assumed to occur at the worst location relative to redundant division damage.

(3) Liquid spills are assumed to instantly confine themselves to that geometry which will cause the most damage to redundant divisions irrespective of the actual spill geometry expected.

These assumptions are used in this analysis in conjunction with a "back calculation" approach. This approach starts with the failure criteria for redundant divisions and calculates the smallest quantity of a flammable liquid which must be spilled in the worst pool geometry and location in order to produce conditions which may achieve this failure criteria. Effectively, this calculation technique measures the level of protection afforded to electrical cables by passive protection in terms of quantities of liquid hydrocarbons.

The "back calculation" approach offers several advantages to the reviewer. It specifies the absolute quantity of liquid hydrocarbon which is necessary to cause electrical cable failure. Using this technique and a consistent failure criteria, it is possible to measure the relative value of additional protection provided through modifications.

6.2 Fire Zone SW-1B

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48(c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2; i.e., the requirement for greater than 20 feet of horizontal separation between required components with no intervening combustibles.

6.2.1 Area Description

Fire zone SW-1B is the entire 4 foot elevation of the Service Water Building. This zone has a 12-inch thick reinforced concrete floor and ceiling separating this zone from the fire zones above and below. All cables entering this zone have fire seals for combustible pathway penetration and some exposed cables have been coated with Flamemastic, a fire-retardant material. Access to zone SW-1B is via a stairway which runs down near the west wall. The height of the ceiling is 15 feet. The arrangement of Division A and B cable trays and conduits is contained in Book 3 of this report.

6.2.2 Safe Shutdown Equipment

Fire zone SW-1B contains the instrument, control and power cables for the Service Water System. In addition, this zone contains the lube water pumps and the motor-operated valves necessary for system operation.

The Service Water Systems for Units 1 and 2 are both in this zone, with Unit 1 cables and equipment generally located in the northern half of the zone and Unit 2 in the southern half. The Service Water Systems are separate and dedicated to a specific unit, and no cross-connect capability exists. Each system contains five Service Water Pumps, all of which can be loaded on a diesel generator. Two of the pumps are designated as "Nuclear Service Water Pumps" and can supply the nuclear service water header only. The three remaining Service Water Pumps can supply either the nuclear or conventional service water header.

The safe shutdown evaluation performed for fire zone SW-1B identified the coexistence of redundant hot safe shutdown circuits with less than 20 feet of horizontal separation. A fire hazards analysis has been performed to evaluate the existing configuration. The following sections document the considerations, assumptions, results and conclusions of the analysis performed.

6.2.3 Fire Protection Systems

Fire zone SW-1B is provided with smoke-sensitive fire detectors suitably arranged throughout the zone which alarm individually at a local control panel and subsequently provide a common fire zone alarm in the control room. A manual 1-1/2-inch hose reel station is located within this zone. In addition, automatic water suppression is provided for the entire zone with a separate system for Unit 1 and 2 general areas. This suppression is designed to provide an area coverage of 0.19 gpm/sq. ft. The minimum density actually provided is 0.49 gpm/sq. ft.

6.2.4 Fire Hazards Analysis

The fixed combustible loading for this zone is due almost entirely to cable insulation, some of which has been coated with Flamemastic, a fire retardant material. The cables within this zone meet the intent of IEEE-383 and as such possess good fire resistance.

The remaining source of combustible material within this zone falls under the category of transient combustibles. Because this zone is exposed to salt water and a high relative humidity, there is a fairly high rate of maintenance activity. The most common flammable liquid present in this zone is paint, which is used frequently. In addition, scaffolding made of fire-retardant wood is a common occurrence. Storage of transient combustibles in fire zone SW-1B is not permitted by plant administrative control procedures, and significant accumulation of such material would be readily noticed and expeditiously removed.

This fire hazards analysis postulates the presence of sufficient quantities of liquid hydrocarbons in the optimum geometry necessary to damage critical cables of redundant divisions. In the performance of this analysis, the cables of interest were assumed to be cross-linked polyethylene insulated with polyvinyl chloride jackets. Polyvinyl chloride jacketed cables are not used at BSEP for any circuit but were specifically selected because they are more susceptible to fire-induced damage than cables with different jacket materials. Such considerations ensure that this analysis is bounding for all cable types.

After selection of cable type, the remaining issue of the particular fuel to be assumed in the calculation was considered. Heptane (gasoline) was selected as the fuel of concern even though it is not reasonably expected to be found within this zone. Heptane is commonly used on-site for portable equipment, but such equipment is prohibited inside vital areas. Heptane was selected primarily due to its high heat release rate and low flash point so as to ensure that this analysis is bounding for all fuel types.

The appendices provide the basis for which heat is assumed to be released from the combustion of heptane. These values are extremely conservative so as to ensure that the bounding nature of this analysis is preserved. The combustible properties of heptane were assumed as follows:

Heat of Combustion	(kJ/g)
Convective	21.6
Radiative	17.4
Actual	39.0
Theoretical	44.6
Vaporization Rate	(g/m^2-s)
Highly luminous flame	70
Heat Release Rate	(kW/m^2)
Convective	1512
Radiative	1218
Actual	2730

Except for the buildup of the stratified layer near the ceiling, all analyses postulated instantaneous achievement of steady state combustion conditions. For radiative and plume calculations, this translates to the instantaneous achievement of a gas temperature of 982°C (1800°F) with a total emissivity of 0.3 (0.2 for gaseous products, 0.1 for luminous soot). In addition, steady state buoyant plume velocities were assumed to be achieved at the same time. These assumptions result in maximizing the heat transfer rate and the cable damage process, thereby bounding less severe fires involving the same fuel quantity and geometry.

In analyzing the effects of these severe fires the appropriate selection of a damage criterion is very important. This analysis focused on the minimum conditions necessary to cause a loss of circuit function via electrical failure. To ensure that the severity of these conditions was maximized, no credit was taken for the use of conduit as a thermal shield from radiation or as a baffle from the effects of impingement of hot gases. Thus, these steel components were assumed to be completely transparent to radiation and to have absolutely no thermal lag.

The damage threshold for electrical cables is based upon research performed by Factory Mutual Research Corporation. Cross-linked polyethylene-insulated cables with polyvinyl choride jackets were tested with and without fire-retardant coatings. The cable samples without coatings indicated failure (short circuiting a 70-volt dc signal under piloted ignition conditions) with a

critical heat flux of 14 kW/m^2 and a critical energy of 10,000 kJ/m^2. The coated cable samples indicated failure with a critical heat flux of 16 kW/m^2 and a critical energy of 21,800 kJ/m^2.

Because this zone has a separate Service Water System for each unit, this analysis was performed assuming that no functional redundancies existed between the two units. This results in each unit being treated individually and the following analyses are therefore separated by applicable unit.

6.2.4.1 Zone SW-1B: Unit 1 - The circuits associated with the Unit 1 Service Water System were analyzed for circuit damage due to postulated liquid hydrocarbon exposure fires. The first step of the analysis was to examine the effects of convective heat transfer due to ceiling stratification of exposure fire combustion gases. The next process modeled was radiant energy deposited on redundant cables, and finally the effects of convective heat transfer due to direct fire plume impingement were analyzed. For each of these steps, appropriate modifications were proposed to assure that the minimum fuel volume was an incredible amount given the zone location and existing administrative controls.

6.2.4.1.1 Combustion Gas Stratification: Unit 1 - The effects of forced convection associated with fire plume impingement and stratification were first analyzed to determine the degree of passive protection provided by the existing configuration. In the case of stratification, horizontal separation offers little inherent protection for any given cable height. The limiting condition for this analysis is the two highest redundant cables, which for the

case of this zone is essentially ceiling height. All of the safe shutdown cables which exit the zone through the ceiling have been coated with Flamemastic and therefore the coated cable failure criterion was used.

Using these assumptions, analysis indicates that the smallest quantity of heptane necessary for redundant circuit failure would be 17.6 gallons spilled over a circular area with an effective diameter of at least 2.8 feet. Under these circumstances achievement of the failure criterion does not occur until at least 1073 seconds after pool ignition. In this case the model fire would have to be approximately 110 mm deep, a depth which is almost 150 times greater than that expected from a spill of heptane on a horizontal surface of concrete.

6.2.4.1.2 Direct Radiation: Unit 1 - Prior to a discussion of the modeling results due to the effects of direct radiation and corrective heat transfer from direct plume impingement, specific modifications are proposed for this zone. These modifications are intended to assure that Unit 1 redundant hot shutdown circuits are protected from the exposure fire effects of plume impingement and radiation to a degree commensurate with that provided by the existing configuration's resistance to combustion gas stratification. The specific modifications listed below are proposed for fire zone SW-1B Unit 1 circuits:

(1) The following conduits will be completely enclosed by an appropriate fire barrier:

9VC1/CB	6MI2/CB	1QX/BB	6BG5/CB
9TA1/BB	4PJ/CB	5PM/BB	6BG3/BB
6MI1/CB	4PI/CB	9RD1/AB	6BG4/BB
6MI3/CB	4PA/CB	6BH4/AB	6BG5/BB
		6BG4/CB	

(2) The following cable tray sections will have fire retardant coatings applied:

69E/CB	69L/CB	69F/AB (only until 100 inches of separation is achieved.)
69E/BB	69M/BB	
69L/BB	69M/CB	

(3) Direct fire plume impingement barriers will be placed beneath the following tray sections until at least 70 inches of horizontal separation is achieved: 69C/CB, 69E/CB and 69M/CB.

(4) In addition, a suitable fire-resistant open top enclosure will be placed around the following equipment: lube water pump 1B and MOV SW-V20 (service water pump discharge valve).

(5) Pressure switch SW-PS-1316 will be completely enclosed by an appropriate fire barrier.

With the above described modifications assumed to be in place the Unit 1 circuits for fire zone SW-1B were individually analyzed for potential damage due to radiant energy deposition. None of the conduits were susceptible to this postulated failure mechanism, as they all were completely enclosed in an appropriate fire barrier.

Each cable tray section was analyzed and the minimum volume of heptane required to reach the defined failure criteria was greater than 17.6 gallons in all cases. Because the minimum required volume of heptane for radiation failure in this fire location is greater than that necessary for impingement stratification failure, this analysis has demonstrated that further horizontal separation beyond that which presently exists would not provide additional protection.

6.2.4.1.3 Plume Impingement: Unit 1 - The effects of direct fire plume impingement upon Unit 1 circuits in fire zone SW-1B were analyzed assuming that the specific modifications detailed in section 6.2.4.1.2 were in place. None of the conduits were susceptible to this postulated failure mechanism, as they all were completely enclosed in an appropriate fire barrier. Each cable tray section was analyzed and the minimum volume of heptane required to reach the defined failure criteria was greater than 17.6 gallons in all cases. Because the minimum required volume of heptane for plume impingement failure in this fire location is greater than that necessary for impingement stratification failure, this analysis has demonstrated that further horizontal separation beyond that which presently exists would not provide additional protection.

6.2.4.2 Zone SW-1B: Unit 2 - The circuits associated with the Unit 2 Service Water System were analyzed for circuit damage due to postulated liquid hydrocarbon exposure fires. The first step of the analysis was to examine the effects of convective heat transfer due to ceiling stratification of exposure fire combustion gases.

The next process modeled was radiant energy deposited on redundant cables, and finally the effects of convective heat transfer due to direct fire plume impingement were analyzed. For each of these steps appropriate modifications were proposed to assure that the minimum fuel volume was an incredible amount given the zone location and existing administrative controls.

6.2.4.2.1 Combustion Gas Stratification: Unit 2 - Because the fire zone ceiling height, cable height, cable failure criterion and fuel type are the same as for Unit 1, the results of Section 6.2.4.1.1 are applicable. Therefore, the minimum volume of heptane required to reach the failure criterion by combustion gas stratification of the limiting Unit 2 redundant safe shutdown circuits is 17.6 gallons.

6.2.4.2.2 Direct Radiation: Unit 2 - Prior to a discussion of the modeling results due to the effects of direct radiation and convective heat transfer from direct plume impingement, specific modifications are proposed for this zone. These modifications are intended to assure that Unit 2 redundant hot shutdown circuits are protected from the exposure fire effects of plume impingement and radiation to a degree commensurate with that provided by the existing configuration's resistance to combustion gas stratification. The specific modifications listed below are proposed for fire zone SW-1B Unit 2 circuits:

(1) The following conduits will be completely enclosed by an appropriate fire barrier:

4PL/CB	5EY/BB	9TW1/BB	6BG1/CB	6BH2/AB
5KP/BB	9VC1/CB	9AF1/AB	6BG2/CB	
4PR/CB	6LQ3/CB	6BG1/BB	6BG6/CB	
		6BG2/BB	6LQ1/CB	
			6LQ2/CB	

(2) The following cable tray sections will have fire retardant coatings applied:

69I/AB	69I/CB	69K/CB
69I/BB	69K/BB	

(3) Cable tray section 69A/CB will have a direct plume impingement barrier beneath the tray until at least 70 in. of horizontal separation is achieved.

(4) In addition, a suitable fire-resistant open top enclosure will be placed around the following equipment: lube water pump 2B and MOV SW-V20 (service water pump discharge valve).

(5) Pressure switch SW-PS-1316 will be completely enclosed by an appropriate barrier.

With the above described modifications assumed to be in place, the Unit 2 circuits for fire zone SW-1B were individually analyzed for potential damage due to radiant energy deposition. None of the conduits were susceptible to this postulated failure mechanism as they all were completely enclosed in an appropriate fire barrier. Each cable tray section was analyzed and the minimum volume of heptane required to reach the defined failure criteria was greater than 17.6 gallons in all cases. Because the minimum required volume of heptane for radiation failure in this fire location is greater than that necessary for impingement stratification failure, this analysis has demonstrated that further horizontal separation beyond that which presently exists would not provide additional protection.

6.2.4.2.3 Plume Impingement: Unit 2 - The effects of direct fire plume impingement upon Unit 2 circuits in fire zone SW-1B were analyzed assuming that the specific modifications detailed in section 6.2.4.2.2 were in place. None of the conduits were susceptible to this postulated failure mechanism as they all were completely enclosed in an appropriate fire barrier. Each cable tray section was analyzed and the minimum volume of heptane required to reach the defined failure criteria was greater than 17.6 gallons in all cases. Because the minimum required volume of heptane for plume impingement failure in this fire location is greater than that necessary for impingement stratification failure, this analysis has demonstrated that further horizontal separation beyond that which presently exists would not provide additional protection.

The pool diameter in the postulated spill impacts the thermal conditions predicted for such a fire. To that extent, spill diameter is as important as the volume in determining the smallest quantity of fuel necessary to achieve the damage criteria. Increasing or decreasing the fire diameter would imply a resulting pool fire involving greater quantities of fuel in order to provide the same energy flux at the locations of interest. Smaller diameters, for example, would require longer-burning fires with greater fuel depth in order to achieve the same incident energy flux on a cable while larger diameter fires would need larger quantities of fuel to cover the wider area; albeit at lesser depths. These results further demonstrate that for the extremely conservative assumptions

utilized in this model, it is not possible for lesser quantities of heptane to exceed the cable damage criteria for both divisions under any circumstances irrespective of fire location.

The stratification model results, for example, demonstrate that containment of the 17.6 gallons of heptane necessary to initiate failure in both divisions to almost 150 times its unconfined spill depth without exceeding 110 mm of depth with a minimum 2.8-foot diameter is an unrealistic condition. Actual plant storage provisions and operating practices further demonstrate that it would be extremely difficult to accumulate 17.6 gallons of heptane anywhere within the plant, much less at the precise location and in the precise geometry determined by this analysis to be necessary for redundant cable failure.

Departing from the conservatisms of analysis, it should be stated that the existing configuration can be expected to provide sufficient passive protection against even greater quantities of acetone than that reported above, with the precise value depending on how realistically a "best estimate" analysis is performed. Elements to be considered in a more realistic analysis might include the response of automatic detectors and of installed manual and automatic suppression systems in the area, the value of administrative controls in reducing the likelihood of substantial fuel quantities, and anticipated operator actions relative to achieving safe shutdown while a fire is in progress.

Fire zone SW-1B relies upon a properly balanced approach to fire protection which includes a comprehensive site fire prevention provided passively by the existing configuration, automatic detection, automatic suppression, and manual firefighting. This balanced approach was developed in response to the Browns Ferry fire and reflects the guidance provided by Branch Technical Position APCSB 9.5-1.

The conservative quantitative fire hazards analysis described herein, in addition to the proposed modification, demonstrates protection of zone SW-1B safe shutdown cables from electrical failure resulting from any reasonable exposure fire postulated in the plant regardless of horizontal separation. The moderate combustible loading of fire zone SW-1B, together with fire protection features described in this analysis, demonstrate that other additional modifications would not enhance fire protection of the safe shutdown capability.

6.2.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

(2) Ionization smoke detectors are provided with a common zone alarm in the control room.

(3) An automatic suppression system is provided for the entire zone.

(4) The fixed combustible loading is moderate in the zone, with no allowable storage of transient combustibles.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-2 Evaluation Parameters Summary Table, Fire Zone SW-1B (Units 1 and 2)

A. Zone description

1. Construction/rating

a. Walls

North - Exterior: 24-inch thick reinforced concrete (below grade)

South - Exterior: 24-inch thick reinforced concrete (below grade)

East - Exterior: 24-inch thick reinforced concrete (below grade)

West - Interior: 36-inch thick reinforced concrete (below grade)

b. Floor - Poured-in-place 12-inch thick reinforced concrete

c. Ceiling - Poured-in-place 12-inch thick concrete slab and concrete beams/4 HR

2. Ceiling height - 15 feet

3. Room volume - Approximately 33,000 cu. ft.

4. Ventilation - two fans, 2300 cfm exhaust air thermostatically controlled

5. Congestion/Access - None; an area approximately 56 by 16 feet surrounded by the conventional SW header provides restricted access for fire fighting. Also, at least 3 feet around the outside of the nuclear SW header provides additional space. The zone is accessible through one stairway and equipment hatch.

Table 6-2 Evaluation Parameters Summary Table, Fire Zone SW-1B (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Equip.	Cable	Description	Equip.	Cable
Normal Shutdown					
Service Water System	X	X	Service Water System	X	X
Elec Distr System		X	Elec Distr System		X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Equip.	Cable	Description	Equip.	Cable
Unit 1 Normal Shutdown					
MCC 1PA		X	MCC 1PB		X
Nuc Hdr SW Pump 1A		X	Nuc Hdr SW Pump 1B & Pump		X
Nuc Con Lube Wtr Pump (P46)	X	X	Nuc Con Lube Wtr Pump (P47)	X	X
Nuc Hdr SW Pump 1A Disch Vlv (KY5)	X	X	Nuc Hdr SW Pump 1B Disch Vlv (KY6)	X	X
Press SW SW-PS-1316 (RF8)	X	X	Press SW SW-PS-1316 (RF8)	X	X
Unit 2 Normal Shutdown					
MCC 2PA		X	MCC 2PB		X
Nuc Con Lube Wtr 2A (P46)	X	X	Nuc Con Lube Wtr 2B (P47)	X	X
Nuc Hdr Swp Mtr 2A		X	Nuc Hdr Swp Mtr 2B		X
SW Nuc Hdr Pmp 2A Disch Vlv (KY5)	X	X	SW Nuc Hdr Pmp 2B Disch Vlv (KY6)	X	X
Press SW Serv Wtr PS-1316 (RF8)	X	X	Press SW Serv Wtr PS-1316 (RF8)	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease in motors of 12 motor-operated valves and oil in 4 pump motors.

Table 6-2 Evaluation Parameters Summary Table, Fire Zone SW-1B (Units 1 and 2) (Cont)

2. Quantity of combustibles: Grease approximately 24 pounds of grease is contained in 16 valve motor operators. Due to spatial separation of piping components, the maximum credible fire would be ignition of approximately 3 pounds of grease from two valve motor operators. Cables - four trays average, approximately 1200 lineal feet, medium to heavy density.
3. Ease of ignition and propagation: Oil flash point requires raising oil bulk volume temperature above 450°F.
4. Suppression damage to equipment - No damage to valve motor operators which are protected by NEMA 4 enclosures. Lube water pumps for both Trains A and B could fail. Backup protection is provided by lube water pumps for the other units which are located at the opposite end of this zone.

D. Fire Protection Existing

1. Fire detection systems: Ten ionization detectors.
2. Automatic suppression systems:
   a. Wet-pipe system, utilizing closed heads charged with water. The water supply is provided with a one-head bypass of deluge valve feature. The deluge valve is automatically operated by actuation of the detection system and flow in the bypass.

Table 6-2 Evaluation Parameters Summary Table, Fire Zone SW-1B (Uni s 1 and 2) (Cont)

3. Hose station/extinguisher:

   a. Distance to hose stations - One hose reel station with 75 feet of hose located approximately at the center of the west wall at the stairway 50 feet from the center of the fire zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.3 Fire Zone SW-1A (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48(c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2; i.e., the requirement for greater than 20 feet of horizontal separation between required components with no intervening combustibles.

6.3.1 Area Description

Fire zone SW-1A is the entire 20 foot elevation of the Service Water Building. This zone has a 12-inch thick reinforced concrete slab floor separating it from the fire zone below and the zone walls and ceiling are 24-inch thick reinforced concrete. All cables entering this zone have fire seals for combustible pathway penetration. Access to zone SW-1A is via a key card access door in the southwest corner of the zone, a locked door in the northwest corner, and a stairway which runs down near the west wall to the zone below. The height of the ceiling is 19 feet.

6.3.2 Safe Shutdown Equipment

Fire zone SW-1A contains the ten Service Water System pumps. Each unit has five dedicated pumps, two of which are classified as Nuclear Service Water Pumps supplying the nuclear service water header and three of which are classified as Conventional Service Water Pumps which can be aligned to either the conventional or nuclear service water header. The power cables for each Service Water Pump enter the zone through the floor and go directly to their

respective pump motors. The only other hot safe shutdown equipment in this zone are the Motor Control Centers (MCCs) for the Service Water System. These MCCs are arranged along the west wall of fire zone SW-1A with the two redundant MCCs for each unit side-by-side. There is approximately 20 inches of horizontal separation between the redundant MCCs.

The safe shutdown evaluation performed for fire zone SW-1A identified the coexistence of redundant hot safe shutdown circuits with less than 20 feet of horizontal separation. A fire hazards analysis has been performed to evaluate the existing configuration. The following sections document the considerations, assumptions, results, and conclusions of the analysis performed.

6.3.3 Fire Protection Systems

Fire zone SW-1A is provided with smoke-sensitive fire detectors suitably arranged throughout the zone which alarm individually at a local control panel and subsequently provide a common fire zone alarm in the control room. Two manual 1-1/2-inch hose reel stations are located within this zone. In addition, automatic water suppression is provided for the entire zone with a separate system for Unit 1 and 2 general areas. This suppression is designed to provide an area coverage of 0.18 gpm/sq. ft. The mimimum density actually provided is 0.30 gpm/sq. ft.

6.3.4 Fire Hazards Analysis

The fixed combustible loading for this zone is due to cable insulation and lubricating oil. The cables within this zone meet the intent of IEEE-383 and, as such, possess good fire resistance.

In addition, almost all of the cables are completely enclosed in conduit and therefore do not add to the zone fire loading. Each of the Service Water Pumps contains approximately 20 gallons of lubricating oil. The specific pump design precludes the possibility of lubricating oil being sprayed throughout the zone, but it is conceivable that a failure of the lubrication system for a single pump could result in an oil spill on the zone floor. This oil can be considered combustible only if it is raised to above its flash point, i.e., above at least 480°F. Suitable hot surfaces simply do not exist within fire zone SW-1A to heat any liquid to this temperature, and if the oil was spilled on the concrete floor a very large external heat flux would be necessary to cause oil ignition. The magnitude of an exposure fire required to generate such a heat flux would cause damage in and of itself and, for this zone, is an incredible quantity. Therefore, due to lack of a credible ignition source, lubricating oil is not considered a combustible hazard for this fire zone.

The remaining source of combustible material within this zone falls under the category of transient combustibles. Because this zone is exposed to salt water and a high relative humidity, there is a fairly high rate of maintenance activity. The most common flammable liquid present in this zone is paint, which is used frequently. In addition, scaffolding made of fire-retardant wood is a common occurrence. Storage of transient combustibles in fire

zone SW-1A is not permitted by plant administrative control procedures, and significant accumulation of such material would be readily noticed and expeditiously removed.

This fire hazards analysis postulates the presence of sufficient quantities of liquid hydrocarbons in the optimum geometry necessary to damage critical cables of redundant divisions. In the performance of this analysis, the cables of interest were assumed to be cross-linked polyethylene insulated with polyvinyl chloride jackets. Polyvinyl chloride jacketed cables are not used at BSEP for any circuit but were specifically selected primarily because they are more susceptible to fire-induced damage than cables with different jacket materials. Such considerations ensure that this analysis is bounding for all cable types.

After selection of cable type, the remaining issue of the particular fuel to be assumed in the calculation was considered. Heptane (gasoline) was selected as the fuel of concern even though it is not reasonably expected to be found within this zone. Heptane is commonly used on-site for portable equipment, but such equipment is prohibited inside vital areas. Heptane was selected primarily due to its high heat release rate and low flash point so as to ensure that this analysis is bounding for all fuel types.

The appendices provide the basis for which heat is assumed to be released from the combustion of heptane. These values are extremely conservative so as to ensure that the bounding nature of this analysis is preserved. The combustible properties of heptane were assumed as follows:

Heat of Combustion	(kJ/g)
Convective	21.6
Radiative	17.4
Actual	39.0
Theoretical	44.6
Vaporization Rate	(g/m^2-s)
Highly luminous flame	70
Heat Release Rate	(kW/m^2)
Convective	1512
Radiative	1218
Actual	2730

Except for the buildup of the stratified layer near the ceiling, all analyses postulated instantaneous achievement of steady state combustion conditions. For radiative and plume calculations, this translates to the instantaneous achievement of a gas temperature of 982°C (1800°F) with a total emissivity of 0.3 (0.2 for gaseous products, 0.1 for luminous soot). In addition, steady state buoyant plume velocities were assumed to be achieved at the same time. These assumptions result in maximizing the heat transfer rate and the cable damage process, thereby bounding less severe fires involving the same fuel quantity and geometry.

As previously discussed in Section 6.3.2, the only components required for hot safe shutdown in fire zone SW-1A are the Service Water Pumps and the Motor Control Centers for the Service Water

System. The two nuclear Service Water Pumps required for hot shutdown will be protected by an appropriate fire barrier, i.e., pumps 1B and 2B will be completely enclosed by an open-topped barrier. This barrier will protect the Train B pumps from any conceivable fire which could damage the Train A pumps.

6.3.4.1 Analysis of Motor Control Cabinet - Once the two Service Water Pumps have been adequately protected the only equipment requiring analysis are the Service Water System Motor Control Centers (MCCs). The methods used in this analysis are described in Appendices A.6 and A.7.

The failure criteria for the MCC was arbitrarily set as any portion of the exterior of a single MCC reaching 600°F. This is a conservative assumption in that failure of redundant circuits is not achieved, nor would the interior components of the MCC be expected to fail when the exterior reaches 600°F. The local breaker controls for this MCC do not have any protruding external parts and the small exposed portion of each circuit breaker, showing breaker position, is of metallic construction.

The total MCC depth is 20 inches with the individual breaker compartments 7 inches deep. The breaker itself has approximately a 1-inch air gap between the breaker body and the exterior wall. Internal air mixing is not assumed due to the steel wall separating the individual breaker compartment from the back portion of the MCC. All objects are treated as gray bodies at an initial temperature of

100°F and the volumetric heat capacity of the breaker was conservatively assumed to be essentially that of a plastic material.

Once the above described parameters were defined, a series of computer model runs was generated assuming an external heat flux varying from 5 to 50 kW/m^2. The output of each model run resulted in a time to reach an external temperature of 600°F for a given external heat flux. This data was then used as input to the exposure fire radiation model to determine a minimum volume of heptane required to reach the failure criteria. In addition, for each external heat flux, various widths of sloping curbs were assumed in order to keep the exposure fire a minimum distance away from the MCC. The conclusion of this analysis is a set of minimum volumes of heptane as a function of sloping curb width.

It was decided that the B division MCC for each unit will be protected by a sloping curb which will extend at least 24 inches away from the base of the MCC. With this curb in place the minimum volume of heptane necessary to heat the external face of the cabinet to 600°F is 6.5 gallons. This postulated exposure fire must be contained in a circular area 39 inches in diameter, which results in an external heat flux to the MCC of 18 kW/m^2. This exposure fire would be 32 mm in depth and would have to burn without mitigation for at least 310 seconds.

The model results above demonstrate that the addition of the proposed sloping curb will provide adequate protection to a single safe shutdown train contained within the B division MCC. It is also

clear that the minimum volume predicted by the model is very conservative. Keeping in mind that damage to the A division MCC was not assumed, it is obvious that a larger volume of heptane would be necessary to cause failure of both MCCs even though they are fairly close together. In addition, the selection of an MCC failure criterion as an external temperature of 600°F is felt to be an extremely conservative assumption in that the temperature of the breaker body reaches only 105°F, a rise of only 5°F for 18kW/m^2 external heat flux.

The pool diameter in the postulated spill impacts the thermal conditions predicted for such a fire. To that extent, spill diameter is as important as the volume in determining the smallest quantity of fuel necessary to achieve the damage criteria. Increasing or decreasing the fire diameter would imply a resulting pool fire involving greater quantities of fuel in order to provide the same energy flux at the locations of interest. Smaller diameters, for example, would require longer-burning fires with greater fuel depth in order to achieve the same incident energy flux while larger diameter fires would need larger quantities of fuel to cover the wider area, albeit at lesser depths. These results further demonstrate that for the extremely conservative assumptions utilized in this model, it is not possible for lesser quantities of heptane to exceed the damage criteria under any circumstances.

The model results demonstrate that containment of the 6.5 gallons of heptane necessary to initiate failure in both divisions

to almost 42 times its unconfined spill depth without exceeding 32 mm of depth with a minimum 3.2 foot diameter is an unrealistic condition. Actual plant storage provisions and operating practices further demonstrate that it would be extremely difficult to accumulate 6.5 gallons of heptane anywhere within the plant, much less at the precise location and in the precise geometry determined by this analysis to be necessary for redundant cable failure.

Departing from the conservatisms of analysis, it should be stated that the existing configuration can be expected to provide sufficient passive protection against even greater quantities of heptane than that reported above with the precise value depending on how realistically a "best estimate" analysis is performed. Elements to be considered in a more realistic analysis might include the response of automatic detectors, of automatic suppression and of installed manual suppression systems in the area, the value of administrative controls in reducing the likelihood of substantial fuel quantities, and anticipated operator actions relative to achieving safe shutdown while a fire is in progress.

Fire zone SW-1B relies upon a properly balanced approach to fire protection which includes a comprehensive site fire prevention provided passively by the existing configuration, automatic detection, automatic suppression, and manual firefighting. This balanced approach was developed in response to the Browns Ferry fire and reflects the guidance provided by Branch Technical Position APCSB 9.5-1.

The conservative quantitative fire hazards analysis described herein, in addition to the proposed modification, demonstrates protection of fire zone SW-1A safe shutdown cables from electrical failure resulting from any reasonable exposure fire postulated in the plant regardless of horizontal separation. The moderate combustible loading of this fire area, together with fire protection features described in this analysis, demonstrate that other additional modifications would not enhance fire protection of the safe shutdown capability.

6.3.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

(2) Photoelectric smoke detectors are provided with a common area alarm in the control room.

(3) A fixed automatic water suppression system is provided for the coverage of the entire fire zone.

(4) The fixed combustible loading is moderate in fire zone SW-1A, with no allowable storage of transient combustibles.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-3 Evaluation Parameters Summary Table, Fire Zone SW-1A (Units 1 and 2)

A. Zone description

1. Construction

a. Walls

North - Exterior: 24-inch thick reinforced concrete (below grade)

South - Exterior: 24-inch thick reinforced concrete (below grade)

East - Exterior: 24-inch thick reinforced concrete (below grade)

West - Exterior: 36-inch thick reinforced concrete (below grade)

b. Floor - Poured-in-place 12-inch thick concrete slab and concrete beams steel plate on concrete or concrete slabs.

c. Ceiling - Poured-in-place 12-inch thick concrete slab and concrete beams steel plate on concrete slab or concrete beams.

2. Ceiling height - 19 feet

3. Room volume - Approximately 64,600 cu. ft.

4. Ventilation - 20,000 cfm exhaust air (two fans, thermostatically controlled).

Table 6-3 Evaluation Parameters Summary Table, Fire Zone SW-1A (Units 1 and 2) (Cont)

5. Congestion/Access - Accessibility is provided in this zone through two exterior doorways, one at the northwest end and one at the southwest end of the zone. The area is not congested. There is ample room for firefighting.

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Normal Shutdown					
Serv Wtr System	X	X	Serv Wtr System	X	X
Elec. Distr Sys.	X	X	Elec. Distr. Sys.	X	X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Unit 1 Normal Shutdown					
MCC 1PA	X	X	MCC 1PB	X	X
Nuc Hdr SW Pump 1A (NA7)	X	X	Nuc Hdr SW Pump 1B (NA8)	X	X
Nuc Hdr SW Pump 1A Disch Vlv		X	Nuc Hdr SW Pump 1B Disch Vlv		X
Nuc & Con Lube Wtr Pump 1A		X	Nuc & Con Lube Wtr Pump 1B		X
Unit 2 Normal Shutdown					
MCC 2PA	X	X	MCC 2PB	X	X
Nuc Hdr SW Pump 2A (NA7)	X	X	Nuc Hdr SW Pump 2B (NA8)	X	X
Nuc Hdr SW Pump 2A Disch Vlv		X	Nuc Hdr SW Pump 2B Disch Vlv		X
Nuc & Con Lube Wtr Pump 2A		X	Nuc & Con Lube Wtr Pump 2B		X

Table 6-3 Evaluation Parameters Summary Table, Fire Zone SW-1A (Units 1 and 2) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area:

   a. Oil in 10 service water motors.

   b. Oil in 4 screen wash water pump motors.

2. Quantity of combustibles:

   a. 120 gallons of lubricating oil for the service water pumps (i.e., 12 gal per pump)

   b. 20 gallons of lubricating oil for the screen wash pumps (i.e., 5 gal per pump)

   c. A small number of cables totally encased in conduit. There are no trays in this zone.

3. Ease of ignition and propagation:

   a. Oil flash point is assumed to be 450°F.

   b. Cables are self-extinguishing and non-propagating.

4. Suppression damage to equipment - Automatic suppression damage to equipment in the zone is not relevant, since sufficient redundancy is available, and suppression will only be at fire location. Manual suppression damage via fire brigade is negligible since competent fire brigade actions are assumed.

Table 6-3 Evaluation Parameters Summary Table, Fire Zone SW-1A (Units 1 and 2) (Cont)

D. Fire Protection Existing

1. Fire detection systems - Eight ionization detectors

2. Automatic suppression systems - Wet-pipe system, utilizing closed heads charged with water. The water supply is provided with a one-head bypass of the deluge valve. The deluge valve is automatically operated upon actuation of the detection system and flow in the bypass.

3. Hose station/extinguisher

   a. Distance to hose stations - Two hose reel station are located in this zone, one at the northwest end and the other at the southwest end of the zone. Each reel has approximately 75 feet of hose. Both hose reels are 38 feet from the center of the zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.4 Fire Zone DG-1 (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48(c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2; i.e., the requirement for greater than 20 feet of horizontal separation between required components with no intervening combustibles.

6.4.1 Area Description

Fire zone DG-1 is the entire 2 foot elevation of the Diesel Generator Building. This zone has a 42-inch thick poured concrete slab floor, a 12-inch thick reinforced concrete ceiling separating this zone from the fire zone above, and 30-inch thick reinforced concrete walls. All cables entering this zone have fire seals for combustible pathway penetration and all exposed cables in cable trays have been coated with Flamemastic, a fire-retardant material. Access to zone DG-1 is via stairways which are located at the north and south ends of the zone. The height of the ceiling is 20 feet. The arrangement of Division A and B cable trays and conduits is contained in Book 3 of this report.

6.4.2 Safe Shutdown Equipment

Fire zone DG-1 contains instrument, control, and power cables for all the safe shutdown systems. In addition, this zone contains electrical equipment associated with the diesel generators and the 1E electrical distribution system.

The safe shutdown evaluation performed for fire zone SW-1B identified the coexistence of redundant hot safe shutdown circuits with less than 20 feet of horizontal separation. A fire hazards analysis has been performed to evaluate the existing configuration. The following sections document the considerations, assumptions, results, and conclusions of the analysis performed.

6.4.3 Fire Protection Systems

Fire zone DG-1 is provided with smoke-sensitive fire detectors suitably arranged throughout the zone which alarm individually at a local control panel and subsequently provide a common fire zone alarm in the control room. Three manual 1-1/2-inch hose reel stations are located within this zone. In addition, automatic water suppression is provided for the entire zone. This suppression system is designed to provide an area coverage of 0.16 gpm/sq. ft. The minimum density actually provided is 0.25 gpm/sq. ft.

6.4.4 Fire Hazards Analysis

The fixed combustible loading for this zone is due almost entirely to cable insulation, all of which has been coated with Flamemastic, a fire-retardant material. The cables within this zone meet the intent of IEEE-383 and, as such, possess good fire resistance.

The remaining source of combustible material within this zone falls under the category of transient combustibles. The transient combustible loading for this fire zone is very low, as maintenance

activities are a rare occurrence. In addition, this zone is the lowest elevation in the building and is not used as a passageway to any other fire zones. For these reasons, transport of significant quantities of combustibles through this zone is not reasonably expected. Storage of transient combustibles in this fire zone is not permitted by plant administrative control procedures, and significant accumulation of such material would be readily noticed and expeditiously removed.

In the performance of this analysis, the cables of interest were assumed to be cross-linked polyethylene insulated with polyvinyl chloride jackets. Polyvinyl chloride jacketed cables are not used at BSEP for any circuit but were specifically selected primarily because they are more susceptible to fire-induced damage than cables with different jacket materials. Such considerations ensure that this analysis is bounding for all cable types.

After selection of cable type, the remaining issue of the particular fuel to be assumed in the calculation was considered. Although any fuel could have been used for the calculation, it was decided that especially meaningful results would be offered if the fuel was one which may be expected to be found within fire zone DG-1, assuming a breakdown of administrative controls. This approach led to the exclusion from consideration of gasoline and related liquid hydrocarbons such as heptane. A hydrocarbon which is both volatile and which may find its way into the plant as a general cleaner is acetone, which was selected as a fuel for study.

Acetone (C_3H_6O), a water-soluble organic solvent, is the simplest aliphatic ketone based on the carbonyl (C=O) group. With a boiling point of 56°C (132.8°F), it easily vaporizes to form a combustible mixture close to its liquid surface. The appendices provide the basis for the rate at which heat is assumed to be released from the combustion of acetone. These values are extremely conservative so as to ensure that the bounding nature of the analysis is preserved. In the analysis, the combustible properties of acetone are assumed as follows:

Heat of Combustion	
Convective	12.0 kJ/g
Radiative	11.4 kJ/g
Actual	23.4 kJ/g
Theoretical	30.8 kJ/g
Vaporization Rate	
Highly luminous flame	40.0 g/m^2-s
Heat Release Rate	
Convective	480 kW/m^2
Radiative	456 kW/m^2
Actual	936 kW/m^2

This analysis treats the combustion of acetone in a manner which emphasizes its thermal effects on electrical cables. For this reason, with the exception of the stratified layers near the ceiling, instantaneous achievement of steady-state overventilated combustion is assumed in all cases. For radiative heat transfer and plume

impingement calculations this translates to the instantaneous achievement of isothermal conditions within the diffusion plume of 982°C (1800°F) with a total emissivity of 0.3 (0 2 for gaseous products, 0.1 for luminous soot) and a uniform mass flux at the liquid-flame interface. These assumptions result in maximizing the heat transfer rate and the cable damage process, thereby bounding less severe fires involving the same fuel quantity and geometry.

In analyzing the effects of these severe fires the appropriate selection of a damage criterion is very important. This analysis focused on the minimum conditions necessary to cause a loss of circuit function via electrical failure. To ensure that the severity of these conditions was maximized, no credit was taken for the use of conduit as a thermal shield from radiation or as a baffle from the effects of impingement of hot gases. Thus, these steel components were assumed to be completely transparent to radiation and to have absolutely no thermal lag.

The damage threshold for electrical cables is based upon research performed by Factory Mutual Research Corporation. Cross-linked polyethylene-insulated cables with polyvinyl choride jackets were tested with and without fire-retardant coatings. The cable samples without coatings indicated failure (short circuiting a 70-Vdc signal under piloted ignition conditions) with a critical heat flux of 14 kW/m^2 and a critical energy of 10,000 kJ/m^2. The coated cable samples indicated failure with a critical heat flux of 16 kW/m^2 and a critical energy of 21,800 kJ/m^2.

Due to the limited access to fire zone DG-1 and the extremely low level of transient combustibles, a series of bounding calculations was completed. The maximum credible quantity of acetone for this zone was assumed to be 2 gallons, and all cable trays and conduits were analyzed to determine if this quantity of acetone confined to an optimum geometry could cause any circuit to reach the defined failure criterion.

For cable trays the failure criterion for coated cables was used as all exposed cables within this zone have been covered with Flamemastic, a fire-retardant material. A minimum tray height of 84 inches was used when examining the exposure fire effects of radiation and direct plume impingement. A maximum cable tray height was assumed to be essentially ceiling height for modeling the effects of ceiling combustion gas stratification. With the specific cable elevation assumed to be the most limiting for the exposure fire energy transfer mechanism under consideration, all of the analysis results indicated that the minimum volume of acetone required to reach the defined failure criterion was in excess of 2 gallons. Therefore, no modifications to cable trays in fire zone DG-1 are proposed.

Cables in conduits were analyzed next and the criterion for uncoated cables was used. In addition, the conduit itself was assumed to be completely transparent to radiation and to have absolutely no thermal lag. A minimum cable height of 84 inches was used when examining the exposure fire effects of radiation

and direct plume impingement. A maximum cable tray height was assumed to be essentially ceiling height for modeling the effects of ceiling combustion gas stratification. With the specific cable elevation assumed to be the most limiting for the exposure fire energy transfer mechanism under consideration, all of the analysis results indicated that the minimum volume of acetone required to reach the defined failure criterion was in excess of 2 gallons. Therefore, no modifications to conduits in fire zone DG-1 are proposed for conduits greater than 84 inches from the floor. Any conduits which are less than 84 inches off the floor and which are also required for hot safe shutdown will be enclosed in an appropriate fire barrier until an 84-inch height is achieved.

The pool diameter in the postulated spill impacts the thermal conditions predicted for such a fire. To that extent, spill diameter is as important as the volume in determining the smallest quantity of fuel necessary to achieve the damage criteria. Increasing or decreasing the fire diameter would imply a resulting pool fire involving greater quantities of fuel in order to provide the same energy flux at the locations of interest. Smaller diameters, for example, would require longer-burning fires with greater fuel depth in order to achieve the same incident energy flux on a cable, while larger diameter fires would need larger quantities of fuel to cover the wider area, albeit at lesser depths. These results further demonstrate that for the extremely conservative assumptions utilized in this model, it is not possible for lesser quantities of

acetone to exceed the cable damage criteria for both divisions under any circumstances irrespective of fire location.

Departing from the conservatisms of analysis, it should be stated that the existing configuration can be expected to provide sufficient passive protection against even greater quantities of acetone than that reported above, with the precise value depending on how realistically a "best estimate" analysis is performed. Elements to be considered in a more realistic analysis might include the response of automatic detectors and of installed automatic and manual suppression systems in the area, the value of administrative controls in reducing further the likelihood of substantial fuel quantities, and anticipated operator actions relative to achieving safe shutdown while a fire is in progress.

Fire zone DG-1 relies upon a properly balanced approach to fire protection which includes a comprehensive site fire prevention provided passively by the existing configuration, automatic detection, automatic suppression, and manual firefighting. This balanced approach was developed in response to the Browns Ferry fire and reflects the guidance provided by Branch Technical Position APCSB 9.5-1.

In addition to the deterministic analysis presented in this report, it is also useful to examine the likelihood of a fire in the Diesel Generator Basement from two perspectives:

(1) The likelihood of a fire in a compartment similar to the Diesel Generator Basement;

(2) The relationship of the existing and proposed protective features to the likely fire hazards in the Diesel Generator Basement.

The process used in this analysis is based upon an examination of the experience recorded in the data collected by Hockenbury and Yeater focusing on the operational phase of a power plant.

Hockenbury and Yeater develop a model for the fire occurrence rate at a nuclear power plant during the operational phase and defined as follows:

$$u(t) = \lambda\beta t^{\beta-1}$$

where: $u(t)$ = fire occurrence rate

t = time

and maximum likelihood estimates for the parameters λ and β are given as follows for t in months

$$\lambda = 0.1284$$

$$\beta = 0.592$$

These parameters are based on the analysis of 24 safety-related fires during the operational phase of 17 nuclear power plants in the period of March, 1968 to June, 1978. Assuming Brunswick Steam Electric Plant (BSEP) is represented or bounded by this occurrence rate, it is suggested that this model may be used to demonstrate the nature of the likelihood of fires. On this basis, the maximum likelihood estimate (MLE) for u(t) may be defined as of July 1, 1982 on the basis of the operational date of the younger of the two BSEP units (BSEP-Unit 2 became operational in March, 1977) to be:

$$u(t = 64 \text{ months}) = 0.0760[64]^{(0.592-1)}$$

$$= 1.39 \times 10^{-2} \text{ fires/month}$$

$$= 1.67 \times 10^{-1} \text{ fires/year}$$

This frequency addresses the occurrence rate of fire anywhere on site. It should be emphasized that it is itself time-dependent and is expected to continue to decline at a decreasing rate over the life of the plant.

Focusing on this occurrence rate, the issue is to relate this frequency of fire which is applicable to plants of the age of BSEP to the expected frequency of a fire in the Diesel Generator Basement. This location is similar in construction, access, and combustible loading to the cable spreading room and, therefore, establishes the basis for carrying forward the analogy.

Hockenbury and Yeater report the probability of a fire in a cable spreading room-like location given the existence of a fire to be 0.04, a number which includes the Browns Ferry experience. No rectification of this experience is credited in this analysis although clearly it should not be overlooked. On this basis, the current expected occurrence rate of any sized fire in a room similar to the Diesel Generator Basement is at its highest value to date of $(4 \times 10^{-2})\ (1.67 \times 10^{-1}) = 6.7 \times 10^{-3}$ fire events/year. This occurrence rate may be expected to continue to decline at a decreasing rate over time.

Since the Diesel Generator Basement is a controlled security area containing power cables and no cabinets, and no fire events have been experienced to date, an in-situ electrical fire is judged to be a rare event. Therefore, following the approach of Hockenbury

and Yeater, the likelihood of propagation leading to a loss of a redundancy given a fire is defined to be 4×10^{-2} yielding a MLE of 2.7×10^{-4} events/year.

As a number, that a fire in the Diesel Generator Basement leading to a loss of redundancy is estimated to occur at a frequency of 2.7×10^{-4} per year is of limited value. Such an event does not imply a complete loss of function, for example. It is of value, however, in focusing on the MLE for a situation to occur which would still ensure that Section III.G would not be violated, i.e., that at least one shutdown system is available subsequent to a fire. To have more complete meaning, however, it is essential to compare this number with the estimated frequency associated with achieving this state with the alternative implemented or, in this case, construction activities associated with modifications to comply with the letter of Appendix R.

To accomplish this goal, this analysis assumes that modifications to comply with Appendix R will involve major construction activities spread over an 18-month period. Under such circumstances, it may be inferred that the occurrence rate for fires may be best described by the data presented for the construction phase of a nuclear power plant. Yet, it is also recognized that the intensity of construction activities would be less than that of unit construction, indicating a reduced likelihood for fires. To reflect such conditions, the

approach used to model this situation employs the Hockenbury and Yeater model for an operational plant at the 6-month point in life yielding a fire occurrence rate of:

$$u(t) = 0.076\ t^{(0.592-1)}$$

$$= [0.076]\ [6]^{-0.408}$$

$$= 3.7 \times 10^{-2} \text{ fires/month}$$

$$= 4.4 \times 10^{-1} \text{ fires/year}$$

Unlike the operational phase fire severity, Hockenbury and Yeater suggest that this occurrence rate may be relatively constant over the period of construction. Moreover, since the construction activity would be in or associated with the Diesel Generator Basement, it may be argued that this occurrence rate would be directly applicable to the location of interest. This is due to the increase in combustible loading such as new cable, solvents, and cellulosics, and a significant amount of potential ignitors such as welding, cutting, and shorts. Therefore, the likelihood of the fire occurring in the Diesel Generator Basement during the period of construction is assumed in this analysis to be a constant at a value representative of the activity at 4.4×10^{-1} fires/year.

Since the construction activities associated with compliance with Appendix R would involve a significant amount of cable rerouting and splicing and perhaps the provision of new panels, the likelihood of an in-situ electrical fire in the Diesel Generator Basement is assumed to be comparable to actual experience in terms of both the

likelihood of propagation to involve a single safety system and an in-situ fire leading to the system's loss. Therefore, the likelihood of a fire leading to a loss of redundancy is given by:

$$P(SSL|F) = P(SSL|PR) \cdot P(PR|F) + P(SSL|NPR) \cdot P(NPR|F)$$

$$= [0.4][0.10] + [0.18][0.9]$$

$$= 1.6 \times 10^{-1}$$

where

$P(SSL|PR)$ = likelihood of safety system loss given propagation

$P(PR|F)$ = likelihood of propagation given a fire

$P(SSL|NPR)$ = likelihood of in-situ fire causing loss of safety system

$P(NPR|F)$ = likelihood of nonpropagation given a fire (All values used are from Hockenbury and Yeater)

This calculation provides the following results for the loss of a safety system over the 18-month period of construction.

$$P(SSL) = P(SSL|F) \cdot P(F)$$

$$= (1.6 \times 10^{-1})(4.4 \times 10^{-1})$$

$$= 7.04 \times 10^{-2} \text{ events/year}$$

The comparative results are presented below:

	Existing Configuration (As of July 1, 1982)	Compliance with Appendix R (During Construction)
Site Fire Occurrence Rate	1.67×10^{-1}/year	4.4×10^{-1}/year
DG Basement Fire Occurrence Rate	6.7×10^{-3}/year	4.4×10^{-1}/year
Likelihood of Propagation to a Loss of Redundancy	4×10^{-2}	1.6×10^{-1}
Likelihood of Fire-Induced Loss of Redundancy	2.7×10^{-4}/year	7.0×10^{-2}/year

These results indicate that the occurence for a fire-induced loss of a safety system is over 250 times more likely during the period of construction than at present. Moreover, upon completion of the Appendix R modifications directed towards reducing the likelihood of propagation between divisions, it it unclear just how much additional reactor safety would be provided since such fire-induced losses are so clearly dominated by the fire occurrence rate. Even a 50 percent reduction in the propagation rate made available by the imposition of fire barriers would be lost in the uncertainties of the data and overwhelmed by the hazards associated with major construction activities and the uncertainties and potential faults introduced in new cable splices or an alternate shutdown system. These results only highlight the relative importance of

fire prevention as evidenced in maintenance of the current configuration over fire mitigation as provided in Appendix R. Clearly, as in other aspects of nuclear safety, improvements in the area of mitigation is feasible provided it does not increase the likelihood of the initiating event above the break even point.

On the basis of the inherent fire protection afforded by the existing configuration and the expected reduction in overall facility safety associated with modifications associated with compliance with Appendix R, it is clear that an exemption from the provisions of Section III.G.2 should be granted for the Diesel Generator Basement.

6.4.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) The conservative quantitative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

(2) Ionization smoke detectors are provided with a common area alarm in the control room.

(3) A fixed automatic water suppression system is provided for the coverage of the entire fire zone.

(4) The fixed combustible loading is moderate in the zone due to cable coatings and no allowable storage of transient combustibles.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-4. Evaluation Parameters Summary Table, Fire Zone DG-1 (Units 1 and 2)

A. Zone description

1. Construction/rating

a. Walls

North - Exterior: 30-inch thick reinforced concrete (below grade)

South - Exterior: 30-inch thick reinforced concrete (below grade)

East - Interior: 30-inch thick reinforced concrete (below grade)

West - Exterior: 30-inch thick reinforced concrete (below grade)

b. Floor - Poured-in-place 42-inch concrete slab

c. Ceiling - 12-inch thick reinforced concrete slab on reinforced concrete beams

2. Ceiling height - 20 feet

3. Room volume - Approximately 232,000 cu. ft.

4. Ventilation - 12,330 cfm (manually operated on-off fan)

5. Congestion/Access - Access is provided by two stairways from elevation 23 feet. Ample room exists around DG pedestals.

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Table 6-4. Evaluation Parameters Summary Table, Fire Zone DG-1 (Units 1 and 2) (Cont)

Train A			Train B		
Description	Equip.	Cable	Description	Equip.	Cable
Unit 1 Normal Shutdown					
Service Water System	X	X	Service Water System	X	X
Residual Heat Removal System		X	Residual Heat Removal System		X
Diesel Generator System	X	X	Diesel Generator System	X	X
Electrical Distr. System		X	Electrical Distr. System		X
Ventilating Air System		X	Ventilating Air System		X
Service Water System					
Unit 2 Normal Shutdown					
Service Water System	X	X	Service Water System	X	X
Residual Heat Removal System		X	Residual Heat Removal System		X
Diesel Generator System	X	X	Diesel Generator System	X	X
Electrical Distr. System	X	X	Electrical Distr. System	X	X
Ventilating Air System	X	X	Ventilating Air System	X	X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Equip.	Cable	Description	Equip.	Cable
Unit 1 Normal Shutdown					
Pot. Xfmr DG 3 (F24)	X	X	Pot Xfmr DG 4 (F25)	X	X
Neut. Grd Xfmr DG 3 (F15)	X	X	Neut. Grd Xfmr DG 4 (F16)	X	X
CTL. Xfmr DG 3 (F28)	X	X	CTL. Xfmr DG 4 (F29)	X	X
Pot. Xfmr DG 1 (F22)	X	X	Pot. Xfmr DG 2 (F23)	X	X
Terminal Box (SQ4)	X	X	Terminal Box (SQ4)	X	X
Neut. Grd Xfmr DG 1 (F13)	X	X	Terminal Box (PB5)	X	X
CTL. Xfmr DG 1 (F26)	X	X	Neut. Grd Xfmr DG 2 (F14)	X	X
			CTL. Xfmr DG 2 (F27)	X	X
Unit 2 Normal Shutdown					
Pot. Xfmr DG 3 75 kVA (F24)	X	X	Pot Xfmr DG 4 75 kVA (F25)	X	X
Neut. Grd Xfmr DG 3 (F15)	X	X	Neut. Grd Xfmr DG 4 (F16)	X	X
CTL. Xfmr DG 3 (F28)	X	X	CTL. Xfmr DG 4 (F29)	X	X
Pot. Xfmr DG 1 75 kVA (F22)	X	X	Pot. Xfmr DG 2 75 kVA (F23)	X	X
Neut. Grd Xfmr DG 1 (F13)	X	X	Neut. Grd Xfmr DG 2 (F14)	X	X
CTL. Xfmr DG 1 (F26)	X	X	CTL. Xfmr DG 2 (F27)	X	X

Table 6-4. Evaluation Parameters Summary Table, Fire Zone DG-1 (Units 1 and 2) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables, transformers.

2. Quantity of combustibles: Transformers - One potential, control, and neutral grounding transformer at each diesel generator pedestal. Cables - Four tray average, approximately 4,600 Lineal feet, medium to heavy density (cable coating has been applied to 90%+ of the exposed cabling).

3. Ease of ignition and propagation: Cables are non-propagating.

4. Suppression damage to equipment - None; electrical equipment is protected from sprinkler water damage by shields. Vital electrical equipment is mounted above the floor to protect against accumulated water. Above adjacent zones will not be affected by suppression in this zone.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on the ceiling.

2. Automatic suppression systems - Wet-pipe system, utilizing automatic on/off sprinkler heads and some closed heads

Table 6-4. Evaluation Parameters Summary Table, Fire Zone DG-1 (Units 1 and 2) (Cont)

charged with water. The water supply is provided with a one-head bypass of the deluge valve feature. The deluge valve is automatically operated upon actuation of the detection system and flow in the bypass.

3. Hose station/extinguisher:

   a. Distance to hose stations - Hose reel stations with 75-foot hose are 60 feet apart, 33 feet from the center of the fire zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.5 Fire Zone DG-7 (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2; i.e., the requirement for greater than 20 feet of horizontal separation between required components with no intervening combustibles and the requirement for automatic fixed suppression.

6.5.1 Area Description

Fire zone DG-7 is located in the northwest corner of the 23 foot elevation of the Diesel Generator Building. This zone has an 8- to 12-inch thick reinforced concrete slab floor and an 8-inch thick concrete slab ceiling separating this zone from the fire zones above and below. The north and west exterior walls are 24-inch thick reinforced concrete and the south wall is 8- to 12-inch thick reinforced concrete/concrete block construction. The east wall is 8-inch thick, reinforced concrete block wall. All cables entering this zone have fire seals for combustible pathway penetration. Access to fire Zone DG-7 is via a key card access door in the north wall or fire doors in the south and east walls. A stairway with a rated enclosure leads down to the fire zone below. The height of the ceiling is 26 feet 4 inches. The arrangement of Division A and B cable trays and conduits is contained in Book 3 of this report.

6.5.2 Safe Shutdown Equipment

Fire zone DG-7 contains Train B Electrical Distribution System equipment and cables and Train A cables to several hot safe shutdown systems. The Train B hot safe shutdown circuits, with the exception of a single conduit, consist of a series of motor control cabinets (MCCs) and transformer cabinets located in the center of the zone. The Train A circuits are cable trays and conduits high in the ceiling over the Train B components, and several Train A conduits run vertically up the west wall.

The safe shutdown evaluation performed for fire zone DG-7 identified the coexistence of redundant hot safe shutdown circuits with less than 20 feet of horizontal separation. A fire hazards analysis has been performed to evaluate the existing configuration. The following sections document the considerations, assumptions, results and conclusions of the analysis performed.

6.5.3 Fire Protection Systems

Fire zone DG-7 is provided with smoke sensitive fire detectors suitably arranged throughout the zone which alarm individually at a local control panel and subsequently provide a common fire zone alarm in the control room. A manual 1-1/2-inch hose reel station is located in the adjacent zone, DG-5.

6.5.4 Fire Hazards Analysis

The fixed combustible loading for this zone is due almost entirely to cable insulation, which is relatively light. The

cables within this zone meet the intent of IEEE-383 and as such posses good fire resistance.

The remaining source of combustible material within this zone falls under the category of transient combustibles. This fire zone has a low level of general maintenance activities and is not generally used as a passageway to other zones. The level of transient combustibles for this fire zone is relatively low. Storage of transient combustibles in fire zone DG-7 is not permitted by plant administrative control procedures, and significant accumulation of such material would be readily noticed and expeditiously removed.

The fire hazards analysis postulates the presence of sufficient quantities of liquid hydrocarbons in the optimum geometry necessary to damage critical cables of redundant divisions. In the performance of this analysis, the cables of interest were assumed to be cross-linked polyethylene insulated with polyvinylchloride jackets. Polyvinyl chloride jacketed cables are not used at BSEP for any circuit but were specifically selected primarily because they are more susceptible to fire-induced damage than cables with different jacket materials. Such considerations ensure that this analysis is bounding for all cable types.

After selection of cable type, the remaining issue of the particular fuel to be assumed in the calculation was considered. Heptane (gasoline) was selected as the fuel of concern even though it is not reasonably expected to be found within this zone. Heptane is commonly used on-site for portable equipment, but such equipment is prohibited inside vital areas. Heptane was selected primarily due

to its high heat release rate and low flash point so as to ensure that this analysis is bounding for all fuel types.

The appendices provide the basis for which heat is assumed to be released from the combustion of heptane. These values are extremely conservative so as to ensure that the bounding nature of this analysis is preserved. The combustible properties of heptane were assumed as follows:

Heat of Combustion	(kJ/g)
Convection	21.6
Radiative	17.4
Actual	39.0
Theoretical	44.6

Vaporization Rate	(g/m^2-s)
Highly Luminous Flame	70

Heat Release Rate	(kW/m^2)
Convective	1512
Radiative	1218
Actual	2730

Except for the buildup of the stratified layer near the ceiling, all analyses postulated instantaneous achievement of steady state combustion conditions. For radiative and plume calculations, this translates to the instantaneous achievement of a gas temperature of 982C (1800F) with a total emissivity of 0.3 (0.2 for gaseous products, 0.1 for luminous soot). In addition steady state buoyant

plume velocities were assumed to be achieved at the same time. These assumptions result in maximizing the heat transfer rate and the cable damage process, thereby bounding less severe fires involving the same fuel quantity and geometry.

In analyzing the effects of these severe fires the appropriate selection of a damage criterion is very important. This analysis focused on the minimum conditions necessary to cause a loss of circuit function via electrical failure. To ensure that the severity of these conditions was maximized, no credit was taken for the use of conduit as a thermal shield from radiation or as a baffle from the effects of impingement of hot gases. Thus, these steel components were assumed to be completely transparent to radiation and to have absolutely no thermal lag.

The damage threshold for electrical cables is based upon research performed by Factory Mutual Research Corporation. Cross-linked polyethylene insulated cables with polyvinyl chloride jackets were tested with and without fire retardant coatings. The cable samples without coatings indicated failure (short circuiting a 70-Vdc signal under piloted ignition conditions) with a critical heat flux of 14 kW/m^2 and a critical energy of 10,000 kJ/m^2. The coated cable samples indicated failure with a critical heat flux of 16 kW/m^2 and a critical energy of 21,800 kJ/m^2.

6.5.4.1 Combustion Gas Stratification - The safe shutdown circuits for fire zone DG-7 were first analyzed for possible damage due to the effects of ceiling stratification of exposure fire combustion

gases. The purpose of this analysis step was to determine the degree of passive protection provided by the existing configuration. In the case of stratification horizontal separation offers little inherent protection for any given cable height. The limiting condition for this analysis is the highest cables, which, for the case of this zone, is essentially ceiling height. The exposure fire was postulated to occur adjacent to the Train B (MCC) and could cause failure of those circuits due to radiation and/or direct plume empingement while the Train A cables would be subject to ceiling stratification.

Using these assumptions, analysis indicates that the smallest quantity of heptane which could cause redundant circuit failure would be 24.8 gallons spilled over a circular area with an effective diameter of at least 4.4 feet. Under these circumstances achievement of the failure criterion does not occur until at least 604 seconds after pool ignition. In this case the model fire would have to be approximately 72 mm deep, a depth which is almost 83 times greater than that expected from a spill of heptane on a horizontal surface of concrete.

The analysis results for fire zone DG-7 indicate that the quantity of heptane required to cause redundant circuit failure would be an incredible amount given the existing fire protection features and administrative controls for fire zone DG-7. Because the ceiling stratification failure minimum volume was such a large quantity of flammable liquid, it was not used as a baseline for

proposing modifications for this zone. To protect redundant circuits from radiation and fire plume impingement to the degree which exists for combustion gas stratification, i.e., 24.8 gallons of heptane, would not provide additional protection to public health and safety in that almost 25 gallons of heptane is an excessive quantity of fuel to be postulated for this fire zone even with the assumption of a total breakdown in administrative controls. For fire zone DG-7, a baseline quantity of 20 gallons of heptane was established. This quantity is still an incredible amount for the zone and will ensure that adequate protection is provided for redundant hot shutdown circuits without requiring excessive modifications to the zone which would not provide significant additional protection to public health and safety.

6.5.4.2 Direct Radiation - Prior to a discussion of the modeling results due to the affects of direct radiation and convective heat transfer due to direct plume impingement, specific modifications are proposed for this zone. These modifications are intended to assure that redundant hot shutdown circuits are protected from the exposure fire effects of plume impingement and radiation to a degree commensurate with the fire effects of the maximum credible exposure for of 20 gallons of heptane. The specific modifications listed below are proposed for fire zone DG-7 circuits:

(1) Conduits 7AH1/CA and 7AH2/CA will be completely enclosed in an appropriate fire barrier until 210 inches from the floor.

(2) Conduit 9MD1/BB will be completely enclosed in an appropriate fire barrier until 256 inches from the floor. This train B conduit was selected for protection because it is easier to protect this single conduit than the five train A conduits near by. The 256-inch height was used as it is the lowest height of the vent fan which this conduit powers, and if the 256-inch height can be proved to be satisfactory then no modifications to the vent fan will be required.

With the above described modifications assumed to be in place the circuits for fire zone DG-7 were individually analyzed for potential damage due to radiant energy deposition. With the Train B conduit protected as described above, the horizontal separation used in this analyses was between the Train B (MCC) and the individual Train A cable being analyzed. Each Train A safe shutdown cable tray section and conduit was subsequently analyzed and the minimum volume of heptane required to reach the defined failure criteria was greater than 20 gallons in every case. In addition the single Train B conduit at an assumed elevation of 256 inches with no horizontal separation credited also had a minimum volume of heptane required to reach the failure criteria greater than 20 gallons. Because the minimum required volume of heptane for radiation failure in this fire location is greater than that defined as the maximum credible fire for fire zone DG-7, this analysis has demonstrated that further horizontal separation beyond that which presently exists would not provide additional protection to public health and safety.

6.5.4.3 Plume Impingement - The effects of direct fire plume impingement upon circuits in fire zone DG-7 were analyzed assuming that the specific modifications detailed in section 6.5.4.2 were in place.

With the Train B conduit protected as described in section 6.5.4.2, the existing horizontal separation in this analysis was between the Train B (MCC) and the individual Train A cable being analyzed. Each Train A safe shutdown cable tray section and conduit was subsequently analyzed and the minimum volume of heptane required to reach the defined failure criteria was greater than 20 gallons in every case. In addition, the single Train B conduit at an assumed elevation of 256 inches with no horizontal separation credited also had a minimum volume of heptane required to reach the defined failure criteria greater than 20 gallons. Because the minimum required volume of heptane for plume impingement failure in this fire location is greater than that defined as the maximum credible fire for fire zone DG-7, this analysis has demonstrated that further horizontal separation beyond that which presently exists would not provide additional protection to public health and safety.

The pool diameter in the postulated spill impacts the thermal conditions predicted for such a fire. To that extent, spill diameter is as important as the volume in determining the smallest quantity of fuel necessary to achieve the damage criteria. Increasing or decreasing the fire diameter would imply a resulting pool fire involving greater quantities of fuel in order to provide the same energy flux at the locations of interest. Smaller diameters, for example, would require longer-burning fires with greater fuel depth in order to achieve the same incident energy flux on a cable, while larger diameter fires would need larger quantities of fuel to cover

the wider area, albeit at lesser depths. These results further demonstrate that for the extremely conservative assumptions utilized in this model, it is not possible for lesser quantities of heptane to exceed the cable damage for both divisions under any circumstances irrespective of fire location.

The model results demonstrate that containment of the 20 gallons of heptane necessary to initiate failure in both divisions to an optimum geometry is an unrealistic condition. Actual plant storage provisions and operating practices further demonstrate that it would be extremely difficult to accumulate 20 gallons of heptane anywhere within the plant, much less at the precise location and in the precise geometry determined by this analysis to be necessary for redundant cable failure.

Departing from the conservatisms of analysis, it should be stated that the existing configuration can be expected to provide sufficient passive protection against even greater quantities of heptane than that reported above with the precise value depending on how realistically a "best estimate" analysis is performed. Elements to be considered in a more realistic analysis might include the response of automatic detectors and of installed manual suppression systems in the area, the value of administrative controls in reducing the likelihood of substantial fuel quantities, and anticipated operator actions relative to achieving safe shutdown while a fire is in progress.

Fire zone DG-7 relies upon a properly balanced approach to fire protection which includes a comprehensive site fire prevention provided passively by the existing configuration, automatic detection, and manual firefighting. This balanced approach was developed in response to the Browns Ferry fire and reflects the guidance provided by Branch Technical Position APCSB 9.5-1.

The conservative quantitative fire hazards analysis described herein, in addition to the proposed modification, demonstrate protection of fire zone DG-7 safe shutdown cables from electrical failure resulting from any reasonable exposure fire postulated in the plant regardless of horizontal separation. The moderate combustible loading, together with fire protection features described in this analysis, demonstrate that other additional modifications would not enhance fire protection of the safe shutdown capability.

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours. Table 6.5a contains a listing of those boundaries for fire zone that;

1) do not meet the separation criteria of Section III.G, and

2) provides a basis for acceptability for the zone boundary with no additional modifications, or

3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Table 6.5a Fire Zone DG-7

Zone Boundary	Deviation from III.G	Proposed Modification	Basis for Acceptability
Floor	Non-rated equipment hatch	None	1. Combustibles in area above hatch consists of one cable tray located >21 feet above floor. 2. Automatic suppression and detection exists throughout entire zone below (DG-1). 3. Detection exists in zone. 4. All cables (+90%) in zone below (DG-1) are coated with fire-retardant material. 5. Hatch cover normally in place (precluding flame propagation).

6.5.5 Conclusion

Based on the previous analysis, exemption is required from the 20-foot separation and automatic suppression requirements as prescibed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

(2) Photoelectric smoke detectors are provided with a common area alarm in the control room.

(3) The fixed combustible loading is low in fire zone DG-7 with no allowable storage of transient combustibles.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-5. Evaluations Parameters Summary Table, Fire Zone DG-7 (Units 1 and 2)

A. Zone description

1. Construction

a. Walls

North - Exterior: 24-inch thick reinforced concrete

South - Interior (west part): 12-inch thick reinforced concrete

- Interior (east part): 8-inch thick reinforced concrete block

East - Interior: 8-inch thick reinforced concrete block

West - Exterior: 24-inch thick reinforced concrete with blow-out panel (4 ft 2 in. by 20 ft)

b. Floor - 8- and 12-inch thick reinforced concrete slab on reinforced concrete beams

c. Ceiling - 8-inch thick reinforced concrete slab on reinforced concrete beams

2. Ceiling height - 26 feet 4 inches

3. Room volume - Approximately 26,305 cu. ft.

4. Ventilation - 11,070 cfm supply from the DG ventilation system and 11,070 cfm exhaust to the outside via a thermostatically controlled exhaust fan

Table 6-5. Evaluations Parameters Summary Table, Fire Zone DG-7 (Units 1 and 2) (Cont)

5. Congestion/Access - This zone is accessible through three doorways (two from adjacent zones and one from the outside)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Unit 1 and 2:					
DG System		X			
RHR System		X			
Electrical Distr. System		X	Electrical Distr. System		X
Service Water System		X			
			Ventilating Air System	X	X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Unit 1:					
			480V Unit Sub. E6	X	X
			Solenoid 2VA-SV-1616 (S56)	X	X
NONE			Temp. Switch 2VA-TS-1616 (TY9)	X	X
			CTL. Switch 2VA-CS-1616 (H86)	X	X
			Exhaust Fan J-EE-DG (NR9)	X	X
Unit 2:					
			480V Unit Sub. E6	X	
			DMPR Control 2VA-SV-1616 (S56)	X	X
NONE			Vent Fan TS 2VA-TS-1616 (TY9)	X	X
			Temp SW TSH-2675 (H86)	X	X
			DG2 EXH. Fan J-EF-DG (NR9)	X	X

Table 6-5. Evaluations Parameters Summary Table, Fire Zone DG-7 (Units 1 and 2) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables and grease

2. Quantity of combustibles:

Grease - small amount in fan assembly

Cables - One tray, approximately 100 lineal feet, medium to heavy density; one dry type transformer

3. Ease of ignition and propagation: Cables are non-propagating. Grease is not considered flammable due to its high ignition point.

4. Suppression damage to equipment - Fire brigade personnel are trained to avoid spraying vital equipment with water and to use CO_2 extinguishers on electrical equipment.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on the ceiling

2. Automatic suppression systems - None

Table 6-5. Evaluations Parameters Summary Table, Fire Zone DG-7 (Units 1 and 2) (Cont)

3. Hose station/extinguisher

   a. Distance to hose stations - One water hose reel station with 75-foot hose in the adjacent zone (DG-5) about 25 feet from the zone centroid.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.6 Fire Zone DG-8 (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2; i.e., the requirement for greater than 20 feet of horizontal separation between required components with no intervening combustibles and the requirement for automatic fixed suppression.

6.6.1 Area Description

Fire zone DG-8 is located in the southwest corner of the 23 foot elevation of the Diesel Generator Building. This zone has an 8- to 12-inch thick reinforced concrete slab floor and an 8-inch thick concrete slab ceiling separating this zone from the fire zones above and below. The south and west exterior walls are 24-inch thick reinforced concrete, and the north and east walls are 8-inch thick reinforced concrete block interior walls. All cables entering this zone have fire seals for combustible pathway penetration. Access to fire zone DG-8 is via a key card access door in the south wall or fire doors in the north and east walls. A stairway, with a rated enclosure, leads down to the fire zone below. The height of the of the ceiling is 26 feet 4 inches. The arrangement of Division A and B cable trays and conduits is contained in Book 3 of this report.

6.6.2 Safe Shutdown Equipment

Fire zone DG-8 contains Train A Electrical Distribution System equipment and cables and Train B cables for several hot safe

shutdown systems and fire protection cabinets and circuits of both divisions.

The Train A hot safe shutdown circuits consist chiefly of (1) a series of motor control cabinets (MCCs) and transformer cabinets located in the east end of the zone; (2) a few fire protection cabinets along the north and south wa ls along with associated conduits; and (3) a vent fan and atta ned conduit on the west wall. The Train B circuits are in cable tra s and conduits high in the ceiling in the northwest section of this zone. The separation between the Train B cables and the Train A MCCs is generally good.

The safe shutdown evaluation performed for fire zone DG-8 identified the coexistence of redundant hot safe shutdown circuits with less than 20 feet of horizontal separation. A fire hazards analysis has been performed to evaluate the existing configuration. The following sections document the considerations, assumptions, results and conclusions of the analysis performed.

6.6.3 Fire Protection Systems

Fire zone DG-8 is provided with smoke sensitive fire detectors suitably arranged throughout the zone which alarm individually at a local control panel and subsequently provide a common fire zone alarm in the control room. A manual 1-1/2-inch hose reel station is located in the adjacent zone, DG-8.

6.6.4 Fire Hazards Analysis

The fixed combustible loading for this zone is due almost entirely to cable insulation, which is relatively light. The

cables within this zone meet the intent of IEEE-383, and as such possess good fire resistance.

The remaining source of combustible material within this zone falls under the category of transient combustibles. This fire zone has a low level of general maintenance activities but is often used as a passageway to other zones in the Diesel Generator Building. The level of transient combustibles, other than lubricating oil is relatively low given the nature of maintenance work in this building. Lubricating oil is not considered a significant transient combustible due to lack of a credible ignition source within fire zone DG-8. No suitable hot surfaces exist in this zone to raise lubricating oil to above its flash point, and the magnitude of an exposure fire necessary to light any postulated oil spill would be an incredible fire for this zone and could cause redundant circuit damage in and of itself. For these reasons, lubricating oil is not considered as a transient combustible, and therefore the general level of transient combustibles for this zone is considered to be moderate. Storage of transient combustibles in fire zone DG-8 is not permitted by plant administrative control procedures, and significant accumulation of such material would be readily noticed and expeditiously removed.

This fire hazards analysis postulates the presence of sufficient quantities of liquid hydrocarbons in the optimum geometry necessary to damage critical cables of redundant divisions. In the performance

of this analysis, the cables of interest were assumed to be cross-linked polyethylene insulated with polyvinyl chloride jackets. Polyvinyl chloride jacketed cables are not used at BSEP for any circuit but were specifically selected primarily because they are more susceptible to fire-induced damage than cables with different jacket materials. Such considerations ensure that this analysis is bounding for all cable types.

After selection of cable type, the remaining issue of the particular fuel to be assumed in the calculation was considered. Heptane (gasoline) was selected as the fuel of concern even though it is not reasonable expected to be found within this zone. Heptane is commonly used on-site for portable equipment, but such equipment is prohibited inside vital areas. Heptane was selected primarily due to its high heat release rate and low flash point so as to ensure that this analysis is bounding for all fuel types. The appendices provide the basis for which heat is assumed to be released from the combustion of heptane. These values are extremely conservative so as to ensure that the bounding nature of this analysis is preserved. The combustible properties of heptane were assumed as follows:

Heat of Combustion	(kJ/g)
Convective	21.6
Radiative	17.4
Actual	39.0
Theoretical	44.6

Vaporization Rate	(g/m^2-s)
Highly Luminous Flame	70

Heat Release Rate	(kW/m^2)
Convective	1512
Radiative	1218
Actual	2730

Except for the buildup of the stratified layer near the ceiling, all analyses postulated instantaneous achievement of steady state combustion conditions. For radiative and plume calculations, this translates to the instantaneous achievement of a gas temperature of 982°C (1800°F) with a total emissivity of 0.3 (0.2 for gaseous products, 0.1 for luminous soot). In addition, steady-state buoyant plume velocities were assumed to be achieved at the same time. These assumptions result in maximizing the heat transfer rate and the cable damage process, thereby bounding less severe fires involving the same fuel quantity and geometry.

In analyzing the effects of these severe fires the appropriate selection of a damage criterion is very important. This analysis focused on the minimum conditions necessary to cause a loss of circuit function via electrical failure. To ensure that the severity of these conditions was maximized, no credit was taken for the use of conduit as a thermal shield from radiation or as a baffle from the effects of impingement of hot gases. Thus, these steel components were assumed to be completely transparent to radiation and to have absolutely no thermal lag.

The damage threshold for electrical cables is based upon research performed by Factory Mutual Research Corporation. Cross-linked polyethylene insulated cables with polyvinyl chloride jackets were tested with and without fire retardant coatings. The cable samples without coatings indicated failure (short circuiting a 70-Vdc signal under piloted ignition conditions) with a critical heat flux of 14 kW/m^2 and a critical energy of 10,000 kJ/m^2. The coated cable samples indicated failure with a critical heat flux of 16 kW/m^2 and a critical energy of 21,800 kJ/m^2.

6.6.4.1 Combustion Gas Stratification - The safe shutdown circuits for fire zone DG-8 were first analyzed for possible damage due to the effects of ceiling stratification of exposure fire combustion gases. The purpose of this analysis step was to determine the degree of passive protection provided by the existing configuration. In the case of stratification horizontal separation offers little inherent protection for any given cable height. The limiting condition for this analysis is the highest redundant cables, which, for the case of this zone, is essentially ceiling height. The exposure fire was postulated to occur adjacent to the Train A MCC and could cause failure of these circuits due to radiation and/or direct plume impingement, while the Train B cables would be subject to ceiling stratification.

Using these assumptions, analysis indicates that the smallest quantity of heptane which could cause redundant circuit failure would be 24.8 gallons spilled over a circular area with an effective

diameter of at least 4.4 feet. Under these circumstances achievement of the failure criterion does not occur until at least 604 seconds after pool ignition. In this case the model fire would have to be approximately 62 mm deep, a depth which is almost 83 times greater than that expected from a spill of heptane on a horizontal surface of concrete.

The analysis results for fire zone DG-8 indicate that the quantity of heptane required to cause redundant circuit failure would be an incredible amount given the existing fire protection features and administrative controls for fire zone DG-8. Because the ceiling stratification failure minimum volume was such a large quantity of flammable liquid, it was not used as a baseline for proposing modifications for this zone. To protect redundant circuits from radiation and fire plume impingement to the degree which exists for combustion gas stratification, i.e., 24.8 gallons of heptane, would not provide additional protection to public health and safety in that almost 25 gallons of heptane is an excessive quantity of fuel to be postulated for this fire zone even with the assumption of a total breakdown in administrative controls. For fire zone DG-8 a baseline quantity of 20 gallons of heptane was established. This quantity is still an incredible amount for the zone and will ensure that adequate protection is provided for redundant hot shutdown circuits without requiring excessive modifications to the zone which would not provide significant additional protection to public health and safety.

6.6.4.2 Direct Radiation - Prior to a discussion of the modeling results due to the affects of direct radiation and convective heat transfer due to direct plume impingement, specific modifications are proposed for this zone. These modifications are intended to assure that redundant hot shutdown circuits are protected from the exposure fire effects of plume impingement and radiation to a degree commensurate with the fire effects of the maximum credible exposure fire of 20 gallons of heptane. The specific modifications listed below are proposed for fire zone DG-8 circuits:

(1) Conduits 2QH1/CB and 9UN2/CB will be completely enclosed in an appropriate fire barrier.

(2) Conduit 9NH1/BA will be completely enclosed in an appropriate fire barrier until 256 inches from the floor. This Train A conduit was selected for protection because it is better to protect this single conduit than the four Train B conduits nearby. The 256-inch height was used as it is the lowest height of the vent fan which this conduit powers, and if the 256-inch height can be proved to be satisfactory then no modifications to the vent fan will be required.

With the above described modifications assumed to be in place the circuits for fire zone DG-8 were individually analyzed for potential damage due to radiant energy deposition. With the Train B conduit protected as described above the existing horizontal separation used in this analysis was between the nearest Train A cable and the Train B circuit being analyzed. Each Train B safe shutdown cable tray section and conduit was separately analyzed and the minimum volume of heptane required to reach the defined failure criteria was greater than 20 gallons in every case. In addition the single Train A conduit at an assumed elevation of 256 inches

with no horizontal separation credited also had a minimum volume of heptane required to reach the failure criteria greater than 20 gallons. Because the minimum required volume of heptane for radiation failure in this fire location is greater than that defined as the maximum credible fire for fire zone DG-8, this analysis has demonstrated that further horizontal separation beyond that which presently exists would not provide additional protection to public health and safety.

6.6.4.3 Plume Impingement - The effects of direct fire plume impingement upon circuits in fire zone DG-8 were analyzed assuming that the specific modifications detailed in section 6.6.4.2 were in place. With the Train A conduit protected as described in section 6.6.4.2, the existing horizontal separation in this analysis was between the nearest Train A cable and the individual Train B cable being analyzed. Each Train B safe shutdown cable tray section and conduit was subsequently analyzed and the minimum volume of heptane required to reach the defined failure criteria was greater than 20 gallons in every case. In addition, the single Train A conduit at an assumed elevation of 256 inches with no horizontal separation credited also had a minimum volume of heptane required to reach the defined failure criteria greater than 20 gallons. Because the minimum required volume of heptane for plume impingement failure in this fire location is greater than that defined as the

maximum credible fire for fire zone DG-8, this analysis has demonstrated that further horizontal separation beyond that which presently exists would not provide additional protection to public health and safety.

The pool diameter in the postulated spill impacts the thermal conditions predicted for such a fire. To that extent, spill diameter is as important as the volume in determining the smallest quantity of fuel necessary to achieve the damage criteria. Increasing or decreasing the fire diameter would imply a resulting pool fire involving greater quantities of fuel in order to provide the same energy flux at the locations of interest. Smaller diameters, for example, would require longer-burning fires with greater fuel depth in order to achieve the same incident energy flux on a cable while larger diameter fires would need larger quantities of fuel to cover the wider area, albeit at lesser depths. These result further demonstrate that for the extremely conservative assumptions utilized in this model, it is not possible for lesser quantities of heptane to exceed the cable damage criteria for both divisions under any circumstances irrespective of fire location.

The model results demonstrate that containment of the 20 gallons of heptane necessary to initiate failure in both divisions to an optimum geometry is an unrealistic condition. Actual plant storage provisions and operating practices further demonstrate that it would be extremely difficult to accumulate 20 gallons of heptane anywhere within the plant, much less at the precise location and in

the precise geometry determined by this analysis to be necessary for redundant cable failure.

Departing from the conservatisms of analysis, it should be stated that the existing configuration can be expected to provide sufficient passive protection against even greater quantities of heptane than that reported above with the precise value depending on how realistically a "best estimate" analysis is performed. Elements to be considered in a more realistic analysis might include the response of automatic detectors and of installed manual suppression systems in the area, the value of adminstrative controls in reducing the likelihood of substantial fuel quantities, and anticipated operator actions relative to achieving safe shutdown while a fire is in progress.

Fire zone DG-8 relies upon a properly balanced approach to fire protection which includes a comprehensive site fire prevention provided passively by the existing configuration, automatic detection, and manual firefighting. This balanced approach was developed in response to the Browns Ferry fire and reflects the guidance provided by Branch Technical Position APCSB 9.5-1.

The conservative quantitative fire hazards analysis described herein, in addition to the proposed modification, demonstrate protection of fire zone DG-8 safe shutdown cables from electrical failure resulting from any reasonable exposure fire postulated in the plant regardless of horizontal separation. The moderate combustible loading, together with fire protection features described in this

analysis, demonstrate that other additional modifications would not enhance fire protection of the safe shutdown capability.

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.6a contains a listing of those boundaries for fire zone that;

1) do not meet the separation criteria of Section III.G, and

2) provides a basis for acceptability for the zone boundary with no additional modifications, or

3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Table 6.6a Fire Zone DG-8

Zone Boundary	Deviation from III.G	Proposed Modification	Basis for Acceptability
Floor	Non-rated equipment hatch	None	1. Automatic Suppression exists throughout zone below (DG-1) 2. Detection exists in zone. 3. All cables (+90%) in zone below (DG-1) are coated with flame-retardant coating. 4. Hatch construction precludes propagation of flame from below. 5. Fixed combustibles are extremely low in zone.

6.6.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescibed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

(2) Photoelectric smoke detectors are provided with a common area alarm in the control room.

(3) The fixed combustible loading is low in fire zone DG-8, with no allowable storage of transient combustibles.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-6. Evaluations Parameters Summary Table, Fire Zone DG-8 (Units 1 and 2)

A. Zone description

1. Construction

a. Walls

North - Interior: 8-inch thick reinforced concrete

South - Exterior: 24-inch thick reinforced concrete

East - Interior: 8-inch reinforced concrete block

West - Exterior: 24-inch thick reinforced concrete with blow-out panel (4 feet 2 inches by 20 feet) unrated

b. Floor - 8- and 12-inch thick reinforced concrete slab on reinforced concrete beams

c. Ceiling - 8-inch thick reinforced concrete slab on reinforced concrete beams

2. Ceiling height - 26 feet 4 inches

3. Room volume - Approximately 31,405 cu.ft.

4. Ventilation - 11,070 cfm supply from the DG ventilation system and 11,070 cfm exhaust to the outside via a thermostatically controlled exhaust fan

5. Congestion/Access - This zone is accessible from three adjacent doorways.

Table 6-6. Evaluations Parameters Summary Table, Fire Zone DG-9 (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Unit 1:					
Electrical Distr. System	X	X	Electrical Distr. System		X
Ventilating Distr. System	X	X	DG Sys.		X
			Ventilating Air System	X	X
			Service Water Sys.		X
			RHR Sys.		X

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Unit 2:					
Electrical Distr. System	X	X	Electrical Distr. System		X
Ventilating Distr. System	X	X	DG Sys.		X

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Fire Detection Cabinet (J32)	X	X			
Fire Detector Relay Cab. (HD9)	X	X	Fire Detector Relay Cab. (HD9)	X	X
Exhaust Fan K-EF-DG (NQØ)					
CTL Switch 2VA-CS-1617 (487)					
Temp. Switch 2VA-TS-1617 (TZØ)	X	X			
480V Unit Sub. E7	X	X			
Solenoid 2VA-SV-1617 (S57)	X	X			

Table 6-6. Evaluations Parameters Summary Table, Fire Zone DG-8 (Units 1 and 2) (Cont)

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Unit 2:			NONE		
Fire Det Cu Die Gen Bldg. (J32)	X	X			
Fire Detector Relay Cab (HD9)	X	X			
DG3 Exhaust Fan K-EF-DG (NQØ)	X	X			
Vent Fan Ctl 2VA-CS-1617 (H87)	X	X			
DMPR Control 2VA-SV-1617 (S57)	X	X			
SWGR Rm Temp VA-TS-167 (TZØ)	X	X			
480V Unit Sub E7	X				

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables and grease

2. Quantity of combustibles:

   Grease - small amount in fan assembly

   Cables - One tray, approximately 30 lineal feet

3. Ease of ignition and propagation: Cables are non-propagating. Grease is not considered a source of fire ignition because of its high flash point.

Table 6-6. Evaluations Parameters Summary Table, Fire Zone DG-8 (Units 1 and 2) (Cont)

4. Suppression damage to equipment - Fire brigade personnel are trained to avoid spraying of vital equipment with water and to use CO_2 extinguishers on electrical equipment.

D. Fire Protection Existing

1. Fire detection systems - Six ionization detectors on ceiling

2. Automatic suppression systems - None

3. Hose station/extinguisher

a. Distance to hose stations - One water hose reel station with 75 foot hose, in the adjacent zone (DG-2) about 25 feet from the zone centroid.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.7 Fire Zone DG-11 (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

6.7.1 Area Description

This fire zone comprises the Diesel Generator Building at column lines U to V and 8D to 15 feet south of 9D at elevation 50 feet. Fire zone DG-11 is bounded by a 24-inch thick reinforced wall to the north and west and by 8-inch thick reinforced concrete block walls to the south and west. The floor and ceiling are 8- and 24-inch thick reinforced concrete slabs, respectively. The ceiling height is 17 feet. Room ventilation is 4410 cfm.

6.7.2 Safe Shutdown Equipment

Fire zone DG-11 contains cable and equipment associated with the RHR, Service Water, Electrical Distribution and Ventilating Air Systems.

6.7.3 Fire Protection Systems

Fire zone DG-11 contains an ionization smoke detector connected to a control room annunciator. A manual 1-1/2-inch. hose station is located in zone DG-12 40 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.7.4 Fire Hazards Analysis

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.7a contains a listing of those boundaries for fire zone that;

1) do not meet the separation criteria of Section III.G, and

2) provides a basis for acceptability for the zone boundary with no additional modifications, or

3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Table 6.7a Fire Zone DG-11

Zone Boundary	Deviation from III.G	Proposed Modification	Basis for Acceptability
Floor	Non-rated equipment hatch	None	1. Combustible loading of fire zone below is extremely low (DG-7). 2. Detection exists in zones DG-11 and DG-7. 3. Moderate number of cables is only fixed combustible in zone.

6.7.5 Conclusions

Based on previous analysis, exemption is requested from the separation requirement as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

1) Ionization smoke detectors are provided with a common area alarm in the control room.

2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

3) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-7. Evaluations Parameters Summary Table, Fire Zone DG-11 (Units 1 and 2)

A. Zone description

1. Construction

a. Walls

North - Exterior: 24-inch thick reinforced concrete

South - Interior: 8-inch thick reinforced concrete block

East - Interior: 8-inch thick reinforced concrete block

West - Exterior: 24-inch thick reinforced concrete

b. Floor - 8-inch thick reinforced concrete slab on reinforced concrete beams

c. Ceiling - 24-inch thick reinforced concrete slab

2. Ceiling height - 17 feet

3. Room volume - Approximately 16,265 cu. ft.

4. Ventilation - 4410 cfm supply and exhaust from the DG ventilation system. The exhaust fan is thermostatically controlled.

5. Congestion/Access - This zone is accessible from three adjacent doorways.

Table 6-7. Evaluations Parameters Summary Table, Fire Zone DG-11 (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Equip.	Cable	Description	Equip.	Cable
RHR System		X			
Service Water System	X	X			
Electrical Distr. System	X	X	NONE		
DG System		X			
Ventilating Air System	X	X			

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Equip.	Cable	Description	Equip.	Cable
Distr. Pnl. 1A-DG XFMR (GF2)	X	X			
Distr. Pnl. 1A-DG (H32)	X	X			
DC Distr. Pnl. 1A (HA7)	X	X			
RHR Serv. Wtr. Pmp. 1C CTL Cab. (H8Ø)	X	X			
Exhaust Fan A-EF-DG (NR6)	X	X			
CTL Switch 2VA-CS-1611 (N29)	X	X			
Solenoid 2VA-SV-1611 (S51)	X	X			
Temp. Switch 2VA-TS-1611 (TY4)	X	X	NONE		
Junction Box (CTL) (ZU8)	X	X			
4160V Swgr. E1	X	X			
DG 1 Exhaust Fan A-EF-DG (NR6)	X	X			
Vent Fan Ctl 2VA-CS-1611 (N29)	X	X			
DMPR Control 2VA-SV-1611 (S51)	X	X			
Vent Fan TS 2VA-TS-1611 (TY4)	X	X			
4160 V Swgr E1	X	X			

Table 6-7. Evaluations Parameters Summary Table, Fire Zone DG-11 (Units 1 and 2) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables and grease

2. Quantity of combustibles:

Grease -

Cables - moderate number of cables

3. Ease of ignition and propagation: Cables are non-propagating

4. Suppression damage to equipment -

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors

2. Automatic suppression systems - None

3. Hose station/extinguisher

a. Distance to hose stations - None in this zone. However, one water hose reel station in adjacent fire zone DG-12 is 40 feet from the center of this zone.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NPFP 10 criteria or closer as circumstances require.

6.8 Fire Zone DG-14 (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

6.8.1 Area Description

This fire zone comprises the Diesel Generator Building at column lines U to V and 14D to approximately 25 feet north of 13D at elevation 50 feet. Fire zone DG-14 is bounded by 8-inch thick reinforced concrete block walls to the north and east and 24-inch thick reinforced concrete walls to the south and west. The floor and ceiling are 8- and 24-inch thick reinforced concrete slabs, respectively.

6.8.2 Safe Shutdown Equipment

Fire zone DG-14 contains cables and equipment associated with the Diesel Generator, RHR, Service Water, and Electrical Distribution Systems necessary for safe shutdown.

6.8.3 Fire Protection Systems

Fire zone DG-14 contains ionization detectors connected to a control room annunciator. A manual 1-1/2-inch hose station is located in zone DG-13, 40 feet from the center of this zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or [illegible] circumstances require.

6.8.4 Fire Hazards Analysis

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.' without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.8a contains a listing of those boundaries for fire zone that;

1) do not meet the separation criteria of Section III.G, and

2) provides a basis for acceptability for the zone boundary with no additional modifications, or

3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Table 6.8a Fire Zone DG-14

Zone Boundary	Deviation from III.G	Proposed Modification	Basis for Acceptability
Floor	Non-rated equipment hatch	None	1. Combustible loading in zone below is extremely low (DG-8). 2. Detection exists in zones DG-14 and DG-8. 3. All cables enclosed in conduit (zones DG-14 and DG-8).

6.8.5 Conclusion

Based on previous analysis, exemption is requested from the separation requirement as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

1) The Staff has previously confirmed the adequacy of fire protection features in this zone.

2) The conservative quantitative fire hazards analysis described previously in addition to the proposed modification demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

3) Ionization smoke detectors are provided with a common area alarm in the control room.

4) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-8. Evaluation Parameters Summary Table, Fire Zone DG-14 (Units 1 and 2)

A. Zone description

1. Construction

a. Walls

North - Interior: 8-inch thick reinforced concrete block

South - Exterior: 24-inch thick reinforced concrete block

East - Interior: 8 inch thick reinforced concrete block

West - Exterior: 24 inch thick reinforced concrete block

b. Floor - 8-inch thick reinforced concrete slab on reinforced concrete beams

c. Ceiling - 24-inch thick reinforced concrete

2. Ceiling height - 17 feet

3. Room volume - Approximately 18,500 cu. ft.

4. Ventilation - 4410 cfm supply and exhaust from the DG ventilation system. The exhaust fan is thermostatically controlled.

5. Congestion/Access - This zone is not congested. It is accessible through a doorway and an airlock.

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Equip.	Cable	Description	Equip.	Cable
NONE			RHR System		X
			Service Water Sys.	X	X
			Electrical Distr. System	X	X
			DG System		X
			Ventilating Air System	X	X

Table 6-8. Evaluation Parameters Summary Table, Fire Zone DG-14 (Units 1 and 2) (Cont)

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Equip.	Cable	Description	Equip.	Cable
			Temp. Switch 2VA-TS-1614 (TY7)	X	X
			Solenoid 2VA-SV-1614 (S54)	X	X
			CTL. Switch 2VA-CS-1614 (H84)	X	X
			4160V Swgr. E4	X	X
			Exhaust Fan D-EF-DG (NQ1)	X	X
			RHR Serv. Wtr. Pmp. 2B CTL Cab. (H83)	X	X
			Junction Box (CTL) (ZU5)	X	X
			DC Distr. Pnl. 2B-DG XFMR (GE8)	X	X
NONE			Distr. Pnl. 2B-DG (HQ7)	X	X
			Vent Fan TS 2-VA-TS-1614 (TY7)	X	X
			DMPR Control 2VA-SV-1614 (S54)	X	X
			Vent Fan Ctl 2VA-CS-1614 (H84)	X	X
			4160V SWGR E4	X	X
			DG-4 Exhaust Fan D-EF-DG (NQ1)	X	X
			RHR Serv Wtr PMP 2B Ctl Cab (H83)	X	X
			DC Dist PNL 2B (HC2)	X	X
			Distr PNL 2B-DG XFMR (GE8)	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables and grease

Table 6-8. Evaluation Parameters Summary Table, Fire Zone DG-14 (Units 1 and 2) (Cont)

2. Quantity of combustibles:

   Grease - Small amount

   Cables - Moderate number of cables totally encased in conduit. Three dry type transformers. No trays in this zone.

3. Ease of ignition and propagation: Cables are non-propagating. Grease is not considered a source of fire ignition due to its high flash point.

4. Suppression damage to equipment - The fire brigade is trained to avoid spraying of vital equipment with water and to use CO_2 extinguishers on electrical equipment.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors located on the ceiling

2. Automatic suppression systems - None

3. Hose station/extinguisher

   a. Distance to hose stations - There is no hose reel in this zone; however, a 75-foot hose reel is located just outside the zone in adjacent zone DG-13. It is 40 feet from the center of this zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NPFP 10 criteria or closer as circumstances require.

6.9 Fire Zone DG-15 (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire zone DG-15 does not comply with the specific provisions of 10 CFR 50 Appendix R, Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) The fixed combustible loading is low in fire zone.

(2) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(3) This zone is difficult to access and the transient combustible loading is extremely low.

6.9.1 Area Description

This fire zone comprises the Diesel Generator Building at column lines V to 8 ft. east of V and 11D to 13D at elevation 50 feet. Fire zone DG-15 is bounded by 8-inch thick reinforced concrete block walls to the north, south, east and west. The floor and ceiling are 8-and 24-inch thick reinforced concrete slabs, repectively.

6.9.2 Safe Shutdown Equipment

Fire zone DG-15 contains cables and equipment associated with the Ventilating Air System.

6.9.3 Fire Protection Systems

Fire zone DG-15 contains no fire detection or fixed suppression systems. Two manual 1-1/2-inch hose station are within 15 feet of the zone boundary.

6.9.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone DG-15 Units 1 and 2, which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required. In addition, this zone is somewhat unique in that ignition of any combustible would be extremely difficult to achieve due to constant high velocity air movement. This zone is the air plenum for the Diesel Building ventilation system and the building supply fans are constantly running.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodolgy described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division.

The conduits/cable trays of concern for Fire Zone DG-15 are individually dispositioned on Table 6-9b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-9(b) UNIT 1 DIESEL GENERATOR BUILDING FIREZONE DG-15

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
2UF1/CB	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
3IH1/CB	Conduit	

Those Appendix R deviation involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-9c.

Table 6-9(c). Fire Zone DG-15

Equipment	Identification	Proposed Modification
Vent Fan Position Switch	R76	Equipment will be enclosed in an appropriate barrier unless 8 feet of horizontal separation from opposite color is achieved and it is at least 1 foot from the ceiling.
Vent Fan Position Switch	R77	
Pull Box	QW5	

6.9.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation, detection, and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) The fixed combustible loading is extremely low in fire zone with no allowable storage of transient combustibles.

(2) Introduction of transient combustibles through this zone during normal operation is not credible due to zone location and extremely high supply ventilation.

(3) The constant high velocity air movement would extinguish any ignition source which might be introduced.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-9. Evaluation Parameters Summary Table, Fire Zone DG-15 (Units 1 and 2)

A. Zone description

1. Construction

a. Walls

North - Interior: 8 inch thick reinforced concrete block

South - Interior: 8-inch thick reinforced concrete block

East - Interior: 8-inch thick reinforced concrete block

West - Interior: 8-inch thick reinforced concrete block

b. Floor - 8-inch thick reinforced concrete slab

c. Ceiling - 24-inch thick reinforced concrete slab

2. Ceiling height - 17 feet

3. Room volume - Approximately 17,000 cu. ft.

4. Ventilation - 274,245 cfm maximum (3 fans operating) during plant emergency condition: 91,415 cfm minimum (1 fan normally operating continuously)

5. Congestion/Access - Four 42- by 30-inch ducts extend from the east to the west wall at irregular intervals along the area. Three of the ducts are 3 feet above floor level. The fourth is approximately 7 feet above floor level. The zone is accessible through one door located at the north end of the area.

Table 6-9. Evaluation Parameters Summary Table, Fire Zone DG-15 (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Equip.	Cable	Train B Description	Equip.	Cable
Ventilating Air System	X	X	Ventilating Air System	X	X

2. Equipment in zone required for safe shutdown:

Train A Description	Equip.	Cable	Train B Description	Equip.	Cable
Pos. SW 2VA-ZS-1611 (R74)	X	X	Pos. SW 2VA-ZS-1612 (R76)	X	X
Pos. SW 2VA-ZS-1615 (R75)	X	X	Pos. SW 2VA-ZS-1616 (R77)	X	X
Pos. SW 2VA-ZS-1613 (R78)	X	X			
Pos. SW 2VA-ZS-1617 (R79)	X	X			
Terminal Box (QW8)	X	X			
Vent Pos SW 2VA-ZS-1611 (R74)	X	X	Vent Pos SW 22VA-ZS-1612 (R76)	X	X
Vent Pos SW 2VA-ZS-1615 (R75)	X	X	Vent Pos SW 2VA-ZS-1616 (R77)	X	X
Vent Pos SW 2VA-ZS-1613 (R78)	X	X			
Vent Pos SW 2VA-ZS-1617 (R79)	X	X			
Terminal Box (QW8)	X	X			

C. Fire Hazards Analysis

1. Type of combustibles in area: Electric Cables

2. Quantity of combustibles: Cable - Small number of cables totally encased in conduit. No trays in this zone.

3. Ease of ignition and propagation: a. Cables are non-propagating.

Table 6-9. Evaluation Parameters Summary Table, Fire Zone DG-15 (Units 1 and 2) (Cont)

4. Suppression damage to equipment - None. No automatic systems in the area.

D. Fire Protection Existing

1. Fire detection systems - None

2. Automatic suppression systems - None

3. Hose station/extinguisher

a. Distance to hose stations - Two hose stations within 15 feet of one boundary

6.10 Fire Zone DG-16 (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2; i.e., the requirement for greater than 20 feet of horizontal separation between required components with no intervening combustibles and the requirement for automatic fixed suppression.

6.10.1 Area Description

Fire zone DG-16 extends the entire north and south along length of the 50 foot elevation of the Diesel Generator Building. This zone has an 8-inch thick reinforced concrete floor and 24-inch thick reinforced concrete ceiling. The north and south walls are 24-inch thick reinforced concrete exterior walls, and the east and west walls are 8-inch thick reinforced concrete block interior walls. All cables entering this zone have fire seals for combustible pathway penetration and all required safe shutdown cables are enclosed in conduit.

Access to Zone DG-16 is via two stairwells which enter the zone at the north and south ends. The height of the ceiling is 17 feet. The arrangement of Division A and B cable trays and conduits is contained in Book 3 of this report.

6.10.2 Safe Shutdown Equipment

Fire zone DG-16 contains the cables and equipment for the Diesel Generating Ventilating Air System.

The safe shutdown evaluation performed for fire zone DG-16 identified the coexistence of redundant hot safe shutdown circuits with less than 20 feet of horizontal separation. A fire hazards analysis has been performed to evaluate the existing configuration. The following sections document the considerations, assumptions, results and conclusions of the analysis performed.

6.10.3 Fire Protection Systems

Fire zone DG-16 is provided with eleven smoke sensitive fire detectors, suitably arranged throughout the zone, which alarm individually at a local control panel and subsequently provide a common fire zone alarm in the control room. These ionization detectors provide fire detection protection for general zone coverage. The four oil bath filters each have their own cross-zoned individual detection systems. Four infrared flame detectors and four thermal detectors are provided for each oil bath filter. Two manual 1-1/2-inch hose reel stations are located within this zone and the hose stations are twin agent type, i.e., water and aqueous film forming foam (AFFF) can be deployed from a single hose station.

The oil bath filters have automatic suppression coverage. Each oil bath filter is enclosed by a dike which is capable of containing all the oil within the filter. Within this dike a closed head preaction AFFF automatic suppression system provides local coverage initiated by the cross-zoned detection system previously described.

6.10.4 Fire Hazards Analysis

The fixed combustible loading for this zone is due to cable insulation and lubricating oil. The cables within this zone do not constitute a significant fire loading for the following reasons: (1) the cable density is extremely light, (2) all cables are enclosed in conduit which precludes cable insulation from adding sensible heat to the room, and (3) cables within this zone meet the intent of IEEE-383 and as such possess good fire resistance.

The oil in the oil bath filters is not considered a significant fixed combustible for the following reasons:

(1) The protective dike and automatic suppression described in Section 6.10.3 protects this fire zone from an oil combustion fire in a oil bath filter or as a result of a filter leak;

(2) The only other time the lubricating oil could be considered combustible is if it could become ignited during the filter oil changeout every three years. This is not considered credible because:

(a) During oil changeout the oil is handled in a 55-gallon drum with a top and the oil is removed via a bung hole. It would take a significant time for the entire drum contents to spill out and the maintenance personnel present would be expected to notice the leak, stop the oil spill and rapidly clean up any oil on the floor;

(b) Even if the oil were to spill, no hot surface exists within the fire zone to raise the oil to its ignition temperature of at least 500°F. The diesel exhaust system does run through the zone but it is completely lagged and a dike completely surrounds the exhaust piping at floor lev l. In addition, the diesel generator cannot be running during filter oil changeout so the exhaust piping would not be hot in the first place;

(c) For an unconfined lubricating oil spill or a concrete floor a sizable external heat flux would be required to raise the oil to above its flash point. If this external heat flux were due to another exposure fire, the size of fire required to ignite the spilled oil could cause redundant circuit failure by itself and would be an incredible quantity of combustibles for this fire zone.

The remaining source of combustible material within this zone fails under the category of transient combustibles. Fire zone DG-16 has a low level of maintenance activity and is not a logical passageway to other zones, and therefore the quantity of transient combustibles is very low.

Storage of transient combustibles in fire zone DG-16 is not permitted by plant administrative control procedures, and significant accumulation of such material would be readily noticed and expeditiously removed.

This fire hazards analysis postulates the presence of sufficient quantities of liquid hydrocarbons in the optimum geometry necessary to damage critical cables of redundant divisions. In the performance of this analysis, the cables of interest were assumed to be cross-linked polyethylene insulated with polyvinyl chloride jackets. Polyvinyl chloride jacketed cables are not used at BSEP for any circuits but were specifically selected because they are more susceptible to fire-induced damage than cables with different jacket materials. Such considerations ensure that this analysis is bounding for all cable types.

After selection of cable type, the remaining issue of the particular fuel to be assumed in the calculation was considered.

Heptane (gasoline) was selected as the fuel of concern even though it is not reasonably expected to be found within this zone. Heptane is commonly used on-site for portable equipment, but such equipment is prohibited inside vital areas. Heptane was selected primarily due to its high heat release rate and low flash point so as to ensure that this analysis is bounding for all fuel types.

The appendices provide the basis for which heat is assumed to be released from the combustion of heptane. These values are extremely conservative so as to ensure that the bounding nature of this analysis is preserved. The combustible properties of heptane were assumed as follows:

Heat of Combustion	(kJ/g)
Convective	21.6
Radiative	17.4
Actual	39.0
Theoretical	44.6
Vaporization Rate	(g/m^2-s)
Highly luminous flame	70
Heat Release Rate	(kW/m^2)
Convective	1512
Radiative	1218
Actual	2730

Except for the buildup of the stratified layer near the ceiling, all analyses postulated instantaneous achievement of steady state combustion conditions. For radiative and plume calculations, this translates to the instantaneous achievement of a gas

temperature of 982°C (1800°F) with a total emissivity of 0.3 (0.2 for gaseous products, 0.1 for luminous soot). In addition, steady state buoyant plume velocities were assumed to be achieved at the same time. These assumptions result in maximizing the heat transfer rate and the cable damage process, thereby bounding less severe fires involving the same fuel quantity and geometry.

In analyzing the effects of these severe fires the appropriate selection of a damage criterion is very important. This analysis focused on the minimum conditions necessary to cause a loss of circuit function via electrical failure. To ensure that the severity of these conditions was maximized, no credit was taken for the use of conduit as a thermal shield from radiation or as a baffle from the effects of impingement of hot gases. Thus, these steel components were assumed to be completely transparent to radiation and to have absolutely no thermal lag.

The damage threshold for electrical cables is based upon research performed by Factory Mutual Research Corporation. Cross-linked polyethylene-insulated cables with polyvinyl choride jackets were tested with and without fire-retardant coatings. The cable samples without coatings indicated failure (short-circuiting a 70-Vdc signal under piloted ignition conditions) with a critical heat flux of 14 kW/m^2 and a critical energy of 10,000 kJ/m^2. The coated cable samples indicated failure with a critical heat flux of 16 kW/m^2 and a critical energy of 21,800 kJ/m^2.

The circuits associated with the Diesel Building Ventilation System were specifically analyzed for circuit damage due to

postulated liquid hydrocarbon exposure fires. The first step of the analysis was to examine the effects of convective heat transfer due to ceiling stratification of exposure fire combustion gases. The next process modeled was radiant energy deposited on redundant cables, and finally the effects of convective heat transfer due to direct fire plume impingement were analyzed. For each of these analysis steps the existing passive protection was examined to assure that the minimum calculated fuel volume was an incredible amount given the zone location and existing administrative controls.

6.10.4.1 Combustion Gas Stratification - The effects of forced convection associated with fire plume impingement and stratification were first analyzed to determine the degree of passive protection provided by the existing configuration. In the case of stratification horizontal separation offers little inherent protection for any given cable height. The limiting condition for this analysis is the two highest redundant cables, which for the case of this zone is essentially ceiling height.

Using these assumptions, analysis indicates that the smallest quantity of heptane necessary for redundant circuit failure would be 11.4 gallons spilled over a circular area with an effective diameter of at least 3.1 feet. Under these circumstances achievement of the failure criterion does not occur until at least 609 seconds after pool ignition. In this case the model fire would have to be approximately 62 mm deep, a depth which is almost 85 times greater than that expected from a spill of heptane on a horizontal surface of concrete.

6.10.4.2 Direct Radiation - A bounding calculation was performed for all hot safe shutdown circuits in fire zone DG-16 for potential damage due to radiant energy disposition. The minimum volume of heptane required for ceiling combustion gas stratification failure is 11.4 gallons as determined in section 6.10.4.2. This volume is an incredible amount given the location, level of maintenance activity and existing administrative controls for fire zone DG-16.

Using 11.4 gallons of heptane as a baseline for analysis a series of bounding calculations were completed for this fire zone. The purpose of these calculations was to determine the minimum horizontal separation for uncoated cables such that the minimum volume of heptane required would be greater than 11.4 gallons. This type of analysis is conservative in that actual conduit elevations is not utilized but the optimum elevation determined which underestimates the existing passive fire protection of this zone.

The results of this calculation are for uncoated cables at an optimum elevation of 50 inches and with a horizontal separation of 100 inches the minimum volume of heptane required for radiation induced failure is 13.7 gallons. With the above described assumptions achievement of the failure criteria does not occur until at least 656 seconds after pool ignition. The postulated fire would also have to be at least 67 mm deep, a depth which is almost 90 times greater than that expected from a spill of heptane on a horizontal surface of concrete. This analysis has demonstrated that redundant circuits in fire zone DG-16 need be separated by

only 100 inches of horizontal distance without intervening combustibles.

6.10.4.3 Plume Impingement

The final calculation performed for fire zone DG-16 hot safe shutdown circuits was for the effects of direct fire plume impingement. As in section 6.10.4.2, a bounding calculation was completed using assumptions and results as discussed above. The baseline minimum volume of heptane was again 11.4 gallons as determined by section 6.10.4.1 and the minimum horizontal separation of 100 inches was assumed due to the bounding calculation in section 6.10.4.2. The cables of interest were assumed to be uncoated and the cable height was varied to give the most limiting minimum volume.

The results of the analysis for direct fire plume impingement based on the above described assumptions indicate the minimum volume of heptane required to reach the failure criteria would be 18.6 gallons spilled over a circular area at least 8.3 feet in diameter. Under these circumstances achievement of the failure criteria does not occur at least 135 seconds after pool ignition.

6.10.4.4 Analysis Conclusions - The limiting configuration for fire zone DG-16 is the highest redundant circuits which are affected by ceiling stratification of combustion gases. This minimum volume of heptane necessary to reach the defined failure criteria via this mechanism is 11.4 gallons, are amount which is considered incredible for this zone. All redundant conduits and equipment regardless of elevation are separated by at least 200 inches of horizontal

distance without intervening combustibles. Because the existing separation is much greater than the minimum required separation of 100 inches as determined by sections 6.10.4.2 and 6.10.4.3, additional horizontal separation above that which presently exists will not provide additional protection for fire zone DG-16. Therefore, no modifications are proposed for this fire zone.

It is important to keep in mind the fact that the pool diameter in the postulated spill impacts the thermal conditions predicted for such a fire. To that extent, spill diameter is as important as the volume in determining the smallest quantity of fuel necessary to achieve the damage criteria. Increasing or decreasing the fire diameter would imply a resulting pool fire involving greater quantities of fuel in order to provide the same energy flux at the locations of interest. Smaller diameters, for example, would require longer-burning fires with greater fuel depth in order to achieve the same incident energy flux on a cable while larger diameter fires would need larger quantities of fuel to cover the wider area, albeit at lesser depths. These results further demonstrate that for the extremely conservative assumptions utilized in this model, it is not possible for lesser quantities of heptane to exceed the cable damage criteria for both divisions under any circumstances irrespective of fire location.

The stratification model results, for example, demonstrate that containment of the 11.4 gallons of heptane necessary to initiate failure in both divisions to almost 81 times its unconfined spill

depth without exceeding 62 mm of depth with a minimum 3.1-foot diameter is an unrealistic condition. Actual plant storage provisions and operating practices further demonstrate that it would be extremely difficult to accumulate 11.4 gallons of heptane anywhere within the plant, much less at the precise location and in the precise geometry determined by this analysis to be necessary for redundant cable failure.

Departing from the conservatisms of analysis, it should be stated that the existing configuration can be expected to provide sufficient passive protection against even greater quantities of heptane than that reported above, with the precise value depending on how realistically a "best estimate" analysis is performed. Elements to be considered in a more realistic analysis might include the response of automatic detectors and of installed manual suppression systems in the area, the value of administrative controls in reducing the likelihood of substantial fuel quantities, and anticipated operator actions relative to achieving safe shutdown while a fire is in progress.

Fire zone DG-16 relies upon a properly balanced approach to fire protection which includes a comprehensive site fire prevention provided passively by the existing configuration, automatic detection, and manual firefighting. This balanced approach was developed in response to the Browns Ferry fire and reflects the guidance provided by Branch Technical Position APCSB 9.5-1.

The conservative quantitative fire hazards analysis described herein, demonstrates protection of fire zone DG-16 safe shutdown cables

from electrical failure resulting from any reasonable exposure fire postulated in the plant regardless of horizontal separation. The very low combustible loading of fire zone DG-16, together with fire protection features described in this analysis, demonstrates that other additional modifications would not enhance fire protection of the safe shutdown capability.

6.10.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

(2) Photoelectric smoke detectors are provided with a common zone alarm in the control room.

(3) The fixed combustible loading is very low in the fire zone, with no allowable storage of transient combustibles.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-10. Evaluations Parameters Summary Table, Fire Zone DG-16 (Units 1 and 2)

A. Zone description

1. Construction

a. Walls

North - Exterior: 24-inch thick reinforced concrete wall to elevation 59 feet around air intake openings (2 openings); wall above openings 24-inch thick reinforced concrete

South - Same as above

East - Interior: 8-inch thick reinforced concrete block walls around exhaust fans; 12-inch thick reinforced concrete block wall between fans

West - Interior: 8-inch thick reinforced concrete block

b. Floor - 8-inch thick reinforced concrete slab on reinforced concrete beams

c. Ceiling - 24-inch thick reinforced concrete slab on reinforced concrete beams

2. Ceiling height - 17 feet

3. Room volume - Approximately 87,669 cu. ft.

4. Ventilation/Access - 91,415 cfm minimum (one supply fan operating continuously): 339,050 cfm maximum (three supply fans and four diesels operating during plant emergency)

Table 6-10. Evaluations Parameters Summary Table, Fire Zone DG-16 (Units 1 and 2) (Cont)

5. Congestion/Access - Access to the zone is via two stairwells. The zone itself is uncongested and ample space exists to allow fire fighting

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Description	Train A Eqpt	Train A Cable	Description	Train B Eqpt	Train B Cable
Ventilating Air System	X	X	Ventilating Air System	X	X

2. Equipment in zone required for safe shutdown:

Description	Train A Eqpt	Train A Cable	Description	Train B Eqpt	Train B Cable
Sup. Air Fan C-SF-DG (NN6)	X	X	Sub. Air Fan D-SF-DG (NN7)	X	X
Sup. Air Fan A-SF-DG (NN4)	X	X	Sub. Air Fan B-SF-DG (NN5)	X	X
DG 3 Sup Fan C-SF-DG (NN6)	X	X	DG 4 Sup Fan D-SF-DG (NN7)	X	X
DG 1 Sup Fan A-SF-DG	X	X	DG 2 Sup Fan B-SF-DG	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area:

a. Oil in oil bath filters

b. Ventilating fan grease

c. Fiberglass building ventilation filters

d. Cable

Table 6-10. Evaluations Parameters Summary Table, Fire Zone DG-16 (Units 1 and 2) (Cont)

2. Quantity of combustibles:

   Oil - 320 gallons

   Grease - 1 lb

   Cable - Small number of cables in conduit. No trays in area

3. Ease of ignition and propagation: The quantities of oil involved and the relative location of the intake filters provide the potential for a serious common fire. The flash point of the oil is approximately 450°F.

4. Suppression damage to equipment - AFFF foam suppression for each of the filters is confined by a curb. In the event of overflow of the curb, drainage is provided. Judicious use of hose streams by trained firefighters should prevent inadvertent spraying of equipment.

D. Fire Protection Existing

1. Fire detection systems -

   a. Ionization detectors on the ceiling

   b. Sixteen cross-zoned flame detectors (four on each oil bath filter)

   c. Sixteen cross-zoned thermal detectors (four on each oil bath filter)

Table 6-10. Evaluations Parameters Summary Table, Fire Zone DG-16 (Units 1 and 2) (Cont)

2. Fire extinguishing systems

   a. AFFF (aqueous film forming foam) sprinkler system actuated by crossed-zoned detection. A closed head preaction system

   b. Curbs around the oil bath filters confine spills and leakage

3. Hose stations/extinguisher

   a. Distance to hose stations - Two water hose reel stations with a 75-foot hose each, 120 feet apart, 60 feet from the center of the zone. Two AFFF hose reels with 75-foot hoses, each 62 feet from the center of the zone

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.11 Fire Zone DG-23 (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone DG-23 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and fixed automatic suppression requirements. The basis for this execption is as follows:

(1) Ionization smoke detectors are provided with control room annunciation.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.11.1 Area Description

This fire zone comprises the diesel generator building at column lines W to 8 feet east of V and 11D to approximately 13.5 feet south of 11D to 13D at elevation 50 feet. Fire zone DG-23 is bounded by 8-inch thick reinforced concrete block walls to the north, south, east and west. The floor and ceiling are 8- and 24-inch thick reinforced concrete slabs respectively.

6.11.2 Safe Shutdown Equipment

Fire zone DG-23 contains cables and equipment associated with the Ventilating Air System.

6.11.3 Fire Protection Systems

Fire zone DG-23 contains an ionization smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 65 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.12.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone DG-23 Units 1 and 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division.

The conduits/cable trays of concern for Fire Zone DG-23 are individually dispositioned on Table 6-11b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-11(b) UNIT 1 DIESEL GENERATOR BUILDING FIREZONE DG-23

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
9MW1/BB	Conduit	86	168	125

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
1VV1/CA	Conduit	Provide an appropriate wrap from floor to 18' 4" off the floor.
1VV1/CA	Conduit	Provide an appropriate wrap down to three feet below the ceiling.
3KF1/CB	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6-12c contains a listing of those boundaries for fire zone RB-1-d that;

(1) do not meet the separation criteria of Section III.G, and

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Table 6-11c. Fire Zone: DG-23

Equipment	Identification	Proposed Modification
Control Panel	HD8	Provide an appropriate fire barrier to enclose this panel.

6.11.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-11. Evaluation Parameters Summary Table, Fire Zone DG-23 (Units 1 and 2)

A. Zone description

1. Construction

a. Walls

North - Interior: 8-inch thick reinforced concrete block

South - Interior: 8-inch thick reinforced concrete block

East - Interior: 8-inch thick reinforced concrete block

West - Interior: 8-inch thick reinforced concrete block

b. Floor - 8-inch thick reinforced concrete slab on reinforced concrete beams

c. Ceiling - 24-inch thick reinforced concrete slab

2. Ceiling height - 17 feet

3. Room volume - Approximately 2750 cu. ft.

4. Ventilation - None

B. Safe Shutdown Equipment

1. Safe shudown systems in zone:

Train A Description	Equip.	Cable	Train B Description	Equip.	Cable
Ventilating Air System	X	X	Ventilating Air System	X	X

2. Equipment in zone required for safe shutdown:

Train A Description	Equip.	Cable	Train B Description	Equip.	Cable
DC Bldg. Vent CTL Pnl. (HD8)	X	X	DG Bldg. Vent CTL Pnl (HD8)	X	X
Diesel Gen Bldg Loc CTL PNL (HD8)	X	X	Diesel Gen Bldg Loc CTL PNL (HD8)	X	X

Table 6-11. Evaluation Parameters Summary Table, Fire Zone DG-23 (Units 1 and 2) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables

2. Quantity of combustibles: Small number of cables totally encased in conduit; one dry type transformer. No trays in this zone.

3. Ease of ignition and propagation: Cables are non-propagating

4. Suppression damage to equipment

D. Fire Protection Existing

1. Fire detection systems - Ionization smoke detectors

2. Fire extinguishing systems - None

3. Hose station/extinguisher

a. Distance to hose stations -

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.12 Fire Zone RB-1-d (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone RB-1-d does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) Fixed, automatic and manual suppression exists throughout this zone.

(3) The fixed combustible loading is low in this fire zone with no allowable storage of transient combustibles.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

6.12.1 Area Description

This fire zone comprises the Reactor Building at column lines P to T and 6R to 8R at elevation -17 feet. The area is bounded by fire-rated reinforced concrete walls, floor and ceiling. The ceiling is 30 inches thick, the south and east walls are 48 inches thick, the north wall is 24 inches thick, and the west wall is 33

inches thick. Access to this area for manual fire-fighting is good. This area is accessible by stairways from elevation 20 feet and a personnel/equipment hatch between this zone and RB-2. Personnel radiation exposure requirements coupled with zone orientation precludes random personnel traverse through this zone. Ceiling height is 34 feet 6 inches. Room ventilation is 8165 cfm.

6.12.2 Safe Shutdown Equipment

Fire zone RB-1-d contains valves, pressure switches, level transmitters and instrument racks associated with the RHR System, RIP System, Service Water System and Diesel Generator System necessary for safe shutdown.

6.12.3 Fire Protection Systems

Fire zone RB-1-d contains ceiling-mounted ionization smoke detectors, a manual fire alarm station, a polarized bell alarm (all providing annunciation to the control room), and a fixed suppression system. A manual 1-1/2-inch hose station is located in the center of this zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.12.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-D Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified,

the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is above the stratification height,

(b) Opposite divisional cables coexist in a given race way.

Those conduits/cable trays deemed unacceptable in their present configuration, are listed in Table 6-12b, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays, or reroute cables for trays, containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist),

(b) Providing an appropriate barrier for those conduits above the stratification height up to the ceiling, or for the duration of traverse through the stratification region.

(c) Providing cable coating or an appropriate barrier for those cable trays above the stratification height up to the ceiling, or for the duration of traverse through the stratification region.

TABLE 6-12(b) UNIT 1 REACTOR BUILDING FIREZONE RB-1-D

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
39G/CB	Tray	348	348	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
4YF1/CB	Conduit	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
YF2/CB	Conduit	
30R/CB	Tray	
30S/CB	Tray	

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.12c contains a listing of those boundaries for fire zone RB-1-d that;

1) do not meet the separation criteria of Section III.G, and

2) provides a basis for acceptability for the zone boundary with no additional modifications, or

3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Table 6.12c
FIRE ZONE RB-1-d (UNIT 1)

Zone Boundary	Deviation From III.G	Proposed Modification	Basis for Acceptability
1. Wall between RB-1-d and RB-2	Nonrated man-door	None	1. Full coverage, automatic suppression exists in zones RB-2 and RB-1-d 2. Detection for zones RB-1-d and RB-2 annunciates in Control Room. 3. High-radiation area, random introduction of transient combustibles or traverse of personnel not likely during normal operation. 4. Previous SER approval for man-doors.

6.12.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) Fixed automatic as well as manual suppression exists in the zone.

(3) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(4) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-12. Evaluations Parameters Summary Table, Fire Zone RB-1-D (Unit 1)

A. Zone description

1. Construction

a. Walls

North - Interior: 24-inch thick reinforced concrete (below grade)

South - Exterior: 48-inch thick reinforced concrete (below grade)

East - Exterior: 48-inch thick reinforced concrete (below grade)

West - Interior: 33-inch minimum reinforced concrete (below grade)

b. Floor - Poured-in-place reinforced concrete slab

c. Ceiling - Poured in place 30-inch average thick reinforced concrete slab and concrete beams

2. Ceiling height - 34 feet 6 inches

3. Room volume - Approximately 85,000 cu. ft.

4. Ventilation - 8165 cfm supply air via normal Reactor Building ventilation system

5. Congestion/Access - This zone is accessible by stairways from elevation 20 feet and by a personnel/equipment hatch between this zone and zone RB-2. Congested area. Minimum distance between two pieces of equipment installed in close proximity is 1 foot. The maximum distance is 6 feet.

Table 6-12. Evaluations Parameters Summary Table, Fire Zone RB-1-D (Unit 1) (Cont)

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
RIP System	X	X	Ventilation Air Sys		X
HPCI System	X	X	RHR System	X	X
			RIP System	X	X
			Elec Distr System		X
			Diesel Gen System		X
			Service Wtr System	X	X
			RCIC System	X	X
			Instrumentation	X	X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Level SW E41-N015A (IH3)	X	X	Term Box (Y31)	X	X
			Valve CAC-PV-1220C (Y31)	X	X
			Term Box (Y26)	X	X
			Valve CAC-PV-1218C (Y26)	X	X
			Term Box (Y78)	X	X
			Press. SW RIP-PSL-1220 (Y78)	X	X
			Term Box (Y76)	X	X
			Press. SW RIP-PSL-1218 (Y76)	X	X
			Valve E11-F020B (VD3)	X	X
			Valve E51-F031 (VF3)	X	X
			Valve E11-F007B (VC6)	X	X
			Valve E51-F029 (VE3)	X	X
			RCIC Turbine (JS7)	X	X
			Valve E51-V8 (VE6)	X	X
			Valve E51-F045 (VE7)	X	X
			Valve E11-F027B (VC4)	X	X
			Valve E11-F024B (VC8)	X	X
			Valve E51-F012 (VE2)	X	X

Table 6-12. Evaluations Parameters Summary Table, Fire Zone RB-1-D (Unit 1) (Cont)

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
			Valve E51-F019 (VE5)	X	X
			Valve E51-F010 (VE1)	X	X
			Valve E51-F022 (VE0)	X	X
			Valve E11-F028B (VC2)	X	X
			Valve E51-F046 (VE4)	X	X
			Valve E11-F048B (VB6)	X	X
			Valve E11-F003B (VA5)	X	X
			Valve E11-F011B (VB2)	X	X
			Valve E11-F006D (VA9)	X	X
			Valve E11-F053B (VB8)	X	X
			Valve E11-F004D (VA3)	X	X
			Valve SW-V126 (U44)	X	X
			Valve E11-F006B (VA7)	X	X
			Valve SW-V125 (U43)	X	X
			Term Box (DQ2)	X	X
			Valve E11-F004B (VA1)	X	X
			Flow SW E11-FS-N021B (I37)	X	X
			Fan 1B-FCU-RB (PL1)		
			Valve E11-F047B (VC0)		
			Valve SW-V117 (KF9)		
			Valve SW-V124 (U19)		
			Solenoid Valve VA-SV-936B (Q31)		
			Pump E11-C002B (NC7)	X	X
			Pump E11-C002D (NC9)	X	X
			Temp SW VA-TS-936C (TU0)	X	X
			Instr Rack H21-P022 (IJ2)	X	
			Press. SW B32-PS-N016B	X	X
			Level XMTR CAC-PT-2601	X	X
			Instr Rack H21-P017 (IJ7)	X	
			Press. SW E51-PS-N009A	X	X
			Press. SW E51-PS-N009B	X	X
			Press. SW E51-PS-N006	X	X
			Flow SW E51-FS-N002	X	X

Table 6-12. Evaluations Parameters Summary Table, Fire Zone RB-1-D (Unit 1) (Cont)

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
			Press. SW E51-PS-N012B	X	X
			Press. SW E51-PS-N012D	X	X
			Press. SW E51-PS-N020	X	X
			Flow XMTR E51-FT-N003	X	X
			Instr Rack H21-P021 (IG8)	X	
			Press. SW E11-PS-N016B	X	X
			Press. SW E11-PS-N016D	X	X
			Press. SW E11-PS-N020B	X	X
			Press. SW E11-PS-N020D	X	X
			Flow XMTR E11-FT-N015B	X	X
			Press. XMTR E11-PT-N002B	X	X
			Instr Rack H21-P037 (IW0)	X	
			Press. SW E51-PS-N012A	X	X
			Press. SW E51-PS-N012C	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area - Oil, grease, and electrical cables.

2. Quantity of combustibles - 27.8 gallons of oil, 30 pounds of grease. Cables - Four trays average, approximately 345 linear feet, medium to heavy density.

3. Ease of ignition and propagation - Oil flash point requires raising oil bulk volume temperature above 450°F.

Table 6-12. Evaluations Parameters Summary Table, Fire Zone RB-1-d (Unit 1) (Cont)

Cables are non-propagating and therefore will not sustain tion due to its high flash point.

4. Suppression damage to equipment - Operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems - Four ionization detectors on ceiling.

2. Automatic suppression systems - Wet-pipe system utilizing automatic on/off sprinkler heads charged with water. The water supply is provided with a one-head bypass of deluge valve feature. The deluge valve is automatically operated upon activation of the detection system and flow in the bypass.

3. Hose station/extinguisher

a. Distance to hose stations - One fire hose reel with 1-1/2-inch 75-foot hose located in the middle of the area.

b. Distance to extinguishers - One CO_2 extinguisher and one chemical extinguisher located side by side in the middle of the area.

6.13 Fire Zone RB-1-n (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone RB-1-n does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and, automatic suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) High radiation, limited access and zone orientation precludes random traverse of personnel through this zone.

(3) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.13.1 Area Description

This fire zone comprises the Reactor Building at column lines S to T and 4R to 6R at elevation +5 feet above the HPCI room (zone RB-2). Fire zone RB-1-n is bounded by a rated fire wall to the east and a 12-inch thick reinforced concrete wall to the west, and is open to the north and south. The floor is a rated concrete slab. The ceiling is a 24-inch reinforced concrete slab containing a personnel/equipment hatch to zone RB-2. Ceiling height is 13

feet. Room ventilation is 3000 cfm. Access to this area is via vertical ladders on the north and south walls of zone RB-2.

6.13.2 Safe Shutdown Equipment

Fire zone RB-1-n contains cables associated with the RHR, HPCI, and RIP Systems and equipment associated with the RHR System.

6.13.3 Fire Protection Systems

Fire zone RB-1-n contains ionization smoke detectors located on the ceiling. A manual 1-1/2-inch hose station is 30 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.13.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-n Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

> The conduit/cable tray of interest is above the stratification height.

The conduits/cable trays of concern for Fire Zone RB-1-n are individually dispositioned on Table 6-13b as:

Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the parti cular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits above the stratification height up to the ceiling, or for the duration of traverse through the stratification region.

TABLE 6-13(b) UNIT 1 REACTOR BUILDING FIREZONE RB-1-N

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
4YF1/CB	Conduit	360	360	0
DCA1/CA	Conduit	377	399	0
3CC3/CB	Conduit	360	360	0
3HR2/CB	Conduit	360	360	0
4YF2/CB	Conduit	360	360	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
DCK1/CA	Conduit	Provide an appropriate wrap down to three feet below the ceiling
4ST1/CA	Conduit	
DCB1/CB	Conduit	

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (of a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.13c contains a listing of those boundaries for fire zone RB-1-n that;

1) do not meet the separation criteria of Section III.G, and

2) provides a basis for acceptability for the zone boundary with no additional modifications, or

3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviation involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-13d.

Table 6.13c
FIRE ZONE RB-1-n (UNIT 1)

Zone Boundary	Deviation From III.G	Proposed Modification	Basis for Acceptability
1. Floor	Nonrated equipment latch	None	1. Full coverage, automatic suppression exists in zone RB-2 2. Detection for zones RB-1-n and RB-2 annunciates in Control Room. 3. High-radiation area, random introduction of transient combustibles or traverse of personnel not likely during normal operation. 4. Previous SER approval for man-doors.

TABLE 6-13(d) FIRE ZONE: RB-1-n

Equipment	Identifier	Proposed Modification
Junction Box	A5Ø	Provide a barrier underneath, extending out at least 40 in. from the equipment in all directions or enclose the equipment by a proper fire retardant material.
Terminal Box (E11-FØ4Ø)	VD6	None - Equipment is safe by configuration
Valve (E11-FØ16B)	VDØ	

6.13.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with annunciation in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) All cables traversing the south boundary (to RB-1-d) are enclosed in conduit, therefore are not considered as intervening combustibles.

(4) Random personnel access to this zone is not credible during normal operation.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(6) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-13. Evaluations Parameters Summary Table, Fire Zone RB-1-n (Unit 1)

A. Zone description

1. Construction

a. Walls

North - Interior: no wall

South - Interior: no wall

East - Exterior:- 48-inch thick reinforced concrete (below grade)

West - Interior: 12-inch thick reinforced concrete (below grade)

b. Floor - Poured-in-place reinforced concrete slab 36 inches thick

c. Ceiling - Poured in place 24-inch thick reinforced concrete slab and concrete beams

2. Ceiling height - 13 feet

3. Room volume - Approximately 23,900 cu. ft.

4. Ventilation - 3,000 cfm supply air from normal Reactor Building ventilation system

5. Congestion/Access - This is an open area above the HPCI room. Access is achieved via two ladders, one located at the north wall of the HPCI room, and the other at the south wall.

Table 6-13. Evaluations Parameters Summary Table, Fire Zone RB-1-n (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe Shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
HPCI Sys		X	RCIC System		X
RHR Sys	X	X	RHR	X	X
Elec. Distr. Sys.		X			
Service Water Sys.		X			
Ventilating Air Sys.		X			
RIP Sys.		X			
Diesel Gen. System		X			

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Valve E11-F016A (VE9)	X	X	E11-F016B	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease and cables

2. Quantity of combustibles:

Grease - 5 pounds

Cables - Four trays, approximately 156 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Cables are non-progating. Grease is not considered a source of fire ignition due to its high flash point.

Table 6-13. Evaluations Parameters Summary Table, Fire Zone RB-1-n (Unit 1) (Cont)

4. Suppression damage to equipment - There are no suppression systems in this area. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in adjacent zones. Also, safety-related valve motor operators are protected by NEMA 4 enclosures.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on the ceiling

2. Automatic suppression systems - None

3. Hose station/extinguisher

a. Distance to hose stations - Two water hose reels (75 feet of hose), one on north wall of RB-2 about 30 feet to the zone centroid; one in RB-1-d, 55 feet from the centroid of the zone.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.14 Fire Zone RB-2 (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-2 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) Fixed automatic suppression (CO_2) provides full zone coverage.

(2) Ionization smoke detectors are provided with a common area alarm in the control room.

(3) Radiation and zone orientation preclude random access of plant personnel during normal operation.

6.14.1 Area Description

This fire zone comprises the Reactor Building at column lines S to T and 4R to 6R at elevation -17 feet. Fire zone RB-2 is bounded by rated fire walls on the north, south, east, and west. The floor is a reinforced concrete slab. The south wall incorporates a personnel hatch providing access to zone RB-1-d. The ceiling is a 36-inch thick reinforced concrete slab with a 10- by 22-foot grated opening covered with 16 gauge sheet metal. Access to this area is fair. Ceiling height is 19 feet. Room ventilation is 2000 cfm.

6.14.2 Safe Shutdown Equipment

Fire zone RB-2 contains the HPCI System and associated valves, necessary for safe shutdown.

6.14.3 Fire Protection Systems

Fire zone RB-2 contains smoke detectors, suitably arranged throughout the zone, connected to a control room annunciator, and a CO_2 fixed suppression system. A manual 1-1/2-inch hose station is 45 feet away in zone RB-1-c. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.14.4 Fire Hazards Analysis

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hr-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hr) rendered a composite boundary rating of less than 3 hr.

Table 6.14b contains a listing of those boundaries for fire zone RB-2 that;

(1) Do not meet the separation criteria of Section III.G, and

(2) Provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) Proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

TABLE 6.14b

FIRE ZONE RB-2 (UNIT 1)

Zone Boundary	Deviation From III.G	Proposed Modification	Basis for Acceptability
1. Wall between RB-1-d and RB-2	Nonrated man-door	None	1. Full coverage, automatic suppression exists in zones RB-2 and RB-1-d
2. Ceiling (to zone RB-1-n)	Nonrated equipment hatch	*None	2. Detection for zones RB-1-d and RB-2 annunciates in Control Room. 3. High-radiation area, random introduction of transient combustibles or traverse of personnel not likely during normal operation. 4. Previous SER approval for man-doors.

*This deviation dispositioned in Section 6.13.

6.14.5 Conclusion

Based on the previous analysis, exemption is requested from the requirement for 3 hr rated barriers between fire zones as prescribed in Section III.G of Appendix R. The technical basis which justify the exemption are summarized as follows:

(1) Fixed automatic CO_2 suppression system provides full zone coverage.

(2) Ionization smoke detectors are provided with a common area alarm in the control room.

(3) Random introduction of transient combustibles is not credible due to personnel radiation requirements during normal operation.

(4) Previous SER approval for man-doors.

(5) The conservative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-14. Evaluations Parameters Summary Table, Fire Zone RB-2 (Unit 1)

A. Zone description

1. Construction

a. Walls

North - Interior: 24-inch thick reinforced concrete (below grade) with airtight fire door

South - Interior: 24-inch thick reinforced concrete (below grade)

East - Interior: 4-inch thick reinforced concrete (below grade)

West - Interior: 6-inch thick reinforced concrete (below grade)

b. Floor - Poured-in-place reinforced concrete slab

c. Ceiling - Poured-in-place 36-inch thick reinforced concrete slab with a 10- by 22-foot opening with grating, covered with 16 gauge sheet metal

2. Ceiling height - 19 feet

3. Room volume - Approximately 32,300 cu. ft.

4. Ventilation - 2000 cfm supply air via normal Reactor Building ventilation system

5. Congestion/Access - Access is via two personnel hatches, one on the north wall and one on the south wall. Accessibility to equipment is good.

Table 6-14. Evaluations Parameters Summary Table, Fire Zone RB-2 (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
HPCI System	X	X	None		

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Valve E41-F012 (VF0)	X	X			
Valve E41-F041 (VF1)	X	X			
Valve E41-F042 (VF2)	X	X			
Valve E41-F028 (KG9)	X	X			
Valve E41-F026 (KH3)	X	X			
Valve E41-F004 (VE8)	X	X	None		
Valve E41-F059 (KG5)	X	X			
Aux. Hyd. Oil Pump E41-C002 (PM2)	X	X			
Valve E41-F001 (VE9)	X	X			
Instr. Rack H21-P034 (IH5)	X	X			
Press Sw. E41-PS-N012B	X	X			
Press Sw. E41-PS-N012D	X	X			
Pump E41-C002	X	X			
Turbine E41-C001	X				

C. Fire Hazards Analysis

1. Type of combustibles in area:

a. Turbine lube oil

b. Grease in motor operators

c. Cables

Table 6-14. Evaluations Parameters Summary Table, Fire Zone RB-2 (Unit 1) (Cont)

2. Quantity of combustibles:

   Oil: 155 gallons

   Grease: 25 pounds

   Cables: All cables are totally encased in conduit. There are no trays in this zone.

3. Ease of ignition and propagation - Oil flash point requires raising the oil bulk volume temperature above 450°F. Cables are non-propagating. Grease is not considered a source of fire ignition due to its high flash point.

4. Suppression damage to equipment - If the HPCI system is lost due to fire, no adjacent equipment can be damaged by suppression inside HPCI room. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in this or adjacent zones.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on the ceiling

2. Automatic suppression systems

   a. Total flooding CO_2 system thermally or manually actuated

Table 6-14. Evaluations Parameters Summary Table, Fire Zone RB-2 (Unit 1) (Cont)

3. Hose station/extinguisher

   a. Distance to hose stations - None inside this fire zone. However, adjacent fire zones RB-1-c and RB-1-d have water hose reels which are 45 and 55 feet, respectively, from the center of this fire zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.15 Fire Zone RB-1-b (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-b does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

1. The entire zone is provided with an automatic fixed water supression system.

2. Ionization smoke detectors are provided with a common area alarm in the control room.

3. The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

4. This zone is physically isolated; the general area radiation levels preclude random access and security requirements dictate that the zone remain locked.

6.15.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 2R to 4R at elevation -17 feet. The area is bounded by fire-rated reinforced concrete walls. The north and west walls are 48 inches thick, the south wall is 33 inches thick, and the ceiling is 30 inches thick. Access to this area is limited. Ceiling height is 34 feet 6 inches. Room ventilation is 2500 cfm.

6.15.2 Safe Shutdown Equipment

Fire zone RB-1-b contains the RHR System and instrumentation, reactor pressure switch B32-PS-NO18A, and terminal box IJ0 necessary for safe shutdown. All of the cables in this zone are encased in conduit. No trays exist in this zone.

6.15.3 Fire Protection Systems

Fire zone RB-1-b contains ionization smoke detectors located on the ceiling connected to a control room annunciator and a fixed suppression system utilizing automatic on/off sprinkler heads charged with water. A manual 1-1/2-inch hose station is 8 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.15.4 Fire Hazards Analysis

Fire Zone RB-1-b has a specific Appendix R deviation which was identified utilizing the methodology and assumptions described by Section 4. This deviation is due to lack of a rated barrier between fire zone RB-1-b and the zone above. This lack of fire rating is is due to a stairwell used for access to this fire zone. The fire zone above zone RB-1-b contains safe shutdown circuits which are predominantly the same train as zone RB-1-b. All of the redundant circuits in the zone above have been appropriately protected for a fire in that zone and would not be endangered by an exposure fire in zone RB-1-b.

In addition, fire zone RB-1-b has a very low concentration of fixed combustibles. All cables are enclosed in conduit and the lubricating oil contained within the pumps is not considered a reasonable fixed combustible due to lack of credible ignition source. Furthermore, this fire zone is completely protected by a fixed automatic water suppression system. Therefore, it can be concluded that this fire zone does not pose a threat to redundant circuits in the zone above, and exemption from the requirement for a three-hour barrier should be granted.

6.15.5 Conclusion

Based upon the previous analysis, exemption is requested from the requirement for a three-hour rated barrier between fire zones as prescribed by Section III.G of Appendix R. The technical bases which justify the exemption are summarized as follows:

1. The entire zone is provided with an automatic fixed water suppression system.

2. Ionization smoke detectors are provided with a common area alarm in the control room.

3. The fixed combustible loading is low in the fire zone because all cables are enclosed in conduit and the lubricating oil contained in the pumps is not considered as a fixed combustible due to lack of credible ignition source.

4. The transient combustible loading for this fire zone is extremely light due to the security and radiological controls required for entry, and because this zone is not a passageway to any other zone.

5. Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-15. Evaluations Parameters Summary Table, Fire Zone RB-1-b (Unit 1)

A. Zone description

1. Construction

a. Walls

North - Exterior: 48-inch thick reinforced concrete (below grade)

South - Interior: 33-inch minimum reinforced concrete (below grade)

East - N/A

West - Exterior: 48-inch thick reinforced concrete (below grade)

b. Floor - Poured-in-place reinforced concrete

c. Ceiling - Poured-in-place 30-inch thick reinforced concrete slab and concrete beams

2. Ceiling height - 34 feet 6 inches

3. Room volume - Approximately 24,564 cu. ft.

4. Ventilation - 2500 cfm supply air from elevation (-)20 feet through floor opening; no duct. 2500 cfm exhaust air to normal Reactor Building ventilation system

5. Congestion/Access - This zone is accessible from one stairway from the above elevation. Adequate room in the center of this zone exists to fight a small fire. A large fire will likely render this zone inaccessible until adequate suppression takes place.

Table 6-15. Evaluations Parameters Summary Table, Fire Zone RB-1-b (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
RHR System	X	X	None		
Instrumentation	X	X			

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Reactor Pressure Sw B32-PS-NO18A (IJO)	X	X	None		
Terminal Box (IJO)	X	X			

C. Fire Hazards Analysis

1. Type of combustibles in area - Oil, grease and cables

2. Quantity of combustibles - 27.8 gallons of oil, 4 pounds of grease. Cables are encased in conduit and therefore should be treated as noncombustible. No trays in this zone, all conduit.

3. Ease of ignition and propagation - Oil flash point requires raising the oil bulk volume temperature above 450°F. Cables are nonpropagating. Grease is not considered a source of fire ignition because of its high flash point.

Table 6-15. Evaluations Parameters Summary Table, Fire Zone RB-1-b (Unit 1) (Cont)

4. Suppression damage to equipment - Damage may occur to the core spray pump due to fire or suppression. The redundant core spray pump and other safety class equipment outside this zone are unaffected since this zone is a confined space with adequate automatic suppression.

D. Fire Protection Existing

1. Fire detection systems - Two ionization detectors on the ceiling.

2. Automatic suppression systems - Wet-pipe system utilizing automatic on/off sprinkler heads charged with water. The water supply is provided with a one-head bypass of deluge valve feature. The deluge valve is automatically operated upon activation of the detection system and flow in the bypass.

3. Hose station/extinguisher

   a. Distance to hose stations - One water hose reel with 75-foot hose 8 feet from the center of fire zone

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.16 Fire Zone RB-1-g(N/W) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone RB-1-g(N/W) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirement. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with annunciation in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Manual suppression exists and is readily accessible throughout the zone.

6.16.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 2R to 4R at elevation 20 feet. Fire zone RB-1-g(N/W) is bounded by walls on the north, and west. The floor consists of a 24-inch thick reinforced concrete slab and the ceiling is a 12-inch thick concrete slab. Access to this area is good. Ceiling height is 29 feet. Room ventilation is 5480 cfm.

6.16.2 Safe Shutdown Equipment

Fire zone RB-1-g(N/W) contains equipment and cables associated with the RHR, HPCI, and RIP Systems necessary for safe shutdown.

6.16.3 Fire Protection Systems

Fire zone RB-1-g(N/W) contains a smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 20 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.16.4 Fire Hazards Analysis

Turning to the next step in the process, the purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-g (N/W)Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

(b) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone RB-1-g(N/W) are individually dispositioned on Table 6-16b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,

(b) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-16(c). UNIT 1 REACTOR BUILDING FIREZONE RB-1-G(N/W)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
35A/DA	Tray	291	291	0
33Y/CA	Tray	303	303	0
33A/CA	Tray	303	303	0
33B/CA	Tray	231	231	0
33C/CA	Tray	231	279	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
36Z/DA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
35F/DA	Tray	
3JLD/CA	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
3JL3/DA	Conduit	

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hr-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hr) rendered a composite boundary rating of less than 3 hr.

Table 6-16c contains a listing of those boundaries for fire zone RB-1-g(N/W) that;

(1) Do not meet the separation criteria of Section III.G, and

(2) Provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) Proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

TABLE 6.16c

FIRE ZONE RB-1-g(N/W) (UNIT 1)

Zone Boundary	Deviation From III.G	Proposed Modification	Basis for Acceptability
1. Floor	Nonrated equipment hatch	None	1. Zone RB-1-b (below) is provided with full automatic suppression coverage. 2. Detection exists in zones RB-1-b and RB-1-g(N/W) with annunciation in the Control Room.

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 ft on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

6.16.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Manual suppression is readily available throughout the zone.

(4) Access to this zone for manual fire-fighting is excellent.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-16. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/W) (Unit 1)

A. Zone description

1. Construction

a. Walls

North - Exterior: 48-inch thick reinforced concrete

South - Interior: 54-inch thick reinforced concrete (30-inch thick interior wall)

East - No wall; 24-inch thick reinforced concrete interior wall

West - Exterior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 24-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height - 29 feet

3. Room volume - Approximately 45,470 cu. ft.

4. Ventilation - 5480 cfm supply from normal Reactor Building ventilation system

5. Congestion/Access - Relatively uncongested. Access available by way of two stairways, one personnel air lock, and one open side (east) of the zone.

Table 6-16. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/W) (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
RHR System	X	X			
HPCI System	X	X	RCIC System		X
Diesel Gen. System		X			
Electrical Distr. Sys.		X			
RIP System		X			
Ventilating Air Sys.		X			
Service Water System		X			
Instrumentation		X	Instrumentation		X
Instrument Air System	X	X			

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Valve E11-F068A (FW5)	X	X			
Valve E41-F006 (KG6)	X	X			
Air Compressor 1A (NP6)	X	X	NONE		
Pres. Sw IA-PSL-3594 (LO7)	X	X			

C. Fire Hazards Analysis

1. Type of combustibles in area:

a. Electrical cables

b. Grease in valves

c. Lube oil in air compressor

Table 6.16. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/W) (Unit 1) (Cont)

2. Quantity of combustibles:

   a. Grease - 3 pounds in valves

   b. Lube oil - 30 gallons (approximate) in compressor

   c. Cables - average four trays, approximately 440 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Cables are non-propagating. The flash point of lube oil is 450°F. Grease is not considered to be a source of fire ignition due to its high flash point.

4. Suppression damage to equipment - Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in this zone or in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on ceiling

2. Automatic suppression systems - None

3. Hose station/extinguisher

   a. Distance to hose stations - One water hose reel with 75 feet of hose about 20 feet from the centroid of the zone.

Table 6-16. Evaluations Parameters Summary Table, Fire Zone RB-1-g(NW) (Unit 1) (Cont)

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.17 Fire Zone RB-1-G(S/W) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-g(S/W) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) Automatic fixed suppression exists throughout the zone and at the open boundary.

(3) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(4) Intervening combustibles pose no threat to zone boundaries.

6.17.1 Area Description

Fire zone RB-1-g(S/W) is bounded by rated fire walls to the north, south, and west and a rated partial barrier to the east. The floor and ceiling are 12-inch thick reinforced concrete slabs. Ceiling height is 29 feet. Room ventilation is 1540 cfm.

6.17.2 Safe Shutdown Equipment

Fire zone RB-1-G (S/W) contains cables associated with the HPCI, RHR, RCIC, and RIP Systems and associated valves, panels, and cabinets necessary for safe shutdown.

6.17.3 Fire Protection Systems

Fire zone RB-1-g(S/W) contains ionization smoke detectors located on the ceiling providing control room annunciation. A fixed suppression system is installed. A manual 1-1/2-inch hose station is 25 feet from the center of fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.17.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-g(S/W) Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

(b) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone RB-1-g(S/W) are individually dispositioned on Table 6-17b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing appropriate barriers for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,

(b) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-17(b) UNIT 1 REACTOR BUILDING FIREZONE RB-1-G(S/W)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
3JM1/CA	Conduit	333	333	0
3JM5/CA	Conduit	333	333	0
3JM6/CA	Conduit	318	318	0
3JA1/CB	Conduit	243	264	12
3JV3/CB	Conduit	231	264	24
31L/CA	Tray	243	243	41
6DB2/CA	Conduit	264	264	0
6DB3/DA	Conduit	264	264	0
3HS1/CB	Conduit	202	238	65
3HS2/CB	Conduit	202	238	65
37R/CA	Tray	302	302	0
38A/CB	Tray	243	243	41
37R/DA	Tray	290	290	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
37S/CA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
37S/DA	Tray	
3AH1/CB	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
3AH2/CB	Conduit	
4MF1/DB	Conduit	
AAH1/BB	Conduit	
AAI1/BB	Conduit	

For those fire zones whose boundaries were defined (for convenience) by "open space", an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviation involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizonta distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-17c.

Table 6-17(c). Fire Zone RB-1-g(S/W)

Equipment	Identification	Proposed Modification
Valve (E11-F068B)	KW6	None - Equipment safe by configuration
Valve (E51-F013)	KS5	Protect the equipment by enclosing it in a proper fire retardant material
Penetration 1X-105J	QD4	None - Equipment safe by configuration
Penetration 1X-105K	QD3	None - Equipment safe by configuration

6.17.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Automatic suppression exists throughout the zone.

(2) Ionization smoke dectectors are provided with a common area alarm in the control room.

(3) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The conservative quantitative fire hazards analysis described previously in additions to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-17. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/W) (Unit 1)

A. Zone description

1. Construction

a. Walls

North - Interior: 48-inch reinforced concrete

South - Exterior: 48-inch reinforced concrete

East - No wall, part reinforced concrete 36 inches thick and 36-inch thick solid concrete block

West - Exterior: 48-inch reinforced concrete

b. Floor - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height - 29 feet

3. Room volume - Approximately 53,454 cu. ft.

4. Ventilation - 1,540 cfm supply from the normal Reactor Building ventilation system

5. Congestion/Access - The area is relatively uncongested. Two stairways provide access in addition to free space available at two sides of this zone.

Table 6-17. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/W) (Unit 1)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
HPCI System	X	X	RCIC System	X	X
RHR System		X			
Electrical Distr. System		X	Electric Distr. System		X
Diesel Gen. System		X	ADS System	X	X
RIP System		X			
Ventilating Air System		X			
Service Water System		X	Service Water System	X	X
Instrumentation		X	Instrumentation	X	X
Instrument Air System		X			

2. Equipment in zone required for safe snutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Penetration X-105J (QD4)	X	X	Penetration X-105K (QD3)	X	X
			Penetration X-105J (QD4)	X	X
			Valve E11-F068B (KW6)	X	X
			Valve E51-F013 (KS5)	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease in valve and electrical cables

2. Quantity of combustibles:

Grease: 3 pounds

Cables: Average three trays, approximately 425 lineal feet, medium to heavy density

Table 6-17. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/W) (Unit 1)

3. Ease of ignition and propagation: Cables are nonpropagating. Grease is not considered a source of fire ignition due to its high flash point.

4. Suppression damage to equipment - Damage is localized to the immediate fire area since suppression systems are thermostatically controlled; adjacent equipment should not be affected.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on ceiling

2. Automatic suppression systems -

   a. Wet-pipe system, utilizing automatic on/off sprinkler heads charged with water. The supply is provided with a one-head bypass of the deluge valve feature. The deluge valve is automatically operated upon actuation of the detection system and flow in the bypass.

3. Hose station/extinguisher

   a. Distance to hose stations - One hose reel with 75-foot hose 25 feet from the zone centroid

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.18 Fire Zone RB-4 (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-4 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is exceedingly low in fire zone with no allowable storage of transient combustibles.

(3) All cables in this zone are completely enclosed in conduit.

6.18.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 4R to 6R at elevation 20 feet. The area is bounded by fire-rated reinforced concrete walls, floor, and ceiling. The north and south walls are 72 inches thick, the east wall is 33 inches thick, the west wall is 48 inches thick, the floor is 24 inches thick, and the ceiling is 12 inches thick. Access to this area is through concrete plugs only. Ceiling height is 29 feet. Room ventilation is 7500 cfm.

6.18.2 Safe Shutdown Equipment

Fire zone RB-4 contains main steam system and associated valves, and feedwater system and associated valves necessary for safe shutdown. Critical related functions include main steam and feedwater to the RIP, HPCI, and RHR systems. A moderate number of cables are totally enclosed in conduit. There are no trays in this zone.

6.18.3 Fire Protection Systems

Fire zone RB-4 contains ionization smoke detectors located on the ceiling connected to a control room annunciator.

6.18.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-4 Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates that there is no need for specific modifications in Fire Zone RB-4.

The conduits/cable trays of concern for Fire Zone RB-4 individually dispositioned on Table 6-18b as those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the table, along with associated minimum and maximum elevations.

TABLE 6-18(b) UNIT 1 REACTOR BUILDING FIREZONE RB-4

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
3JLD/CA	Conduit	308	308	0
3JL3/DA	Conduit	310	310	0

6.18.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is exceedingly low in fire zone with no allowable storage of transient combustibles.

(3) All cables in this zone are completely enclosed in rigid steel conduit.

(4) The random introduction of transient combustibles to this zone is not credible during normal operation.

(5) The conservative quantitative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-18. Evaluations Parameters Summary Table, Fire Zone RB-4 (Unit 1)

A. Zone description

1. Construction

a. Walls

North - Interior: 72-inch thick reinforced concrete

South - Interior: 72-inch thick reinforced concrete

East - Interior: 33-inch thick reinforced concrete

West - Exterior: 48-inch thick reinforced concrete

b. Floor - Poured-in-place 24-inch thick reinforced concrete

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab

2. Ceiling height - 29 feet

3. Room volume - Approximately 39,700 cu. ft.

4. Ventilation - 7500 cfm supply, 7500 cfm exhaust via the normal Reactor Building ventilation system

5. Congestion/Access - The zone is accessible only through concrete plugs.

Table 6-18. Evaluations Parameters Summary Table, Fire Zone RB-4 (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
HPCI System		X	RCIC System		X
HR System		X			
Ventilation Air System		X			
Electrical Distribution System		X			
Diesel Gen. System		X			
RIP System		X			
Service Water System		X			
Instrumentation		X	Instrumentation		X
Inst. Air System		X			
Main Steam System		X			
Feedwater System		X			

2. Equipment in zone required for safe shutdown - Main steam isolation valves F028A, F028B, F028C and F028D, and feedwater isolation valves F032A and F032B

C. Fire Hazards Analysis

1. Type of combustibles in area - Grease located in six motor-operated valves (four steam and two feedwater)

2. Quantity of combustibles - 60 pounds of grease. A moderate number of cables are totally encased in conduit. There are no trays in this zone.

3. Ease of ignition and propagation - Cables are nonpropagating. Grease is not considered a source of fire ignition due to its high flash point.

Table 6-18. Evaluations Parameters Summary Table, Fire Zone RB-4 (Unit 1) (Cont)

4. Suppression damage to equipment - No automatic suppression equipment in zone

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on the ceiling

2. Automatic suppression systems - None

3. Hose station/extinguisher

a. Distance to hose stations - Inaccessible

b. Distance to extinguishers - Inaccessible

6.19 Fire Zone RB-6 (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-6 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a control room annunciator.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Zone orientation precludes random introduction of transient combustibles during normal plant operation.

6.19.1 Area Description

This fire zone comprises the Reactor Building at column lines P to S and 4R to 6R at elevation 20 feet. The area is bounded by fire-rated reinforced concrete walls. The north and south walls are 24 inches thick, the east wall is 48 inches thick, and the ceiling is 18 inches thick. Access to this area is good. The northeast and southeast corners each incorporate a door. Ceiling height is 14 feet 6 inches. Room ventilation is 3000 cfm.

6.19.2 Safe Shutdown Equipment

Fire zone RB-6 contains various equipment and cables associated with the RHR, HPCI, and RCIC Systems necessary for safe shutdown. A small number of cables are totally encased in conduit. There are no trays in this zone.

6.19.3 Fire Protection Systems

Fire zone RB-6 contains ionization smoke detectors located on the ceiling connected to a control room annunciator. Two manual 1-1/2-inch hose stations are 50 feet and 65 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.19.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-6 Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in

Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is above the stratification height,

The conduits/cable trays of concern for Fire Zone RB-6 are individually dispositioned on Table 6-19b as:

Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits above the stratification height up to the ceiling, or for the duration of traverse through the stratification region.

TABLE 6-19(b) UNIT 1 REACTOR BUILDING FIREZONE RB-6

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
5LJ1/CB	Conduit	Provide an appropriate wrap
5LJ2/CB	Conduit	
3GU1/CB	Conduit	
3HW1/CB	Conduit	
3YN1/CB	Conduit	
YAD2/CB	Conduit	
5LJ3/BB	Conduit	

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.19c contains a listing of those boundaries for fire zone RB-6 that;

1) do not meet the separation criteria of Section III.G, and
2) provides a basis for acceptability for the zone boundary with no additional modifications, or
3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Table 6.19c

Fire Zone RB-6

Zone Boundary	Deviation From III.G	Proposed Modification	Basis For Acceptability
North	Non-rated non-door	None	1. Combustible loading in zone is low.
South	Non-rated non-door	None	2. Random access of personnel unlikely during normal operation. 3. Previous SER approval of man-door.

Those Appendix R deviation involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-19(d).

Table 6-19(d) Fire Zone: RB-6

Equipment	Identification	Proposed Modification
Valve (E51-F008)	KS6	Protect the equipment by enclosing it in a proper fire retardant material.
Valve (E11-F015B)	KJ3	Protect equipment by enclosing in a proper fire retardant material.
Valve (E51-F008)	KS6	Protect equipment by enclosing in a proper fire retardant material.
Junction Box	X93	Protect equipment by enclosing in a proper fire retardant material.
Junction Box	XQ4	Protect equipment by enclosing in a proper fire retardant material.
Junction Box	XQ3	Protect equipment by enclosing in a proper fire retardant material.
Junction Box	W63	Protect equipment by enclosing in a proper fire retardant material.

6.19.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with annunciation in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) The introduction of transient combustibles during normal plant operation is not credible due to zone orientation.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-19. Evaluations Parameters Summary Table, Fire Zone RB-6 (Unit 1)

A. Zone description

1. Construction

a. Walls

North - Interior: 24-inch thick reinforced concrete

South - Interior: 24-inch thick reinforced concrete

East - Interior: 48-inch reinforced concrete

West - Interior: 72-inch minimum reinforced concrete

b. Floor - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 18-inch thick reinforced concrete slab

2. Ceiling height - 14 feet 6 inches

3. Room volume - Approximately 16,660 cu. ft.

4. Ventilation - 3000 cfm transfer from zone RB-1-g (S/E), 3000 cfm exhaust

5. Congestion/Access - Access doors are at northeast and southeast corners of zone. Access to the zone is via zone RB-1-g(N/E) which, in turn, is accessible via equipment access doors located on the east side of this zone. Access to the zone is good. Access within the zone is limited.

Table 6-19. Evaluations Parameters Summary Table, Fire Zone RB-6 (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
RHR System	X	X	RHR System	X	X
HPCI System	X	X	RCIC System	X	X

2. Equipment in zone required for safe shutdown:

Train A			Train A		
Description	Eqpt	Cable	Description	Eqpt	Cable
Valve E11-F015A (KJ6)	X	X	Valve E11-F015B (KJ3)	X	X
Valve E11-F008 (KM3)	X	X	Valve E11-F008 (KM3)	X	X
Valve E41-F003 (KG8)	X	X	Valve E51-F008 (KS6)	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area - Grease located in 10 safety-related motor-operated valves, and electrical cables.

2. Quantity of combustibles - 45 pounds of grease. A small number of cables are totally encased in conduit. There are no trays in this zone.

3. Ease of ignition and propagation - Grease is not considered a source of fire ignition due to its high flash point. Cables are nonpropagating.

Table 6-19. Evaluations Parameters Summary Table, Fire Zone RB-6 (Unit 1) (Cont)

4. Suppression damage to equipment - Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on the ceiling

2. Automatic suppression systems - None

3. Hose station/extinguisher

a. Distance to hose stations - Hose reels with 75 feet of hose are in adjacent areas. One is 50 feet away from the centroid of the area, another is 65 feet.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.20 Fire Zone RB-1-e (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-B does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.20.1 Area Description

This fire zone comprises the Reactor Building at column lines S to T and 2R to 3R at elevation 20 feet. The area is bounded by fire-rated 24-inch thick reinforced concrete walls, an 18-inch thick reinforced concrete floor, and a 12-inch thick reinforced concrete ceiling. Access to this area for manual fire-fighting is fair. The zone is accessible through one doorway. The concrete walls and ceiling both have nonrated hatches. Ceiling height is 28 feet 6 inches. Room ventilation is 10,484 cfm.

6.20.2 Safe Shutdown Equipment

Fire zone RB-1-e contains cables associated with train A service water pumps and a train A RHR heat exchanger necessary for

safe shutdown. A small number of cables are totally enclosed in conduit. There are no trays in this zone.

6.20.3 Fire Protection Systems

Fire zone RB-1-e contains ionization smoke detectors located on the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is 50 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.20.4 Fire Hazards Analysis

The specific deviations which were identified utilizing the methodology and assumptions described in Section 4 for fire zone RB-1-e are lack of rated barriers. This lack of barrier ratings is due to a non-rated hatch in the ceiling and a non-rated door in south wall. The hatch in the ceiling is part of the exterior wall of the Reactor Building, and therefore no redundant circuits are opposite this hatch. The door in the south wall of this zone accesses the adjacent zone which contains cables of the same division as RB-1-e. All redundant circuits in the adjacent zone have been properly dispositioned in that area analysis. In addition more than twenty feet of horizontal separation exists between safe shutdown circuits in zone RB-1-e and redundant circuits in the adjacent zone.

6.20.5 Conclusion

Based on previous analysis, exemption is requested from the requirements for three hour barriers between fire zones as prescribed by Section III.G.2 of Appendix R. The technical basis which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that already provided by the existing configuration.

Table 6-20. Evaluations Parameters Summary Table, Fire Zone RB-1-e (Unit 1)

A. Zone description

1. Construction

a. Walls

North - Exterior: 24-inch thick reinforced concrete

South - Interior: 24-inch thick reinforced concrete

East - Exterior: 24-inch thick reinforced concrete

West - Interior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 18-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height - 28 feet 6 inches average (underside of roof)

3. Room volume - Approximately 20,900 cu. ft.

4. Ventilation - 10,484 cfm exhaust; supply 1000 cu. ft. infiltration through door at elevation 20 feet and 9484 cu. ft. infiltration from elevation (-)17 feet through floor grating

5. Congestion/Access - This zone is accessible through one doorway. Inside the zone, ample space exists around the RHR heat exchanger and associated piping.

Table 6-20. Evaluations Parameters Summary Table, Fire Zone RB-1-e (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

   a. Service Water system

   b. RHR system

2. Equipment in zone required for safe shutdown:

Description	Train A Eqpt	Train A Cable	Description	Train A Eqpt	Train A Cable
RHR Heat Exchanger	X			NONE	
Valve E11-F002A (VQ0)	X	X			

C. Fire Hazards Analysis

1. Type of combustibles in area - Grease and cables

2. Quantity of combustibles - Approximately 2 pounds of grease may be contained in the operator for valve E11-F002A.

3. Ease of ignition and propagation - Grease is not considered a source of fire ignition because of its high flash point. Cables are non-propagating.

4. Suppression damage to equipment - This is an enclosed area with open grating to elevation (-)17 feet. Any water spray would be confined to this area and the elevation (-)17 feet area directly below, which does not contain redundant train equipment.

Table 6-20. Evaluations Parameters Summary Table, Fire Zone RB-1-e (Unit 1) (Cont)

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on the ceiling

2. Automatic suppression systems - None

3. Hose station/extinguisher

   a. Distance to hose stations - One water hose reel with a 75-foot hose is located near the entrance to this zone approximately 50 feet from the centroid of the zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.21 Fire Zone RB-1-f (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-f does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.21.1 Area Description

This fire zone comprises the Reactor Building at column lines S to T and 7R to 8R at elevation 20 feet. The area is bounded by fire-rated 24-inch thick reinforced concrete walls, a 24-inch thick reinforced concrete floor, and a 12-inch thick reinforced concrete ceiling. Access to this zone for manual suppression is good. One doorway provides access. The concrete walls and ceiling both have nonrated hatches. Ceiling height is 29 feet. Room ventilation is 14,364 cfm.

6.21.2 Safe Shutdown Equipment

Fire zone RB-1-f contains equipment and cables associated with the Service Water System and the RHR System necessary for safe shutdown. A small number of cables are totally encased in conduit. There are no trays in this zone.

6.21.3 Fire Protection Systems

Fire zone RB-1-f contains ionization smoke detectors located on the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is 30 feet away in the adjacent area. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.21.4 Fire Hazards Analysis

The specific deviations which are identified utilizing the methodology and assumptions described in Section 4 for fire zone RB-1-f are lack of unrated barriers. The lack of non-rated barriers is due to a non-rated hatch in the ceiling and a non-rated door in the north wall. The hatch in the ceiling is part of the exterior wall of the Reactor Building, and therefore no redundant circuits are opposite this hatch. The door in the north wall accesses the adjacent zone which contains mostly cables of the same train as RB-1-f. All redundant circuits in the adjacent zone have been properly dispositioned in that area analysis, and therefore any circuit redundancies which might exist across the non-rated door would be bounded by the fire hazards analysis in the adjacent zone.

6.21.5 Conclusion

Based on previous analysis, exemption is requested from the requirement for a three hour rated barrier between fire zones as prescribed in Section III.G of Appendix R. The technical basis which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that already provided by the existing configuration.

Table 6-21. Evaluations Parameters Summary Table, Fire Zone RB-1-f (Unit 1)

A. Zone description

1. Construction

a. Walls

North - Interior: 24-inch thick reinforced concrete

South - Exterior: 24-inch thick reinforced concrete

East - Exterior: 24-inch thick reinforced concrete

West - Interior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 24-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height - 29 feet (underside of roof)

3. Room volume - Approximately 20,940 cu. ft.

4. Ventilation - 14,364 cfm exhaust to the normal Reactor Building ventilation system. The supply is provided from fire zone RB-1-d below through a grating and by infiltration through the door.

5. Congestion/Access - This area is uncongested. One doorway provides access to this zone.

Table 6-21. Evaluations Parameters Summary Table, Fire Zone RB-1-f (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
NONE			RHR System	X	X
			Service Wtr. Sys.		X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
NONE			Valve E11-F075 (KR5)	X	X
			Valve E11-F002B (VQ1)	X	X
			Valve E11-F073 (KR4)	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area - Electrical cables and grease in valve motor operators

2. Quantity of combustibles - 4.5 pounds of grease. A small number of cables are totally encased in conduit. There are no trays in this zone.

3. Ease of ignition and propagation - Grease is not considered to be a source of fire ignition due to its high flash point. Cables are non-propagating.

Table 6-21. Evaluations Parameters Summary Table, Fire Zone RB-1-f (Unit 1) (Cont)

4. Suppression damage to equipment - This is an enclosed area with open grating to elevation -17 feet. Any water spray would be confined to those zones which do not contain any redundant train equipment.

D. Fire Protection Existing

1. Fire detection systems - Two ionization detectors on the ceiling

2. Automatic suppression systems - None

3. Hose station/extinguisher

a. Distance to hose stations - None inside the room. One water hose reel with 75-foot hose is located outside the door about 30 feet from the zone centroid.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.22 Fire Zone RB-1-g(E/C) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-g(E/C) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is exceedingly low in fire zone with no allowable storage of transient combustibles.

(3) Access to this zone is excellent for manual fire-fighting.

(4) Full-coverage, automatic fixed suppression exists at adjacent zone boundary (RB-1-g(N/E)).

6.22.1 Area Description

This fire zone is bounded by a rated fire wall to the east and west and is open to the north and south. The floor and ceiling are 12-inch thick reinforced concrete slabs. Ceiling height is 29 feet. Room ventilation is 3000 cfm.

6.22.2 Safe Shutdown Equipment

Fire zone RB-1-g(E/C) contains cables, associated with the HPCI, RIP, RCIC, and RHR systems and associated valves and panels necessary for safe shutdown.

6.22.3 Fire Protection Systems

Fire zone RB-1-g(E/C) contains ionization smoke detectors located on the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is 70 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided base on the hazards present in the zone. These extinguishers ar spaced to meet NFPA 10 criteria or closer as circumstances require.

6.22.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-g(E/C) Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

> The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division.

The conduits/cable trays of concern for Fire Zone RB-1-g(E/C) are individually dispositioned on Table 6-22b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier from the floor to a given elevation (for those vertical conduits/ trays penetrating the floor),

(b) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved,

(c) Providing a thermal shield, cable coatings or a one-hour barrier for those opposite division cable trays that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-22(b) UNIT 1 REACTOR BUILDING FIREZONE: RB-1-G(E/C)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
DCM1/CA	Conduit	301	301	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
DCK1/CA	Conduit	Provide an appropriate wrap from floor to 18' 4" off the floor.
DCB1/CB	Conduit	
DCK1/CA	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
DCL1/CA	Conduit	
3B11/CB	Conduit	
3B12/CB	Conduit	
DCC1/CB	Conduit	
DCB1/CB	Conduit	
YSU1/CA	Conduit	

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviations involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment, which is separated from the opposite division of horizontal distance without intervening combustibles, was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-22c.

Table 6-22c. Fire Zone: RB-1-g(E/C)

Equipment	Identification	Proposed Modification
Junction Box	A52	None - equipment safe by configuration.
Junction Box	FR5	Provide a barrier underneath, extending out at least 40 inches from the equipment in all directions or enclose the equipment by a proper fire-retardant material.
Junction Box	A54	None - equipment safe by configuration.
MCC (1XC)	DS4	Provide a sloping curb extending 5 feet from the face of the cabinets and/or protect the equipment with appropriate fire-retardant material.
Valve (E11-FØ17B)	KJ2	None - equipment safe by configuration.

6.22.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is extremely low in fire zone with no allowable storage of transient combustibles.

(3) Access for manual fire-fighting is excellent with abundant free maneuvering space.

(4) Intervening combustibles pose no threat at the open boundaries of this zone.

(5) The conservative quantitative fire hazards analysis described previously, in addition to the proposed modifications, demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-22. Evaluations Parameters Summary Table, Fire Zone RB-1-g(E/C) (Unit 1)

A. Zone description

1. Construction

a. Walls

North - No wall

South - No wall

East - Exterior: 24-inch thick reinforced concrete

West - Interior: 24-inch thick reinforced concrete part wall, 48-inch thick reinforced concrete

b. Floor - Poured-in-place 12-inch reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height - 29 feet

3. Room volume - Approximately 46,060 cu. ft.

4. Ventilation - 3000 cfm supply air via the normal Reactor Building ventilation system

5. Congestion/Access - This zone is not congested. It can be easily accessed by the fire brigade from the open sides located to the north and south.

Table 6-22. Evaluations Parameters Summary Table, Fire Zone RB-1-g(E/C) (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
RHk System		X	RHR System	X	X
Service Wtr. System	X	X			
Electrical Distr. System	X	X			
Diesel Gen. Sys.		X			
HPCI System		X	RCIC System	X	X
RIP System		X			
Instr. Air System	X	X			
Ventilating Air System		X			
Instrumentation		X			

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Valve E11-F017A (KJ5)	X	X	Valve E11-F017B (KJ2)	X	X
Partial Winding Htr. Cab. (FR5)	X	X	Valve E51-F007 (DS4)	X	X
MCC 1XC	X	X			

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease and cables

2. Quantity of combustibles:

Grease: 6 pounds

Cables: Average four trays, approximately 600 lineal feet, medium to heavy density

Table 6-22. Evaluations Parameters Summary Table, Fire Zone RB-1-g(E/C) (Unit 1) (Cont)

3. Ease of ignition and propagation: Cables are non-propagating. Grease is not considered a source of fire ignition due to its high flash point.

4. Suppression damage to equipment - Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital components in this zone or in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on the ceiling

2. Automatic suppression systems - None

3. Hose station/extinguisher

   a. Distance to hose stations - None in this zone. However, the adjacent north and south fire zones each have one hose reel with 75-foot hose, located 75 feet from the center of the zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.23 Fire Zone RB-1-g(N/C) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-g(N/C) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and fixed automatic suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with annunciation in the control room.

(2) The fixed combustible loading is very low in fire zone with no allowable storage of transient combustibles.

(3) Personnel radiation requirements during normal operation limit the random introduction of transient combustible materials.

(4) Intervening combustibles pose no threat to adjacent zone boundaries.

6.23.1 Area Description

Fire zone RB-1-g(N/C) is bounded by a rated fire wall to the north and south and a rated partial barrier to the west, and is open to the east. The floor is a 48-inch thick concrete slab and the ceiling is a 12-inch thick concrete slab. Ceiling height is 29 feet 6 inches. Room ventilation is 8220 cfm.

6.23.2 Safe Shutdown Equipment

Fire zone RB-1-g(N/C) contains cables associated with the HPCI, RIP, RCIC, and CRD Systems, and associated valves, cabinets, MCCs, CRD NCU Banks 1 and 2, and switches necessary for safe shutdown.

6.23.3 Fire Protection Systems

Fire zone RB-1-g(N/C) contains ionization smoke detectors located on the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is 25 feet from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.23.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-g(N/C) Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite opposite division,

(b) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-G(N/C) are individually dispositioned on Table 6-23b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,

(b) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved,

TABLE 6-23(b) UNIT 1 REACTOR BUILDING FIREZONE RB-1-G(N/C)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
33E/CA	Tray	255	255	0
33D/CA	Tray	231	279	0
33C/CA	Tray	231	231	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
36A/DA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
36Z/DA	Tray	
4SA1/CA	Conduit	
33J/DA	Tray	
37J/DA	Tray	
36F/DA	Tray	
36E/DA	Tray	
36D/DA	Tray	
36C/DA	Tray	
36B/DA	Tray	
4UH1/CA	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
4UG1/CA	Conduit	
4TQ1/CA	Conduit	
DCR1/CA	Conduit	
45L/CA	Tray	

(c) Providing a thermal shield, cable coatings or a one-hour barrier for those opposite division cable trays that cross or come within close proximity of one another until a specified separation is achieved.

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviations involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment, which is separated from the opposite division of horizontal distance without intervening combustibles, was assumed to be safe by existing configurations. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-23(c).

Table 6-23c. Fire Zone: RB-1-g(N/C)

Equipment	Identification	Proposed Modification
Instrument Rack (HZ1 - PØ35)	IE3	None - safe by configuration.

6.23.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is very low in fire zone (consisting only of cables in cable trays) with no allowable storage of transient combustibles.

(3) Personnel radiation considerations preclude random introduction of transient combustibles.

(4) Intervening combustibles pose no threat at adjacent zone boundaries.

(5) The conservative quantitative fire hazards analysis described previously, in addition to the proposed modifications, demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-23. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/C) (Unit 1)

A. Zone description

1. Construction

a. Walls

North - Exterior: 48-inch thick reinforced concrete

South - Interior: 33-inch thick minimum reinforced concrete

East - No wall

West - No wall, part wall 24-inch thick reinforced concrete

b. Floor - Poured-in-place 48-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height - 29 feet 6 inches

3. Room volume - Approximately 87,416 cu. ft.

4. Ventilation - 8220 cfm supply air via the normal Reactor Building ventilation system

5. Congestion/Access - This area is not congested. It can be accessed from the adjacent areas to the west and east (no walls).

Table 6-23. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/C) (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
RHR System		X			
Electrical Distr. System	X	X			
Diesel Gen. System		X			
HPCI System	X	X	RCIC System	X	X
RIP System	X	X	RIP System	X	X
Service Water System		X			
Instrumentation	X	X	Instrumentation	X	X
Instrument Air System		X			
Containment Atmos-pheric Control System	X	X			

CRD System (COMMCO Train A and B)

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Term. Box/Valve CAC-PV-1209A (Y86)	X	X	Term. Box/Valve B21-F056 (YM4)	X	X
Term. Box/Valve B32-F056F (YK8)	X	X			
Term. Box/Valve E41-F023A (YL1)	X	X			
Term. Box/Valve E41-F023C (YLØ)	X	X			
Instrument Rack H21-P016 (IJ6)	X		Instrument Rack H21-P035 (IE3)		X
Press. SW E41-PS-N001A	X	X	Press. SW E51-PS-N019A	X	X
Press. SW E41-PS-N001C	X	X	Press. SW E51-PS-N019C	X	X
Press. SW E41-PS-N004	X	X	Press. SW E51-PS-N017	X	X

Table 6-23. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/C) (Unit 1) (Cont)

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
MCC 1XA	X	X			
MCC 1XA-2	X	X			
MCC 1XDA	X	X			
			Penetration X-015D QB3)	X	X
Term. Box/Valv CAC-PV-1209D (Y89)	X	X			
			Term. Box/Valve E51-F043A (YM8)	X	X
			Term. Box/Valve E51-F043C (YM9)	X	X
Penetration X-104A (QA7)	X	X			
Penetration X-103A (QB6)	X	X			
Instrument Rack H21-P006 (IJ1)		X			
Press. SW B21-PS-N021C	X	X			
Level SW B21-LITS-N036	X	X			

CRD NCU Banks 1 and 2

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables

2. Quantity of combustibles:

Cables - average four trays, approximately 1,100 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Cables are non-propagating.

Table 6-?3. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/C) (Unit 1) (Cont)

4. Suppression damage to equipment - Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on the ceiling

2. Fire extinguishing systems - None

3. Hose station/extinguisher

a. Distance to hose stations - One hose reel with 75-foot hose 25 feet from the center of the zone

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.24 Fire Zone RB-1-g(N/E) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-g(N/E) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) The zone is fully covered by an automatic fixed suppression system.

(2) Ionization smoke detectors are provided with a common area alarm in the control room.

(3) The fixed combustible loading is extremely low in fire zone, comprised of cable trays and cables enclosed in conduit, with no allowable storage of transient combustibles.

6.24.1 Area Description

This fire zone comprises the Reactor Building at column lines R to T and 2R to 4R at elevation 20 feet. Access to this area for manual firefighting is excellent. Fire zone RB-1-g(N/E) is bounded by rated fire walls to the north and east and open boundaries to the south and west. The floor consists of a 24-inch thick reinforced concrete slab. The ceiling consists of a 12-inch thick reinforced concrete slab. Ceiling height is 29 feet. Room ventilation is 1000 cfm.

6.24.2 Safe Shutdown Equipment

Fire zone RB-1-g(N/E) contains cables associated with instrumentation and the RHR, HPCI, and Diesel Generator Systems.

6.24.3 Fire Protection Systems

Fire zone RB-1-g(N/E) contains an ionization smoke detection system connected to a control room annunciator, and a fixed automatic water suppression system providing full zone coverage. A manual 1-1/2-inch hose station is located 15 feet away on the north wall of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.24.4 Fire Hazards Analy

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-g(N/E) Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone RB-1-g(N/E) are individually dispositioned on Table 6-24b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist.

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

TABLE 6-24(b) UNIT 1 REACTOR BUILDING FIREZONE: RB-1-G(N/E)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
45M/DA	Tray	285	285	0
45L/CA	Tray	297	297	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
33K/DA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
4UH1/CB	Conduit	Provide an appropriate wrap until
4UG1/CA	Conduit	eight feet of horizontal separation
4TG1/CA	Conduit	from opposite color is achieved.

6.24.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) The zone is provided with an automatic fixed suppression system.

(2) Ionization smoke detectors are provided with a common area alarm in the control room.

(3) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(4) Zone boundaries are free of intervening combustibles.

(5) The conservative quantitative fire hazards analysis described previously, in addition to the proposed modifications, demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-24. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/E) (Unit 1)

A. Zone description

1. Construction

a. Walls

North - Exterior: 24-inch thick reinforced concrete

Interior: same as above

South - Interior - 24-inch thick reinforced concrete (at zone RB-6); no wall (partial) for remainder of boundary.

East - Exterior: 24-inch thick reinforced concrete

Interior: 24-inch thick reinforced concrete (at zone RB-9); partially open.

West - No wall

b. Floor - Poured-in-place 24-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height - 29 feet

3. Room volume - Approximately 53,650 cu. ft.

4. Ventilation - 1000 cfm exhaust air via the normal Reactor Building ventilation system

5. Congestion/Access - None. This zone is essentially an open area which is open to two adjacent zones.

Table 6-24. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/E) (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Electrical Distr. System		X			
Diesel Gen. System		X	Instrumentation		X
Instrumentation		X			
Service Water System		X			
RHR System		X			
HPCI System		X			

2. Equipment in zone required for safe shutdown: No safe shutdown equipment requiring review for this evaluation (i.e., no motor-operated valves, MCCs, etc.)

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables

2. Quantity of combustibles: Cables - three trays, approximately 90 lineal feet, medium density

3. Ease of ignition and propagation: Cables are non-propagating.

6. Suppression damage to equipment - Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in this zone and adjacent zones.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on the ceiling

Table 6-24. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/E) (Unit 1) (Cont)

2. Automatic suppression systems - Wet-pipe system, utilizing automatic on/off sprinkler heads charged with water. The water supply is provided with a one-head bypass of deluge valve feature. The deluge valve is automatically operated upon actuation of the detection system and flow in the bypass.

3. Hose station/extinguisher

   a. Distance to hose stations - One water hose station is mounted on the north wall of this zone about 15 feet from the zone centroid.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.25 Fire Zone RB-1-g(S/E) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-g(S/E) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Mobility within the zone for firefighting is excellent.

6.25.1 Area Description

This fire zone comprises the Reactor Building at column lines R to T and 6R to 8R at elevation 20 feet. The area is bounded by fire-rated walls to the south and east, is open to the west, and has a partial rated barrier to the north. The floor is a 24-inch thick reinforced concrete slab and the ceiling is a 12-inch thick reinforced concrete slab. Ceiling height is 29 feet. Room ventilation is 2540 cfm. Access to this zone is excellent for the purpose of manual firefighting.

6.25.2 Safe Shutdown Equipment

Fire zone RB-1-g(S/E) contains cables associated with the HPCI, RIP, RCIC, RHR and Diesel Generator Systems necessary for safe shutdown.

6.25.3 Fire Protection Systems

Fire zone RB-1-g(S/E) contains ionization smoke detectors located on the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is 36 feet away from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.25.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-g(S/E) Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite opposite division,

(b) The conduit/cable tray of interest is above the stratification height,

(c) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-g(S/E) are individually dispositioned on Table 6-25b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier from the floor to a given elevation (for those vertical conduits/ trays penetrating the floor),

(b) Providing an appropriate barrier for those conduits/ trays or reroute cable for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,

TABLE 6-25(b). UNIT 1 REACTOR BUILDING FIREZONE RB-1-G(S)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
39P/CB	Tray	266	266	0
39N/CB	Tray	266	266	0
39M/CB	Tray	266	266	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
39Q/CB	Tray	Provide an appropriate wrap from floor to 18' 4" off the floor.
40P/CB	Tray	Provide an appropriate wrap down to three feet below the ceiling.
39Q/CB 40P/CB 39L/CB	Tray Tray Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
8ZB3/DA 8ZB4/DA DCC1/CB	Conduit Conduit Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.

(c) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

(d) Providing cable coating or an appropriate barrier for those cable trays above the stratification height up to the ceiling, or for the duration of traverse through the stratification region.

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviation involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment, which is separated from the opposite division of horizontal distance without intervening combustibles, was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-25c.

Table 6-25c. Fire Zone: RB-1-g(S/E)

Equipment	Identification	Proposed Modification
MCC (1XD)	DW1	Provide a sloping curb extending 5 feet from the face of the cabinets and/or protect the equipment with appropriate fire-retardant material.

6.25.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Zone is easily accessible from adjacent zones RB-1-g(S/E) to the west and RB-1-g(E/C) to the north.

(4) Fire brigade mobility within the zone is excellent.

(5) Intervening combustibles do not pose a hazard at the open boundaries.

(6) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(7) The conservative quantitative fire hazards analysis described previously, in addition to the proposed modifications, demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-25. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/E) (Unit 1)

A. Zone description

1. Construction

a. Walls

North - Interior: 24-inch thick reinforced concrete

No wall (partial)

South - Exterior: 24-inch thick reinforced concrete

Interior: 24-inch thick reinforced concrete

East - Exterior: 24-inch thick reinforced concrete

Interior: 24-inch thick reinforced concrete

West - No wall

b. Floor - Poured-in-place 24-inch thick reinforced concrete slabs and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height - 29 feet

3. Room volume - Approximately 61,118 cu. ft.

4. Ventilation - 2540 cfm supply from the normal Reactor Building ventilation system

5. Congestion/Access - This zone is uncongested. It can be accessed via two open sides from the adjacent zones to the north and west, a stairway and a doorway. An additional doorway provides access to the personnel decontamination room.

Table 6-25. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/E) (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
HPCI System		X	ADS System		X
RIP System		X	Elec Distr Sys		X
Instrumentation	X	X	Diesel Gen Sys		X
			RHR System		X
			Service Wtr Sys		X
			Vent. Air Sys		X
			RCIC System		X
			RIP System		X
			Instrumentation	X	X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Remote Shutdown Pnl (RS4)	X	X	Remote Instr Pnl (RS4)	X	X
Instrumentation	X	X	Partial Wndg Htr Cab (FR6)	X	X
			Inst Air Comp 1B (NP7)	X	X
			Press. SW IA-PSL-3595 (L08)	X	X
			MCC IXD	X	X
			Instrumentation		

Table 6-25. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/E) (Unit 1) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area - Oil for lubrication of standby air compressor and electrical cables

2. Quantity of combustibles -

Oil - 30 gallons of lube oil (approximately based on engineering judgement)

Cables - average (four) trays approximately 700 linear feet, medium to heavy density.

3. Ease of ignition and propagation - The flash point of lube oil is 450°F. Cables are non-propagating.

4. Suppression damage to equipment - Fire brigade personnel are trained to avoid inadvertent spraying of vital components in this zone and in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on the ceiling

2. Fire extinguishing systems - None

3. Hose station/extinguisher

a. Distance to hose stations - One water hose reel with 75-foot hose 36 feet from the center of the fire zone

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.26 Fire Zone RB-1-g(S/C) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-g(S/C) does not comply with the specific provisions of 10 CFR 50 Appendix R, Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and fixed automatic suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is extremely low in fire zone with no allowable storage of transient combustibles.

(3) Adjacent zones to the east and west provide excellent access to the zone for fire brigade personnel.

6.26.1 Area Description

This fire zone comprises the Reactor Building at column lines M to R and 6R to 8R at elevation 20 feet. Fire zone RB-1-g(S/C) is bounded by rated fire walls to the north and south and a 24-inch thick reinforced concrete partial wall to the west, and is open to the east. The floor is a 48-inch thick reinforced concrete slab. The ceiling is a 12-inch thick reinforced concrete slab. This fire zone has excellent accessibility from the east and west.

6.26.2 Safe Shutdown Equipment

Fire zone RB-1-g(S/C) contains cables and equipment associated with the HPCI, RCIC, ADS, and RHR Systems.

6.26.3 Fire Protection Systems

Fire zone RB-1-g(S/C) contains an ionization smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 26 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.26.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-g(S/C) Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

(b) The conduit/cable tray of interest is above the stratification height,

(c) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone RB-1-g(S/C) are individually dispositioned on Table 6-26b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,

(b) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

(c) Providing a thermal shield, cable coatings or an appropriate barrier for those opposite division cable trays that cross or come within close proximity of one another until a specified separation is achieved.

(d) Providing an appropriate barrier for those conduits above the stratification height up to the ceiling, or for the duration of traverse through the stratification region.

TABLE 6-26(P) UNIT 1 REACTOR BUILDING FIREZONE RB-1-G(S/C)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
39H/CB	Tray	252	252	0
39I/CB	Tray	252	252	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
DMB1/CB	Conduit	Provide an appropriate wrap down to three feet below the ceiling.
8CH1/CB	Conduit	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
8CK1/CB	Conduit	
39J/CB	Tray	
39K/CB	Tray	
39L/CB	Tray	
DMB1/CB	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
DCH1/CB	Conduit	
40P/CB	Tray	

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviations involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-26c.

Table 6-26(c). Unit 1 Reactor Building, Fire Zone RB-1-g(S/C)

Equipment	Identification	Proposed Modification
Instrument Rack (H21-P036)	IH7	None - equipment safe by configuation

6.26.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Photoelectric smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is extremely low in fire zone with no allowable storage of transient combustibles.

(3) Lack of congestion throughout this zone allows excellent mobility of the fire brigade.

(4) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety, which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-26. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/C)

A. Zone Description

1. Construction

a. Walls

North - Interior: 33-inch thick minimum reinforced concrete

South - Exterior: 48-inch thick reinforced concrete

East - No wall

West - No wall; part wall 24-inch thick reinforced concrete

b. Floor - Poured-in-place 48-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Same as floor except 12 inches thick

2. Ceiling height - 29 feet 6 inches

3. Room volume - approximately 87,400 cu. ft.

4. Ventilation - 4,620 cfm supply from the normal Reactor Building ventilation system

5. Congestion/Access - This area is not congested. It is accessible from the adjacent zones.

Table 6-26. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/C) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
HPCI System	X	X	ADS System	X	X
RCIC System	X	X	RCIC System	X	X
RIP System	X	X	Service Water System		X
			Elec. Distr. System		X
			Diesel Gen. System		X
			RHR System	X	X
			Instrumentation		X
			Ventilating Air System		X
			RIP System	X	X
			Instrument Air System		X

CRD HCU Banks 3 and 4

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Term. Box/Vlv. E51-F043D (YS7)	X	X	Term. Box/Vlv. B32-F056E (YS2)	X	X
Term. Box/Vlv. E41-F023D (YS8)	X	X	Term. Box/Vlv. E51-F043B (YS5)	X	X
Instr. Rack H21-P036 (IH7)	X		Term. Box/Vlv. E51-F043D (YS6)	X	X
Press. SW E41-PS-N005	X	X	Penetration X-102H (QD2)	X	X
Press. SW E41-PS-N001B	X	X	Term Box (W13)	X	X
Press. SW E41-PS-N001D	X	X	Term. Box/Vlv. CAC-PV-1225C (Y36)	X	X
			MCC 1XB	X	X
			MCC 1XB-2	X	X
			MCC 1XDB	X	X
			Penetration X-103B (QD0)	X	X
			Penetration X-102F (QC8)	X	X

Table 6-26. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/C) (Cont)

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
			Penetration X-104F (QC9)	X	X
NONE			Penetration X-102E (QC3)	X	X
			Instrument Rack H21-P010 (IJ4)	X	
			Press. SW B21-PS-N021B	X	X
			CRD System contains Trains A and B		

C. Fire Hazards Analysis:

1. Type of combustibles in area: Cables
2. Quantity of combustibles: Cables - average four trays, approximately 700 lineal feet, medium to heavy density
3. Ease of ignition and propagation: Cables are non-propagating.
4. Suppression damage to equipment - Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in this area and in adjacent zones. Safety-related valve motor operators are protected by NEMA 4 enclosures.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on ceiling
2. Automatic suppression systems - None
3. Hose station/extinguisher
   a. Distance to hose stations - One water hose reel with 75-foot hose 26 feet from centroid of zone

Table 6-26. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/C) (Cont)

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.27 Fire Zone RB-1-o (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-o does not comply with the specific provisions of 10 CFR 50 Appendix R, Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic suppression requirements. The basis for this exemption is as follows:

(1) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(2) Ionization smoke detectors are provided with a common area alarm in the control room.

(3) Random introduction of transient combustibles in this zone is not credible due to zone orientation.

(4) Intervening combustibles pose no threat to adjacent zone boundaries due to zone orientation.

6.27.1 Area Description

This fire zone comprises the Reactor Building at column lines P to S and 4R to 6R at elevation 36 feet. The north, south and east boundaries are open, the west wall is 72-inch thick reinforced concrete, the floor is 18-inch thick reinforced concrete, and the ceiling is 12-inch thick reinforced concrete. Access to this area is limited, via a vertical ladder on the north wall of zone RB-6, extending from zone RB-1-g(N/E). Ceiling height is 13 feet. No forced ventilation exists in this zone; ventilation is by natural convection only.

6.27.2 Safe Shutdown Equipment

Fire zone RB-1-o contains cables associated with the HPCI, RHR, RIP, and ADS Systems, and associated valves necessary for safe shutdown.

6.27.3 Fire Protection Systems

Fire zone RB-1-o contains ionization smoke detectors located on the ceiling and connected to a control room annunciator. A manual 1-1/2-inch hose station is 60 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.27.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-o Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) the conduit/cable tray of interest is above the stratification height.

The conduits/cable trays of concern for Fire Zone RB-1-o are individually dispositioned on Table 6-27b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) providing an appropriate barrier for those conduits above the stratification height up to the ceiling, or for the duration of traverse through the stratification region.

TABLE 6-27(b) UNIT 1 REACTOR BUILDING FIREZONE RB-1-O

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
DCR1/CA	Conduit	Provide an appropriate wrap
DCN1/CA	Conduit	
3CQ1/CB	Conduit	
3IC1/CB	Conduit	
YCR1/CB	Conduit	
8ZB3/DA	Conduit	
8ZB4/DA	Conduit	
DCI1/CB	Conduit	
DCH1/CB	Conduit	
DCJ1/CB	Conduit	
DCQ1/CA	Conduit	

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviations involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-27(c).

Table 6-27(c). Fire Zone RB-1-o

Equipment	Identification	Proposed Modification
Junction Box Junction Box	A53 A55	Provide a barrier underneath, extending out at least 40 inches from the equipment in all directions, or enclose the equipment by a proper fire-retardant material.
Valve (E11-F052B)	VD5	Protect the equipment by enclosing it in a proper fire-retardant material.
Junction Box	QC1	None - equipment safe by configuration
Junction Box	QC0	None - equipment safe by configuration

6.27.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Zone orientation precludes introduction of transient combustibles.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-27. Evaluations Parameters Summary Table, Fire Zone RB-1-o (Unit 1)

A. Zone description

1. Construction

a. Walls

North - No wall

South - No wall

East - Interior: 48-inch thick reinforced concrete

West - Interior: 72-inch thick reinforced concrete

b. Floor - Poured-in-place 18-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height - 13 feet

3. Room volume - Approximately 20,100 cu. ft.

4. Ventilation - No forced ventilation in zone; natural convection only.

5. Congestion/Access - Access to this zone is via a ladder on the south wall of zone RB-6. Accessibility within the zone is limited.

Table 6-27. Evaluations Parameters Summary Table, Fire Zone RB-1-c (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown system in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
HPCI System		X	ADS System		X
RHR System		X	RHR System	X	X
RIP System		X			
Electrical Distr. Sys.		X			
Diesel Gen. System		X			
Instrument Air Sys.		X			
Ventilating Air Sys.		X			
Service Water Sys.		X			

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Valve E11-F052A (VD4)	X	X	Valve E11-F052B (VD5)	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area:

Grease contained in valve motor operators

Electrical cables

2. Quantity of combustibles:

Grease - 30 pounds

Cables - Average two trays, approximately 225 lineal feet, medium density

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition due to its high flash point. Cables are non-propagating.

Table 6-27. Evaluations Parameters Summary Table, Fire Zone RB-1-o (Unit 1) (Cont)

4. Suppression damage to equipment - Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on the ceiling

2. Automatic suppression systems - None

3. Hose station/extinguisher

a. Distance to hose stations - One hose station in the adjacent zone approximately 60 feet from the centroid of this zone

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.28 Fire Zone RB-1-h(E/C) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the Specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-h(E/C) does not comply with the specific provisions of 10 CFR 50 Appendix R, Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.28.1 Area Description

This fire zone comprises the Reactor Building at column lines P to S and 4R to 6R at elevation 50 feet. The north and south walls are open, the east wall is 24 inches thick, the west wall is 72 inches thick, and the floor and the ceiling are 12 inches thick. The walls, floor, and ceiling are reinforced concrete. Access to this area is excellent for the purposes of firefighting. Ceiling height is 29 feet. Room ventilation is 3750 cfm.

6.28.2 Safe Shutdown Equipment

Fire zone RB-1-h(E/C) contains equipment for the RIP, HPCI, RHR, and RCIC Systems, and associated pumps, valves, terminal boxes, and instruments necessary for safe shutdown.

6.28.3 Fire Protection Systems

Fire zone RB-1-h(E/C) contains ionization smoke detectors located on the ceiling and connected to a control room annunciator. A manual 1-1/2-inch hose station is 10 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.28.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-h(E/C) Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

(b) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone RB-1-h(E/C) are individually dispositioned on Table 6-28b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier from the floor to a given elevation (for those vertical conduits/trays penetrating the floor),

(b) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,

(c) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-28(b) UNIT 1 REACTOR BUILDING FIREZONE RB-1-H(E/C)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
4CT1/CA	Conduit	264	264	0
0IU1/CA	Conduit	72	177	72
3FV1/CA	Conduit	60	237	144
4DA1/CA	Conduit	72	181	160
4CQ1/CB	Conduit	180	216	144
4CQ2/CB	Conduit	180	216	144
4WS1/CB	Conduit	156	276	180
4WT1/CB	Conduit	156	276	180
4DK1/CB	Conduit	0	0	160
4MR2/DA	Conduit	96	170	108

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
DCN1/CA	Conduit	Provide an appropriate wrap from floor to 18' 4" off the floor.
4AA/AA	Conduit	
4AF/AB	Conduit	
45M/DA	Tray	
48R/CA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
48P/CA	Tray	
41P/CB	Tray	
42E/CB	Tray	
40K/DB	Tray	
45Q/CA	Tray	
45L/CA	Tray	
45S/DA	Tray	
45R/DA	Tray	
45Q/DA	Tray	
45M/DA	Tray	
47R/CA	Tray	
4CT2/CA	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
DCN1/CA	Conduit	
5NZ1/CB	Conduit	
5NZ4/CB	Conduit	
5NZ8/CB	Conduit	
5NZ1/DB	Conduit	
4MR2/DA	Conduit	

(d) Providing a thermal shield, cable coatings, or an appropriate barrier for those opposite division cable trays that cross or come within close proximity of one another until a specified separation is achieved.

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviations involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combutibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-28c.

Table 6-28(c). Fire Zone RB-1-h(E/C)

Equipment	Identification	Proposed Modification
Terminal Box (B21-F042B)	YP7	None - equipment safe by configuration
Terminal Box (B21-F044B)	YP8	None - equipment safe by configuration
Junction Box	WV2	Provide a barrier underneath, extending out at least 40 inches from the equipment in all directions, or enclose the equipment by a proper fire-retardant material.
Pressure Switch (SW-PS-1175)	JW0	None - equipment safe by configuration
Valve (SW-V137)	KB5	None - equipment safe by configuration
Pump (E11-CØØ1C)	NC2	None - equipment safe by configuration

6.28.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Lubricating oil would be confined by curbing in the event of a spill, and no credible ignition source is present.

(4) Lack of congestion within the zone would enhance fire brigade mobility.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(6) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-28. Evaluations Parameters Summary Table, Fire Zone RB-1-h(E/C)

A. Zone description

1. Construction

a. Walls

North - No walls

South - No walls

East - Exterior: 24-inch thick reinforced concrete

West - Interior: 72-inch thick reinforced concrete

b. Floor - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Same as floor

2. Ceiling height - 29 feet

3. Room volume - Approximately 74,936 cu. ft.

4. Ventilation - 3750 cfm of supply from normal Reactor Building ventilation system

5. Congestion/Access - This area is not congested. It is easily accessible from the adjacent areas to the north and south as there are no walls on these sides.

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Electrical Distr. Sys.		X			
Diesel Gen. System		X			
Ventilating Air Sys.		X			
Service Water Sys.	X	X	Service Water Sys.	X	X
RIP System	X	X	RIP System	X	X
HPCI System	X	X	RICI System	X	X
RHR System	X	X	RHR System	X	X
Instrumentation	X	X	Instrumentation	X	X

Table 6-28. Evaluations Parameters Summary Table, Fire Zone RB-1-h(E/C) (Cont)

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Valve SW-V136 (KB4)	X	X			
Pump SW-C001A (NC0)	X	X	Pump SW-C001B (NC1)	X	X
Junction Box (WV2)	X	X			
Flow SW. SW-FSL-895	X	X			
Temp. SW. SW-TSH-1109	X	X			
Pump SW-C001C (NC2)	X	X			
Junction Box (WT8)	X	X			
Flow SW. SW-FSL-897	X	X			
Temp. SW. SW-TSH-1111	X	X			
Valve SW-V101 (VI2)	X	X			
Valve SW-V137 (KB5)	X	X			
Press. SW SW-PS-1175 (JW0)	X	X			
Term. Box/Vlv. B21-F042A (YK2)	X	X	Term. Box/Vlv. B21-F042B (YP7)	X	X
Term. Box/Vlv. B21-F044A (YK3)	X	X	Term. Box/Vlv. B21-F044B (YP8)	X	X
Term. Box/Vlv. B21-F046A (YK4)	X	X	Term. Box/Vlv. B21-F046B (YP9)	X	X
Term. Box/Vlv. B21-F048A (YK7)	X	X	Term. Box/Vlv. B21-F048B (YQ0)	X	X
			Valve SW-V138 (KC3)	X	X
			Valve SW-V102 (VI6)	X	X
Instr. Rack H21-P004 (IG6) & Instruments	X	X	Instr. Rack H21-P005 (IG7) & Instruments	X	X
Level XMTR B21-LT-N026A (IG6)	X	X	Level XMTR B21-LT-N026B (IG7)	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area:

Grease, cables, oil

Table 6-28. Evaluations Parameters Summary Table, Fire Zone RB-1-h(E/C) (Cont)

2. Quantity of combustibles:

   Grease - 55 pounds

   Oil - 30 gallons

   Cables - Average four trays, approximately 500 lineal feet, medium density

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition due to its high flash point. Cables are non-propagating. Oil flash point requires raising oil bulk volume temperature above 450°F.

4. Suppression damage to equipment - Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital components in this area and in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems - Ionization detectors on the ceiling

2. Automatic suppression systems - None

3. Hose station/extinguisher

   a. Distance to hose stations - One water hose reel with 75-foot hose 10 feet from the center of the fire zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.29 Fire Zone RB-1-h(N/E) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-h(N/E) does not comply with the specific provisions of 10 CFR 50 Appendix R, Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room and fixed wet-pipe suppression.

(2) The fixed combustible loading is extremely low in fire zone with no allowable storage of transient combustibles.

6.29.1 Area Description

This fire zone comprises the Reactor Building at column lines P to S and 2R to 4R at elevation 50 feet. The south and west walls are open, the north wall is 24 to 48 inches thick (variable), and the floor and ceiling are 12-inch thick fire-rated reinforced concrete. Access to this area is excellent. Ceiling height is 29 feet. Room ventilation is 1500 cfm.

6.29.2 Safe Shutdown Equipment

Fire zone RB-1-h(N/E) contains cables associated with the HPCI, RIP, and RCIC Systems necessary for safe shutdown.

6.29.3 Fire Protection Systems

Fire zone RB-1-h(N/E) contains ionization smoke detectors located on the ceiling and connected to a control room annunciator, and a fixed suppression system utilizing automatic on/off sprinkler heads charged with water. A manual 1-1/2-inch hose station is 25 feet away from the center of the zone. A CO_2 extinguisher is located approximately 10 feet from the center of the zone. Also, additional portable CO_2 extinguishers are available from adjacent zones.

6.29.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-h(N/E) Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone RB-1-h(N/E) are individually dispositioned on Table 6-29b as:

(1) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or a thermal shield and cable coatings for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist.

TABLE 6-29(b) UNIT 1 REACTOR BUILDING FIREZONE RB-1-H(N/E)

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
48N/CA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
45P/CA	Tray	

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustible 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

6.12.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room and fixed wet-pipe suppression.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Lack of congestion within the zone boundaries enhance the fire brigade's ability to extinguish a fire.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-29. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/E)

A. Zone description

1. Construction/rating

a. Walls

North - Exterior: 24- and 48-inch thick reinforced concrete

South - Interior: No wall

East - Exterior: 24-inch thick reinforced concrete

West - No wall

b. Floor - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height - 29 feet

3. Room volume - approximately 56,950 cu. ft.

4. Ventilation - 1500 cfm, supply from normal Reactor Building ventilation system.

5. Congestion - Open area easily accessible from two adjacent zones. No congestion in the zone.

Table 6-29. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/E) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown system in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
HPCI System		X	RIIC System		X
RIP System		X			
Electrical Distr. Sys.		X			
Diesel Gen. System		X			
Service Water System		X			
Ventilating Air System		X			
Instrumentation		X			
RHR System		X			

2. Equipment in zone required for safe shutdown:

No safe shutdown equipment requiring review for this evaluation.

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease and cables

2. Quantity of combustibles:

Grease - approximately 10 pounds

Cables - Four trays, approximately 324 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition due to its high flash point. Cables are non-propagating.

Table 6-29. Evaluations Parameters Summary Table, Fire Zone RB-1-h(E/C) (Cont)

4. Suppression damage to equipment - Fire brigade personnel are trained to avoid inadvertent spraying of equipment in adjacent zones.

D. Fire Protecton Existing

1. Fire detection systems - Four ionization detectors on ceiling.

2. Fire extinguishing systems - Preactive system, utilizing automatic on/off sprinkler heads charged with water. The water supply is provided with a one-head bypass of deluge valve feature. The deluge valve is automatically operated upon actuation of the detection system and flow in the bypass.

3. Hose station/extinguisher

   a. Distance to hose stations - One 75-foot water hose reel on the north wall 25 feet from the centroid of the zone.

   b. Distance to extinguishers - One CO_2 extinguisher in the zone approximately 10 feet from the zone centroid.

6.30 Fire Zone RB-1-h(S/E) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-h(S/E) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Zone is easily accessible from the adjacent zone to the north and by a stairwell in the southeast corner.

6.30.1 Area Description

This fire zone comprises the Reactor Building at column lines P to S and 6R to 82 at elevation 50 feet. Access to this area is good. Fire zone RB-1-h(S/E) is bounded by 24-inch thick reinforced concrete walls to the south, east, and west. There is no wall to the north. The floor and ceiling are 24- to 12-inch thick reinforced concrete slabs. Ceiling height is 13 feet 8 inches and 29 feet. Room ventilation is 750 cfm intake and 6000 cfm exhaust. This zone is easily accessible from the adjacent zones to the north and a stairwell in the southeast corner.

6.30.2 Safe Shutdown Equipment

Fire zone RB-1-h(S/E) contains equipment and cables associated with the RIP, HPCI, and Nuclear Steam Systems.

6.30.3 Fire Protection Systems

Fire zone RB-1-h(S/E) contains an ionization smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 20 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.30.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly dispose all of the Appendix R deviations for Fire Zone RB-1-h(S/E) Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

(b) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-h(S/E) are individually dispositioned on Table 6-30b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier from the floor to a given elevation (for those vertical conduits/ trays penetrating the floor),

(b) Providing an appropriate barrier for those conduits/ trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,

(c) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-30(b) UNIT 1 REACTOR BUILDING FIREZONE RB-1-H(S/E)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
4CT1/CA	Conduit	168	264	120
4CT2/CA	Conduit	168	264	120
4DNA/CB	Conduit	243	243	2
4DNC/CB	Conduit	231	231	2
4DN6/CB	Conduit	231	231	2
4DN7/CB	Conduit	231	231	2

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
DMB1/CB	Conduit	Provide an appropriate wrap from floor to 18' 4" off the floor.
DCJ1/CB	Conduit	
40D/CB	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
40E/CB	Tray	
40I/CB	Tray	
40J/CB	Tray	
40P/CB	Tray	
DCJ1/CB	Conduit	
DLH1/CB	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
DMB1/CB	Conduit	
DMA2/CB	Conduit	
DMA1/CB	Conduit	
DLY1/CB	Conduit	
DLH1/CB	Conduit	

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

6.30.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Access to this zone for the purpose of fire fighting is excellent from the open boundary to the north and the southeast corner stairwell.

(4) Curbing within the fire zone would confine the lubricating oil in the event of a spill and no credible ignition exists in this zone.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(6) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-30. Evaluations Parameters Summary Table, Fire Zone RB-1-h(S/E)

A. Zone Description

1. Construction:

a. Walls

North - No wall

South - Exterior: 24- and 48-inch thick reinforced concrete

East - Exterior: 24-inch thick reinforced concrete

West - Interior: 36- and 48-inch thick reinforced concrete

b. Floor - Poured-in-place 24- and 12-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 24- and 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 29 feet and 13 feet 8 inches partial

3. Room volume: Approximately 60,000 cu. ft.

4. Ventilation: 750 cfm supply from the normal Reactor Building ventilation systems 6000 cfm exhaust to the adjacent zone

5. Congestion/Access: Access is via the southeast stairwell and adjacent zone RB-1-h (E/C). Access is good and mobility in the zone is good.

Table 6-30. Evaluations Parameters Summary Table, Fire Zone RB-1-h(S/E) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
RIP System		X	RIP System		X
HPCI System	X	X	RCIC System	X	X
Instrumentation	X	X	ADS System		X
Service Water System	X	X	Diesel Gen. System		X
Nuclear Steam System	X	X	RHR System	X	X
			Service Water System	X	X
			Instrumentation		X
			Nuclear Steam System	X	X

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Valve SW-V106 (VI8)	X	X	Valve SW-V102 (VI6)	X	X
Instr. Rack H12-P005-002 (IE1)	X		Valve SW-V105 (VI4)	X	X
Level SW B21-LITS-N017D	X	X	Press. SW SW-PS-1176 (JW1)	X	X
			Pump SW-C001D (NC3)	X	X
			Valve SW-V139 (KC4)	X	X
			Pump SW-C001B (NC1)	X	X
			Junction Box (WV3)	X	X
			Flow SW SW-FSL-896	X	X
			Temp. SW SW-TSH-1110	X	X
			Valve E11-F021B (VD8)	X	X
			Junction Box (WT9)	X	X
			Flow SW SW-FSL-898	X	X
			Temp. SW SW-TSH-1112	X	X
			Instr. Rack H12-P005-002 (IE1)	X	
			Level Sw B21-LITS-N017C	X	X

Table 6-30. Evaluations Parameters Summary Table, Fire Zone RB-1-h(S/E) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease, cables, and oil

2. Quantity of combustibles:

   Grease - 5 pounds in pump

   Cable - Average three trays, approximately 545 lineal feet, medium to heavy density

   Oil - 10 gallons

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition due to its high flash point. Cables are non-propagating. Oil flash point requires raising the oil bulk volume temperature above 450°F.

4. Suppression damage to equipment: Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment.

Table 6-30. Evaluations Parameters Summary Table, Fire Zone RB-1-h(S/E) (Cont)

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

   a. Distance to hose stations - One 75-foot water hose station in the zone, 20 feet from the centroid.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.31 Fire Zone RB-1-h(N/W) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-h(N/W) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Access to and mobility within time zone for purposes of fire fighting is excellent.

6.31.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 2R to 4R at elevation 50 feet. Access to this area is excellent. Fire zone RB-1-h(N/W) is bounded by rated fire walls to the north and west and is open to the south and east. The floor and ceiling are 12-inch thick reinforced concrete slabs. Ceiling height is 29 feet. Room ventilation is 2250 cfm.

6.31.2 Safe Shutdown Equipment

Fire zone RB-1-h(N/W) contains cables associated with the HPCI, RIP, RHR and Diesel Generator Systems.

6.31.3 Fire Protection Sytems

Fire zone RB-1-h(N/W) contains an ionization smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 20 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require. Zone is easily accessible from the adjacent zones to the south and east and a stairwell in the northeast corner.

6.31.4 Fire Hazards Analysis

Turning to the next step in the process, the purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-h(N/W) Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such th t the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone RB-1-h(N/W) are individually dispositioned on Table 6-31b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,).

TABLE 6-31(b) UNIT 1 REACTOR BUILDING FIREZONE RB-1-H(N/W)

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
48E/CA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
48F/CA	Tray	
45E/CA	Tray	
45F/CA	Tray	

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

6.31.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Access to this zone is excellent from adjacent zones to the south and east and a stairwell in the northeast corner of the zone.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-31. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/W) (Unit 1)

A. Zone Description

1. Construction:

a. Walls

North - Exterior: 24- and 48-inch thick reinforced concrete

South - No wall

East - No wall

West - Exterior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Same as floor

2. Ceiling height: 29 feet

3. Room volume: Approximately 58,725 cu. ft.

4. Ventilation: 2250 cfm supply and return air from the normal Reactor Building ventilation system

5. Congestion/Access: This area is not congested. Access to this zone can be obtained from the northwest stairs, adjacent zones to the east and south, and the west personnel air lock.

Table 6-31. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/W) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
HPCI System		X			
RIP System		X	RCIC System		X
Diesel Gen. System		X			
Service Water System		X			
RHR System		X			
Ventilating Air System		X			
Instrumentation		X			

2. Equipment in zone required for safe shutdown: No equipment required for safe shutdown is located within this fire zone.

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease, charcoal, cables

2. Quantity of combustibles:

Grease - 15 pounds

Charcoal - 120 pounds

Cables - Six trays, approximately 350 lineal feet, medium density

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition due to its high flash point. Ignition temperature of charcoal is 451°F. Cables are non-propagating and therefore will not sustain a fire.

Table 6-31. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/W) (Cont)

4. Suppression damage to equipment: Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems:

   a. No sprinklers in the general fire zone

   b. Automatic deluge sprinkler system within the standby gas treatment charcoal filters

3. Hose station/extinguisher:

   a. Distance to hose stations - One water hose reel 20 feet from the center of fire zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.32 Fire Zone RB-1-h(N/C) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-h(N/C) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is very low in fire zone with no allowable storage of transient combustibles.

(3) Intervening combustibles do not pose a hazard at the open boundaries.

6.32.1 Area Description

This fire zone comprises the Reactor Building at column lines M to P and 2R to 4R at elevation 50 feet. The east and west walls are open, the north wall is 48 inches thick, the south wall is 72 inches thick, the floor is 1 foot thick, and the ceiling is 62-inch thick reinforced concrete. Access to this area is excellent for the purpose of fire fighting. Ceiling height is 22 feet. Room ventilation is 600 cfm.

6.32.2 Safe Shutdown Equipment

Fire zone RB-1-h(N/C) contains cables associated with the HPCI, RIP, RHR, and RCIC Systems, and associated valves, terminal boxes, and instruments necessary for safe shutdown.

6.32.3 Fire Protection Systems

Fire zone RB-1-h(N/C) contains an ionization smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 60 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.32.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-h Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in

Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone RB-1-h are individually dispositioned on Table 6-32b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,).

TABLE 6-32(b) UNIT 1 REACTOR BUILDING FIREZONE RB-1-H(N/C)

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
48J/CA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
48K/CA	Tray	
48M/CA	Tray	
48F/CA	Tray	
45J/CA	Tray	
45K/CA	Tray	
45N/CA	Tray	

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

6.32.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is extremely low in fire zone with no allowable storage of transient combustibles.

(3) Intervening combustibles do not pose a hazard at the open boundaries to the east and west.

(4) Fire brigade personnel would have excellent mobility throughout this zone.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(6) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirement of Section III.G.2 of Appendix R.

Table 6-32. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/C)

A. Zone description

1. Construction:

a. Walls

North - Exterior: 48-inch thick reinforced concrete

South - Interior: 72-inch thick reinforced concrete

East - Interior: no wall

West - Interior: no wall

b. Floor - Poured-in-place 12-inch thick reinforced concrete slab and concrete beam

c. Ceiling - Poured-in-place 62-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 22 feet

3. Room volume: Approximately 53,277 cu. ft.

4. Ventilation: 600 cfm supply from the normal Reactor Building ventilation system

5. Congestion/Access: This zone is totally open and accessible to two adjacent zones. Ample space (about 6 feet) exists around the RBCCW heat exchangers and around the RBCCW pumps for firefighting.

Table 6-32. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/C) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
HPCI System	X	X	RCIC	X	X
RIP System		X	Instrumentation	X	X
Diesel Gen. System		X			
Service Water System		X			
RHR System	X	X			
Ventilating Air System		X			
Instrumentation		X			

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Instr. Rack H21-P004-002 (IE0)	X		Instr. Rack H21-P004-002 (IE0)	X	
Level SW B21-LITS-N017B	X	X	Level SW B21-LITS-N017A	X	X
Valve E11-F021A (KK1)	X	X			

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables and grease

2. Quantity of combustibles:

Grease - Approximately 10 pounds of grease contained in three RBCCW pumps

Cables - Average six trays, approximately 500 lineal feet, medium density

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition because of its high flash point. Cables are non-propagating.

Table 6-32. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/C) (Cont)

4. Suppression damage to equipment: Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - Two water hose stations about 60 feet from the centroid of this zone. Each station has a 75-foot hose.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.33 Fire Zone RB-1-h(W/C) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-h(W/C) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Access to and mobility throughout the zone are excellent from a fire fighting standpoint.

6.33.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 4R to 6R at elevation 50 feet. Fire zone RB-1-h(W/C) is bounded by a 72-inch thick reinforced concrete wall to the east and a 24-inch thick reinforced concrete wall to the west, and is open to the north and south. The floor consists of a 60-inch thick reinforced concrete slab with a portion of the slab 12 inches thick. The ceiling is a 12-inch thick reinforced concrete slab. Access to this zone from the standpoint of fire fighting is excellent.

6.33.2 Safe Shutdown Equipment

Fire zone RB-1-h(W/C) contains cables and equipment associated with the RHIC System, and cables associated with the HPCI, RIP, and RCIC Systems necessary for safe shutdown.

6.33.3 Fire Protection Systems

Fire zone RB-1-h(W/C) contains an ionization smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 20 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.33.4 Fire Hazards Analysis

Turning to the next step in the process, the purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-h Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in

Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(b) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone RB-1-h(W/C) are individually dispositioned on Table 6-33b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,).

TABLE 6-33(b) UNIT 1 REACTOR BUILDING FIREZONE:RB-1-H(W/C)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
4CH1/CB	Conduit	324	324	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
48B/CA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
48C/CA	Tray	
48D/CA	Tray	
45B/CA	Tray	
45C/CA	Tray	
45D/CA	Tray	

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

6.33.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Lack of congestion throughout the zone would enhance mobility of the fire brigade.

(4) Intervening combustibles do not pose a hazard at the open boundaries.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-33. Evaluation Parameters Summary Table, Fire Zone RB-1-h(W/C) (Unit 1)

A. Zone description

1. Construction:

a. Walls

North - No wall

South - No wall

East - Exterior: 72-inch thick reinforced concrete

West - Interior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 60-inch thick reinforced concrete slab and concrete beams; a portion of the slab is 12 inches thick.

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 29 feet

3. Room volume: Approximately 67,000 cu. ft.

4. Ventilation: 3750 cfm supply from normal Reactor Building ventilation system

5. Congestion/Access: This area is not congested. It can be accessed easily from the adjacent areas north and south as there are no walls on these sides.

Table 6-33. Evaluation Parameters Summary Table, Fire Zone RB-1-h(W/C) (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt.	Cable	Description	Eqpt.	Cable
HPCI System		X	RCIC System		X
RIP System		X			
Diesel Gen. System		X			
Service Water System		X			
RHR System		X	RHR System	X	X
Ventilating Air System		X			
Instrumentation		X			

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt.	Cable	Description	Eqpt.	Cable
None			Valve E11-F023 (BG4)	X	X
			Valve E51-F007		X

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease and cables

2. Quantity of combustibles:

Grease - 17 pounds

Cables -

3. Ease of ignition and propagation: Cables are non-propagating and therefore will not sustain a fire. Grease is not considered a source of fire ignition due to its high flash point.

Table 6-33. Evaluation Parameters Summary Table, Fire Zone RB-1-h(W/C) (Unit 1) (Cont)

4. Suppression damage to equipment: Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital components in this zone and in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling
2. Automatic suppression systems: None
3. Hose station/extinguisher:
   a. Distance to hose stations - One water hose reel with 75-foot hose approximately 20 feet from the center of the zone.
   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.34 Fire Zone RB-1-h(S/W) (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-h(S/W) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Access to and mobility throughout the zone is excellent.

6.34.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 6R to 8R at elevation 50 feet. The area is bounded by fire-rated reinforced concrete walls, floor, and ceiling. The south wall is 24 and 48 inches thick (variable), the east wall is 36 and 48 inches thick (variable), the west wall is 24 inches thick, the floor is 12 inches thick, and the ceiling is 12 and 36 inches thick (variable). Access to this area is relatively easy. The north wall is one complete opening to this zone. The ceiling height is 29 feet. Room ventilation is 6000 cfm.

6.34.2 Safe Shutdown Equipment

Fire zone RB-1-h (S/W) contains cables associated with the HPCI, RIP, and RHR Systems necessary for safe shutdown.

6.34.3 Fire Protection Systems

Fire zone RB-1-h(S/W) contains an ionization smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 25 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.34.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-h(S/W) Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in

Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

(b) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone RB-1-h(S/W) are individually dispositioned on Table 6-34b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,).

(b) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

(c) Providing a thermal shield, cable coatings or an appropriate barrier for those opposite division cable trays that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-34(b) UNIT 1 REACTOR BUILDING FIREZONE RB-1-H(S/W)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
4DM2/CB	Conduit	226	226	72
41D/CB	Tray	252	252	0
41E/CB	Tray	252	252	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
47A/CA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
47B/CA	Tray	
48A/CA	Tray	
48B/CA	Tray	
45A/CA	Tray	
45B/CA	Tray	
6DDL/CA	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
6DD3/CA	Conduit	
6DD4/CA	Conduit	
DL11/CB	Conduit	
DLH1/CB	Conduit	
DLY1/CB	Conduit	
4CH1/CB	Conduit	
41Q/CB	Tray	Provide cable coating and plume impingement barrier until eight feet of horizontal separation from opposite color is achieved.
41F/CB	Tray	
41B/CB	Tray	

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

6.34.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Access to this zone is obtained from the adjacent zone to the north and a stairway to the south.

(4) Lack of congestion throughout the zone enhances fire brigade mobility.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-34. Evaluations Parameters Summary Table
Fire Zone RB-1-h(S/W) (Unit 1)

A. Zone Description

1. Construction:

a. Walls

North - No wall

South - Exterior: 48- and 24-inch thick reinforced concrete

East - Interior: 48- and 36-inch thick reinforced concrete

West - Exterior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 12- and 24-inch thick reinforced concrete slab and concrete beams

c. Ceiling - 12- and 36-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 29 feet and 13 feet 8 inches partial

3. Room volume: Approximately 59,060 cu. ft.

4. Ventilation: 6000 cfm exhaust via the normal Reactor Building ventilation system

5. Congestion/Access: This area is relatively uncongested. Access to it can be easily obtained from the adjacent area to the north (no wall in between) or through the lower elevation. The zone has one stairway. A small sampling room located in the middle of the area can be accessed through a doorway or from above as it has no roof.

Table 6-34. Evaluations Parameters Summary Table
Fire Zone RB-1-h(S/W) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
RIP System		X	Diesel Gen. Sytem		X
Diesel Gen. System		X	ADS System		X
Service Water System		X	RHR System		X
RHR System		X	RCIC System		X
HPCI System		X			
Ventilating Air System		X			
Instrumentation		X			

2. Equipment in zone required for safe shutdown: No equipment required for safe shutdown is located within this fire zone.

C. Fire Hazards Analysis

1. Type of combustibles in area: Charcoal and cables

2. Quantity of combustibles:

Charcoal: 120 pounds

Cables: average three trays, approximately 400 lineal feet, medium to heavy density

3. Ease of ignition and propagation: cables are non-propagating.

Table 6-34. Evaluations Parameters Summary Table
Fire Zone RB-1-h(S/W) (Cont)

4. Suppression damage to equipment: Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment. Safety-related valve motor operators are protected by a NEMA 4 enclosures.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems:

   a. No sprinkler system in general zone area

   b. Automatic deluge sprinkler system within the standby gas treatment charcoal filters

3. Hose station/extinguisher:

   a. Distance to hose stations: One hose reel with a 75-foot hose 25 feet from the center of the zone

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.35 Fire Zone RB-10 (Unit 1)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Caroline Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-10 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Introduction of transient combustibles is not credible due to high radiation level.

6.35.1 Area Description

This fire zone comprises the Reactor Building at column lines M to P and 6R to 8R at elevation 50 feet. The area is bounded by fire-rated reinforced concrete walls, floor, and ceiling. The north wall is 72 inches thick, the south wall is 48 inches thick, the east and west walls are 36 and 48 inches thick (variable), the floor is 12 inches thick, and the ceiling is 28 inches thick. Access to this area is through two labyrinth protected doorways at opposite ends of the zone. Ceiling height is 24 feet. Room ventilation is 12,000 cfm.

6.35.2 Safe Shutdown Equipment

Fire zone RB-10 contains cables associated with the RIP, HPCI, and Service Water Systems, necessary for safe shutdown.

6.35.3 Fire Protection Systems

Fire zone RB-10 contains an ionization smoke detection system connected to a control room annunciator. Two manual 1-1/2-inch hose stations are 30 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.35.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-10 Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division.

The conduits/cable trays of concern for Fire Zone RB-1-10 are individually dispositioned on Table 6-35b as:

(1) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

(b) Providing a thermal shield, cable coatings or an appropriate barrier for those opposite division cable trays that cross or come within close proximity of one another until a specified separation is achieved.

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3-hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

TABLE 6-35(b) UNIT 1 REACTOR BUILDING FIREZONE RB-10

Conduit and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
40C/CB	Tray	240	240	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
4DNC/CB	Conduit	Provide an appropriate wrap down to three feet below the ceiling.
4DN6/CB	Conduit	
4DN7/CB	Conduit	
6DZE/CB	Conduit	
6DZ8/CB	Conduit	
6DZ9/CB	Conduit	
6DZC/CB	Conduit	
4DNA/CB	Conduit	
40A/CB	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
40B/CB	Tray	
DLK1/CB	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved
DLJ1/CB	Conduit	
DLH1/CB	Conduit	
DLI1/CB	Conduit	
DLY1/CB	Conduit	

Table 6-35c contains a listing of those boundaries for fire zone RB-10 that:

(1) do not meet the separation criteria of Section III.G, and

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Those Appendix R deviations involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment, which is separated from the opposite division of horizontal distance without intervening combustibles, was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-35d.

Table 6-35c. Fire Zone RB-10

Zone Boundary	Deviation from II..G	Proposed Modification	Basis for Acceptability
East	Nonrated man-door	None	1. Doors protected by labyrinth.
West	Nonrated man-door	None	2. Zone has ionization-type detection.
			3. High radiation area (no random access).
			4. Previous SER approval of man-doors.

Table 6-35d. Fire Zone: RB-10

Equipment	Identification	Proposed Modification
Junction Box	X1C	Provide a barrier underneath, extending out at least 40 inches from the equipment in all directions or enclose the equipment by a proper fire-retardant material.
Junction Box	X1D	Provide a barrier underneath, extending out at least 40 inches from the equipment in all directions or enclose the equipment by a proper fire-retardant material.

6.35.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) High radiation precludes random access through this zone.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) Zone orientation would preclude personnel from introducing random transient combustibles through this zone.

Table 6-35. Evaluations Parameters Summary Table, Fire Zone RB-10

A. Zone description

1. Construction:

a. Walls

North - Interior: 72-inch thick reinforced concrete

South - Exterior: 48-inch thick reinforced concrete

East - Interior: 48- and 36-inch thick reinforced concrete

West - Interior: 36- and 48-inch thick reinforced concrete

b. Floor - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 28- and 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 24 feet and 8 feet

3. Room volume: Approximately 37,660 cu. ft.

4. Ventilation: 12,000 cfm supply from the normal Reactor Building ventilation system

5. Congestion/Access: This zone is accessible through two labyrinth protected doorways at opposite ends of the zone. Room exists within the zone for firefighting around both RWCU pumps and heat exchangers.

Table 6-35. Evaluations Parameters Summary Table, Fire Zone RB-10 (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
HPCI System		X	RCIC Logic		X
RIP System		X	RCIC System		X
			ADS System		X
			Diesel Gen. System		X
			RIP System		X
			Instrumentation		X
			RHR System		X
			Service Water System		X

2. Equipment in zone required for safe shutdown: This zone does not contain any safe shutdown equipment requiring review for this evaluation.

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables and grease

2. Quantity of combustibles:

Grease - 45 pounds

Cable - Average four trays, approximately 275 lineal feet, medium density

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition because of its high flash point and because it is contained within safety-related motor operators.

Table 6-35. Evaluations Parameters Summary Table, Fire Zone RB-10 (Cont)

4. Suppression damage to equipment: Fire brigade personnel are trained to avoid inadvertent spraying of safety equipment in this zone. This zone is a confined space protected by doors and labyrinths so that spraying of water to equipment in adjacent zones is virtually impossible.

D. Fire Protection Existing

1. Fire detection sytems: Ionization detectors on the ceiling
2. Automatic suppression systems: None
3. Hose station/extinguisher:
   a. Distance to hose stations - Two water hose reel stations are located at the zone entrances about 30 feet from the zone centroid. Each hose station has a 75-foot hose.
   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.36 Fire Zone RB-1-d (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-d does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room and fixed wet-pipe suppression system is installed in this fire zone.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) High radiation area and zone orientation limits random access of personnel to the zone.

(4) Access to and mobility throughout is adequate from a fire-fighting standpoint.

6.36.1 Area Description

This fire zone comprises the Reactor Building at column lines P to T and 22R to 24R at elevation (-) 17 feet. The south and east walls are 48-inch thick reinforced concrete; the north wall is 24-inch thick reinforced concrete; the west wall is 33-inch thick reinforced concrete; the ceiling is 27-inch thick (average) reinforced concrete; and the floor is a poured-in-place reinforced concrete slab. Access to this area is good for the purpose of manual firefighting. Ceiling height is 34 feet 9 inches. Room ventilation is 7865 cfm.

6.36.2 Safe Shutdown Equipment

Fire zone RB-1-d contains equipment and cables associated with the RCIC, Service Water, RIP, and Diesel Generator Systems necessary for safe shutdown. The Division A and Division B cable trays in this area are separated by a few feet in several instances.

6.36.3 Fire Protection Systems

Fire zone RB-1-d contains ionization smoke detectors on the ceiling connected to a control room annunciator, and a fixed wet-pipe suppression system utilizing automatic on/off sprinkler heads charged with water. A manual 1-1/2-inch hose station with 75 feet of hose in the middle of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.36.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-d Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

(b) The conduit/cable tray of interest is above the stratification height,

(c) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-d are individually dispositioned on Table 6-36b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional c .es (for the entire length of the raceway i. which red and green cables coexist).

(b) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

(c) Providing an appropriate barrier for those conduits above the stratification height up to the ceiling, or for the duration of traverse through the stratification region.

(d) Providing cable coating or an appropriate barrier for those cable trays above the stratification height up to the ceiling, or for the duration of traverse through the stratification region.

TABLE 6-36(b) UNIT 2 REACTOR BUILDING FIREZONE:RB-1-D

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
3MN1/CA	Conduit	238	238	18

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
4YF1/CB	Conduit	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
4YF3/CB	Conduit	
30S/CB	Tray	
30R/CB	Tray	
3NK2/CA	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 5.36c contains a listing of those boundaries for fire zone RB-1-d that:

(1) do not meet the separation criteria of Section III.G., and

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Those Appendix R deviation involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-36d.

Table 6.36c. FIRE ZONE RB-1-d (UNIT 2)

Zone Boundary	Deviation From III.G	Proposed Modification	Basis for Acceptability
Wall between 2B-1.-d and RB-2	Nonrated man-door	None	1. Full coverage, automatic suppression exists in zones RB-2 and RB-1-d. 2. Detection for zones RB-1-d and RB-2 annunciates in Control Room. 3. High-radiation area, random introduction of transitent combustibles or traverse of personnel not likely during normal operation. 4. Previous SER approval for man-doors.

Table 6-36-d. FIRE ZONE: RB-1-d

Equipment	Identifier	Proposed Modification
Limit/Pressure Switch (E41-NØ15A)	IH3	Protect the equipment by enclosing it in a proper fire retardant material.
Valve (SW-V118)	VI1	None - safe by configuration.

6.36.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room and fixed wet-pipe suppression.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) High radiation area precludes transportation of non-essential combustibles into this zone.

(4) Mobility for purposes of fire fighting is good.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(6) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-36. Evaluations Parameters Summary Table, Fire Zone RB-1-d (Unit 2)

A. Zone Description

1. Construction:

a. Walls

North - Interior: 24-inch thick reinforced concrete (below grade)

South - Exterior: 48-inch thick reinforced concrete (below grade)

East - Exterior: 48-inch thick reinforced concrete (below grade)

West - Interior: 33-inch thick (minimum) reinforced concrete (below grade)

b. Floor - Poured-in-place reinforced concrete slab

c. Ceiling - Poured-in-place reinforced concrete slab varying from 18 to 36 inches thick. Average thickness is 27 inches

2. Ceiling Height: 34 feet 9 inches (average)

3. Room volume: Approximately 85,000 cu. ft.

4. Ventilation: 7865 cfm supply air via the normal Reactor Building ventilation system

5. Congestion/Access: Accessible by stairways from elevation 20 feet and by a personnel and equipment hatch between this zone and zone RB-2. Congested area. Minimum distance between two pieces of equipment installed in close proximity is 1 foot, maximum distance is 6 feet.

Table 6-36. Evaluations Parameters Summary Table, Fire Zone RB-1-d (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Serv. Water Sys.	X	X	Diesel Gen. Sys.		X
HPCI Sys.	X	X	Serv. Water Sys.		X
RIP Sys.		X	Elec. Distr. Sys.		X
			Ventilation Air Sys.	X	X
			RHR Sytem	X	X
			RCIC Sys.	X	X
			RIP Sys.		X
			Instrumentation	X	X

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Valve CAC-PV-1221C		X	Term Box (Y31)	X	X
Valve CAC-PV-1219C		X	Valve CAC-PV-1220C (Y31)	X	X
Press SW RIP-PSL-1221		X	Term Box (Y26)	X	X
Press SW RIP-PSL-1219		X	Valve CAC-PV-1218C (Y26)	X	X
			Term Box (Y78)	X	X
			Press SW RIP-PSL-1220 Term Box (Y78)	X	X
			Press SW RIP-PSL-1218 Term Box (Y76)	X	X
			Valve E11-F020B (VD3)	X	X
			Valve E51-F031 (VF3)	X	X
			Valve E11-F007B (VC6)	X	X
			Valve E11-F029 (VE3)	X	X
			RCIC Turbine (JS7)	X	X
			Valve E51-V8 (VE6)	X	X
			Valve E51-F045 (VE7)	X	X
			Valve E11-F027B (VC4)	X	X

Table 6-36. Evaluations Parameters Summary Table, Fire Zone RB-1-d (Unit 2) (Cont)

Train A Description	Eqpt	Cable
Level SW E41-N015A (IH3)	X	X
Serv. Water Crossover Valve SW-V118 (VI1)	X	X

Train B Description	Eqpt	Cable
Valve E11-F024B (VC8)	X	X
Valve E51-F012 (VE2)	X	X
Valve E51-F019 (VE5)	X	X
Valve E51-F010 (VE1)	X	X
Valve E51-F022 (VE0)	X	X
Valve E11-F028B (VC2)	X	X
Valve E51-F046 (VE4)	X	X
Valve E11-F048B (VB6)	X	X
Valve E11-F003B (VA5)	X	X
Valve E11-F011B (VB2)	X	X
Valve E11-F006D (VA9)	X	X
Valve E11-F053B (VB8)	X	X
Vavle E11-F004D (VA3)	X	X
Valve SW-V126 (U44)	X	X
Valve E11-F006B (UA7)	X	X
Valve SW-V125 (U43)	X	X
Term Box (DQ2)	X	X
Valve E11-F004B (VA1)	X	X
Flow SW E1-FS-N021B (I37)	X	X
Fan 1B-FCU-RB (PL1)	X	X
Valve E11-F047B (VC0)	X	X
Valve SW-V117 (KF9)	X	X
Valve SW-V124 (U19)	X	X
Solenoid Valve VA-SV-936B (Q31)	X	X
Pump E11-C002B (NC7)	X	X
Pump E11-C002D (NC9)	X	X
Temp. SW VA-TS-936C (TU0)	X	X
Instr. Rack H21-P0022 (IJ2)		
Press SW B32-PS-N016B	X	X
Level Xmtr CAC-LT-2601 (N08)	X	X
Instr. Rack H21-P017 (IJ7)	X	
Press SW E51-PS-N009A	X	X
Press SW E51-PS-N009B	X	X
Press SW E51-PS-N006	X	X
Flow SW E51-FS-N002	X	X
Press SW E51-PS-N012lB	X	X

Table 6-36. Evaluations Parameters Summary Table, Fire Zone RB-1-d (Unit 2) (Cont)

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
			Press SW E51-PS-N012D	X	X
			Press SW E51-PS-N020	X	X
			Flow Xmtr E51-FT-N003	X	X
			Instr Rack H21-P021 (IG8)	X	X
			Press SW E11-PS-N016B	X	X
			Press SW E11-PS-N016D	X	X
			Press SW E11-PS-N020B	X	X
			Press SW E11-PS-N020D	X	X
			Flow Xmtr E11-FT-N015B	X	X
			Press Xmtr E11-PT-N002B	X	X
			Instr Rack H21-P037 (IW0)	X	X
			Press SW E51-PS-N012A	X	X
			Press SW E51-PS-N012C	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area: oil, grease, and cables

2. Quantity of combustibles:

Oil - 27.8 gallons

Grease - 30 pounds

Cables - Four trays average, approximately 345 lineal feet

3. Ease of ignition and propagation: Medium to heavy density. Oil flash point requires raising oil bulk volume temperature above 450°F. Cables are non-propagating. Grease is not considered a source of fire ignition due to its high flash point.

Table 6-36. Evaluations Parameters Summary Table, Fire Zone RB-1-d (Unit 2) (Cont)

4. Suppression damage to equipment: Damage is localized to the immediate fire area since in situ suppression systems are thermostatically controlled and adjacent equipment should not be affected. Operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems:

   a. Wet-pipe system, utilizing automatic on/off sprinkler heads charged with water. The water supply is provided with a one-head bypass of deluge valve feature. The deluge valve is automatically operated upon actuation of the detection system and flow in the bypass.

3. Hose station/extinguisher:

   a. Distance to hose stations - One water hose reel with 75-foot hose is located in the middle of the zone

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.37 Fire Zone RB-1-n (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone RB-1-n does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) Ionization smoke detectors, connected to a control room annunciator, are provided throughout the area.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) High radiation area precludes introduction of transient combustibles during normal operation.

6.37.1 Area Description

This fire zone comprises the Reactor Building at column lines S to T and 20R to 22R at elevation 5 feet. The north and south walls are completely open, the east and west walls are 48-inch thick reinforced concrete, the floor is 36-inch thick reinforced concrete, and ceiling is 12-inch thick reinforced concrete. Access to this area is fair. The north and south wall incorporate ladders opening to the HPCI room. Ceiling height is 14 feet. Room ventilation is 3000 cfm.

6.37.2 Safe Shutdown Equipment

Fire zone RB-1-n contains equipment and cables associated with the HPCI, RIP, RHR and service water systems necessary for safe shutdown. The Division A and Division B cable trays in this area are separated by a few feet in several instances.

6.37.3 Fire Protection Systems

Fire zone RB-1-n contains ionization smoke detectors located on the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is 30 feet away from the center of the zone and another is 55 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.37.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-n Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in

Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

> The conduit/cable tray of interest is above the stratification height,

The conduits/cable trays of concern for Fire Zone RB-1-n are individually dispositioned on Table 6-37b as:

Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits above the stratification height up to the ceiling, or for the duration of traverse through the stratification region.

TABLE 6-37(b) UNIT 2 REACTOR BUILDING FIREZONE RB-1-N

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
3HR2/CB	Conduit	386	386	0
4YF1/CB	Conduit	360	360	0
4YF3/CB	Conduit	360	360	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
CSS1/CA	Conduit	Provide an appropriate wrap down to three feet below the ceiling.
CST1/CA	Conduit	
3CC3/CB	Conduit	
3CC2/CB	Conduit	
CSI1/CB	Conduit	

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hr-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hr) rendered a composite boundary rating of less than 3 hr.

Table 6.37c contains a listing of those boundaries for fire zone RB-1-n that;

(1) Do not meet the separation criteria of Section III.G, and

(2) Provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) Proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 ft on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviation involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following Table 6-37d.

TABLE 6.37c

FIRE ZONE RB-1-n (UNIT 2)

Zone Boundary	Deviation From III.G	Proposed Modification	Basis for Acceptability
Floor	Nonrated equipment hatch	None	1. Full coverage, automatic suppression exists in zones RB-2. 2. Detection for zones RB-1-n and RB-2 annunciates in Control Room. 3. High-radiation area, random introduction of transient combustibles or traverse of personnel not likely during normal operation. 4. Previous SER approval for man-doors.

TABLE 6-37(d) FIRE ZONE: RB-1-n

Equipment	Identification	Proposed Modification
Junction Box	A50	Provide a barrier underneath, extending out at least 40 in. from the equipment in all directions or enclose the equipment by a proper fire retardant material.
Valve (E11-F040)	VD6	None-equipment is safe by configuration
Valve (E11-F016B)	VD0	

6.37.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) High radiation area would not allow introduction of transient combustibles during normal operation.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-37. Evaluations Parameters Summary Table, Fire Zone RB-1-n (Unit 2)

A. Zone description:

1. Construction:

a. Walls

North - Interior: No wall

South - Interior: No wall

East - Interior: 48-inch thick reinforced concrete

reinforced concrete (below grade)

West - Interior: 48-inch thick reinforced concrete

b. Floor - Poured-in-place 36-inch thick reinforced concrete slab

c. Ceiling - Poured-in-place 12-inch thick concrete slab (reinforced)

2. Ceiling height: 14 feet

3. Room volume: Approximately 25,700 cu. ft.

4. Ventilation: 3000 cfm supply air from the normal Reactor Bulding ventilation system

5. Congestion/Access: This is an open area above the HPCI room. Access is achieved via two ladders, one located at the north wall of the HPCI room, the other at the south wall.

Table 6-37. Evaluations Parameters Summary Table, Fire Zone RB-1-n (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
HPCI Sys.		X	RCIC Sys.		X
RHR Sys.	X	X	RHR Sys.	X	X
Elec. Distr. Sys.		X			
Service Water Sys.		X			
Ventilating Air Sys.		X			
RIP Sys.		X			

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Valve E11-F016A (VC9)	X	X	Valve E11-F016B (VD0)	X	X
			Valve E11-F040 (VD6)	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area: grease and cable

2. Quantity of combustibles:

Grease - 5 pounds

Cable - Four trays, approximately 155 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Cables are non-propagating. Grease is not considered a source of fire ignition due to its high flash point.

Table 6-37. Evaluations Parameters Summary Table, Fire Zone RB-1-n (Unit 2) (Cont)

4. Suppression damage to equipment: There are no in situ suppression systems in this area. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in adjacent zones. Also, safety-related valve motor operators are protected by NEMA 4 enclosures

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling
2. Automatic suppression systems: None
3. Hose station/extinguisher
   a. Distance to hose stations - Two water hose reels with 75 feet of hose, one in zone RB-2 about 30 feet from zone centroid, and one in RB-1-d, 55 feet from centroid of this zone.
   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.38 Fire Zone RB-2 (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone RB-2 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) Automatic fixed CO_2 suppression system provides full zone coverage.

(2) Ionization smoke detectors are provided with a common area alarm in the control room.

(3) Personnel radiation requirements precludes random access of plant personnel during normal operation.

6.38.1 Area Description

This fire zone comprises the Reactor Building at column lines S to T and 20R to 22R at elevation (-)17 feet. The north and south walls are 24-inch thick reinforced concrete, the east wall is 48-inch thick reinforced concrete, the west wall is 72-inch thick reinforced concrete, and the ceiling is 36-inch thick reinforced concrete. Access to this area is fair. The south wall incorporates a personnel hatch. The ceiling contains a nonrated grated opening 10 ft by 22 ft covered with 16 gauge sheet metal. Ceiling height is 19 feet. Room ventilation is 200 cfm.

6.38.2 Safe Shutdown Equipment.

Fire zone RB-2 contains equipment and cables associated with the HPCI System necessary for safe shutdown. All of the cables are totally encased in conduit, no trays exist in this area.

6.38.3 Fire Protection Systems

Fire zone RB-2 contains ionization smoke detectors located on the ceiling connected to a control room annunciator, and a fixed CO_2 suppression system which can either be thermally or manually actuated. A manual 1-1/2-inch hose station is 45 feet away from the center of the zone and another is 55 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.38.4 Fire Hazards Analysis

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hr-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hr) rendered a composite boundary rating of less than 3 hr.

Table 6.38c contains a listing of those boundaries for fire zone RB-2 that;

(1) Do not meet the separation criteria of Section III.G, and

(2) Provides a basis for acceptability for the zone boundary with no additional modifications, or

TABLE 6.38c

FIRE ZONE RB-2 (UNIT 2)

Zone Boundary	Deviation From III.G	Proposed Modification	Basis for Acceptability
1. Wall between RB-1-d and RB-2	Nonrated man-door	None	1. Full coverage, automatic suppression exists in zones RB-2 and RB-1-d
2. Ceiling (to zone RB-1-n)	Nonrated equipment hatch	*None	2. Detection for zones RB-1-d and RB-2 annunciates in Control Room. 3. High-radiation area, random introduction of transient combustibles or traverse of personnel not likely during normal operation. 4. Previous SER approval for man-doors.

*This deviation dispositioned in Section 6.37.

(3) Proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

6.38.5 Conclusion

Based upon the previous analysis, exemption is requested from the requirement for 3 hr rated barriers between fire zones as prescribed in Section III.C of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Fixed automatic CO_2 suppression system provides full zone coverage.

(2) Ionization smoke detectors provide a common area alarm in the control room.

(3) Random introduction of transient combustibles is not credible due to personnel radiation requirements during normal operation.

(4) The Staff has previously confirmed the adequacy of fire protection features in this zone via SER approval.

(5) The conservative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-38. Evaluations Parameters Summary Table, Fire Zone RB-2 (Unit 2)

A. Zone description

1. Construction:

a. Walls

North - Interior: 24-inch thick reinforced concrete (below grade)

South - Interior: 24-inch thick reinforced concrete (below grade)

East - Interior: 48-inch thick reinforced concrete (below grade)

West - Interior: 72-inch thick reinforced concrete (below grade)

b. Floor - Poured-in-place reinforced concrete slab

c. Ceiling - Poured-in-place 36-inch thick reinforced concrete slab with 10- by 22- foot opening with grating and covered with 16 gauge sheet metal

2. Ceiling height: 19 feet

3. Room volume: Approximately 32,300 cu.ft.

4. Ventilation: 2000 cfm supply air via the normal Reactor Building ventilation system

5. Congestion/Access: Access is via two personnel hatches, one on the north wall and one on the south wall. Accessibility for fire brigade personnel is good around the HFCI pump and turbine.

Table 6-38. Evaluations Parameters Summary Table, Fire Zone RB-2 (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
HPCI Sys.	X	X	None		

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Valve E41-F012 (VF0)	X	X			
Valve E41-F041 (VF1)	X	X			
Valve E41-F042 (VF2)	X	X			
Valve E41-F004 (VE8)	X	X	None		
Valve E41-F001 (VE9)	X	X			
Valve E41-F059 (KG5)	X	X			
Instr. Rack H21-P034 (IH5)	X				
Press SW E41-PS-N012B	X	X			
Press SW E41-PS-N012D	X	X			
Pump E41-C002 (PM2)	X	X			
Turbine E41-C001 (J16)	X	X			

C. Fire Hazards Analysis

1. Type of combustibles in area: Turbine lube oil, grease in motor operators, and cables

Table 6-38. Evaluations Parameters Summary Table, Fire Zone RB-2 (Unit 2) (Cont)

2. Quantity of combustibles:

   Oil - 155 gallons

   Grease - 25 pounds

   Cables - All cables are totally encased in conduit; there are no trays in this zone.

3. Ease of ignition and propagation: Oil flash point requires raising the oil bulk volume temperature above 450°F. Cables are non-propagating. Grease is not considered a source of fuel ignition due to its high flash point.

4. Suppression damage to equipment: If the HPCI System is lost due to fire, no adjacent equipment can be damaged by suppression inside HPCl room. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in this or adjacent zones.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: Total flooding CO_2 system, thermally or manually actuated

Table 6-38. Evaluations Parameters Summary Table, Fire Zone RB-2 (Unit 2) (Cont)

3. Hose station/extinguisher:

   a. Distance to hose stations - None inside this fire zone. However, adjacent fire zones RB-1-C and RB-1-D have water hose reels which are 45 feet and 55 feet from the center of this fire zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.39 Fire Zone RB-1-b (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-6 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

1. The entire zone is provided with an automatic fixed suppression system.

2. Ionization smoke detectors are provided with a common area alarm in the control room.

3. The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

4. This zone is physically isolated, the general area radiation levels preclude random access and security requirements dictate that the zone remain locked.

6.39.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 18R to 20R at elevation -17 feet. The north and west walls are 48-inch thick reinforced concrete; the southeast wall is 33-inch thick reinforced concrete; and the ceiling is 30-inch thick reinforced concrete. Access to this area is fair. Ceiling height is 34 feet 6 inches. Room ventilation is 2500 cfm.

6.39.2 Safe Shutdown Equipment.

Fire zone RB-1-b contains equipment and cables associated with the RHR System necessary for safe shutdown. All of the cables are encased in conduit and no trays exist in this zone.

6.39.3 Fire Protection Systems

Fire zone RB-1-b contains ionization smoke detectors located on the ceiling connected to a control room annunciator, and a fixed water suppression system utilizing automatic on/off sprinkler heads charged with water. A manual 1-1/2-inch hose station is 8 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.39.4 Fire Hazards Analysis

Fire zone RB-1-b has a specific Appendix R deviation which was identified utilizing the methodology and assumptions described by Section 4. This deviation is due to lack of a rated barrier between fire zone RB-1-6 and the zone above. This lack of fire rating is due to a stairwell used for access to this fire zone. The fire zone above RB-1-6 contains safe shutdown circuits of both trains and all of these circuit redundancies have been dispositioned by the analysis for this zone. Fire zone RB-1-b contains only train A equipment and cables required for safe shutdown.

The combustible loading for this zone is very low. All cables in this zone are completely enclosed in conduit and the lubricating oil contained within the pumps is not considered a plausible fixed

combustible due to lack of a credible ignition source. The transient combustible loading is virtually nonexistent due to the security and radiological controls for this zone combined with the fact that it is not a passageway for any other area. The zone is continuously locked and the radiological control requirements necessary for access are extensive. This lack of general access also reduces the probability of an ignition source being introduced during unit operation. In addition, the automatic fixed suppression system can be expected to reduce the probability and severity of an exposure fire.

It is therefore concluded that this zone does not pose a fire hazard to the redundant circuits of the fire zone above and an exemption from the requirement for a rated barrier is justified.

6.39.5 Conclusion

Based upon the previous analysis, exemption is requested from the requirement for a three hour rated barrier between fire zones as prescribed by Section III.G of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) The entire zone is provided with an automatic fixed water suppression system.

(2) Ionization smoke detectors are provided with a common area alarm in the control room.

(3) The fixed combustible loading is low in the fire zone because all cables are enclosed in conduit and the lubricating oil contained in the pumps are not considered as a fixed combustible due to lack of a credible ignition source.

(4) The transient combustible loading for this fire zone is extremely light due to the security and radiological controls required for entry and because this zone is not a passageway to any other zone.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-39. Evaluations Parameters Summary Table, Fire Zone RB-1-b (Unit 2)

A. Zone description

1. Construction:

a. Walls

North - Exterior: 48-inch thick reinforced concrete (below grade)

Southeast - Interior: 33-inch thick (minimum) reinforced concrete (below grade)

West - Exterior: 48-inch thick reinforced concrete (below grade)

b. Floor - Poured-in-place reinforced concrete

c. Ceiling - Poured-in-place 30-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 34 feet 6 inches

3. Room volume: Approximately 24,564 cu. ft.

4. Ventilation: 2500 cfm supply air from elevation 20 feet down the stairway through the floor opening; no duct. 2500 cfm exhaust air to the normal Reactor Building ventilation system.

5. Congestion/Access: This zone is accessible from one stairway from elevation 20 feet. Adequate room exists in the center of this zone to fight a small fire. A large fire will likely render this zone inaccessible until adequate suppression takes place.

Table 6-39. Evaluations Parameters Summary Table, Fire Zone RB-1-b (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Instr. Rack H21-P006 (IJ0)	X		None		
B-32-PS-N018A	X	X			

C. Fire Hazards Analysis

1. Type of combustibles in area: Oil, grease, and cables

2. Quantity of combustibles:

Oil - 27.8 gallons

Grease - 4 pounds

Cables - All cables are totally encased in conduit and therefore should be treated as non-combustible; no trays in this zone.

3. Ease of ignition and propagation: Oil flash point requires raising oil bulk volume temperature above 450°F. Cables are non-propagating. Grease is not considered a source of fuel ignition because of its high flash point.

Table 6-39. Evaluations Parameters Summary Table, Fire Zone RB-1-b (Unit 2) (Cont)

4. Suppression damage to equipment: Damage may occur to core spray pump due to fire or suppression. The redundant core spray pump and other safety class equipment outside this zone are unaffected since this zone is a confined space with adequate automatic suppression.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: Wet-pipe system, utilizing automatic on/off sprinkler heads charged with water. The water supply is provided with a one-head bypass of deluge valve feature. The deluge valve is automatically operated upon actuation of the detection system and flow in the bypass.

Table 6-39. Evaluations Parameters Summary Table, Fire Zone RB-1-b (Unit 2) (Cont)

3. Hose station/extinguisher:

   a. Distance to hose stations - One water hose reel with 75-foot hose 8 feet from the center of fire zone

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.40 Fire Zone RB-1-g(N/W) (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone RB-1-g(N/W) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is very low in fire zone with no allowable storage of transient combustibles.

(3) Access to this zone is excellent for fire fighting purposes.

6.40.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 18R to 20R at elevation 20 feet. Fire zone RB-1-g (N/W) is bounded by reinforced concrete walls 48 inches thick to the north; 54 inches thick to the south; and 24 inches thick to the west. The east end of the zone is bounded by a partial reinforced concrete wall 30 inches thick. The floor and ceiling are 24-inch thick and 12-inch thick reinforced concrete slabs, respectively.

Access to this zone is excellent for fire fighting by means of a stairway in the northwest corner, an air lock door to west and open boundary to the east.

6.40.2 Safe Shutdown Equipment. Fire zone RB-1-g(N/W) contains cable and equipment associated with the motor-operated valves and the HPCI, RHR, and ADS systems necessary for safe shutdown.

6.40.3 Fire Protection Systems

Fire zone RB-1-g(N/W) contains an ionization smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 20 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.40.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-g Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared

with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

The conduits/cable trays of concern for Fire Zone RB-1-g(N/W) are individually dispositioned on Table 6-40b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier from the floor to a given elevation (for those vertical conduits/ trays penetrating the floor),

(b) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

(c) Providing a thermal shield, cable coatings or an appropriate barrier for those opposite division cable trays that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-40(b) UNIT 2 REACTOR BUILDING FIREZONE RB-1-G(N/W)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
3JM1/CB	Conduit	336	336	0
3JM2/CB	Conduit	336	336	0
3JM3/CB	Conduit	318	318	0
3JM4/CB	Conduit	318	318	0
3JM5/CB	Conduit	318	318	0
37N/CB	Tray	243	306	72
3JLD/CB	Conduit	320	320	0
3JLF/CB	Conduit	320	320	0
6DCC/CB	Conduit	240	240	0
3HK1/CA	Conduit	219	318	24
3HK2/CA	Conduit	219	318	24
3HK3/CA	Conduit	219	318	24
3AG1/CA	Conduit	225	283	41
3AG2/CA	Conduit	225	283	41
34J/CB	Tray	231	303	0
34I/CB	Tray	231	231	0
34H/CB	Tray	231	231	0
33A/CA	Tray	231	231	72
33B/CA	Tray	231	231	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
3LU2/CA	Conduit	Provide an appropriate wrap from floor to 18' 4" off the floor.
35B/CA	Tray	Provide cable coating until four feet of horizontal separation from opposite color is achieved.
3LU2/CA 4LK1/DA	Conduit Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hr-rated)

boundaries containing assembles (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hr) rendered a composite boundary rating of less than 3 hr.

Table 6.40c contains a listing of those boundaries for fire zone RB-1g(N/W) that;

(1) Do not meet the separation criteria of Section III.G, and

(2) Provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) Proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 ft on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviations involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizonatal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifictions proposed. The specific disposition of each equipment deviation is detailed in the following Table 6-40d.

TABLE 6.40c

FIRE ZONE RB-1-g(N/W) (UNIT 2)

Zone Boundary	Deviation From III.G	Proposed Modification	Basis for Acceptability
Floor	Nonrated equipment hatch	None	1. Zone RB-1-b (below) is provided with full automatic suppression coverage. 2. Detection exists in zones RB-1-b and RB-1-g(N/W) with annunciation in the Control Room.

TABLE 6-40(d) FIRE ZONE: RB-1-g(N/W)

Equipment	Identification	Proposed Modification
Valve (E41-F006)	KG6	None - safe by configuration
Valve (E11-F068A)	KW5	None - safe by configuration

6.40.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Excellent mobility exists throughout the zone for fire fighting personnel.

(4) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-40. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/W) (Unit 2)

A. Zone description

1. Construction:

a. Walls

North - Exterior: 48-inch thick reinforced concrete

South - Interior: 54-inch thick reinforced concrete and 30-inch thick interior wall

East - Interior: 30-inch thick wall reinforced concrete at south end. No wall at NE end.

West - Exterior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 24-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 29 feet

3. Room volume: Approximately 45,4570 cu. ft.

4. Ventilation: 5480 cfm supply from the normal Reactor Building ventilation system

Table 6-40. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/W) (Unit 2) (Cont)

5. Congestion/Access: Relatively uncongested. Accessible by way of two stairways, one personnel airlock, and one open side (east) of the zone.

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
			Diesel Gen. Sys.		X
			Elect. Dist. Sys.		X
HPCI Sys.	X	X	RCIC Sys.		X
			Ventilating Air Sys.		X
RHR Sys.	X	X	RHR Sys.		X
			ADS Sys.		X
			RIP Sys.		X
			Serivce Water Sys.		X
			Instrumentation		X
			Instr. Air Sys.		X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Valve E11-F068A (KW5)	X	X	None		
Valve E41-F006 (KG6)	X	X			

Table 6-40. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/W) (Unit 2) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables and grease in valves

2. Quantity of combustibles:

   Grease - 3 pounds in valves

   Cables - Average three trays, approximately 550 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Cables are non-propagating. Grease is not considered to be a source of fuel ignition due to its high flash point.

4. Suppression damage to equipment: Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in this zone or in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

   a. Distance to hose stations - One water hose reel with 75 feet of hose approximately 20 feet from the center of the zone

Table 6-40. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/W) (Unit 2) (Cont)

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.41 Fire Zone RB-1-g(S/W) (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-g(S/W) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Fixed wet-pipe suppression is provided throughout the zone.

(4) Transportation of transient combustibles is minimized due to location of zone.

6.41.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 22R to 24R at elevation 20 feet. Fire zone RB-1-g (S/W) is bounded by 48-inch thick reinforced concrete walls to the north, south, and west and by a 36-inch thick concrete partition and a 36-inch thick concrete block wall to the east. The floor and ceiling are 24-inch thick and 12-inch thick reinforced concrete slabs, respectively.

6.41.2 Safe Shutdown Equipment. Fire zone RB-1-g(S/W) contains cables associated with the RCIC, RHR, ADS, and RIP Systems as well as various valves and penetrations necessary for safe shutdown.

6.41.3 Fire Protection Systems

Fire zone RB-1-g(S/W) contains an ionization smoke detection system connected to a control room annunciator, and a wet-pipe water fixed suppression system. A manual 1-1/2-inch hose station is 25 feet away from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.41.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-g Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-g are individually dispositioned on Table 6-41b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing one-hour barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist).

TABLE 6-41(b) UNIT 2 REACTOR BUILDING FIREZONE RB-1-G(S/W)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
3JLF/CB	Conduit	320	320	0
3JLD/CB	Conduit	320	320	0
39B/CB	Tray	302	302	0
39A/CB	Tray	302	302	0
CSN1/CB	Conduit	270	270	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
39D/CB	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).

For those fire zones whose boundaries were defined (for convenience) by "open space", an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

6.41.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room and fixed wet-pipe suppression.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Location of zone precludes transportation of non-essential transient combustibles.

Table 6-41. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/W) (Unit 2)

A. Zone description

1. Construction:

a. Walls

North - Interior: 48-inch thick concrete

South - Exterior: 48-inch thick reinforced concrete

East - No wall: part reinforced concrete 36 inches thick and part solid concrete block 36 inches thick

West - Exterior: 48-inch thick reinforced concrete

b. Floor - Poured-in-place 24-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 28 feet

3. Room volume: Approximately 53,454 cu. ft.

4. Ventilation: 1540 cfm supply from the normal Reactor Building ventilation system

Table 6-41. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/W) (Unit 2) (Cont)

5. Congestion/Access: Access via stairways at the south side of the zone. Access via zone RB-1-0 (S/C) on the east, no access from north. Mobility within the area is good. Access to the area is good.

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
			Ventilating Air Sys.		X
			RCIC Sys.		X
			Service Water Sys.		X
			RHR Sys.		X
None			ADS Sys.		X
			RIP Sys.		X
			Instr. Air Sys.		X
			Instrumentation		X
			Diesel Gen. Sys.		X
			Elec. Dis. Sys.		X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
			Penetration X-105K (QD3)	X	X
			Penetration X-105J (QD4)	X	X
None			Valve E11-F068B (KW6)	X	X
			Valve E51-F013 (KS5)	X	X
			Instr Air Compr 2B (NP7)	X	X
			Press SW IA-PSL-3595 (L08)	X	X

Table 6-41. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/W) (Unit 2) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area: grease in valves, cables, and oil in the Standby Air Compressor

2. Quantity of combustibles:

   Grease - 53 pounds

   Oil - 30 gallons

   Cables - Average three trays, approximately 580 linear feet, medium to heavy density

3. Ease of ignition and propagation: Cables are non-propagating. Grease is not considered a source of fuel ignition due to its high flash point. Oil flash point requires raising the bulk volume temperature to 450°F.

4. Suppression damage to equipment: Damage is localized to the immediate fire area since in situ suppression systems are thermostatically controlled and adjacent equipment should not be affected. Safety-related motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in this zone and adjacent zones.

Table 6-41. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/W) (Unit 2) (Cont)

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: Wet-pipe system utilizing automatic on/off sprinkler heads charged with water. The supply is provided with a one-head bypass of the deluge valve feature. The deluge valve is automatically operated upon actuation of the detection system and flow in the bypass.

3. Hose station/extinguisher:

   a. Distance to hose stations - One water hose reel with 75-foot hose 25 feet from the zone centroid

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.42 Fire Zone RB-4 (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-4 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) All cables in this zone are encased in conduit.

6.42.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 20R to 22R at elevation 20 feet. Fire zone RB-4 is bounded by 72-inch thick reinforced concrete walls to the north and south, a 33-inch thick reinforced concrete wall to the east and a 48-inch thick reinforced concrete wall to the west. The floor and ceiling are 24-inch thick and 12-inch thick reinforced concrete slabs, respectively.

6.42.2 Safe Shutdown Equipment

Fire zone RB-4 contains isolation valves for the Main Steam and Feedwater Systems and cables associated with the RHR, ADS, RIP and RCIC Systems.

6.42.3 Fire Protection Systems

Fire zone RB-4 contains an ionization smoke detection system connected to a control room annunciator. Hose stations and CO_2 extinguishers are inaccessible.

6.42.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-4 Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates that the existing configuration provides sufficient fire protection.

The conduits/cable trays of concern for Fire Zone RB-4 are individually dispositioned on Table 6-42b as:

> Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the table, along with associated minimum and maximum elevations.

TABLE 6-42(b) UNIT 2 REACTOR BUILDING FIREZONE RB-4

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
3JLF/CB	Conduit	320	320	0
3JLD/CB	Conduit	320	320	0

6.42.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) All cables in this zone are completely encased in steel conduit.

(4) Access to and location of this zone prevents introduction or storage of transient combustibles during normal operation.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(6) The conservative quantitative fire hazards analysis described previously, in addition to the proposed modifications, demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-42. Evaluations Parameters Summary Table, Fire Zone RB-4 (Unit 2)

A. Zone Description

1. Construction:

a. Walls

North - Interior: 72-inch thick reinforced concrete

South - Interior: 72-inch thick reinforced concrete

East - Interior: 33-inch thick (minimum) reinforced concrete

West - Exterior:- 48-inch thick reinforced concrete

b. Floor - Poured-in-place 24-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab

2. Ceiling height: 29 feet

3. Room volume: Approximately 39,700 cu. ft.

4. Ventilation: 7500 cfm supply and 7500 cfm exhaust via the normal Reactor Building ventilation system

5. Congestion/Access: The zone is inaccessible. The only access into this area is through two concrete plugs. The zone does not have adequate room for firefighting.

Table 6-42. Evaluations Parameters Summary Table, Fire Zone RB-4 (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
			Die. Gen Sys.		X
			Elect. Dist. Sys.		X
			RCIC Sys.		X
NONE			Ventilating Air Sys.		X
			RHR Sys.		X
			ADS Sys.		X
			RIP Sys.		X
			Service Water Sys.		X
			Instrumentation		X
			Instr. Air Sys.		X

2. Equipment in zone required for safe shutdown: Main steam isolation valves F028A, B, C, and D; feedwater isolation valves F032A and B.

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease located in six motor-operated valves (four steam, two feedwater)

2. Quantity of combustibles:

Grease - 60 pounds

Cables - Moderate number of cables totally encased in conduit; no trays in this zone.

3. Ease of ignition and propagation: Cables are non-propagating. Grease is not considered a source of fire ignition due to its high flash point

Table 6-42. Evaluations Parameters Summary Table, Fire Zone RB-4 (Unit 2) (Cont)

4. Suppression damage to equipment: No automatic suppression equipment in zone. Safety-related valve motor operators are protected by NEMA 4 enclosures.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling
2. Automatic suppression systems: None
3. Hose station/extinguisher:
   a. Distance to hose stations - inaccessible
   b. Distance to extinguishers - inaccessible

6.43 Fire Zone RB-6 (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-6 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatix fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Zone orientation precludes the random introduction of transient combustibles.

6.43.1 Area Description

This fire zone comprises the Reactor Building at column lines P to S and 20R to 22R at elevation 20 feet. Fire zone RB-6 is bounded by 24-inch thick reinforced concrete walls to the north and south, a 48-inch thick reinforced concrete wall to the east, and a 6 foot thick reinforced concrete wall to the west. The floor and ceiling are 12- and 18-inch thick reinforced concrete slabs, respectively.

6.43.2 Safe Shutdown Equipment

Fire zone RB-6 contains equipment and cables associated with the RHR, HPCI, and RCIC Systems.

6.43.3 Fire Protection Systems

Fire zone RB-6 contains an ionization smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 40 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.43.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-6 Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is above the stratification height,

The conduits/cable trays of concern for Fire Zone RB-6 are individually dispositioned on Table 6-43b as:

Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits above the stratification height up to the ceiling, or for the duration of traverse through the stratification region.

TABLE 6-43(b) UNIT 2 REACTOR BUILDING FIREZONE RB-6

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
3GM1/CA	Conduit	Provide an appropriate wrap
3GM2/CA	Conduit	
6AC1/CA	Conduit	
6AC2/CA	Conduit	
5MT1/CA	Conduit	
3GT1/CA	Conduit	
3GL2/BA	Conduit	
3GT1/BA	Conduit	
3HL1/CA	Conduit	
3CF1/CA	Conduit	

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.43c contains a listing of those boundaries for fire zone that:

(1) does not meet the separation criteria of Section III.G, and

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

6.43.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors throughout the zone connected to control room annunciator.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) The presence of transient combustibles is not credible during normal operation due to zone orientation.

(4) The conservative quantitative fire hazards analysis described previously, in addition to the proposed modifications, demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6.43c. Fire Zone: RB-6

Zone Boundary	Deviation from III.G	Proposed Modification	Basis for Acceptability
North	Nonrated man-door	None*	*These deviations dispositioned in Section 6.19.
South	Nonrated man-door	None*	

Table 6-43. Evaluations Parameters Summary Table, Fire Zone RB-6 (Unit 2)

A. Zone Description

1. Construction:

a. Walls

North - Interior: 24-inch thick reinforced concrete

South - Interior: 24-inch thick reinforced concrete

East - Interior: 48-inch thick reinforced concrete

b. Floor - Poured-in-place 12-inch thick reinforced concrete and concrete beams

c. Ceiling - Poured-in-place 18-inch thick reinforced concrete slab

2. Ceiling height: 14 feet 6 inches

3. Room volume: Approximately 16,660 cu. ft.

4. Ventilation: 3000 cfm transfer from zone RB-1-g (S/E); 3000 cfm exhaust via the normal Reactor Building ventilation system

5. Congestion/Access: Access doors at the northeast and southeast corners of zone. Access to the zones is via zone RB-1-g(N/E) and RB-1-g(S/E), which in turn are accessible via equipment access doors located on the east and west side of this zone. Access to the zone is good. Access within the zone is limited due to pipes.

Table 6-43. Evaluations Parameters Summary Table, Fire Zone RB-6 (Unit 2) (Cont)

B. Safe shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
RHR Sys.	X	X	RHR Sys.	X	X
HPCI Sys.	X	X	RCIC Sys.	X	X

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Valve E11-F015A (KJ6)	X	X	Valve E11-F015B (KJ3)	X	X
			Valve E11-F008 (KM3)	X	X
Valve E41-F003 (KG8)	X	X	Valve E51-F008 (KS6)	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease located in 10 safety-related motor-operated valves, and cables

2. Quantity of combustibles:

Grease - 45 pounds.

Cables - Small number of cables totally encased in conduit, no trays in this zone.

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition due to its high flash point. Cables are non-propagating.

4. Suppression damage to equipment: Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in adjacent zones.

Table 6-43. Evaluations Parameters Summary Table, Fire Zone RB-6 (Unit 2) (Cont)

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling.

2. Automatic suppression systems: None

3. Hose station/extinguisher:

   a. Distance to hose stations - Two water hose reels with 75 feet of hose are located in adjacent zones, one in zone RB-5 approximately 40 feet from the centroid of this zone and another located in zone RB-1-g(N/E) approximately 50 feet the zone centroid of this zone

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.44 Fire Zone RB-1-e (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-e does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.44.1 Area Description

This fire zone comprises the Reactor Building at column lines S to T and 18R to 19R at elevation 20 feet. The north, south, east, and west walls are 24 inches thick; the ceiling is 12 and 24 inches thick; and the floor is 18-inch thick reinforced concrete. Access to this area for manual fire fighting is fair. Ceiling height is 28 feet 6 inches (average). Room ventilation is 10,484 cfm.

6.44.2 Safe Shutdown Equipment

Fire zone RB-1-e contains equipment and cables associated with the RHR and Service Water Systems necessary for safe shutdown. All of the cables are encased in conduit; there are no trays in this zone.

6.44.3 Fire Protection Systems

Fire zone RB-1-e contains ionization smoke detectors located on the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is 50 feet from the center of the zone.

6.44.4 Fire Hazards Analysis

The specific deviations which were identified utilizing the methodology and assumptions described in Section 4 for fire zone RB-1-e are lack of rated barriers. This lack of barrier rating is due to a non-rated hatch in the ceiling and a non-rated door in the south wall. The hatch in the ceiling is part of the exterior wall of the Reactor Building, and therefore no redundant circuits are opposite this hatch. The door in the south wall of this zone accesses the adjacent zone which contains mostly cables of the same division as RB-1-e. All redundant circuits in the adjacent zone have been properly dispositioned in that area analysis. In addition, more than twenty feet of horizontal separation exists between safe shutdown circuits in zone RB-1-e and redundant circuits in the adjacent zone. It can be concluded, therefore that no reasonable exposure fire within fire zone RB-1-e will threaten redundant shutdown function.

6.44.5 Conclusions

Based on previous analysis, exemption is requested from the requirement for the three hour barriers between fire zones as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

1. Ionization smoke detectors are provided with a common area alarm in the control room.

2. The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

3. Modifications required to meet Section III.G.2 would not enhance fire protection safety above that already provided by the existing configuration.

Table 6-44. Evaluations Parameters Summary Table, Fire Zone RB-1-e (Unit 2)

A. Zone Description

1. Construction:

a. Walls

North - Interior: 24-inch thick reinforced concrete

South - Interior: 24-inch thick reinforced concrete

East - Exterior: 24-inch thick reinforced concrete

West - Interior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 18-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12- to 24-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 28 feet 6 inches (underside of roof, average

3. Room volume: Approximately 20,900 cu. ft.

4. Ventilation: 10,484 cfm exhaust to the normal reactor Building ventilation system. 10,484 cfm supply, 1,000 cfm infiltration through the door at elevation 20 feet and 9,484 infiltration from elevation -17 feet through the floor grating.

5. Congestion/Access: This zone is accessible through one doorway and one stairway from elevation 20 feet. Inside the zone ample space exists around the RHR heat exchanger and associated piping.

Table 6-44. Evaluations Parameters Summary Table, Fire Zone RB-1-e (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Serv. Water Sys.		X	NONE		
RHR System	X	X			

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
RHR Heat Exchanger	X		NONE		
Valve E11-F002A (VQO)	X	X			

C. Fire Hazards Analysis

1. Type of combustibles in area: grease and cables

2. Quantity of combustibles:

Grease - Approximately 2 pounds in the operator for valve E11-F002A.

Cables - Small number of cables totally encased in conduit; no trays in this zone.

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition due to its high flash point. Cables are non-propagating.

Table 6-44. Evaluations Parameters Summary Table, Fire Zone RB-1-e (Unit 2) (Cont)

4. Suppression damage equipment: This is an enclosed area with open grating to elevation -17 feet. Any water spray would be confined to this area and directly below which does no contain redundant train equipment.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling.

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - One water hose reel with a 75-foot hose located near the entrance to this zone approximately 50 feet from the centroid of the zone.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.45 Fire Zone RB-1-f (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-f does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

1. Ionization smoke detectors are provided with a common area alarm in the control room.

2. The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.45.1 Area Description

This fire zone comprises the Reactor Building at column lines S to T and 23R to 24R at elevation 20 feet. All walls and the floor are 24-inch thick reinforcd concrete; the ceiling is 12-inch thick reinforced concrete. Access to this zone for manual suppression is good. Ceiling height is 29 feet. Room ventilation is 14,364 cfm.

6.45.2 Safe Shutdown Equipment

Fire zone RB-1-f contains equipment and cables associated with the RHR and Service Water Systems necessary for safe shutdown. All of the cables are encased in conduit; there are no trays in this zone.

6.45.3 Fire Protection Systems

Fire zone RB-1-f (Unit 2) contains ionization smoke detectors located on the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is 30 feet away from the center of the zone. Twenty-Pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.45.4 Fire Hazards Analysis

The specific deviations which were identified utilizing the methodology and assumptions described in Section 4 for fire zone RB-1-f are lack of unrated barriers. This lack of non-rated barriers is due to a non-rated hatch in the ceiling and a non-rated door in the north wall. The hatch in the ceiling is part of the exterior wall of the Reactor Building, and therefore no redundant circuits are opposite this hatch. The door in the north wall accesses the adjacent zone which contains mostly cables of the same train as RB-1-f. All redundant circuits in the adjacent zone have been properly dispositioned in that area analysis, and therefore any circuit redundancies which might exist across the non-rated door would be bounded by the fire hazards analysis in the adjacent zone.

6.41.5 Conclusions

Based on previous analysis, exemption is requested from the requirement for a three hour rated barrier between fire zones as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

1. Ionization smoke detectors are provided with a common area alarm in the control room.

2. The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

3. Modifications required to meet Section III.G.2 would not enhance fire protection safety above that already provided by the existing configuration.

Table 6-45. Evaluations Parameters Summary Table, Fire Zone RB-1-f (Unit 2)

A. Zone Description

1. Construction:

a. Walls

North - Interior: 24-inch thick reinforced concrete

South - Exterior: 24-inch thick reinforced concrete

East - Exterior: 24-inch thick reinforced concrete

West - Interior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 24-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 1'-0" thick reinforced concrete slab and concrete beams

2. Ceiling height: 29 feet (underside of roof)

3. Room volume: Approximately 20,940 cu. ft.

4. Ventilation: 14,364 cfm exhaust to the normal Reactor Building ventilation system. Supply provided from zone RB-1-d below through the grating and by infiltration through the door.

5. Congestion/Access: This area is uncongested. One stairway (from elevation 20 feet) and one doorway provide access to this zone.

Table 6-45. Evaluations Parameters Summary Table, Fire Zone RB-1-f (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
NONE			RHR Sys.	X	X
			Serv. Water Sys.		X

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
NONE			Valve E11-F075 (KR5)	X	X
			Valve E11-F002B (VQ1)	X	X
			Valve E11-F073 (KR4)	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area: cables and grease in valve motor operators.

2. Quantity of combustibles:

Grease approximately 4.5 pounds

Cables - Small number of cables totally encased in conduit; no trays in this zore.

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition due to its high flash point. Cables are non-propagating.

Table 6-45. Evaluations Parameters Summary Table, Fire Zone RB-1-f (Unit 2) (Cont)

4. Suppression damage to equipment: This is an enclosed area with open grating to elevation -17 feet. Any water spray would be confined to these zones, which do not contain any redundant train equipment. Valve motor operators for safety class valves are protected with a NEMA 4 enclosure.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling
2. Fire extinguishing systems: None
3. Hose station/extinguisher:
   a. Distance to hose stations - None inside the room. One water hose reel with a 75-foot hose is located outside the door about 30 feet from the zone centroid.
   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.46 Fire Zone RB-1-g(E/C) (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-g(E/C) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and light Company seeks to comply with Appendix R through an exemption from the separation and fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Intervening combustibles do not pose a hazard at open boundaries.

(4) Excellent mobility for fine fighting.

6.46.1 Area Description

This fire zone comprises the Reactor Building at column lines S to T and 20R to 22R at elevation 20 feet. The north and south walls are open and the west and east walls are 24-inch thick reinforced concrete. The floor and ceiling are 12-inch thick reinforced concrete. Access to this area for manual fire suppression is very good. Ceiling height is 29 feet. Room ventilation is 3,000 cfm.

6.46.2 Safe Shutdown Equipment

Fire zone RB-1-g(E/C) contains equipment and cables associated with the RHR and Service Water Systems necessary for safe shutdown. The Division A and Division B cable trays in this area are separated by a few feet in several instances.

6.46.3 Fire Protection Systems

Fire zone RB-1-g(E/C) contains ionization smoke detectors located on the ceiling connected to a control room annunciator. Two manual 1-1/2-inch hose stations are located 20 and 50 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.46.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-g(E/C) Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in

Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

The conduits/cable trays of concern for Fire Zone RB-1-g(E/C) are individually dispositioned on Table 6-46b as:

Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier from the floor to a given elevation (for those vertical conduits/trays penetrating the floor),

(b) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
CST1/CA	Conduit	Provide an appropriate wrap from floor to 18' 4" off the floor.
CSJ1/CB	Conduit	
CST1/CA	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
CSA1/CA	Conduit	
3BI1/KB	Conduit	
3BJ2/CB	Conduit	
CSL1/CB	Conduit	
CSJ1/CB	Conduit	
CAT1/CA	Conduit	
3BI1/CB	Conduit	
3BI2/CB	Conduit	
CSK1/CB	Conduit	
3GB1/CA	Conduit	
CSI1/CB	Conduit	

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviation involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate

separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-46c.

Table 6-46(c) Fire Zone: RB-1-g(E/C)

Equipment	Identification	Proposed Modification
Cabinet (2xC)	FR5	None - Equipment safe by configuration.
MCC (2xC)	DS4	Provide a sloping curb extending 5 feet from the face of the cabinet/s and/or protect the equipment with appropriate fire retardant material.
Junction Box Junction Box	A52 A54	Provide a barrier underneath, extendinng out at least 40 inches from the equipment in all directions or enclose the equipment by a proper fire retardant material.
Valve (E11-F017B)	KJ2	None - Equipment safe by configuration.

6.46.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with annunciation in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Access to this zone is excellent for fine fighting.

(4) Intervening combustibles do not pose a hazard at open boundaries to the north and south.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-46. Evaluations Parameters Summary Table, Fire Zone RB-1-g(E/C) (Unit 2)

A. Zone Description

1. Construction:

a. Walls

North - No wall

South - No wall

East - Exterior: 24-inch thick reinforced concrete

West - Interior: 24-inch thick reinforced concrete; part wall 48-inch thick reinforced concrete

b. Floor - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 29 feet

3. Room volume: Approximately 46,060 cu. ft.

4. Ventilation: 3000 cfm supply air via the normal Reactor Building ventilation system

5. Congestion/Access: This zone is not congested. It can be easily accessed from the open sides located to the north and south.

Table 6-46. Evaluations Parameters Summary Table, Fire Zone RB-1-g(E/C) (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Service Water Sys.		X	RHR Sys.	X	X
Elect Dist. Sys.		X	RCIC Sys.		X
Die. Gen. Sys.		X			
RPI Sys.		X			
Instr. Air Sys.		X			
Ventilating Air Sys.		X			
Instrumentation		X			
RHR Sys.		X			

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Valve E11-F-17A (KJ5)	X	X	Valve E11-F017B (KJ2)	X	X
Partial Winding Htr Cab (FR5)			Valve E51-F002B (DS4)	X	X
			RCIC Logic		X
MCC 2XC	X	X			
MCC 2XD		X			

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease and cables

2. Quantity of combustibles:

Grease - 6 pounds

Cables - Average (4) trays, approximately 620 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Cables are non-propagating. Grease is not considered a source of fire ignition due to its high flash point.

Table 6-46. Evaluations Parameters Summary Table, Fire Zone RB-1-g(E/C) (Unit 2) (Cont)

4. Suppression damage to equipment: Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertant spraying of vital components in this zone or in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling.

2. Automatic supression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - None in this zone. However, the adjacent north and south fire zones each have one water hose reel with a 75-foot hose. The reel in the north zone (RB-1-g(N/E) is approximately 50 feet from the zone centroid. The reel in the south zone (RB-1-g(S/E) is approximately 50 feet from the centroid of this zone.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.47 Fire Zone RB-1-g(N/C) (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-g(N/C) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.47.1 Area Description

This fire zone comprises the Reactor Building at column lines M to R and 18R to 20R at elevation 20 feet. Fire zone RB-1-g(N/C) is bounded by a 48-inch thick reinforced concrete wall to the north, a 72-inch thick reinforced concrete wall to the south, and a 24-inch thick partial reinforced concrete wall to the west, and is open to the east. The floor and ceiling are 48-inch thick and 12-inch thick reinforced concrete slabs, respectively. Ceiling height is 29 feet 6 inches. Room ventilation is 8,220 cfm.

6.47.2 Safe Shutdown Equipment

Fire zone RB-1-g(N/C) contains equipment and cables associated with the RCIC, RHR, RIP and RCIC Systems as well as various terminal boxes and MCCs necessary for safe shutdown.

6.47.3 Fire Protection Systems

Fire zone RB-1-g(N/C) contains an ionization smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 25 from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.47.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-g(N/C) Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

(b) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RP-1-g(N/C) are individually dispositioned on Table 6-47b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist),

(b) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

(c) Providing a thermal shield, cable coatings or an appropriate barrier for those opposite division cable trays that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-47(b) UNIT 2 REACTOR BUILDING FIREZONE RB-1-G(N/C)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
CSD1/CA	Conduit	270	270	0
33E/CA	Tray	255	255	0
33D/CA	Tray	255	255	0
33C/CA	Tray	231	255	0
36A/CA	Tray	231	255	0
3GB1/CA	Conduit	270	270	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
37J/DA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
33J/DA	Tray	
6DB3/CA	Conduit	
36B/DA	Tray	
36C/DA	Tray	
36D/DA	Tray	
36E/DA	Tray	
36F/DA	Tray	
4UH1/CA	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
4UG1/CA	Conduit	
4TQ1/CA	Conduit	
4SA1/CA	Conduit	
CSG1/CA	Conduit	
6DB3/DA	Conduit	

For those fire zones whose boundaries were defined (for convenience) by "open space," and evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviation involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-47c.

Table 6-47(c) Fire Zone: RB-1-g(N/C)

Equipment	Identification		Proposed Modification
Instrument Rack (H21-P035)	IE3		Protect the equipment by enclosing it in an appropriate fire retardant container.
Terminal Box (E51-F043C)	YM9	-->	Provide a barrier underneath, extending out at least 40 inches from the equipment in all directions or enclose the equipment by a proper fire retardant material.
Terminal Box (E51-F043A)	YM8	-->	
Terminal Box (B21-F056)	YM4	-->	
Penetration (X-1050)	QB3		Protect by enclosing in an appropriate fire retardant material.

6.47.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Excellent mobility throughout the zone for fire fighting.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-47. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/C) (Unit 2)

A. Zone Description

1. Construction:

a. Walls

North - Exterior: 48-inch thick reinforced concrete

South - Interior: 72-inch and 36-inch thick reinforced concrete

East - No wall

West - No wall; part wall 48-inch thick reinforced concrete

b. Floor - Poured-in-place 48-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 29 feet 6 inches

3. Room volume: Approximately 87,416 cu. ft.

4. Ventilation: 8220 cfm supply air via the normal Reactor Building ventilation system.

5. Congestion/Access: This area is congested. It can be accessed from the adjacent areas to the west and east (no walls).

Table 6-47. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/C) (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
RHR Sys.		X			
Elect Dist. Sys.		X			
Die. Gen. Sys.		X			
HPCI Sys.		X	RCIC Sys.	X	X
RIP Sys.		X	RIP Sys.		X
Service Water Sys.		X			
Instrumentation		X	Instrumentation	X	
Instr. Air Sys.		X	Nuclear Steam System	X	
Containment Atmosphere Control System	X	X			
CRD System (Common Train A&B)	X	X			

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Term Box/VLV CAC-PV-1209D (Y89)	X	X			
Term Box/VLV CAC-PV-1209D (Y86)	X	X			
			Term Box/VLV B21-F056 (YM4)	X	X
Term Box/VLV B32-F056F (YK8)	X	X			
Term Box/VLV E41-F023A (YL1)	X	X			
Term Box/VLV E41-F023C (YL0)	X	X			
			Term Box/VLV E51-F043A (YM8)	X	X
			Term Box/VLV E51-F043C (YM9)	X	X
Instr Rack H21-P016(IJ6)	X		Instr. Rack H21-P035(IE3)	X	
Press SW E41-PS-N001A	X	X	Press SW E51-PS-N019A	X	X
Press SW E41-PS-N001C	X	X	Press SW E51-PS-N019C	X	X
Press SW E41-PS-N004	X	X	Press SW E51-PS-N017	X	X

Table 6-47. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/C) (Unit 2) (Cont)

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
MCC 2XA	X	X			
MCC 2XA-2	X	X			
MCC 2XDA	X	X			
			Penetration X-105D(QB3)	X	X
			Valve E51-F007	X	X
Level XMTR B21-LT-N026A		X	Level XMTR B21-LT-N026A		X
Penetration X-104A(QA7)	X	X			
Penetration X-104A(QA7)	X	X			
Instr Rack H21-P009(IJ1)	X				
Press SW B21-PS-N021C	X	X			
Level SW B21-LITS-N036	X	X			

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables

2. Quantity of combustibles: Cables - Average three trays, approximately 1,040 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Cables are non-propagating.

4. Suppression to damage to equipment: Fire brigade personnel are trained to avoid inadvertant spraying of vital components in this zone or in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

Table 6-47. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/C) (Unit 2) (Cont)

3. Hose station/extinguisher:

   a. Distance to hose stations - One water hose reel with a 75-foot hose 25 feet from the center of the zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

(b) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-g are individually dispositioned on Table 6-48b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or rerouting cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist.

(b) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-48(b) UNIT 2 REACTOR BUILDING FIREZONE:RB-1-G(N/E)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
45L/CA	Tray	285	327	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
33K/DA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
4UH1/CA	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
4UG1/CA	Conduit	
4TG1/CA	Conduit	
45M/DA	Tray	

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 ft on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

6.48.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Good mobility and easy access to this zone enhances fire brigades effectiveness in fire fighting.

(4) Intervening combustibles do not pose a hazard at open boundaries to the south and west.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-48. Evaluations Parameters Summary Table, Fire Zone No. RB-1-g(N/E)

A. Zone description

1. Construction:

a. Walls

North - Exterior: 24-inch thick reinforced concrete

Interior: 24-inch thick reinforced concrete

South - Interior: 24-inch thick reinforced concrete

Exterior: No wall (partial)

East - Exterior: 24-inch thick reinforced concrete

Interior: 24-inch thick reinforced concrete.

West - No wall

b. Floor - Poured-in-place 24-inch thick reinforced concrete slabs and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 29 feet

Table 6-48. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/E) (Cont)

3. Room volume: Approximately 53,650 cu. ft.

4. Ventilation: 1000 cfm exhaust air via the normal Reactor Building ventilation system

5. Congestion/Access: No congestion. This zone is essentially an open area which is open to two adjacent zones.

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Elect. Dist. Sys.		X			
Diesel Gen. Sys.		X	NONE		
Instrumentation		X			
Serv. Water Sys.		X			
RHR Sys.		X			
HPCI Sys.		X			

2. Equipment in zone required for safe shutdown: No safe shutdown equipment requiring review for this evaluation (i.e., no motor-operated valves, MCCs, etc.)

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables Oil in Standby Air Compressors

Table 6-48. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/E) (Cont)

2. Quantity of combustibles:

   Oil - 30 gallons

   Cables - Three trays, approximately 100 linear feet, medium density

3. Ease of ignition and propagation: Oil flash point requires raising the oil bulk volume temperature above 450°F. Cables are non-propagating.

4. Suppression damage to equipment: Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling.

2. Automatic suppression systems: Wet-pipe system utilizing automatic on/off sprinkler heads charged with water. The water supply is provided with a one-head bypass of deluge valve feature. The deluge valve is automatically operated upon actuation of the detection system and flow in the bypass.

3. Hose station/extinguisher:

   a. Distance to hose stations - One 75-foot water hole reel approximately 10 feet from the zone centroid

Table 6-48. Evaluations Parameters Summary Table, Fire Zone RB-1-g(N/E) (Cont)

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.49 Fire Zone RB-1-g(S/E) (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-g(S/E) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

1. Ionization smoke detectors are provided with a common area alarm in the control room.
2. The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.
3. Good access and mobility for manual fire suppression.

6.49.1 Area Description

This fire zone comprises the Reactor Building at column lines R to T and 22R to 24R at elevation 20 feet. The west wall is completely open; the north, south, and east walls, as well as the floor and ceiling, are 12-inch thick reinforced concrete. Access to this area is good for purpose of fire fighting. Ceiling height is 29 feet. Room ventilation is 2540 cfm.

6.49.2 Safe Shutdown Equipment

Fire zone RB-1-g(S/E) contains equipment and cables associated with the RHR, HPCI, RIP, and RCIC Systems necessary for safe shutdown.

6.49.3 Fire Protection Systems

Fire zone RB-1-g(S/E) contains ionization smoke detectors located on the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is 20 feet away from the center of the zone. A portable CO_2 extinguisher is hung on the wall. Approximately 20 feet from the center of the zone. Twenty-pound dry chemical extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.49.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-g Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire, the horizontal separation necessary as a function of cable elevation, such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

(b) The conduit/cable tray of interest is above the stratification height,

(c) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-g are individually dispositioned on Table 6-49b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing one-hour barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,

(b) Providing a one-hour barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-49(b) UNIT 2 REACTOR BUILDING FIREZONE:RB-1-G(S/E)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
38M/CB	Tray	254	254	0
38L/CB	Tray	278	278	0
CSL1/CB	Conduit	145	294	68

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
38P/CB	Tray	Provide an appropriate wrap from floor to 18' 4" off the floor.
38N/CB	Tray	
42M/CB	Tray	Provide an appropriate wrap down to three feet below the ceiling.
40P/CB	Tray	
38N/CB	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
39L/CB	Tray	
39K/CB	Tray	
38K/CB	Tray	
38J/CB	Tray	
38P/CB	Tray	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
IBU2/DA	Conduit	
DDT1/DA	Conduit	

(c) Providing a thermal shield, cable coatings or a one-hour barrier for those opposite division cable trays that cross or come within close proximity of one another until a specified separation is achieved.

(d) Providing cable coating or a one-hour barrier for those cable trays above the stratification height up to the ceiling, or for the duration of traverse through the stratification region.

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviation involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-49d.

Table 6-49 (d). Fire Zone RB-1-3(S/E)

Equipment	Identification	Proposed Modification
MCC (2xD)	DW1	Provide a sloping curb extending 5 feet from the face of the cabinet/s and/or protect the equipment with appropriate fire retardant material.

6.49.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with now allowable storage of transient combustibles.

(3) Easily accessible by fire brigade.

(4) Intervening combustibles do not pose a hazard at open boundaries.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-49. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/E) (Unit 2)

A. Zone description

1. Construction:

a. Walls

North - Interior: 24-inch thick reinforced concrete

Exterior: No wall (partial)

South - Exterior: 24-inch thick reinforced concrete

Interior: 24-inch thick reinforced concrete

East - Exterior: 24-inch thick reinforced concrete

Interior: 24-inch thick reinforced concrete

West - No wall

b. Floor - Poured-in-place 24-inch reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 24-inch reinforced concrete slab and concrete beams

2. Ceiling height: 29 feet

3. Room volume: Approximately 61,118 cu. ft.

Table 6-49. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/E) (Unit 2) (Cont)

4. Ventilation: 2540 cfm supply from the normal Reactor Building ventilation system

5. Congestion/Access: This zone is uncongested. It can be accessed via two open sides from the adjacent to the north and west, a stairway and a doorway. An additional doorway provides access to the personnel decontamination room (fire zone RB-5).

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
			Ventilating Air Sys.	X	X
HPCI Sys.		X	RCIC Sys.		X
			RIP Sys.		X
RIP Sys.		X	ADS Sys.		X
			Diesel Gen. Sys.		X
			RHR Sys.		X
			Elect. Dist. Sys.	X	X
			Instrumentation		X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
			Remote Instr. Pnl (RS4)	X	X
NONE			Partial Winding Htr. Cab (FR6)	X	X
			MCC 2XD	X	X

Table 6-49. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/E) (Unit 2) (Cont)

C. Fire Hazards Analysis

1. Type of combusibles in area - Cables

2. Quantity of combustibles:

   Cables - Average four trays, approximately 600 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Cables are non-propagating and therefore will not sustain a fire.

4. Suppression damage to equipment: Fire brigade personnel are trained to avoid inadvertent spraying of vital components in this zone and in adjacent zones.

D. Fire Protection Exisiting

1. Fire detection systems - Four ionization detectors on the ceiling

2. Fire extinguishing systems - None

3. Hose station/extinguisher

   a. Distance to hose stations - One 75-foot water hose reel 20 feet from the center of the zone.

   b. Distance to extinguishers - One CO_2 extinguisher approximately 20 feet from center of zone.

6.50 Fire Zone RB-1-g(S/C) (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone RB-1-g(S/C) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors throughout the zone are connected to a control room annunciator.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Mobility throughout the zone for the purpose of fire fighting is excellent.

6.50.1 Area Description

This fire zone comprises the Reactor Building at column lines M to R and 22R to 24R at elevation 20 ft. The east wall is completely open, the south wall and floor are 48-inch thick reinforced concrete, the north wall varies from 36- to 72-in. thick reinforced concrete, the ceiling is 12-in. thick reinforced concrete, and the east wall is a partial wall of 24-in. thick reinforced concrete. Access to this area is good via open boundary to the east. Ceiling height is 29 ft 6 in. Room ventilation is 4620 cfm.

6.50.2 Safe Shutdown Equipment

Fire zone RB-1-g(S/C) contains equipment and cables associated with the RIP, RHR, and HPCI Systems necessary for safe shutdown.

6.50.3 Fire Protection Systems

Fire zone RB-1-g(S/C) contains ionization smoke detectors located on the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is 26 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.50.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-g Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

(b) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-g are individually dispositioned on Table 6-50b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,

(b) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-50(b) UNIT 2 REACTOR BUILDING FIREZONE: RB-1-C(S/C)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
CSN1/CB	Conduit	270	270	0
39F/CB	Tray	252	252	0
39H/CB	Tray	252	252	0
39I/CB	Tray	276	276	0
38G/CB	Tray	228	264	0
38H/CB	Tray	264	264	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
38I/CB	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s)
39E/CB	Tray	
39J/CB	Tray	
39K/CB	Tray	
38J/CB	Tray	
4RU1/CB	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved
8KX/CB	Conduit	
CSR1/CB	Conduit	
8CH1/CB	Conduit	
8CK1/CB	Conduit	

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 ft on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviation involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate

separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following Table 6-50c.

TABLE 6-50(c) FIRE ZONE: RB-1-g(S/C)

Equipment	Identification	Proposed Modification
Instrument Rack (H21-P036)	IH7	None-equipment is safe by configuration.
Terminal Box (E41-F0238)	YS7	Provide a barrier underneath, extending out at least 40 in. from the equipment in all directions or enclose the equipment by a proper fire retardant material.
Terminal Box (E41-F023D)	YS8	

6.50.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Excellent mobility throughout the zone for fire fighting.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-50. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/C) (Unit 2)

A. Zone description

1. Construction:

a. Walls

North - Interior: 72-inch and 36-inch thick reinforced concrete

South - Exterior: 48-inch thick reinforced concrete.

East - No wall

West - No wall; partial wall 24-inch thick reinforced concrete

b. Floor - Poured-in-place 48-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 29 feet 6 inches

3. Room volume: Approximately 87,400 cu. ft

4. Ventilation: 4,620 cfm supply from the normal Reactor Building ventilation system

5. Congestion/Access: This area is not congested. It can be accessed through the open sides to the east and west.

Table 6-50. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/C) (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
			RCIC Logic	X	X
			ADS System		X
			RCIC System	X	X
NONE			Service Water System		X
			Elect. Dist. Sys.	X	X
			Diesel Gen. Sys.		X
			RIP Sys.		X
			RHR Sys.		X
			Instrumentation		X
			Instr. Air Sys.		X
			Ventilating Air Sys.		X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
HPCI Logic	X	X	NONE		

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables

2. Quantity of combustibles:

Cables - Average four trays, approximately 1,000 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Cables are non-propagating.

Table 6-50. Evaluations Parameters Summary Table, Fire Zone RB-1-g(S/C) (Unit 2) (Cont)

4. Suppression damage to equipment: Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in this zone and in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

   a. Distance to hose stations - One water hose reel with a 75-foot hose 25 feet from the zone centroid.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.51 Fire Zone RB-1-o (Unit 2)

Exemption Request

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone RB-1-0 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Random access to this zone is not credible, due to zone orientation, during normal operation.

6.51.1 Area Description

This fire zone comprises the Reactor Building at column lines P to S and 20R to 22R at elevation 36 feet. Fire zone RB-1-o is bounded by a 48-inch thick reinforced concrete wall to the east and a 72-inch thick reinforced concrete wall to the west, and is open to the north and south. Access to this zone is limited, via a vertical ladder on the north wall of zone RB-6. The floor and ceiling are 18-inch and 12-inch thick reinforced concrete slabs, respectively. Ceiling height is 13 feet. Room ventilation is by natural convection.

6.51.2 Safe Shutdown Equipment

Fire zone RB-1-o contains cables associated with the HPCI, RIP, RHR, and Diesel Generator Systems, and associated valves and penetrations necessary for safe shutdown.

6.51.3 Fire Protection Systems

Fire zone RB-1-o contains ionization smoke detectors connected to a control room annunciator. A manual 1-1/2-inch hose station is 60 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.51.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-o Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

The conduit/cable tray of interest is above the stratification height.

The conduits/cable trays of concern for Fire Zone RB-1-o are individually dispositioned on Table 6-51b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

Providing an appropriate barrier for those conduits above the stratification height up to the ceiling, or for the duration of traverse through the stratification region.

For those fire zones whose boundaries were defined (for convenience) by "open space", an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
1BU2/DA	Conduit	Provide an appropriate wrap
DDT1/DA	Conduit	
CSN1/CB	Conduit	
CSR1/CB	Conduit	
CSK1/CB	Conduit	
CSB1/CA	Conduit	
CSG1/CA	Conduit	
CSC1/CA	Conduit	
3CG1/CB	Conduit	
3JU2/CB	Conduit	
3JU3/CB	Conduit	
3IC1/CB	Conduit	
3GB1/CA	Conduit	
3MM2/CB	Conduit	
CSD1/CA	Conduit	

Those Appendix R deviations involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-51c.

Table 6-51(c). Fire Zone: RB-1-o

Equipment	Identification	Proposed Modification
Junction Box	A55	Provide a barrier underneath, extending out at least 40 inches from the equipment in all directions or enclose the equipment by a proper fire retardant material.
Junction Box	A53	
Valve (E11-FØ52B)	VD5	Protect the equipment by enclosing it in a proper fire retardant material.
Penetration	QC1	None - equipment safe by configuration.
Penetration	QCØ	None - equipment safe by configuration.

6.51.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Photoelectric smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Random introduction of transient combustible material not credible due to zone orientation.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The conservative quantitative fire hazards analysis described previously, in addition to the proposed modifications, demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-51 Evaluation Parameters Summary Table, Fire Zone RB-1-o

A. Zone description

1. Construction:

a. Walls

North - No wall

South - No wall

East - Interior: 48-inch thick reinforced concrete

West - Interior: 72-inch thick reinforced concrete

b. Floor - Poured-in-place 18-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 13 feet

3. Room volume: Approximately 20,100 cu. ft.

4. Ventilation: No forced ventilation in the zone; natural convection ventilation only

5. Congestion/Access: Access to this zone is via the ladder on the south wall of zone RB-6. Accessibility within the zone is limited.

Table 6-51 Evaluation Parameters Summary Table, Fire Zone RB-1-o

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Equip.	Cable	Description	Equip.	Cable
HPCI. SYS.		X			
RIP SYS.		X			
ELECT. DIST. SYS.		X			
DIESEL GEN. SYS.		X			
INSTR. AIR SYS.		X			
VENTILATING AIR SYS.		X			
SERV. WATER SYS.		X			
RHR SYS.	X	X			
			RHR SYS.	X	X
			ADS SYS.	X	X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Equip.	Cable	Description	Equip.	Cable
VALVE E11-F052A (VD4)	X	X	VALVE E11-F052B (VD5)	X	X
PENETRATION X-102C(QB4)	X	X	PENETRATION X-105G (QCØ)	X	X
			PENETRATION X-105H (QC1)	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease contained in valve motor operators, and cables

2. Quantity of combustibles:

Grease - 30 pounds

Cables - Average two trays, approximately 200 lineal feet, medium to heavy density.

Table 6-51 Evaluation Parameters Summary Table, Fire Zone RB-1-o

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition due to its high flash point. Cables are non-propagating.

4. Suppression damage to equipment: Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

   a. Distance to hose stations - One 75-foot water hose station in the adjacent area approximately 60 feet from the centroid of this zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.52 Fire Zone RB-1-h(E/C) (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2. pression.

Summary

Fire Zone RB-1-h(E/C) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common control room annunciator.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Zone is easily accessible from adjacent zones for fire-fighting purposes.

6.52.1 Area Description

This fire zone comprises the Reactor Building at column lines P to S and 20R to 22R at elevation 50 feet. The north and south walls are completely open, the east wall is 24-inch thick reinforced concrete, the west wall is 72-inch thick reinforced concrete, and the floor and ceiling are 12-inch thick reinforced concrete. Access to this area is very good for fire brigade response. Ceiling height is 29 feet. Room ventilation is 3750 cfm.

6.52.2 Safe Shutdown Equipment

Fire zone RB-1-h(E/C) contains equipment and cables associated with the RIP, RHR, HPCI and Service Water Systems necessary for safe shutdown.

6.52.3 Fire Protection Systems

Fire zone RB-1-h(E/C) contains ionization smoke detectors located on the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is located 15 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.52.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-h(E/C) Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

(b) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-h(E/C) are individually dispositioned on Table 6-52b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier from the floor to a given elevation (for those vertical conduits/ trays penetrating the floor),

(b) Providing an appropriate barrier for those conduits/ trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist,

TABLE 6-52(b) UNIT 2 REACTOR BUILDING FIREZONE RB-1-H(E/C)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
4WS1/CB	Conduit	191	257	146
4WT1/CB	Conduit	191	257	146
4CQ2/CB	Conduit	170	264	74
4CW2/CB	Conduit	53	174	166

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
45L/CA	Tray	Provide an appropriate wrap from floor to 18' 4" off the floor.
45M/DA	Tray	
CSC1/CA	Conduit	
41K/DB	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
45K/CA	Tray	
45L/CA	Tray	
48G/CA	Tray	
40M/CB	Tray	
45G/DA	Tray	
45F/DA	Tray	
45K/DA	Tray	
45M/DA	Tray	
CSC1/CA	Conduit	
47G/CA	Tray	
47F/CA	Tray	
5NZ1/DB	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
3FV1/CA	Conduit	
3LR1/CA	Conduit	
4DA1/CA	Conduit	
4AC/AA	Tray	
5NZ5/CB	Conduit	
5NZ8/CB	Conduit	
5NZ1/CB	Conduit	
5NZ2/CB	Conduit	
5NZ4/CB	Conduit	
4MR1/DA	Conduit	
5NZ3/CB	Conduit	
4MR2/DA	Conduit	

(c) Providing an appropriate barrier for those opposite division conduits that cross or come within close proximity of one another until a specified separation is achieved.

(d) Providing a thermal shield, cable coatings or an appropriate barrier for those opposite division cable trays that cross or come within close proximity of one another until a specified separation is achieved.

For those fire zones whose boundaries were defined (for convenience) by "open space", an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviations involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite divison of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specified disposition of each equipment deviation is detailed in the following table 6-52c.

Table 6-52(c). Fire Zone: RB-1-h(E/C)

Equipment	Identification	Proposed Modification
Junction Box	WTB	Provide a barrier underneath, extending out at least 40 inches from the equipment in all directions or enclose the equipment by a proper fire retardant material.
Terminal Box (B21-FØ42B)	YP9	None - equipment safe by configuration
Terminal Box (B21-FØ46B)	YP9	None - equipment safe by configuration
Terminal Box (B21-FØ48B)	YQØ	None - equipment safe by configuration
Terminal Box (B21-FØ44B)	YP8	None - equipment safe by configuration
Pressure Switch (SW-PS-1175)	JWØ	Protect the equipment by enclosing it in a proper fire retardant material
Valve (SW-V137)	KB5	None - equipment safe by configuration
Instrument Rack	IG7	Protect the equipment by enclosing it in an appropriate fire retardant container.
Pump (E11-CØØ1C)	NC2	Protect the equipment by enclosing it in an appropriate fire retardant container.

6.52.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a control room annunciator.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Zone can be accessed from adjacent zones RB-1-h(S/E) and RB-1-h(N/E) for fire-fighting purposes.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The conservative quantitative fire hazards analysis described previously, in addition to the proposed modifications, demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-52. Evaluations Parameters Summary Table, Fire Zone RB-1-h(E/C) (Unit 2)

A. Zone description

1. Construction:

a. Walls

North - No walls

South - No walls

East - Exterior: 24-inch thick reinforced concrete

West - Interior: 72-inch thick reinforced concrete

b. Floor - Poured-in-place 12-inch thick reinforced concrete slabs and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slabs and concrete beams

2. Ceiling height: 29 feet

3. Room volume: Approximately 74,936 cu. ft.

4. Ventilation: 3750 cfm supply from the normal Reactor Building ventilation system

5. Congestion/Access: This area is not congested. It can be accessed easily from the adjacent areas to the north and south as there are no walls on these sides.

Table 6-52. Evaluations Parameters Summary Table, Fire Zone RB-1-h(E/C) (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Elect. Distr. Sys.		X			
Diesel Gen. Sys.		X			
Ventilating Air Sys.		X			
Serv. Water Sys.	X	X	Serv. Water Sys.		X
RIP Sys.	X	X	RIP Sys.	X	X
Instrumentation	X	X	Instrumentation	X	X
HPCI Sys.		X			
RHR Sys.		X			

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Valve SW-V136 (KB4)	X	X	Pump SW-C001B (NC1)	X	X
Pump SW-C001A (NC0)	X	X			
Flow SW SW-FSL-895	X	X			
Temp. SW SW-TSH-1109	X	X			
Pump SW-C001C (NC2)	X	X			
Flow SW SW-FSL-897	X	X			
Temp. SW TSH-1111	X	X			
Valve SW-V101 (VI2)	X	X			
Press. SW SW-PS-1175 (JW0)	X	X			

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease, cables, and oil

Table 6-52. Evaluations Parameters Summary Table, Fire Zone RB-1-h(E/C) (Unit 2) (Cont)

2. Quantity of combustibles:

   a. Grease - 55 pounds

   b. Oil - 30 gallons

   c. Cables - Average three trays, approximately 535 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition due to its high flash point. Cables are non-propagating. Oil flash point requires raising the bulk volume temperature above 450°F.

4. Suppression damage to equipment: Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital components in this area and in adjacent zones.

Table 6-52. Evaluations Parameters Summary Table, Fire Zone RB-1-h(E/C) (Unit 2) (Cont)

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher

a. Distance to hose stations - One water hose reel with a 75-foot hose 15 feet from the center of the fire zone

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.53 Fire Zone RB-1-h(N/E) (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone RB-1-h(N/E) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) Ionization smoke detectors and automatic fixed suppression are provided with control room annunciation.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Excellent access and mobility for fire-fighting personnel.

6.53.1 Area Description

This fire zone comprises the Reactor Building at column lines S to P and 18R to 20R at elevation 50 feet. Fire zone RB-1-h (N/E) is bounded by a 24- to 48-inch thick reinforced concrete wall to the north and a 24-inch thick reinforced concrete wall to the east, and is open to the south and west. The floor and ceiling are 12-inch thick reinforced concrete slabs. Access to this zone is excellent for manual fire suppression.

6.53.2 Safe Shutdown Equipment

Fire zone RB-1-h(N/E) contains cables associated with the HPCI, RIP and Diesel Generator Systems necessary for safe shutdown.

6.53.3 Fire Protection Systems

Fire zone RB-1-h(N/E) contains ionization smoke detectors connected to a control room annunciator, and a preaction fixed suppression system. A manual 1-1/2-inch hose station is 30 feet away from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.53.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-h Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-h are individually dispositioned on Table 6-53b as:

Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist.

TABLE 6-53(b) UNIT 2 REACTOR BUILDING FIREZONE:RB-1-H(N/E)

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
47D/CA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
47E/CA	Tray	
45E/CA	Tray	
45D/CA	Tray	

For those fire zones whose boundaries were defined (for convenience) by "open space", an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

6.53.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors and automatic fixed suppression are provided with annunciation in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Fire brigade access and mobility is excellent in this zone.

(4) The conservative quantitative fire hazards analysis described previously, in addition to the proposed modifications, demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-53. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/E) (Unit 2)

A. Zone description

1. Construction:

a. Walls

North - Exterior: 24- to 48-inch thick reinforced concrete

South - Interior: No wall

East - Exterior: 24-inch thick reinforced concrete

West - No wall

b. Floor - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 29 feet

3. Room volume: Approximately 56,950 cu. ft.

4. Ventilation: 1500 cfm supply air from the normal Reactor Building ventilation system

5. Congestion/Access: Open area easily accessible from two adjacent zones. No congestion in zone due to in situ equipment.

Table 6-53. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/E) (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
HPCI Sys.		X			
RIP Sys.		X			
Elect. Distr. Sys.		X			
Diesel Gen. Sys.		X	NONE		
Serv. Water Sys.		X			
Ventilating Air Sys.		X			
Instrumentation		X			
RHR Sys.		X			

2. Equipment in zone required for safe shutdown: This zone contains no safe shutdown equipment requiring review for this evaluation.

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease and cables

2. Quantity of combustibles:

   a. Grease - 10 pounds (approximately)

   b. Cables - Four trays, approximately 225 lineal feet, medium density

3. Ease of ignition and propagation: Grease is not considered a source of fuel ignition due to its high flash point. Cables are non-propagating.

Table 6-53. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/E) (Unit 2) (Cont)

4. Suppression damage to equipment: Fire brigade personnel are trained to avoid inadvertent spraying of equipment in adjacent zones.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: Wet-pipe system, utilizing automatic on/off sprinkler heads charged with water. The water supply is provided with a one-head bypass of deluge valve feature. The deluge valve is automatically operated upon actuation of the detection system and flow in the bypass.

3. Hose station/extinguisher:

   a. Distance to hose stations - One 75-foot water hose reel on the north wall approximately 30 feet from the centroid of the zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.54 Fire Zone RB-1-h(S/E) (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone RB-1-h(S/E) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Excellent mobility and access for fire-fighting purposes.

6.54.1 Area Description

This fire zone comprises the Reactor Building at column lines S to P and 22R to 24R at elevation 50 feet. Fire zone RB-1-h (S/E) is open to the north and bounded by a 24- to 48-inch thick reinforced concrete wall to the south, a 24-inch thick reinforced concrete wall to the east, and a 36- to 48-inch thick reinforced concrete wall to the west. The floor is a 12- to 24-inch thick reinforced concrete slab. The ceiling is a 12- to 36-inch thick reinforced concrete slab.

6.54.2 Safe Shutdown Equipment

Fire zone RB-1-h(S/E) contains cables and equipment associated with the RIP, ADS, RHR, Service Water, and Diesel Generator Systems necessary for safe shutdown.

6.54.3 Fire Protection Systems

Fire zone RB-1-h(S/E) contains ionization smoke detectors connected to a control room annunciator. A manual 1-1/2-inch hose station is located 20 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require. Zone RB-1-h(S/E) is easily accessible from zone RB-1-h(E/C) to the north and a stairway in the southeast corner.

6.54.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-h(S/E) Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared

with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

(b) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-h(S/E) are individually dispositioned on Table 6-54b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier from the floor to a given elevation (for those vertical conduits/trays penetrating the floor),

(b) Providing an appropriate barrier for those conduits/ trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist.

TABLE 6-54(b) UNIT 2 REACTOR BUILDING FIREZONE:RB-1-H(S/E)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
42I/CB	Tray	236	236	0
42H/CB	Tray	236	236	0
41I/CB	Tray	248	248	0
41H/CB	Tray	248	248	0
4CT1/CA	Conduit	168	264	183
4CT2/CA	Conduit	168	264	183

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
42M/CB	Tray	Provide an appropriate wrap from floor to 18' 4" off the floor.
40P/CB	Tray	
42M/CB	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
42L/CB	Tray	
42J/CB	Tray	
41K/CB	Tray	
41J/CB	Tray	
40P/CB	Tray	
40N/CB	Tray	

For those fire zones whose boundaries were defined (for convenience) by "open space", an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles post a threat to adjacent zones.

Those Appendix R deviations involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to be safe by existing configuration. Equipment with inadequate separation has specific modificatins proposed. The specific dispostion of each equipment deviation is detailed in the following table 6-54c.

Table 6-54(c). Fire Zone: RB-1-h(S/E)

Equipment	Identification	Proposed Modification
Valve (SE-V1Ø6)	VI8	None - equipment is safe by configuration

6.54.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a control room annunciator.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Excellent mobility and access for fire brigade.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The conservative quantitative fire hazards analysis described previously, in addition to the proposed modifications, demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-54. Evaluations Parameters Summary Table, Fire Zone RB-1-h(S/E) (Unit 2)

A. Zone description

1. Construction:

a. Walls

North - Interior: 72-inch thick reinforced concrete

South - Exterior: 24-inch and 48-inch thick reinforced concrete

East - Exterior: 24-inch thick reinforced concrete

West - Interior: 36-inch and 48-inch thick reinforced concrete

b. Floor - Poured-in-place 12- and 24-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 12- and 36-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 29 feet and 13 feet 8 inches

3. Room volume: Approximately 59,062 cu. ft.

Table 6-54. Evaluations Parameters Summary Table, Fire Zone RB-1-h(S/E) (Unit 2) (Cont)

4. Ventilation: 750 cfm supply from the normal Reactor Building ventilation system; 6000 CFM exhaust to adjacent zone RB-10.

5. Congestion/Access: Access is via the southeast stairwell and adjacent zone RB-1-h(E/C). Access is good and mobility in the zone is good.

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
RIP Sys.		X	RIP Sys.		X
			ADS Sys.		X
			Diesel Gen. Sys.		X
			RHR Sys.	X	X
Serv. Water Sys.	X	X	Serv. Water Sys.	X	X
			Instrumentation		X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Valve SW-V106 (V18)	X	X			
			Valve SW-V105 (V14)	X	
			Press. SW-SW-PS-1176 (JW1)	X	
			Pump SW-C001D (NC3)	X	
			Valve SW-V139 (KC4)	X	
			Flow SW SW-FSL-896	X	
			Temp. SW SW TSH-1110	X	
			Valve E11-F021B (VD8)	X	
			Temp. SW SW-TSH-1112	X	
			Instr. Rack H32-P005 (IG7)	X	

Table 6-54. Evaluations Parameters Summary Table, Fire Zone RB-1-h(S/E) (Unit 2) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area: Oil, grease, and cables

2. Quantity of combustibles:

   Grease - 5 pounds in valve

   Oil - 10 gallons in pump motor

   Cables - Average three trays, approximately 550 lineal feet, medium density

3. Ease of ignition and propagation: Grease is not considered a source of fuel ignition due to its high flash point. Oil flash point requires raising the bulk volume temperature to 450°F. Cables are non-propagating.

Table 6-54. Evaluations Parameters Summary Table, Fire Zone RB-1-h(S/E) (Unit 2) (Cont)

4. Suppression damage to equipment: Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling
2. Automatic suppression systems: None
3. Hose station/extinguisher
   a. Distance to hose stations - One 75-foot water hose station in the zone 20 feet from the zone centroid
   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.55 Fire Zone RB-1-h(N/W) (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-h(N/W) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with control room annunciation.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.55.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 18R to 20R at elevation 50 feet. The fire zone RB-1-h (N/W) is bounded by a 24- to 48-inch thick reinforced concrete to the north and a 24-inch thick reinforced concrete wall to the west, and is open to the south and east. The floor and ceiling are 12-inch thick reinforced concrete slabs. Ceiling height is 29 feet. Room ventilation is 3,000 cfm. This zone has good access for manual fire fighting.

6.55.2 Safe Shutdown Equipment

Fire zone RB-1-h(N/W) contains cables associated with the RHR, RIP, HPCI, and Diesel Generator Systems necessary for safe shutdown.

6.55.3 Fire Protection Systems.

Fire zone RB-1-h(N/W) contains an ionization smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 35 feet from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.55.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-h Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-h are individually dispositioned on Table 6-55b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or remote cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist.

TABLE 6-55(b). UNIT 2 REACTOR BUILDING FIREZONE:RB-1-H(N/W)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
41B/BB	Tray	168	168	324
41B/DB	Tray	120	120	324

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
42B/CB	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
42A/CB	Tray	
41B/CB	Tray	
41A/CB	Tray	
6DZF/CB	Conduit	
6DZG/CB	Conduit	
6DZL/CB	Conduit	
6DZJ/CB	Conduit	
6DZC/CB	Conduit	

For those fire zones whose boundaries were defined (for convenience) by "open space" an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to the adjacent zone.

Those Appendix R deviation involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed to

be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-55(c).

Table 6-55(c). Unit 1 Reactor Building, Fire Zone RB-1-g(S/C)

Equipment	Identification	Proposed Modification
Valve (E11-F023)	IH7	None - equipment is safe by configuation

6.55.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common annunciator in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Excellent mobility for fire fighting purposes.

(4) Zone location precludes the introduction of nonessential transient combustibles.

(5) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

(6) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-55. Evaluations Parameters Summary Table, Fire Zone RB-1-1.(N/W) (Unit 2)

A. Zone Description

1. Construction:

a. Walls

North - Exterior: 24- and 48-inch thick reinforced concrete

South - No wall

East - No wall

West - Exterior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Same as floor

2. Ceiling height: 29 feet

3. Room volume: Approximately 58,725 cu. ft.

4. Ventilation: 3000 cfm supply and return air from the normal Reactor Building ventilation system

5. Congestion/Access: This area is not congested. Access to this zone can be obtained from the adjacent areas to the east and south (no walls) or by one stairway.

Table 6-55. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/W) (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
HPCI Sys.		X			
RIP Sys.		X			
Diesel Gen. Sys.		X			
Serv. Water Sys.		X			
RHR Sys.		X			
Ventilating Air Sys.		X			
Instrumentation		X	RCIC System		

2. Equipment in zone required for safe shutdown: No equipment required for safe shutdown is located within this fire zone.

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease, charcoal, and cables

2. Quantity of combustibles:

   Grease - 15 pounds

   Charcoal - 120 pounds

   Cables - Six trays, approximately 325 linear feet, medium to heavy density

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition due to its high flash point. Ignition temperature of charcoal is 451°F. Cables are non-propagating.

Table 6-55. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/W) (Unit 2) (Cont)

4. Suppression damage to equipment: Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling
2. Automatic suppression systems: No sprinklers in the general fire zone; automatic water sprinkler system within the standby gas functional charcoal filters
3. Hose station/extinguisher:
   a. Distance to hose stations - One 75-foot water hose reel 35 feet from the center of the zone
   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.56 Fire Zone RB-1-h(N/C) (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-h(N/C) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with control room annunciation.

(2) The fixed combustible loading is very low in this fire zone with no allowable storage of transient combustibles.

(3) Lack of congestion allows excellent fire brigade mobility.

(4) Access to this zone is excellent to the north and south.

6.56.1 Area Description

This fire zone comprises the Reactor Building at column lines M to P and 18R to 20R at elevation 50 feet. The east and west walls are totally open, the north wall is 48-inch thick reinforced concrete, and the south wall is 72-inch thick reinforced concrete. The floor is 12-inch thick reinforced concrete. The ceiling is 62-inch thick reinforced concrete. Access to this area for manual fire suppression is excellent. Ceiling height is 22 feet. There is no room ventilation.

6.56.2 Safe Shutdown Equipment

Fire zone RB-1-h(N/C) contains equipment and cables associated with the RCIC, RIP, RHR, and Service Water Systems necessary for safe shutdown.

6.56.3 Fire Protection Systems

Fire zone RB-1-h(N/C) contains ionization smoke detectors located on the ceiling connected to a control room annunciator. Two manual 1-1/2-inch hose stations are locted 60 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.56.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-h Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-h are individually dispositioned on Table 6-56b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or remote cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist).

TABLE 6-56(b) UNIT 2 REACTOR BUILDING FIREZONE:RB-1-H(N/C)

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
47D/CA	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
47C/CA	Tray	
47B/CA	Tray	
47A/CA	Tray	
6DDH/CA	Conduit	
6DD3/CA	Conduit	
6DD4/CA	Conduit	
45A/CA	Tray	
45B/CA	Tray	
45C/CA	Tray	
4CH1/CB	Conduit	Provide an appropriate wrap until eight feet of horizontal separation from opposite color is achieved.
4CH2/CB	Conduit	

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Those Appendix R deviaiton involving equipment were assumed to be bounded by the previously described analysis for electrical cables. All equipment which is separated from the opposite division of horizontal distance without intervening combustibles was assumed

to be safe by existing configuration. Equipment with inadequate separation has specific modifications proposed. The specific disposition of each equipment deviation is detailed in the following table 6-56c.

Table 6-56(c). Unit 1 Reactor Building, Fire Zone RB-1-g(S/C)

Equipment	Identification	Proposed Modification
Instrument Rack (H21-P004)	IG6	Provide an appropriate fire barrier.

6.56.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors ae provided throughout the zone and annunciated at the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Intervening combustibles do not pose a hazard at zone boundaries.

(4) Fire brigade access and mobility is excellent for this zone.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(6) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-56. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/C) (Unit 2)

A. Zone Description

1. Construction:

a. Walls

North - Exterior: 48-inch thick reinforced concrete

South - Interior: 72-inch thick reinforced concrete

East - Interior: No wall

West - Interior: No wall

b. Floor - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 62-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 22 feet

3. Room volume: Approximately 53,277 cu. ft.

4. Ventilation: None

5. Congestion/Access: This zone is totally open and accessible to two adjacent zones. Ample space (about 6 feet) exists around the RBCCW heat exchangers and around the RBCCW pumps for firefighting.

Table 6-56. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/C) (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
HPCI Sys.		X	RCIC Logic		X
RIP Sys.	X	X	RCIC Sys.		X
Die. Gen. Sys.		X			
Serv. Water Sys.		X			
RHR Sys.		X			
Ventilating Air Sys.		X			
Instrumentation		X	Instrumentation	X	X

2. Equipment in zone required for safe shutdown:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Term Box/VLV B21-F044A (YK3)	X	X			
Term Box/VLV IA-PV-1201A (Y81)	X	X			
Term Box/VLV B21-F042A (YK2)	X	X			
Term Box/VLV B21-F046A (YK4)	X	X			
Instr. Rack H21-P004 (IG6)	X	X	Instr. Rack H21-P004 (IG6)	X	X
Valve E11-F021A (KK1)	X	X			
Term Box/VLV B21-F048A (YK7)	X	X			
Level XMTR B21-LT-N026A (IG6)	X	X			

C. Fire Hazards Analysis

1. Type of combustibles in area: Electrical cables and grease

Table 6-56. Evaluations Parameters Summary Table, Fire Zone RB-1-h(N/C) (Unit 2) (Cont)

2. Quantity of combustibles:

   Grease - Approximately 10 pounds

   Cables - Six trays, approximately 555 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition due to its high flash point. Cables are non-propagating.

4. Suppression to damage to equipment: Fire brigade personnel are trained to avoid inadvertant spraying of vital equipment in adjacent zones. Safety-related valve motor operators are protected by NEMA 4 enclosures.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling.

2. Automatic suppression systems: None

3. Hose station/extinguisher

   a. Distance to hose stations - Two 75-foot water hose stations about 60 feet from the centroid of this zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.57 Fire Zone RB-1-h(W/C) (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-h(W/C) does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with control room annunciation.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.57.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 20R to 22R at elevation 50 feet. Fire zone RB-1-h (W/C) is bounded by a 72-inch thick reinforced concrete wall to the east and a 24-inch thick reinforced concrete wall to the west, and is open to the north and south. The floor and ceiling are 12-inch thick reinforced concrete slabs. Ceiling height is 29 feet. Room ventilation is 3,750 cfm.

6.57.2 Safe Shutdown Equipment

Fire zone RB-1-h(W/C) contains cables and equipment associated with the RIP, RHR, HPCI, and ADS Systems necessary for safe shutdown.

6.57.3 Fire Protection Systems

Fire zone RB-1-h(W/C) contains an ionization smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 20 feet from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.57.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-h(W/C) Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-h(W/C) are individually dispositioned on Table 6-57b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or remote cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist.

TABLE 6-57(b). UNIT 2 REACTOR BUILDING FIREZONE:RB-1-H(W/C)

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
42D/CB	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
42C/CB	Tray	
42B/CB	Tray	
41D/CB	Tray	
41C/CB	Tray	
41B/CB	Tray	

For those fire zones whose boudaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

6.57.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with control room annunciation.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-57. Evaluations Parameters Summary Table, Fire Zone RB-1-h(W/C) (Unit 2)

A. Zone Description

1. Construction:

a. Walls

North - No wall

South - No wall

East - Interior: 72-inch thick reinforced concrete

West - Exterior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 12-inch reinforced concrete slab and concrete beams

c. Ceiling - Same as floor

2. Ceiling height: 29 feet

3. Room volume: Approximately 67,000 cu. ft.

4. Ventilation: 3750 cfm supply air from the normal reactor building ventilation system

5. Congestion/Access: This area is not congested. It can be accessed easily from the adjacent areas to the north and south as there are no walls on these sides.

Table 6-57. Evaluations Parameters Summary Table, Fire Zone RB-1-h(W/C) (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
			ADS Sys.		X
			Diesel Gen. Sys.		X
RIP Sys.		X	RIP Sys.		X
RHR Sys.		X	RHR Sys.	X	X
			Serv. Water Sys.		X
HPCI Sys.		X	RCIC Sys.		X

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
NONE			Valve E11-F023 (VG4)	X	X

C. Fire Hazards Analysis

1. Type of combustibles in area: Grease and cables

2. Quantity of combustibles:

Grease - 17 pounds

Cables - Five trays, approximately 300 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Cables are non-propagating. Grease is not considered a source of fire ignition due to its high flash point.

Table 6-57. Evaluations Parameters Summary Table, Fire Zone RB-1-h(W/C) (Unit 2) (Cont)

4. Suppression damage to equipment: Safety-related valve motor operators are protected by NEMA 4 enclosures. Fire brigade personnel are trained to avoid inadvertent spraying of components in this zone and in adjacent zones.

D. Fire Protection Exisitng

1. Fire detection systems: Ionization detectors on the ceiling.

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - One 75-foot water hose reel approximately 20 feet from the center of the zone

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria oir closer as circumstances require.

6.58 Fire Zone RB-1-h(S/W) (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-1-h(S/W) does not comply with the specific provisions of 10 CFR 50 Appendix R Sectior III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.58.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 22R to 24R at elevation 50 feet. Fire zone RB-1-h(S/W) is bounded by a 72-inch thick reinforced concrete wall to the south, a 48- to 36-inch thick reinforced concrete wall to the east, and a 24-inch thick reinforced concrete wall to the west. The floor is a 24- to 12-inch reinforced concrete slab. The ceiling is a 36- to 12-inch reinforced concrete slab. Ceiling height is 29 feet and 13 feet 8 inches. Room ventilation is 6000 cfm.

6.58.2 Safe Shutdown Equipment

Fire zone RB-1-h(S/W) contains cables associated with the HPCI, RIP, RHR, and Diesel Generator Systems necessary for safe shutdown.

6.58.3 Fire Protection Systems

Fire zone RB-1-h(S/W) contains ionization smoke detectors connected to a control room annunciator. A manual 1-1/2-inch hose station is located 25 feet from the center of the fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.58.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-1-h(S/W) Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone RB-1-h(S/W) are individually dispositioned on Table 6-58b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/ trays or remote cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist.

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

TABLE 6-58(b) UNIT 2 REACTOR BUILDING FIREZONE:RB-1-H(S/W)

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
42F/CB	Tray	236	236	0
41F/CB	Tray	248	248	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
42E/CB	Tray	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
41E/CB	Tray	

6.58.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with annunciation in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Excellent access and mobility for fire fighting.

(4) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-58. Evaluations Parameters Summary Table, Fire Zone RB-1-h(S/W) (Unit 2)

A. Zone Description

1. Construction:

a. Walls

North - No wall; interior 72-inch thick reinforced concrete

South - Exterior: 48- and 24-inch thick reinforced concrete

East - Interior: 48- and 36-inch thick reinforced concrete

West - Exterior - 24- inch thick reinforced concrete

b. Floor - Poured-in-place 12- and 24-inch thick reinforced concrete

c. Ceiling - Poured-in-place 12- and 36-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 29 feet and 13 feet 8 inches

3. Room volume: Approximately 59,060 cu. ft.

4. Ventilation: 6000 cfm exhaust air transfer to adjacent fire zone RB-10

5. Congestion/Access: This zone is relatively uncongested. Access to it can be obtained through one open side (north), one stairway, and one airlock. A small sampling room located in the middle of this area can be accessed through one doorway or from above, as it has no roof.

Table 6-58. Evaluations Parameters Summary Table, Fire Zone RB-1-h(S/W) (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
RIP Sys.		X			
Diesel Gen. Sys.		X			
Serv. Water Sys.		X			
RHR Sys.		X	RHR Sys.		X
HPCI Sys.		X			
Ventilating Air Sys.		X			
Instrumentation		X			

2. Equipment in zone required for safe shutdown:

No equipment required for safe shutdown is located within this fire zone.

C. Fire Hazards Analysis

1. Type of combustibles in area: Charcoal and cables

2. Quantity of combustibles:

Charcoal - 120 pounds

Cables - Average three trays, approximately 400 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Ignition temperature of charcoal is 450°F. Cables are non-propagating.

4. Suppression damage to equipment: Fire brigade personnel are trained to avoid inadvertent spraying of vital equipment. Safety-related valve motor operators are protected by NEMA 4 enclosures.

Table 6-58. Evaluations Parameters Summary Table, Fire Zone RB-1-h(S/W) (Unit 2) (Cont)

D. Fire Protection Existing

1. Fire detection systems: Three ionization detectors on ceiling

2. Automatic suppression systems: No sprinklers in the general zone area; automatic water sprinkler system within the standby gas treatment and charcoal filters

3. Hose station/extinguisher:

   a. Distance to hose stations - One 75-foot water hose reel 25 feet from the center of the zone.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.59 Fire Zone RB-10 (Unit 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone RB-10 does not comply with the specific provisions of 10 CFR 50 Appendix R, Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with control room annunication.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) High radiation area precludes random access.

(4) Location of zone precludes introduction of transient combustibles.

6.59.1 Area Description

This fire zone comprises the Reactor Building at column lines P to M and 23R to 24R at elevation 50 feet. The north wall is 72-inch reinforced concrete, the south, east, and west walls are 48-inch thick reinforced concrete, the floor is 12-inch thick reinforced concrete, and the ceiling is 28- to 36-inch thick reinforced concrete. Access to this area is through two labyrinth protected doorways at opposite ends of the zone. Ceiling heights are 24 feet and 8 feet. Room ventilation is 12,000 cfm.

6.59.2 Safe Shutdown Equipment

Fire zone RB-10 contains cables associated with the RIP, HPCI, RHR, and ADS Systems necessary for safe shutdown.

6.59.3 Fire Protection Systems.

Fire zone RB-10 contains ionization smoke detectors located on the ceiling connected to a control room annunciator. Two manual 1-1/2-inch hose stations are located 30 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.59.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone RB-10 Unit 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) The conduit/cable tray of interest is below the safe region and/or does not maintain adequate horizontal separation with the opposite division,

The conduits/cable trays of concern for Fire Zone RB-10 are individually dispositioned on Table 6-59b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing a thermal shield, cable coatings or an appropriate barrier for those opposite division cable trays that cross or come within close proximity of one another until a specified separation is achieved.

TABLE 6-59(b) UNIT 2 REACTOR BUILDING FIREZONE:RB-10

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
42H/CB	Tray	236	236	0
42G/CB	Tray	236	236	0
42F/CB	Tray	236	236	0
41H/CB	Tray	248	248	0
41G/CB	Tray	248	248	0
41F/CB	Tray	248	248	0

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R, in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours. Table 6.59c contains a listing of those boundaries for fire zone RB-10 that:

Table 6.59c contains a listing of those boundaries for fire zone RB-10 that:

(1) do not meet the separation criteria of Section III.3, and

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

6.59.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) High radiation area precludes random access during normal operation.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The conservative quantitative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6.59(c). Fire Zone RB-10

Zone Boundary	Deviation from III.G	Proposed Modification	Basis for Acceptability
EAST	Non-rated man-door	*None	*These deviations dispositioned in Section 6.35
WEST	Non-rated man-door	*None	

Table 6-59. Evaluations Parameters Summary Table, Fire Zone RB-10 (Unit 2)

A. Zone Description

1. Construction:

a. Walls

North - Interior: 72-inch thick reinforced concrete

South - Exterior: 72-inch thick reinforced concrete

East - Interior: 36- and 48-inch thick reinforced concrete

West - Interior: 36- and 48-inch thick reinforced concrete

b. Floor - Poured-in-place 12-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 28- and 36-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 24 feet and 8 feet

3. Room volume: Approximately 29,820 cu. ft.

4. Ventilation: 12,000 cfm supply and exhaust from the normal Reactor Building ventilation system

5. Congestion/Access: This zone is accessible through two labyrinth protected doorways at opposite ends of the zone. Room exists within the zone for firefighting around both RWCU pumps and heat exchangers.

Table 6-59. Evaluations Parameters Summary Table, Fire Zone RB-10 (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
HPCI Sys.		X			
			RCIC Sys.		X
			ADS Sys.		X
			Diesel Gen. Sys.		X
RIP Sys.		X	RIP Sys.		X
			Instrumentation		X
			RHR Sys.		X
			Serv. Water Sys.		X

2. Equipment in zone required for safe shutdown: This zone does not contain any safe shutdown equipment requiring review for this evaluation.

C. Fire Hazards Analysis

1. Type of combustibles in area: Electrical cables and grease

2. Quantity of combustibles:

Grease - 45 pounds

Cables - Average three trays, approximately 270 lineal feet, medium to heavy density

3. Ease of ignition and propagation: Grease is not considered a source of fire ignition due to its high flash point. Cables are non-propagating.

Table 6-59. Evaluations Parameters Summary Table, Fire Zone RB-10 Unit 2 (Cont)

4. Suppression damage to equipment: Fire brigade personnel are trained to avoid inadvertent spraying of safety equipment in this zone. This zone is a confined space protected by doors and labyrinths so that spraying of water on equipment in adjacent zones is virtually impossible.

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling.

2. Automatic suppresssion systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - Two 75-foot water hose reel stations located at the zone entrances about 30 feet from the zone centroid.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.60 Fire Zone CB-1a (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone CB-1b does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detector is provided with a common area alarm in the control room.

(2) Cables are enclosed in flexible or rigid conduit and coated with fire-retardant.

(3) Acccess to area is by security escort only.

(4) No cables or equipment in zone required for safe shutdown.

(5) No allowable storage of transient combustibles.

6.60.1 Area Description

This fire zone comprises the Control Building at elevation 23 feet. Fire zone CB-1a is bounded by rated fire walls to the north and south, a rated fire wall to the west, and a 24-inch thick reinforced concrete wall to the east. The floor is a 48-inch thick reinforced concrete slab and the ceiling is an 8-inch thick poured concrete slab. Ceiling height is 25 feet 4 inches. Access to this zone is through zone CB-1b, requiring security escort. There is no room ventilation.

6.60.2 Safe Shutdown Equipment

Fire zone CB-1a contains cables associated with the RCIC, RHR, RIP, ADS, Service Water, and Diesel Generator systems. Remote shutdown capability allows zone to be isolated in the event of a fire, maintaining safe shutdown capability from remote shutdown panels.

6.60.3 Fire Protection Systems

Fire zone CB-1a contains an ionization smoke detector connected to a control room annunciator. A manual 1-1/2-inch hose station is 90 feet from the center of the fire zone, located in zone CCB-3. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.60.4 Fire Hazards Analysis

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (three-hour rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than three hours) rendered a composite boundary rating of less than three hours.

Table 6.60c contains a listing of those boundaries for fire zone CB1a that:

1. does not meet the separation criteria of Section III.G, and
2. provides a basis for acceptability for the zone boundary with no additional modifications, or
3. proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Table 6.60(c). Fire Zone CB-1a

Zone Boundary	Deviation From III.G	Proposed Modification	Basis For Acceptability
West Wall	Non-rated man-door	*None	*This deviation dispositioned in Section 6.61

6.60.5 Conclusions

Based on previous analysis, exemption is requested from the separation and automatic suppression requirements as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

1. Ionization smoke detector is provided with a common area alarm in the control room.

2. The fixed combustible loading is low (coated, conduit enclosed cables) in fire zone with no allowable storage of transient combustibles.

3. Access to zone is by security escort only.

4. No cables/equipment in zone required for safe shutdown.

5. The Staff has previously confirmed the adequacy of fire doors in this zone.

6. Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by existing configurations.

7. The conservative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-60. Evaluations Parameters Summary Table, Fire Zone CB-1a (Units 1 and 2)

A. Zone description

1. Construction:

a. Walls

North - Exterior: 24-inch thick reinforced concrete

South - Interior: 24-inch thick reinforced concrete

East - Exterior: 24-inch thick reinforced concrete

West - Interior: 8-inch thick concrete block reinforced

b. Floor - Poured-in-place 48-inch thick reinforced concrete slab

c. Ceiling - Poured-in-place 8-inch thick concrete slab and concrete beam

2. Ceiling height: 25 feet 4 inches

3. Room volume: Approximately 2933 cu. ft

4. Ventilation: None

5. Congestion/Access: Accessible through one door from zone CB-1B, limmited mobility through area.

Table 6-60. Evaluations Parameters Summary Table, Fire Zone CB-1a (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Diesel Gen. Sys.		X	Diesel Gen. Sys.		X
RHR Sys.		X	Ventilating Air Sys.		X
Ventilating Air Sys.		X	RCIC Sys.		X
Service Wtr. Sys.		X	Service Water Sys.		X
Electrical Distr. Sys.		X	RHR Sys.		X
			RIP Sys.		X
			Instrument Air Sys.		X
			ADS Sys.		X
			Instrumentation		X
			Electrical Distr.Sys.		X

2. Equipment in zone required for safe shutdown: None

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables

2. Quantity of combustibles: Cables - all cables are encased in flexible conduit coated with Flamemastic. There are no trays in this zone.

3. Ease of ignition and propagation: Cables are non-propagating.

4. Suppression damage to equipment: None

Table 6-60. Evaluations Parameters Summary Table, Fire Zone CB-1a (Units 1 and 2) (Cont)

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling and above the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

   a. Distance to hose stations - One CO_2 hose reel (semi-automatic) with 3/4-inch 100-foot-long hose and horn is located outside the adjacent fire zone (CB-1b). It is in fire zone CB-5 and is 35 feet from the center of this fire zone. One water hose reel with 1-1/2-inch 100-foot-long hose located in zone CB-3 approximately 90 feet from the center of zone CB-1a.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.61 Fire Zone CB-1b (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone CB-1b does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with common annunciation in the control room.

(2) The fixed combustible loading consists entirely of cables enclosed in flexible conduit and coated with fire retardant, with no allowable storage of transient combustibles.

(3) Personnel access limited by locked entry security requirements.

6.61.1 Area Description

This fire zone comprises the Control Building at elevation 23 feet. Fire zone CB-1b is bounded by walls to the north, south, west and east. The floor is a 48-inch thick reinforced concrete slab and the ceiling is an 8-inch thick concrete slab. Ceiling height is 25 feet 4 inches. There is no room ventilation.

6.61.2 Safe Shutdown Equipment

Fire zone CB-1b contains cables assocsiated with the RHR, HPCI, RIP, Diesel Generator, and Service Water Systems. Remote shutdown capability allows complete isolation of this zone, maintaining safe shutdown capability in the event of the loss of this zone due to fire.

6.61.3 Fire Protection Systems

Fire zone CB-1b contains an ionization smoke detection system connected to a control room annunciator. A manual 1-1/2-inch hose station is 65 feet from the center of the fire zone, located in zone CB-3. Twenty-pound dry chemical and/or CO_2 extingushers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.61.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone CB-1B Units 1 and 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in

Section 5. This matrix shows for a 10 gal heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The conduits/cable trays of concern for Fire Zone CB-1b are individually dispositioned on Table 6-61b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

TABLE 6-61(b) UNIT 1 CONTROL BUILDING FIREZONE CB-1B

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
6DB3/CA	Conduit	263	263	0
6DB3/DA	Conduit	221	221	0

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3-hour rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.61c contains a listing of those boundaries for fire zone CB1b that:

(1) does not meet the separation criteria of Section III.G, and

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Table 6.61(c). Fire Zone CB-1b

Zone Boundary	Deviation From III.G	Proposed Modification	Basis For Acceptability
Walls between CB-1a and CB-1b, and CB-1b and CB-5	Non-rated man-door	None	1. Door between CB-1a and CB-1b has UL rating label (no hourly rating). 2. Zone CB-1b and CB-5 locked requires security escort for access. 3. All cables in CB-1a and CB-1b are enclosed in flexible conduit and coated with fire-retardant. 4. Detection exists in both zones. 5. Doors in CB-1b and CB-5 given previous SER approval.

6.61.5 Conclusions

Based on previous analysis, exemption is requested from the separation and automatic suppression requirements as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detector is provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) No cables or equipment in this zone are required for safe shutdown.

(4) Random introduction of transient combustibles is precluded by security requirements.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by existing configurations.

(6) The Staff has previously confirmed the adequacy of fire doors in this zone.

(7) The conservative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-61. Evaluations Parameters Summary Table, Fire Zone CB-1b (Units 1 and 2)

A. Zone description

1. Construction:

a. Walls

North - Exterior: 24-inch thick reinforced concrete

South - Interior: 24-inch thick reinforced concrete

East - Exterior: 8-inch thick concrete block reinforced

West - Interior - 24-inch thick reinforced concrete

b. Floor - Poured-in-place 48-inch thick reinforced concrete slab

c. Ceiling - Poured-in-place 8-inch concrete slab and concrete beam

2. Ceiling height: 25 feet 4 inches

3. Room volume: Approximately 8,992 cu. ft.

4. Ventilation: None

5. Congestion/Access: Accessible through one door from zone CB-5, limited mobility in the area.

Table 6-61. Evaluations Parameters Summary Table, Fire Zone CB-1b (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Level XMTR B21-LT-N026A		X	Level XMTR B21-LT-N026B		X
HPCI Logic		X	RCIC Logic		X
Diesel Gen. Sys.		X	RCIC Sys.		X
Ventilating Air Sys.		X	Instrumentation		X
HPCI Sys.		X	Diesel Gen. Sys.		X
Service Water Sys.		X	RHR Sys.		X
RHR Sys.		X	Ventilating Air Sys.		X
Electrical Distr. Sys.		X	Service Wtr. Sys.		X
RIP Sys.		X	Electrical Distr. Sys.		X
Instrument Air Sys.		X			
Instrumentation		X			

2. Equipment in zone required for safe shutdown: None

C. Fire Hazards Analysis

1. Type of combustibles in area: Cable

2. Quantity of combustibles: Cables - all cables are encased rigid and flexible conduit; all flexible conduit is coated with Flamemastic. There are no trays in this zone.

3. Ease of ignition and propagation: Cables are non-propagating.

4. Suppression damage to equipment: None

Table 6-61. Evaluations Parameters Summary Table, Fire Zone CB-1b (Units 1 and 2) (Cont)

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling and above the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

   a. Distance to hose stations - One CO_2 hose reel (semi-automatic) with 3/4-inch 100-foot-long hose and horn is located outside the doorway. It is in fire zone CB-5 and is 15 feet from the center of this fire zone. One water hose reel with 3/4-inch 100-foot-long hose is located in zone CB-3 approximately 65 feet from the center of zone CB-1b.

   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.62 Fire Zone CB-2a (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone CB-2a does not comply with the specific provisions of 10 CFR 50 Appendix R, Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from and the separation and suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.62.1 Area Description

This fire zone comprises the Control Building at elevation 23 feet. The north, south, and east walls are fire-rated, 24-inch thick reinforced concrete. The floor is 48-inch thick reinforced concrete, the west wall is fire-rated 8-inch thick reinforced concrete, and the ceiling is 8-inch thick reinforced concrete. Ceiling height is 25 feet 4 inches. There is no room ventilation.

6.62.2 Safe Shutdown Equipment

Fire zone CB-2a contains cables associated with the RHR, Electrical Distribution and RCIC Systems necessary for safe conduit; all flexible conduit is coated with Flamemastic.

6.62.3 Fire Protection Systems

Fire zone CB-2a contains an ionization smoke detector on the ceiling, and one above the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is located 75 feet from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.62.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone CB-2a Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone CB-2a are individually dispositioned on Table 6-62b as:

(1) Those conduits and trays which are safe by configuration, in that they have been identified by the computer model and database as being able to maintain circuit integrity due to passive protection. They are listed in the first section of the table, along with associated minimum and maximum elevations.

(2) Those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist.

TABLE 6-62(b) UNIT 2 CONTROL BUILDING FIREZONE:CB-2A

Conduits and Trays Safe by Configuration

Identifier	Conduit/Tray	Minimum Elevation (in)	Maximum Elevation (in)	Minimum Distance To The Opposite Color Circuit(in)
6DB3/CA	Conduit	239	239	0

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
6DB3/DA	Conduit	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R, in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment, hatches, etc.) without an approvied fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours. Table 6.62c contains a listing of those boundaries for fire zones that:

(1) do not meet separation criteria of Section III.G, and

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

6.62.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) The conservative quantitative fire hazards analysis described previously in addition to the proposed modification demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6.62(c). Fire Zone CB-2a

Zone Boundary	Deviation from III.G	Proposed Modification	Basis for Acceptability
Walls between CB-2a & CB-2b, CB-2a & CB-6	Non-rated man-doors	None	1. Door between CB-2a & CB-2b has UL rating label (no hourly rating noted). 2. Door between CB-2a & CB-6 is locked and requires security escort for access. 3. All cables in CB-2a and CB-2b are enclosed in flexible conduit and coated with fire-retardant coating. 4. Detection exists in both zones. 5. Doors in CB-2a & CB-2b given previous SER approval.

Table 6-62. Evaluations Parameters Summary Table, Fire Zone CB-2a (Units 1 and 2)

A. Zone Description

1. Construction:

a. Walls

North - Interior: 24-inch thick reinforced concrete

South - Exterior: 24-inch thick reinforced concrete

East - Exterior: 24-inch thick reinforced concrete

West - Interior: 8-inch thick concrete block reinforced

b. Floor - Poured-in-place 48-inch thick reinforced concrete slab

c. Ceiling - Poured-in-place 8-inch thick concrete slab and concrete beams

2. Ceiling height: 25 feet 4 inches

3. Room volume: Approximately 7978 cu. ft.

4. Ventilation: None

5. Congestion/Access: This zone is accessible through one door from zone CB-2B. There is limited mobility in the area.

Table 6-62. Evaluations Parameters Summary Table, Fire Zone CB-2a (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Unit 1:					
Diesel Gen. Sys.		X			
RHR Sys.		X			
Ventilating Air Sys.		X			
Electrical Distr. Sys.		X			
Unit 2:					
Diesel Gen. Sys.		X			
Ventilating Air Sys.		X			
HPCI Sys.		X	RCIC Sys.		X
Service Wtr. Sys.		X			
RHR Sys.		X			
Electrical Distr. Sys.		X			
RIP Sys.		X			
Instrument Air Sys.		X			
Instrumentation		X	Instrumentation		X

2. Equipment in zone required for safe shutdown:

None

C. Fire Hazards Analysis

1. Type of combustibles in area: Cable

2. Quantity of combustibles: Cable - All cables are encased in rigid and flexible conduit. All flexible conduit is coated with Flamemastic. There are no trays in this zone.

Table 6-62. Evaluations Parameters Summary Table, Fire Zone CB-2a (Units 1 and 2) (Cont)

3. Ease of ignition and propagation: Cables are non-propagating.

4. Suppression damage to equipment: None

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling and above the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - One CO_2 hose reel (semi-automatic) with 3/4-inch 100-foot-long hose and horn is located outside adjacent fire zone CB-2B. It is in fire zone CB-6 and is 35 feet from the center of this fire zone. One water hose reel with 1-1/2-inch 100-foot-long hose is located in zone CB-4 approximately 75 feet from the center of zone CB-2A.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.63 Fire Zone CB-2b (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone CB-2b does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and suppression requirements. The basis for this exemption is as follows:

(1) The fixed combustible loading is low (consisting of coated cables) in fire zone with no allowable storage of transient combustibles.

(2) Ionization smoke detection is provided with a common area alarm in the control room.

(3) Random personnel access to this zone is not credible due to security escort requirements.

6.63.1 Area Description

This fire zone comprises the Control Building at elevation 23 feet. The north, south, and west walls are fire-rated 24-inch thick reinforced concrete, the east wall is fire-rated 8-inch thick reinforced concrete, the floor is 48-inch thick reinforced concrete, and the ceiling is 8-inch thick reinforced concrete. Access to this area is through zone CB-2a. The east wall (boundary at zone CB-2a) contains a nonrated man-door. Ceiling height is 25 feet 4 inches. There is no room ventilation.

6.63.2 Safe Shutdown Equipment

Fire zone CB-2b contains cables associated with the RHR, Diesel Generator, and HPCI Systems necessary for safe shutdown. All of the cables are encased in flexible conduit and coated with fire-retardant coating; there are no trays in this zone.

6.63.3 Fire Protection Systems

Fire zone CB-2b contains an ionization smoke detector on the ceiling and one above the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is located 60 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.63.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone CB-2b Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in

Section 5. This matrix shows for a 10-gallon heptane fire, the horizontal separation necessary as a function of cable elevation, such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone CB-2b are individually dispositioned on Table 6-63b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist).

TABLE 6-63(b) UNIT 2 CONTROL BUILDING FIREZONE CB-2b

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
6DCC/CB	Conduit	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s)

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3-hour rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.63c contains a listing of those boundaries for fire zone CB2b that:

(1) does not meet the separation criteria of Section III.G, and

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

6.63.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone (consisting exclusively of coated cables).

(3) Security requirements preclude random access by plant personnel (zone RB-2a locked at all times).

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The conservative fire hazards analysis described previously demonstrate protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6.63(c). Fire Zone CB-2b

Zone Boundary	Deviation From III.G	Proposed Modification	Basis For Acceptability
East Wall	Non-rated man-door	*None	*This deviation dispositioned in Section 6.62.

Table 6-63. Evaluations Parameters Summary Table, Fire Zone CB-2b (Units 1 and 2)

A. Zone Description

1. Construction:

a. Walls

North - Interior: 24-inch thick reinforced concrete

South - Exterior: 24-inch thick reinforced concrete

East - Interior: 8-inch thick reinforced concrete block

West - Interior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 48-inch thick reinforced concrete slab

c. Ceiling - Poured-in-place 8-inch thick concrete slab and concrete beams

2. Ceiling height: 25 feet 4 inches

3. Room volume: Approximately 3946 cu. ft.

4. Ventilation: None

5. Congestion/Access: Access is through one door from zone CB-6. There is ample mobility in the area.

Table 6-63. Evaluations Parameters Summary Table, Fire Zone CB-2b (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
NONE			Unit 1:		
			Diesel Gen. Sys.		X
			RHR Sys.		X
			Ventilating Air Sys.		X
			Electrical Distr. Sys.		X

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Unit 2:					
			Diesel Gen. Sys.		X
			Ventilating Air Sys.		X
HPCI Sys.		X	RCIC Sys.		X
			Service Wtr. Sys.		X
			RHR Sys.		X
Electrical Distr. Sys.		X	Electrical Distr. Sys.		X
			RIP Sys.		X
			Instrument Air Sys.		X
			ADS Sys.		X

2. Equipment in zone required for safe shutdown: None

C. Fire Hazards Analysis

1. Type of combustibles in area: Cable

2. Quantity of combustibles: Cable - All cables are encased in flexible conduit coated with Flamemastic. There are no trays in this zone.

3. Ease of ignition and propagation: Cables are non-propagating.

Table 6-63. Evaluations Parameters Summary Table, Fire Zone CB-2b (Units 1 and 2) (Cont)

4. Suppression damage to equipment: None

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling and above the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - One CO_2 hose reel (semi-automatic) with 3/4-inch 100-foot-long hose and horn is located in fire zone CB-6, 15 feet from this fire zone. One water hose reel with 1-1/2-inch 100-foot-long hose is located in zone CB-3 approximately 60 feet from the center of zone CB-1B.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.64 Fire Zone CB-12a (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone CB-12a does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided in zone (as well as adjacent zones) with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone, consisting exclusively of fire-retardent coated flexible conduit, with no allowable storage of transient combustibles.

(3) Adjacent zone CB-23 (Control Room) is continuously manned, enabling rapid response in case of fire.

6.64.1 Area Description

This fire zone comprises the Control Building at elevation 49 feet. Fire zone CB-12a is is bounded by rated fire walls to the north, south, west and east. Access to this zone is through zone CB-12b. The floor is an 8-inch thick concrete slab, and the ceiling is a 24-inch thick concrete slab. Ceiling height is 19 feet. There is no ventilation.

6.64.2 Safe Shutdown Equipment

Fire zone CB-12a contains cables associated with the HPCI, RIP, RCIC, RHR, ADS, Diesel Generator, and Service Water Systems. Remote shutdown capability allows complete isolation of this zone, thereby maintaining safe shutdown capability in the event of the loss of this zone due to fire.

6.64.3 Fire Protection Systems

Fire zone CB-12a contains two ionization smoke detectors connected to a control room annunciator. A manual 1-1/2-inch water hose station is located 88 feet from the center of the fire zone in zone CB-23. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.64.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone CB-12a Units 1 and 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site management. The database was then compared with

a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gal heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone CB-12a are individually dispositioned on Table 6-64b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing 1 hr barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist.

TABLE 6-64(b). UNIT 1 CONTROL BUILDING FIREZONE CB-12A

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
6DZE/CB	Conduit	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
DLK1/CB	Conduit	
6DZ8/CB	Conduit	
6DZ9/CB	Conduit	

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours. Table 6.64c contains a listing of those boundaries for fire zone CB-12a that:

(1) do not meet the separation criteria of Section III.G, and

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

6.64.5 Conclusion

Based on previous analysis, exemption is requested from the separation and automatic suppression requirements as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided in zone (and adjacent zones) with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone, consisting exclusively of cables enclosed in flexible conduit and coated with fire-retardant coating, with no allowable storage of transient combustibles.

(3) Adjacent zone CB-23 (Control Room) is continuously manned, enabling rapid fire emergency response.

(4) The Staff has previously confirmed the adequacy of fire protection features in this zone.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by existing configurations.

Table 6.64(c). Fire Zone CB-12a

Zone Boundary	Deviation From III.G	Proposed Modification	Basis For Acceptability
West Wall	Non-rated non-door between CB-12a and CB-12b.	*None	*This deviation dispositioned in Section 6.65

(6) The conservative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2. of Appendix R.

Table 6-64. Evaluations Parameters Summary Table, Fire Zone CB-12a (Units 1 and 2)

A. Zone Description

1. Construction:

a. Walls

North - Exterior: 24-inch thick reinforced concrete

South - Interior: 24-inch thick reinforced concrete

East - Exterior: 24-inch thick reinforced concrete

West - Interior: 8-inch thick reinforced concrete block

b. Floor - Poured-in-place 8-inch thick concrete slab and concrete beams

c. Ceiling - Poured-in-place 24-inch thick concrete roof slab

2. Ceiling height: 19 feet

3. Room volume: Approximately 2200 cu. ft.

4. Ventilation: None

5. Congestion/Access: This zone is accessible through one door from zone CB-12b. There is ample mobility in the area.

Table 6-64. Evaluations Parameters Summary Table, Fire Zone CB-12a (Units 1 and 2) (Cont.)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Unit 1:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
HPCI Logic		X	RCIC Logic		X
			Diesel Gen. Sys.		X
HPCI Sys.		X	RCIC Sys.		X
			Serv. Water Sys.		X
			RHR Sys.		X
RIP Sys.		X	RIP Sys.		X
			ADS Sys.		X
			Instrumentation		X

Unit 2:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
Diesel Gen. Sys.		X			

2. Equipment in zone required for safe shutdown: None

C. Fire Hazards Analysis

1. Type of combustibles in area: Cable

2. Quantity of combustibles: Cables - All cables are encased in flexible conduit coated with flamemastic. There are no trays in the zone.

3. Ease of ignition and propagation: Cables are non-propagating.

Table 6-64. Evaluations Parameters Summary Table, Fire Zone CB-12a (Units 1 and 2) (Cont)

4. Suppression damage to equipment: None

D. Fire Protection on Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - One Co_2 hose reel (semi-automatic) with 3/4-inch x 100-foot-long hose and horn located in adjacent zone CB-23, approximately 28 feet from the center of this fire zone. One water hose reel with 1-1/2-inch x 100-foot-long hose is located in zone CB-3, 88 feet from the center of this zone.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.65 Fire Zone CB-12b (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone CB-12b does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided in zone (and adjacent zones) with a common area alarm in the control room.

(2) The fixed combustible loading consists only of cables enclosed in flexible conduit and coated with fire-retardant coating in fire zone with no allowable storage of transient combustibles.

(3) Adjacent zone CB-23 (Control Room) is continuously manned.

6.65.1 Area Description

This fire zone comprises the Control Building at elevation 49 feet. Fire zone CB-12b is bounded by fire rated walls to the north, south, west and east. The floor is an 8-inch thick reinforced concrete slab and the ceiling is a 24-inch thick reinforced concrete slab. Ceiling height is 19 feet. There is no room ventilation.

6.65.2 Safe Shutdown Equipment

Fire zone CB-12b contains cables associated with the HPCI, RHR, RIP, and Diesel Generator Systems. Remote shutdown capability enables complete isolation of this zone, thereby maintaining safe shutdown capability in the event of the loss of this zone due to fire.

6.65.3 Fire Protection Systems

Fire zone CB-12b contains ionization smoke detectors connected to a control room annunciator. A manual 1-1/2-inch hose station is located 68 feet from the center of the fire zone in zone CB-23. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.65.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone CB-12b Units 1 and 2 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in

Section 5. This matrix shows for a 10-gal heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific difications in those instances where:

(a) Opposite divisional cables coexist in a given race way.

The conduits/cable trays of concern for Fire Zone CB-12b are individually dispositioned on Table 6-65b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing 1 hr barrier for those conduits/trays or reroute cables for trays containing both red and green divisional cables for the entire length of the raceway in which red and green cables coexist.

TABLE 6-65(b). UNIT 1 CONTROL BUILDING FIREZONE CB-12B

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
6DDB/CA	Conduit	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
6DDL/CA	Conduit	

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.65c contains a listing of those boundaries for fire zone CB-12b that:

1) do not meet the separation criteria of Section III.G, and

2) provides a basis for acceptability for the zone boundary with no additional modifications, or

3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

6.65.5 Conclusion

Based on previous analysis, exemption is requested from the separation and automatic suppression requirements as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided in zone (and adjacent zones) with a common annunciation in the control room.

(2) The fixed combustible loading consists of cable routed in fire-retardent coated flexible conduit in fire zone with no allowable storage of transient combustibles.

Table 6.65(c). Fire Zone CB-12b

Zone Boundary	Deviation From III.G	Proposed Modification	Basis For Acceptability
Walls between CB-12a, CB-12b, and CB-23 (Control Room)	Non-rated non-doors	None	1. Door between CB-12a and CB-12b has UL rating label (no hourly rating). 2. Zone CB-23 (Control Room) is continuously manned. 3. All cables in CB-12a and CB-12b are enclosed in flexible conduit and coated with fire retardant coating. 4. Detection exists in zones CB-12a, CB-12b, and CB-23. 5. Doors in CB-12a and CB-12b give previous SER approval.

(3) Adjacent zone CB-23 (Control Room) is continuously manned, enabling rapid fire emergency response.

(4) The Staff has previously confirmed the adequacy of fire protection features in this zone.

(5) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by existing configurations.

(6) The conservative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-65. Evaluations Parameters Summary Table, Fire Zone CB-12b (Units 1 and 2)

A. Zone Description

1. Construction:

a. Walls

North - Exterior: 24-inch thick reinforced concrete

South - Interior: 24-inch thick reinforced concrete

East - Interior: 8-inch thick reinforced concrete block

West - Interior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 8-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Poured-in-place 24-inch thick reinforced concrete

2. Ceiling height: 19 feet

3. Room volume: Approximately 6,745 cu. ft.

4. Ventilation: None

5. Congestion/Access: Zone CB-12b is accessible through one door from zone CB-23. There is ample mobility in the area.

Table 6-65. Evaluations Parameters Summary Table, Fire Zone CB-12b (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Unit 1:					
HPCI Logic		X	RCIC Logic		X
Diesel Gen. Sys.		X			
Ventilating Air Sys.		X			
HPCI Sys.		X			
Service Water Sys.		X			
RHR Sys.		X			
Instrumentation		X			
RIP Sys.		X	RIP Sys.		X

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Unit 2:					
NONE			Diesel Gen. Sys.		X

2. Equipment in zone required for safe shutdown: None

C. Fire Hazards Analysis

1. Type of combustibles in area: Cable

2. Quantity of combustibles: Cables - All cables are encased in rigid and flexible conduit. All flexible conduit is coated with flamemastic. There are no trays in this zone.

3. Ease of ignition and propagation: Cables are non-propagating.

Table 6-65. Evaluations Parameters Summary Table, Fire Zone CB-12b (Units 1 and 2) (Cont)

4. Suppression damage to equipment: None

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - One CO_2 (semi-automatic) with 3/4-inch 100-foot-long hose and horn is located in adjacent fire zone CB-23, approximately 12.5 feet from the center of zone CB-12b. One water hose reel with 1-1/2-inch 100-foot-long hose is located in zone CB-3, 68 feet from the center of this zone.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.66 Fire Zone CB-13a (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone CB-13a does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from separation and automatic suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided in zone (and adjacent zones) with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Adjacent area CB-23 (Control Room) is continuously manned.

6.66.1 Area Description

This fire zone comprises the Control Building at elevation 49 feet. Fire zone CB-13a is bounded by rated fire walls to the north and south, a rated fire wall to the west and a 24-inch thick reinforced concrete wall to the east. The floor is an 8-inch thick concrete slab and the ceiling is a 24-inch reinforced concrete slab. Ceiling height is 19 feet. Access to this zone is from zone CB-23 (Control Room).

6.66.2 Safe Shutdown Equipment

Fire zone CB-13a contains cables associated with the RIP, RHR, HPCI, and Diesel Generator systems necessary for safe shutdown. All cables are routed in rigid or flexible conduit, coated with fire-retardant coating.

6.66.3 Fire Protection Systems

Fire zone CB-13a contains two ionization smoke detectors connected to a control room annunciator. A manual 1-1/2-inch hose station is 70 feet from the center of the fire zone, located in zone CB-4. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.66.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone CB-13a Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in

Section 5. This matrix shows for a 10-gallon heptane fire the horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone CB-13a are individually dispositioned on Table 6-66b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their presnet configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or re-route cable for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist).

TABLE 6-66(b) UNIT 2 CONTROL BUILDING FIREZONE CB-13A

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
6DD4/CA	Conduit	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
6DDH/CA	Conduit	
6DD9/CA	Conduit	
6DD6/CA	Conduit	

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.66c contains a listing of those boundaries for fire zone CB-13a that:

(1) do not meet the separation of criteria of Section III.G, and

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

6.66.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) Combustibles in zone limited to cables enclosed in rigid or flexible conduit and coated with fire-retardant coating.

(3) Zone adjacent to zone CB-23 (Control Room) ensuring rapid response to fire in this zone.

(4) No allowable storage of transient combustibles.

(5) The staff has previously confirmed the adequacy of fire doors in this zone.

(6) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6.66(c). Fire Zone CB-13a

Zone Boundary	Deviation From III.G	Proposed Modification	Basis For Acceptability
Walls between CB-13a, CB-13b, and CB-23 (Control Room)	Non-rated non-doors	None	1. Door between CB-13a and CB-13b has UL rating label (no hourly rating). 2. Zone CB-23 (Control Room) is continuously manned. 3. All cables in CB-13a and CB-13b are enclosed in flexible conduit and coated with fire retardant coating. 4. Detection exists in zones CB-13a, CB-13b, and CB-23. 5. Doors in CB-13a and CB-13b give previous SER approval.

(7) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-66. Evaluations Parameters Summary Table, Fire Zone CB-13a (Units 1 and 2)

A. Zone Description

1. Construction:

a. Walls

North - Interior: 24-inch thick reinforced concrete

South - Exterior: 24-inch thick reinforced concrete

East - Interior: 24-inch thick reinforced concrete

West - Exterior: 8-inch thick reinforced concrete block

b. Floor - Poured-in-place 8-inch thick concrete slab and concrete beams

c. Ceiling - Poured-in-place 24-inch thick reinforced concrete

2. Ceiling height: 19 feet

3. Room volume: Approximately 6,427 cu. ft.

4. Ventilation: None

5. Congestion/Access: This zone is accessed through one door from zone CB-23. There is ample mobility in the area.

Table 6-66. Evaluations Parameters Summary Table, Fire Zone CB-13a (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Unit 1:					
Diesel Gen. Sys.		X			
Ventilating Air Sys.		X			
RHR Sys.		X	NONE		
Serv. Water Sys.		X			
Electrical Distr. Sys.		X			
Unit 2:					
Diesel Gen. Sys.		X			
RIP Sys.		X	RIP Sys.		X
RHR Sys.		X			
HPCI Sys.		X	RCIC Sys.		X
Ventilating Air Sys.		X			
Instrument Air Sys.		X			
Instrumentation		X			

2. Equipment in zone required for safe shutdown: None

C. Fire Hazards Analysis

1. Type of combustibles in area: Cable

2. Quantity of combustibles: Cable - all cables are encased in rigid and flexible conduit; all flexible conduit is coated with flamemastic. There are no trays in this zone.

3. Ease of ignition and propagation: Cables are non-propagating.

Table 6-66. Evaluations Parameters Summary Table, Fire Zone CB-13a (Units 1 and 2) (Cont)

4. Suppression damage to equipment: None

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - One CO_2 hose reel (semi-automatic) with 3/4-inch 100-foot-long hose and horn is located in adjacent zone CB-23, approximately 13 feet from the center of this zone. One water hose reel with 1/2-inch 100-foot-long hose located in zone CB-4, approximately 70 feet from the center of this zone

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.67 Fire Zone CB-13b (Units 1 and 2)

EXEMPTION REQUEST

Per the provisions of 10 CFR 50.48 (c)(6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone CB-13b does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic suppression requirement. The basis for this exemption is as follows:

(1) Ionization smoke detectors are provided in zone (and adjacent zones) with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Zone easily accessible from CB-23 (Control Room) through CB-13a.

6.67.1 Area Description

This fire zone comprises the Control Building at elevation 49 feet. Fire zone CB-13b is bounded by rated fire walls to the north and south, and rated fire walls to the east and west. The floor is an 8-inch thick concrete slab and the ceiling is a 24-inch thick reinforced concrete slab. Ceiling height is 19 feet. Access to this zone is only through CB-13a.

6.67.2 Safe Shutdown Equipment

Fire zone CB-1.b contains cables associated with the RHR, RIP, HPCI, RCIC, and Diesel Generator Systems necessary for safe shutdown. All cables in this zone are routed in flexible conduit and coated with fire-retardant coating.

6.67.3 Fire Protection Systems

Fire zone CB-13b contains ionization smoke detectors connected to a control room annunciator. A manual 1-1/2-inch hose station is located in zone CB-4, located 90 feet from the center of this fire zone. Twenty-pound dry chemical and/or CO_2 extinguishers are based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.67.4 Fire Hazards Analysis

The purpose of this fire hazards analysis is to properly disposition all of the Appendix R deviations for Fire Zone CB-13b Unit 1 which are listed in Table 1-1 of Section 1. These specific deviations were identified utilizing the methodology and assumptions described by Section 4. For each deviation previously identified, the methodology described in Section 5 was applied to determine if the existing configuration was satisfactory or if specific modifications were required.

Each individual deviation has been entered into a computer database along with dimensional data for that deviation which was obtained by on-site measurement. The database was then compared with a matrix generated using the modeling methodology described in Section 5. This matrix shows for a 10-gallon heptane fire the

horizontal separation necessary as a function of cable elevation such that the cable of interest does not exceed the defined failure criteria.

The results obtained utilizing this methodology, in conjunction with the conduit and cable tray database, demonstrates the need for specific modifications in those instances where:

(a) Opposite divisional cables coexist in a given raceway.

The conduits/cable trays of concern for Fire Zone CB-13b are individually dispositioned on Table 6-67b as those conduits/cable trays which require modifications.

Those conduits/cable trays deemed unacceptable in their present configuration are listed in the second part of the table, along with the particular type of modification proposed. The types of modifications include:

(a) Providing an appropriate barrier for those conduits/trays or re-route cable for trays containing both red and green divisional cables (for the entire length of the raceway in which red and green cables coexist).

TABLE 6-67(b) UNIT 2 CONTROL BUILDING FIREZONE CB-13B

Conduits and Trays Requiring Modifications

Identifier	Conduit/Tray	Proposed Modifications
6DZF/CB	Conduit	Provide an appropriate wrap for full extent of red/green color mix, or re-route cable(s).
6DZG/CB	Conduit	
6DZL/CB	Conduit	
6DZC/CB	Conduit	
6DZJ/CB	Conduit	

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.67c contains a listing of those boundaries for fire zone CB-13b that:

(1) do not meet the separation criteria of Section III.G, and

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

6.67.5 Conclusion

Based on the previous analysis, exemption is requested from the 20-foot separation and automatic suppression requirements as prescribed in Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) Combustibles in zone limited to cables routed in flexible conduit and coated with fire retardant coating.

(3) Adjacent zones CB-23 and CB-13a ensure rapid fire brigade response.

(4) No allowable storage of transient combustibles.

(5) The Staff has previously confirmed the adequacy of fire doors in this zone.

(6) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6.67(c). Fire Zone CB-13b

Zone Boundary	Deviation From III.G	Proposed Modification	Basis For Acceptability
East Wall	Non-rated non-non-door	*None	*This deviation dispositioned in Section 6.66

(7) The conservative quantitative fire hazards analysis described previously in addition to the proposed modifications demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-67. Evaluations Parameters Summary Table, Fire Zone CB-13b (Units 1 and 2)

A. Zone Description

1. Construction:

a. Walls

North - Interior: 24-inch thick reinforced concrete

South - Exterior: 24-inch thick reinforced concrete

East - Interior: 8-inch thick reinforced concrete block

West - Interior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 8-inch thick concrete slab and concrete beams

c. Ceiling - Poured-in-place 24 inch thick reinforced concrete slab

2. Ceiling height: 19 feet

3. Room volume: Approximately 2,517.50 cu. ft.

4. Ventilation: None

5. Congestion/Access: This zone is accessed through one door from zone CB-13a. There is ample mobility in the area.

Table 6-67. Evaluations Parameters Summary Table, Fire Zone CB-13b (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Unit 1:					
Diesel Gen. Sys.		X			
Ventilating Air Sys.		X			
RHR Sys.		X	NONE		
Service Wtr. Sys.		X			
Electrical Distr. Sys.		X			
Train A Description	Eqpt	Cable	Train B Description	Eqpt	Cable
Unit 2:					
			Diesel Gen. Logic		X
			RHR Sys.		X
			Ventilating Air Sys.		X
RIP Sys.		X	RIP Sys.		X
			Instrument Air Sys.		X
HPCI Sys.		X	RCIC Sys.		X
			Instrumentation		X

2. Equipment in zone required for safe shutdown: None

C. Fire Hazards Analysis

1. Type of combustibles in area: None

2. Quantity of combustibles: Cables - all cables are encased in conduit. There are no trays in this zone.

3. Ease of ignition and propagation: Cables are non-propagating.

Table 6-67. Evaluations Parameters Summary Table, Fire Zone CB-13b (Units 1 and 2) (Cont)

4. Suppression damage to equipment: None

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling.

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - One CO_2 (semi-automatic) with 3/4-inch 100-foot-long hose and horn is located in adjacent zone CB-23, approximately 28 feet from the center of this zone. One water hose with reel 1-1/2-inch 100-foot-long hose is located in zone CB-4, approximately 90 feet from the center of this zone.

b. Twenty-pound dry chemical and/or CO_2 entinguishers are provided based on the hazards present in the zone. These entinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.68 Fire Zone CB-16 (Units 1 and 2)

Exemption Request

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone CB-16 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detection is provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Adjacent zone CB-23 (Control Room) is continuously manned.

6.68.1 Area Description

This fire zone comprises the Control Building at elevation 49 feet. The north, south, and east walls are fire-rated 8-inch thick reinforced concrete, the west wall is fire-rated 24-inch thick reinforced concrete, and the floor and ceiling are 8-inch thick reinforced concrete. Access to this area is good. The east wall incorporates a double door opening to zone CB-23. Ceiling height is 20 feet. Room ventilation is 615 cfm.

6.68.2 Safe Shutdown Equipment

Fire zone CB-16 contains no equipment or cables necessary for safe shutdown. A small number of cables are totally encased in conduit; there are no trays in this zone.

6.68.3 Fire Protection Systems

Fire zone CB-16 contains two ionization detectors located in the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is located 20 feet from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.68.4 Fire Hazards Analysis

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.68a contains a listing of those boundaries for fire zone CB-16 that;

1) do not meet the separation criteria of Section III.G, and

2) provides a basis for acceptability for the zone boundary with no additional modifications, or

3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Table 6.68a Fire Zone CB-16

Zone Boundary	Deviation from III.G	Proposed Modification	Basis for Acceptability
East	Non-rated man-door	None	1. Adjacent zone CB-23 is continuously manned. 2. No safe shutdown cables or equipment exist in zone. 3. Previous SER approval of man-doors.

6.68.5 Conclusion

Based on previous analysis, exemption is requested from the automatic suppression requirements as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Adjacent zone CB-23 is continuously manned.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The Staff has previously confirmed the adequacy of fire protection features in this zone.

(6) The conservative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-68. Evaluation Parameters Summary Table, Fire Zone CB-16 (Units 1 and 2)

A. Zone description

1. Construction:

a. Walls

North - Interior: 8-inch thick reinforced concrete block

South - Interior: 8-inch thick reinforced concrete block

East - Interior: 8-inch thick reinforced concrete block

West - Exterior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 8-inch thick reinforced concrete slab and beams

c. Ceiling - Poured-in-place 8-inch thick reinforced concrete slab and beams

2. Ceiling height: 20 feet

3. Room volume: Approximately 8,000 cu. ft.

4. Ventilation: 615 cfm supply and exhaust continuously under all conditions from the control room air conditioning system.

5. Congestion/Access: This fire zone is accessible from fire zone CB-23 via a double door on the east wall.

Table 6-68. Evaluation Parameters Summary Table, Fire Zone CB-16 (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone: No safe shutdown equipment or cables in this zone

2. Equipment in zone required for safe shutdown: No safe shutdown equipment or cables in this zone

C. Fire Hazards Analysis

1. Type of combustibles in area: Cable

2. Quantity of combustibles: Small number of cables totally encased in conduit. There are no trays in this zone.

3. Ease of ignition and propagation: Cables are non-propagating.

4. Suppression damage to equipment: None

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - One CO_2 hose reel (semi-automatic) with 3/4-inch 100-foot-long hose and horn is located in zone CB-23, approximately 20 feet from the center of this zone. One water hose reel with 1-1/2-inch 100-foot-long hose is located in zone CB-23, approximately 20 feet from the center of this zone.

Table 6-68. Evaluation Parameters Summary Table, Fire Zone CB-16 (Units 1 and 2) (Cont)

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.69 Fire Zone CB-17 (Units 1 and 2)

Exemption Request

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone CB-17 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detection is provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Adjacent zone CB-23 (Control Room) is continuously manned.

6.69.1 Area Description

This fire zone comprises the Control Building at elevation 49 feet. Fire zone CB-17 is bounded by rated fire walls to the north and east, and by a rated fire wall to the west. The east boundary consists of a double wall consisting of rated concrete block and rated reinforced concrete. The floor and ceiling construction consists of 8-inch thick reinforced concrete slabs.

6.69.2 Safe Shutdown Equipment

Fire zone CB-17 contains no systems or equipment necessary for safe shutdown.

6.69.3 Fire Protection Systems

Fire zone CB-17 contains ionization detectors connected to a control room annunciator. A manual 1-1/2-inch hose station is located 70 feet from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.69.4 Fire Hazards Analysis

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.69a contains a listing of those boundaries for fire zone that;

1) do not meet the separation criteria of Section III.G, and

2) provides a basis for acceptability for the zone boundary with no additional modifications, or

3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Table 6.69a Fire Zone CB-17

Zone Boundary	Deviation from III.G	Proposed Modification	Basis for Acceptability
East	Non-rated man-door	None	1. Adjacent zone CB-23 is continuously manned. 2. No safe shutdown cables or equipment exist in zone. 3. Previous SER approval of man-doors.

6.69.5 Conclusion

Based on previous analysis, exemption is requested from the automatic suppression requirements as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading s low in fire zone with no allowable storage of transi t combustibles.

(3) Adjacent zone CB-23 is continucusly manned.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The Staff has previously confirmed the adequacy of fire protection features in this zone.

(6) The conservative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-69. Evaulation Parameters Summary Table, Fire Zone CB-17 (Units 1 and 2)

A. Zone description

1. Construction:

a. Walls

North - Interior: 8-inch thick reinforced concrete block

South - Interior: 8-inch thick reinforced concrete block, 12-inch thick reinforced concrete

East - Interior: 8-inch thick reinforced concrete block

West - Exterior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 8-inch thick reinforced concrete slab and beams.

c. Ceiling - Poured-in-place 8-inch thick reinforced concrete slab and beams

2. Ceiling height: 20 feet

3. Room volume: Approximately 4,400 cu. ft.

4. Ventilation: 650 cfm exhaust via a manually controlled on-off exhaust system

5. Congestion/Access: This zone is accessible from fire zone CB-23 via a door in the east wall.

Table 6-69. Evaulation Parameters Summary Table, Fire Zone CB-17 (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone: No safe shutdown equipment or cables in this zone

2. Equipment in zone required for safe shutdown: No safe shutdown equipment or cables in this zone

C. Fire Hazards Analysis

1. Type of combustibles in area: Cable

2. Quantity of combustibles: Cable-small number of lighting cables encased in conduit

3. Ease of ignition and propagation: Cables are non-propagating.

4. Suppression damage to equipment: None

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - One CO_2 hose reel (semi-automatic) with 3/4-inch 100-foot-long hose is located in adjacent zone CB-23, approximately 17 feet from the center of this zone. One water hose reel with 1-1/2-inch 100-foot-long hose is located in zone CB-4, approximately 70 feet from the center of this zone.

Table 6-69. Evaulation Parameters Summary Table, Fire Zone CB-17 (Units 1 and 2) (Cont)

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.70 Fire Zone CB-18 (Units 1 and 2)

Exemption Request

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone CB-18 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detection is provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Adjacent zone CB-23 (Control Room) is continuously manned.

6.70.1 Area Description

This fire zone comprises the Control Building at elevation 40 feet. Fire zone CB-18 is bounded by rated fire walls on the north, south, and east, and by a rated fire wall to the west. The floor and ceiling are 8-inch thick reinforced concrete slabs.

6.70.2 Safe Shutdown Equipment

Fire zone CB-18 contains no systems or equipment necessary for safe shutdown.

6.72.3 Fire Protection Systems

Fire zone CB-18 contains ionization smoke detectors connected to a control room annunciator. Manual 1-1/2-inch hose stations are

48 feet away in zones CB-3 and CB-4. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.70.4 Fire Hazards Analysis

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.70a contains a listing of those boundaries for fire zone that;

1) do not meet the separation criteria of Section III.G, and
2) provides a basis for acceptability for the zone boundary with no additional modifications, or
3) propose modifications to bring the boundary of concern into strict compliance with Section III.G.

For those fire zones whose boundaries were defined (for convenience) by "open space", an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Table 6.70a Fire Zone CB-18

Zone Boundary	Deviation from III.G	Proposed Modification	Basis for Acceptability
East	Open boundary	None	1. Zone CB-18 (and adjacent zone CB-23) are continuously manned. 2. No safe shutdown cables or equipment exist in zone. 3. Previous SER approval of man-doors.

6.70.5 Conclusion

Based on previous analysis, exemption is requested from the automatic suppression requirements as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Adjacent zone CB-23 is continuously manned.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The Staff has previously confirmed the adequacy of fire protection features in this zone.

(6) The conservative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-70. Evaluation Parameters Summary Table, Fire Zone CB-18 (Units 1 and 2)

A. Zone description

1. Construction:

a. Walls

North - Interior: 8-inch thick reinforced concrete block

South - Interior: 8-inch thick reinforced concrete block

East - Interior: 8-inch thick reinforced concrete block

West - Interior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 8-inch thick reinforced concrete slab and beams

c. Ceiling - Poured-in-place 8-inch thick reinforced concrete slab and beams

2. Ceiling height: 20 feet

3. Room volume: Approximately 852.8 cu. ft.

4. Ventilation: None

5. Congestion/Access: This fire zone is accessible from fire zone CB-23 via a door in the east wall.

Table 6-70. Evaluation Parameters Summary Table, Fire Zone CB-18 (Units 1 and 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone: None

2. Equipment in zone required for safe shutdown: None

C. Fire Hazards Analysis

1. Type of combustibles in area: Cable

2. Quantity of combustibles: Small amount of cables totally encased in conduit

3. Ease of ignition and propagation: Cables are non-propagating.

4. Suppression damage to equipment: None

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - One CO_2 hose reel (semi-automatic) with 3/4-inch 100-foot-long hose and horn is located outside in fire zone CB-23, approximately 32 feet from the center of this fire zone. Two water hose reels with 1-1/2-inch 100 foot-long hose are located in zones CB-3 and CB-4, approximately 48 feet away from the center of this zone.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.71 Fire Zone CB-19 (Units 1 and 2)

Exemption Request

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone CB-19 does not comply with the specific provisions of 10 CFR 50 Appendix R, Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic suppression requirement. The basis for this exemption is as follows:

(1) Ionization smoke detection are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Adjacent zone CB-23 (Control Room) is continuously manned.

6.71.1 Area Description

This fire zone comprises the Control Building at elevation 52 feet. The Fire zone CB-19 is bounded to the north by a double wall consisting of a rated concrete block wall and a rated reinforced concrete wall. This zone is bounded by rated walls to the south and west, and to the east by a wall constructed of ballistic wall panels and glass windows. The ceiling is constructed of insulated ballistic panels and the floor is an 8-inch thick concrete slab.

6.71.2 Safe Shutdown Equipment

Fire zone CB-19 contains no systems or equipment necessary for safe shutdown.

6.71.3 Fire Protection Systems

Fire zone CB-19 contains ionization smoke detectors connected to a control room annunciator. A manual 1-1/2-inch hose station is located 49 feet from the center of the zone in zone CB-23. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.71.4 Fire Hazards Analysis

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R, in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours. Table 6.71c contains a listing of those boundaries for fire zone CB-19 that:

(1) do not meet the separation criteria of Section III.G, AND

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

Table 6.62(c). Fire Zone CB-2a

Zone Boundary	Deviation from III.G	Proposed Modification	Basis for Acceptability
East	Non-rated man-door	None	1. Adjacent zone CB-23 is continuously manned. 2. No safe shutdown cables or equipment exist in zone. 3. Previous SER approval of man-doors.

6.71.5 Conclusion

Based on previous analysis, exemption is requested from the automatic suppression requirements as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no ailowable storage of transient combustibles.

(3) Adjacent zone CB-23 is continuously manned.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The Staff has previously confirmed the adequacy of fire proteciton features in this zone.

(6) The conservative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-71. Evaluation Parameters Summary Table, Fire Zone CB-19 (Units 1 and 2)

A. Zone description

1. Construction:

a. Walls

North - Interior: 8-inch thick reinforced concrete block, 12-inch thick reinforced concrete

South - Interior: 8-inch thick reinforced concrete block

East - Interior: insulated ballistic wall panels with glass windows

West - Exterior: 29-inch thick reinforced concrete

b. Floor - Poured-in-place 8-inch reinforced concrete slab and beams

c. Ceiling - Insulated ballistic panels

2. Ceiling height: 9 feet 3 inches

3. Room volume: Approximately 2,761 cu. ft.

4. Ventilation: 615 cfm continuously supplied and exhausted by the control room air conditioning system

5. Congestion/Access: The zone is accessible from adjacent fire zone CB-4. Being a visitor's gallery, it is free of any obstruction.

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone: None

2. Equipment in zone <u>required</u> for safe shutdown: None

Table 6-71. Evaluation Parameters Summary Table, Fire Zone CB-19 (Units 1 and 2) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area: Cable
2. Quantity of combustibles: Cable-small number of lighting cables encased in conduit. There are no trays in this zone.
3. Ease of ignition and propagation: Cables are non-propagating.
4. Suppression damage to equipment: None

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling
2. Automatic suppression systems: None
3. Hose station/extinguisher:
   a. Distance to hose stations - One CO_2 hose reel (semi-automatic) with 3/4-inch 100-foot-long hose is located in zone CB-23, approximately 65 feet from the center of the subject zone. One water station with 1-1/2-inch 100-foot-long hose is located in zone CB-23, approximately 55 feet from the center of this zone.
   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.72 Fire Zone CB-20 (Units 1 and 2)

Exemption Request

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone CB-20 does not comply with the specific provisions of 10 CFR 50 Appendix R, Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic suppression requirement. The basis for this exemption is as follows:

(1) Ionization smoke detection is provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage or transient combustibles.

(3) Adjacent zone CB-23 (Control Room) is continuously manned.

6.72.1 Area Description

This fire zone comprises the Control Building at elevation 49 feet. Fire zone CB-20 is bounded by rated fire walls to the north, northeast corner, and west and a rated fire wall to the south, and is open to the southeast. The floor is an 8-inch thick reinforced concrete slab with a steel hatch 11 feet 6 inches by 14 feet 7 inches. The ceiling is a 24-inch thick reinforced concrete slab.

6.72.2 Safe Shutdown Equipment

Fire zone CB-20 contains no systems or equipment necessary for safe shutdown.

6.72.3 Fire Protection Systems

Fire zone CB-20 contains ionization smoke detectors connected to a control room annunciator. A manual 1-1/2-inch hose station is located 55 feet from the center of the Zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.72.4 Fire Hazards Analysis

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.72a contains a listing of those boundaries for fire zone that:

(1) does not meet the separation criteria of Section III.G, and

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Table 6.72a. Fire Zone CB-20

Zone Boundary	Deviation from III.G	Proposed Modification	Basis for Acceptability
EAST	Open boundary	None	1. Adjacent zone CB-23 is continuously manned. 2. No safe shutdown cables or equipment exist in zone. 3. Previous SER approval of man-doors.

6.72.5 Conclusion

Based on previous analysis, exemption is requested from the automatic suppression requirements as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Adjacent zone CB-23 is continuously manned.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The Staff has previously confirmed the adequacy of fire proteciton features in this zone.

(6) The conservative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6-72. Evaluation Parameters Summary Table, Fire Zone CB-20 (Units 1 and 2)

A. Zone description

1. Construction:

a. Walls

North - Exterior: 24-inch thick reinforced concrete

South - Interior: 8-inch thick reinforced concrete block

East - Interior: 24-inch thick reinforced concrete (N/E); open (S/E)

West - Exterior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 8-inch thick reinforced concrete slab and beams with steel hatch

c. Ceiling - Poured-in-place 24-inch thick reinforced concrete slab

2. Ceiling height - 19 feet

3. Room volume - Approximately 7,600 cu. ft.

4. Ventilation - None

5. Congestion/Access - Easily accessible from nearby fire zone CB-20; no wall or door on the east side of the zone.

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone: None

2. Equipment in zone required for safe shutdown: None

Table 6-72. Evaluation Parameters Summary Table, Fire Zone CB-20 (Units 1 and 2) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area: Cables and cellulose material
2. Quantity of combustibles:

   Cables-small number of lighting cables totally encased in conduit.

   Cellulose-770 pounds
3. Ease of ignition and propagation: Cables are non-propagating.
4. Suppression damage to equipment: None

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling and above the ceiling
2. Automatic suppression systems: None
3. Hose station/extinguisher:
   a. Distance to hose stations - One CO_2 hose reel (semi-automatic) with 3/4-inch 100-foot-long hose is located in adjacent zone CB-23, approximately 25 feet from the center of this zone. One water hose stations with 1-1/2 inch 100-foot-long hose is located in zone CB-3, approximately 55 feet from the center of this zone.
   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.73 Fire Zone CB-21 (Units 1 and 2)

Exemption Request

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

SUMMARY

Fire Zone CB-21 does not comply with the specific provisions of 10 CFR 50 Appendix R, Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic suppression requirement. The basis for this exemption is as follows:

(1) Ionization smoke detection is provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Adjacent zone CB-23 (Control Room) is continuously manned.

6.73.1 Area Description

This fire zone comprises the Control Building at elevation 49 feet. The north wall is fire-rated 8-inch thick reinforced concrete block, the south, east, and west walls are fire-rated 24-inch thick reinforced concrete, the floor is 8-inch thick reinforced concrete, the ceiling is 24-inch thick reinforced concrete. The northeast wall is entirely open. Access to this area is good. Ceiling height is 19 feet.

6.73.2 Safe Shutdown Equipment

Fire zone CB-21 contains no equipment or cables necessary for safe shutdown.

6.73.3 Fire Protection Systems

Fire zone CB-21 contains ionization detectors on the ceiling and above the ceiling connected to a control room annunciator. A manual 1-1/2-inch hose station is 40 feet away from the center of the zone. One CO_2 hose station is located 32 feet from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.73.4 Fire Hazards Analysis

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hour-rated) boundaries containing assemblies (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hours) rendered a composite boundary rating of less than 3 hours.

Table 6.73a contains a listing of those boundaries for fire zone that:

(1) does not meet the separation criteria of Section III.G, and

(2) provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) proposes modifications to bring the boundary of concern into strict compliance with Section III.G

For those fire zones whose boundaries were defined (for convenience) by "open space," an evaluation was performed to determine the presence of intervening combustibles 10 feet on either side of the "open space boundary" of concern. In no case evaluated did intervening combustibles pose a threat to adjacent zones.

Table 6.73(a). Fire Zone CB-21

Zone Boundary	Deviation from III.G	Proposed Modification	Basis for Acceptability
East	Open boundary	None	1. Adjacent zone CB-23 is continuously manned. 2. No safe shutdown cables or equipment exist in zone. 3. Previous SER approval of man-doors.

6.73.5 Conclusion

Based on previous analysis, exemption is requested from the automatic suppression requirements as prescribed by Section III.G.2 of Appendix R. The technical bases which justify exemption are summarized as follows:

(1) Ionization smoke detectors are provided with a common area alarm in the control room.

(2) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(3) Adjacent zone CB-23 is continuously manned.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

(5) The Staff has previously confirmed the adequacy of fire protection features in this zone.

(6) The conservative fire hazards analysis described previously demonstrates protection of public health and safety which is equivalent to that which would be provided by the prescriptive requirements of Section III.G.2 of Appendix R.

Table 6.73 Evaluation Parameters Summary Table, Fire Zone CB-21 (Units 1 and 2)

A. Zone description

1. Construction:

a. Walls

North - Interior: 8-inch thick reinforced concrete block

South - Exterior: 24-inch thick reinforced concrete

East - Interior: 24-inch thick reinforced concrete (S/E); open (N/E)

West - Exterior: 24-inch thick reinforced concrete

b. Floor - Poured-in-place 8-inch thick reinforced concrete slab and beams with steel hatch

c. Ceiling - Poured-in-place 24-inch thick reinforced concrete slab

2. Ceiling height: 19 feet

3. Room volume: Approximately 7,600 cu. ft.

4. Ventilation: None

5. Congestion/Access - This zone is easily accessible from nearby fire zone CB-20. (There is no wall or door on the east side of this zone.)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone: None

2. Equipment in zone required for safe shutdown: None

Table 6.73 Evaluation Parameters Summary Table, Fire Zone CB-21 (Units 1 and 2) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area: Cellulose and cable

2. Quantity of combustibles:

Cable-small number of lighting cables encased in conduit; no trays in this zone.

Cellulose-assumed, 5 lbs per square foot of paper products - 770 pounds

3. Ease of ignition and propagation: Cables are non-propagating.

4. Suppression damage to equipment: None

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling and above the ceiling connected to a control room annunciator.

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - One CO_2 hose reel (semi-automatic) with 3/4-inch 100-foot-long hose is located in adjacent zone CB-23, approximately 32 feet from the center of this zone. One water hose reel with 1-1/2-inch 100-foot-long hose is located in zone CB-4, approximately 40 feet from the center of this zone.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.74 Fire Zone CB-22 (Units 1 and 2)

Exemption Request

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone CB-22 does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation and automatic fixed suppression requirements. The basis for this exemption is as follows:

(1) Ionization smoke detection is provided with a common area alarm in the control room.

(2) The fixed combustible loading is extremely low in the fire zone with no allowable storage of transient combustibles.

(3) Adjacent zone continuously manned (CB-23; Control Room).

6.74.1 Area Description

This fire zone comprises the Control Building at elevation 49 feet. Fire zone CB-22 is bounded by rated walls to the north, south, east, and west. The floor is an 8-inch thick reinforced concrete slab. The ceiling is a 24-inch thick reinforced concrete slab.

6.74.2 Safe Shutdown Equipment

Fire zone CB-22 contains no systems or equipment necessary for safe shutdown.

6.74.3 Fire Protection Systems

Fire zone CB-22 contains an ionization smoke detector connected to a control room annunciator. A manual 1-1/2-inch hose station is located 15 feet from the center of the zone in zone CB-4. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.74.4 Fire Hazards Analysis

For fire zone boundaries deviating from the separation requirements of Section III.G of Appendix R; in that physical (3 hr-rated) boundaries containing assembles (doors, equipment hatches, etc.) without an approved fire rating (or a rating less than 3 hr) rendered a composite boundary rating of less than 3 hr.

Table 6.74c contains a listing of those boundaries for fire zone CB-22 that;

(1) Do not meet the specification criteria of Section III.G, and

(2) Provides a basis for acceptability for the zone boundary with no additional modifications, or

(3) Proposes modifications to bring the boundary of concern into strict compliance with Section III.G.

TABLE 6.74c

FIRE ZONE CB-22

Zone Boundary	Deviation From III.G	Proposed Modification	Basis for Acceptability
East Wall	Unrated man-door	None	1. Adjacent zone continuously manned (CB-23; Control Room). 2. Extremely low fixed combustible loading. 3. No safe shutdown systems or equipment in zone. 4. Previous SER approval of man-door.

6.74.5 Conclusions

Based on previous analysis, exemption is requested from the requirement for three lower barriers between fire zones as prescribed by Section III.G of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) Ionization smoke detector is provided in zone with a common area alarm in the control room.

(2) The fixed combustible loading is extremely low in fire zone with no allowable storage of transient combustibles.

(3) No safe shutdown systems or equipment exist in zone.

(4) Adjacent area is continuously manned (CB-23; Control Room).

(5) Staff previously granted SER approval of man-door for this zone.

Table 6-74. Evaluation Parameters Summary Table, Fire Zone CB-22 (Units 1 and 2)

A. Zone description

1. Construction

a. Walls

North - Interior: 8-inch thick reinforced concrete block

South - Interior: 8-inch thick reinforced concrete block

East - Interior: 8-inch thick reinforced concrete block

West - Interior: 8-inch thick reinforced concrete block

b. Floor - Poured-in-place 8-inch thick reinforced concrete slab and beams

c. Ceiling - Poured-in-place 24-inch thick reinforced concrete slab

2. Ceiling height - 19 feet

3. Room volume - Approximately 1,520 cu. ft.

4. Ventilation - 350 cfm transfer air from zone CB-23 and 350 cfm exhaust air via manually controlled exhaust air system.

5. Congestion/Access - The zone is accessible from fire zone CB-23 via a door at the east wall.

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone: None

Table 6-74. Evaluation Parameters Summary Table, Fire Zone CB-22 (Units 1 and 2) (Cont)

2. Equipment in zone required for safe shutdown: None

C. Fire Hazards Analysis

1. Type of combustibles in area: Paper products and cables

2. Quantity of combustibles:

Cable-small amount of lighting cables encased in conduit.

Paper products - 15 to 20 pounds.

3. Ease of ignition and propagation: Cables are non-propagating.

4. Suppression damage to equipment: None

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling

2. Automatic suppression systems: None

3. Hose station/extinguisher:

a. Distance to hose stations - One CO_2 hose reel (semi-automatic) with 3/4-inch 100-foot-long hose is located in adjacent zone CB-23, approximately 10 feet from the center of this zone. One water hose station with 1-1/2-inch 100-foot-long hose is located in adjacent zone CB-4, approximately 15 feet from the center of this zone.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.75 Fire Zone CB-23 (Units 1 and 2)

Exemption Request

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

6.75.1 Area Description

This fire zone comprises the Control Building at elevation 49 feet. The north, south and east walls are 24-inch thick reinforced concrete, the west wall varies between 8- and 24-inch thick reinforced concrete, the floor is 8-inch thick reinforced concrete, and the ceiling is 12- to 24-inch thick (varies) reinforced concrete. Access to this area is good. Ceiling height is 19 feet. Room ventilation is 34,200 cfm.

6.75.2 Safe Shutdown Equipment

Fire zone CB-23 contains equipment and cables associated with the RHR, HPCI, RCIC, and Electrical Distribution Systems necessary for safe shutdown. All of the cable trays are coated for 9 feet from the north and south access way walls, uncoated for 25 feet, and then coated for another 10 feet.

6.75.3 Fire Protection Systems

Fire Zone CB-23 contains ionization smoke detectors located on the ceiling and above the ceiling connected to a control room annunciator.

Table 6.75 Evaluation Parameters Summary Table, Fire Zone CB-23 (Units 1 and 2)

A. Zone description

1. Construction:

a. Walls

North - Interior: 24-inch thick reinforced concrete

South - Interior: 24-inch thick reinforced concrete

East - Exterior: 24 inch reinforced concrete

West - Interior: varies; 8-inches reinforced concrete block, insulated ballistic panels, open, at interior and exterior reinforced concrete walls 12 inches thick and 24 inches deep

b. Floor - Poured-in-place 8-inch thick reinforced concrete slab and concrete beams

c. Ceiling - Part poured-in-place 12-inch thick reinforced concrete slab and beams; part poured-in-place 2-inch thick reinforced concrete slab

2. Ceiling height: 19 feet

3. Room volume: Approximately 193,271 cu. ft.

4. Ventilation: 34,200 cfm, supply and exhaust via continuously operating Control Building ventilation system

Table 6.75. Evaluation Parameters Summary Table, Fire Zone CB-23 (Units 1 and 2) (Cont)

5. Congestion/Access: This zone occupies the entire 49 foot elevation and is accessible via stairwells (zones CB-3 and CB-4) from elevation 23 feet.

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
ELEC.DISTR. SYS.		X	ELEC. DISTR. SYS.		X
DIESEL GEN. SYS.		X	DIESEL GEN. CYS.		X
RHR SYS.		X	RHR SYS.		X
SERVICE WTR. SYS.		X	SERVICE WTR. SYS.		X
VENT. AIR SYS.		X	VENTILATING AIR SYS.		X
DIESEL GEN. SYS.		X	DIESEL GEN. SYS.		X
VENTILATING AIR SYS.		X	VENTILATING AIR SYS.		X
RHR SYS.		X	RHR SYS.		X
SERV. WATER SYS.		X	SERV. WATER SYS.		X

Table 6-75. Evaluation Parameters Summary Table, Fire Zone CB-23 (Units 1 and 2) (Cont)

2. Equipment in zone required for safe shutdown:

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
RHR "A" RELAY VERT. BD. H12-PG17 (JE6)	X	X	RHR "B" RELAY VERT BD. H12-P618 (JHØ)	X	X
HPCI VERT. BD. H12-P620 (JE7)	X	X	RCIC VERT. BD. H12-P621 (JH1)	X	X
INBD. PRI ISO VLV RELAY VERT. BD. H12-P622			OTBD PRI ISO VLV RELAY VERT. BD. H12-P623 (J)	X	X
VERT. BD. H12-P622 (JE8)	X	X			
			TERM. CAB FOR RIP XU-57 (JX2)	X	X
TERM CAB/MIC. DIV. 1 UNIT 2 XU-13 (JU4)	X	X	TERM. CAB/MISC. DIV 2 UNIT 1 XU-25 (JU3)	X	X
DG NO. 3 LOGIC CAB. XU-29 (H6Ø)			DG NO. 4 LOGIC CAB. XU-30 (H61)	X	X
TERM. CAB. FOR JA7 UNIT No. 2 XU-41 (JKØ)	X	X	TERM. CAB FOR JA8 UNIT NO. 2 XU-42 (J18)	X	X
BENCH BD. AUX RELAY CAB H12-P624 (JFØ)	X	X	FLUID FLOW DET CAB. XU-73 (I2R)	X	X
			TERM. CAB. BOP XU-14 (J19)	X	X
			TERM. CAB. BOP XU-28 (JK3)	X	X
TERM. CAB. BOP XU-27 (JK2)	X	X			
125VDC DIST. PNL 4A (H-23)	X	X	125VDC DIST. PNL. (H24)	X	X
VITAL DIST. PNL V-10A (HG9)	X	X			
AC DIST. PNL 32B (HW9)	X	X			
ENG. SFGRD PNL. H12-P601 (JF1)	X	X	ENG. SFGRD PNL H12-P601 (JF8)	X	X

Table 6-75. Evaluation Parameters Summary Table, Fire Zone CB-23 (Units 1 and 2) (Cont)

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
RX CTL BENCHBRD. VERT SECT. H12-P603 (JN3, JF9)	X	X	RX CTL. BENCHBRD. VERT. SECT. H12-P603 (JN4)	X	X
RTG BOARD VERT. SECT. B, C,G&H XU-2(JA6,JA8, JT5,JA5)	X	X	RTG BOARD VERT. SEC. C,B, & H XU-2(JA7,JA9,JB8)	X	X
RTG BD. VERT. SECT. L&M XU-3 (JTØ,JC3,JC4)	X	X	RTG BOARD VERT. SECT. L&M XU-3 (JA2&JA1)	X	X
RTG BOARD CONS. SECT. III XU-51 (JW8)	X	X	RTG BOARD CONS. SECT. III XU-51 (JW9)		
BOP PROC. INSTR. PWR SUP. XU-60 (JU2)	X	X			
TERM. CAB FOR RIP XU-49 (JU6)	X	X	TERM. CAB FOR RIP XU-47 (JS8)	X	X
TERM. CAB FOR RIP XU-50 (JU9)	X	X	TERM. CAB FOR RIP XU-50 (JU9)	X	X
NSS TEMP REC. & LEAK DET. VERT. BD. H12-PG14 (JF3,JP5)	X	X	NSS TEMP REC. & LEAK DET. VERT. BD. H12-PG14 (JP5)	X	X
FDWTR & RX RECIRC INSTR. RACK H12-P612 (JG2)	X	X	FDWTR & RX RECIRC. INSTR. RACK H12-P612 (JN5)	X	X
PROCC. INSTR. CAB H12-PG13 (JC3)			PROCC. INSTR. CAB. H12-PG13 (JP1)	X	X
JET PMP INSTR. VERT. BD. H12-PG19 (JK4)	X	X	AUTO BLOW DN RELAY VERT. BD. H12-PG28 (JG8)	X	X
CORE SPRAY "A" RELAY VERT BD. H12-PG26 (JE5)	X	X	CORE SPRAY "B" RELAY VERT. BD. H12-PG27 (JG9)	X	X
			TERM. CAB FOR RIP XU-48 (JS9)	X	X

Table 6-75. Evaluation Parameters Summary Table, Fire Zone CB-23 (Units 1 and 2) (Cont)

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
ELEC. DISTR. SYS.	X	X	ELEC. DISTR. SYS.	X	X
DIESEL GEN. SYS.	X	X	DIESEL GEN. SYS.	X	X
RHR SYS.	X	X	RHR SYS.	X	X
VENTILATING AIR SYS.	X	X	VENTILATING AIR SYS.	X	X
RIP SYS.	X	X	RIP SYS.	X	X
SERVICE WTR. SYS.	X	X	SERVICE WTR. SYS.	X	X
INSTRUMENTATION	X	X	INSTRUMENTATION	X	X
INSTRUMENT AIR SYS.	X	X	INSTRUMENT AIR SYS.	X	X
HPCI SYS.	X	X	RCIC SYS.	X	X
			ADS SYS.	X	X
125 V DC DIST. PNL. (H23)	X	X	125 V DC DIST. PNL (H24)	X	X
LOGIC CAB. DG 1 (H58) XU-7	X	X	LOGIC CAB. DG 2 (H59) XU-24	X	X
TERM. CAB. E1 DIV. 1 (JH6) XU-39	X	X	TERM. CAB. E2 DIV. 2 (JH7) XU-40	X	X
TERM. CAB. EB XU-13 (JU2)	X	X	TERM. CAB. ED XU-25 (JU3)	X	X
TERM. CAB. BOP XU-27 (JK2)	X	X	TERM. CAB. BOP XU-28 (JK3)	X	X
RHR B RELAY VERT. BD. H12-P618 (JH0)	X	X	RHR A RELAY VERT. BD. H12-P617 (JE6)	X	X
U1 FIRE PROT. LOGIC CAB. (JU4) XU-70	X	X			
RTG BOARD VERT. SECT. B, C, G & H XU-2 (JA6, JA8)	X	X	RTG BOARD VERT. SECT. C, B, G & H XU-2 (JA7, JA9)	X	X
RTG BOARD VERT. SECT. L & M XU-3 (JC4)	X	X	RTG BOARD VERT. SECT. L & M XU-3 (JA1)	X	X

Table 6-75. Evaluation Parameters Summary Table, Fire Zone CB-23 (Units 1 and 2) (Cont)

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
FDWTR & RX RECIRC INSTR RACT H12-P612 (JG2)	X	X	FDWTR & RX RECIRC INSTR RACT H12-P612 (JN5)	X	X
PROC INSTR CAB H12-P613 (JG3)	X	X	PROC INSTR CAB H12-P613 (JP1)	X	X
JET PMP INSTR VERT BD H12-P619 (JK4)	X	X			
			Auto Blow DN Relay VERT BOARD H12-P628 (JG8)	X	X
CORE SPRAY "A" Relay VERT BOARD H12-P626 (JE5)	X	X	CORE SPRAY "B" Relay VERT BOARD H12-P627 (JG9)	X	X
RHR "A" Relay VERT BOARD H12-P617 (JE6)	X	X	RHR "A" Relay VERT BOARD H12-P617 (JE6)		
HPCI VERT BOARD H12-P620 (JE7)	X	X	RCIC VERT BOARD H12-P621 (JH1)	X	X
INBD PRI ISOL VLV Relay VERT BD H12-P622 (JE8)	X	X	OTBD PRI ISOL VLV Relay VERT BD H12-P623 (JH2)	X	X
TERM. CAB FOR RIP XU-57 (JX2)	X	X	TERM CAB FOR RIP XU-57 (JX2)	X	X
			TERM CAB/MISC DIV. 2-XU-25 (JU3)	X	X
ENG. SFGRD PNL H12-P601 (JF1)	X	X	ENG. SFGRD PNL H12-P-601 (JF8)	X	X
RX CTL BNCHBRD VERT SECT H12-P603 (JN3,JF9)	X	X	RX CTL BNCHBRD VERT SECT H12-P603 (JN4)	X	X
RTB BOARD VERT SECTION B,C,F,G,&H XU-2 (JA6, JA8,JT5,JA4,JA5)	X	X	RTG BOARD VERT SECT B,C&G XU-2 (JA7,JA9, JM4)	X	X
RTG BOARD VERT SECT. L&M XU-3 (JTØ,JC,JC4)	X	X	RTG BOARD VERT SECT. L&M XU-3 (JA2,JA1)	X	X
RTG BOARD CONS. SECT III XU-51 (JW8)	X	X	RTG BOARD CONS SECT III XU-51 (JW9)	X	X
BOP PROC. INSTR PWR SUP XU-60 (JU1)	X	X	BOP PROC INSTR PWR SUP XU-60 (JU1)	X	X
TERM CAB FOR RIP XU-49 (JU6)	X	X	TERM CAB FOR RIP XU-47 (JS8)	X	X
TERM CAB FOR RIP XU-50 (JU9)	X	X	TERM CAP FOR RIP XU-50 (JU9)	X	X

Table 6-75. Evaluation Parameters Summary Table, Fire Zone CB-23 (Units 1 and 2) (Cont)

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
NSS TEMP REC & LEAK DET VERT BOARD H12-P614 (JF3,JP5)	X	X	NSS TEMP REC & LEAK DET VERT BOARD H12-P614 (JP5)	X	X
			TERM. CAB FOR RIP XU 48 (JS9)	X	X
			XU-25 (JU3)	X	X
DG NO. 1 Logic CAB (Unit 1) XU-7 (H58)	X	X	DG NO. 2 Logic CAB (Unit 1) XU-24 (H59)	X	X
TERM CAB for JA6 XU-39 (JH6)	X	X	TERM CAB for JA7 XU-40 (JH7)	X	X
TERM CAB BOP XU-14 (J19)	X	X	TERM CAB BOP XU-14 (J19)	X	X
TERM CAB BOP XU-27 (JK2)	X	X	TERM CAB BOP XU-28 (JK3)	X	X
RHR "B" Relay VERT BOARD H12-P618 (JHØ)	X	X	RHR "B" Relay VERT BOARD H12-P618 (JHØ)	X	X
TERM CAB FOR EB (JU2) XU-13	X	X			
BENCHBOARD AUX Relay Cabinet H12-P624 (JFØ)	X	X			
			Fluid Flow DET CAB XU-73 (I2R)	X	X
VTL Dist PNL V-7A (HG8)	X	X			
VTL Dist PNL V-9A (HG9)	X	X			
DC Dist. PNL 3A (H23)	X	X	DC Dist PNL 3A (H23)	X	X
			DC Dist PNL 3B (H24)	X	X
ELEC. DISTR. SYS.	X	X	ELEC. DISTR. SYS.	X	X
DIESEL GEN. SYS.	X	X	DIESEL GEN. SYS.	X	X
RHR SYS.	X	X	RHR SYS.	X	X
VENTILATING AIR SYS.	X	X	VENTILATING AIR SYS.	X	X
RIP SYS.	X	X	RIP SYS.	X	X
SERV. WATER SYS.	X	X	SERV. WATER SYS.	X	X
INSTRUMENTATION	X	X	INSTRUMENTATION	X	X
INSTRUMENT AIR SYS.	X	X	INSTRUMENTATION AIR SYS.	X	X
HPCI SYS.	X	X	ADS SYS.	X	X

Table 6-75. Evaluation Parameters Summary Table, Fire Zone CB-23 (Units 1 and 2) (Cont)

Train A			Train B		
Description	Eqpt	Cable	Description	Eqpt	Cable
RTG. BOARD VERT. SECT. M XU-3 (JC4)	X	X	RTG BOARD VERT. SECT. M XU-3 (JA1)	X	X
RTG BOARD VERT. SECT. B,C XU-3 (JA6,JA8)	X	X	RTG BOARD VERT. SECT. B&C XU-3 (JA7,JA9)	X	X
TERM CAB BOP XU-27 (JK2)	X	X	TERM CAB BOP XU-28 (JK3)	X	X
DC DISTR. PNL 3A (H23)	X	X	DC DISTR. PNL 3B (H24)	X	X
TERM CAB BOP XU-14 (J19)	X	X	TERM CAB BOP XU-14 (J19)	X	X
LOGIC CAB DG 3 XU-29 (HG0)	X	X	LOGIC CAB DG 4 XU-30 (HG1)	X	X
TERM CAB XU-41 (JK0)	X	X	TERM CAB XU-42 (J18)	X	X
TERM CAB XU-13 (JU4)	X	X	TERM CAB XU-25 (JU5)	X	X
ELECTRICAL DISTR. SYS.		X	ELECTRICAL DISTR. SYS.		X

Table 6-75. Evaluation Parameters Summary Table, Fire Zone CB-23 (Units 1 and 2) (Cont)

C. Fire Hazards Analysis

1. Type of combustibles in area: Cable
2. Quantity of combustibles: Cables average five trays, approximately 4,700 lineal feet, medium to heavy density; cable trays are coated for approximate'y 9 feet from north and south accessway walls, are uncoated for approximately 25 feet, and then are coated for another 10 feet.
3. Ease of ignition and propagation: Cables are non-propagating.
4. Suppression damage to equipment: Fire personnel are brigade trained to avoid inadvertent spraying of vital equipment in this area.

D. Fire Protection Existing

1. Fire detection systems: Ionization detecctors on the ceiling and above the ceiling.
2. Automatic suppression systems: None
3. Hose station/extinguisher:
   a. Distance to hose stations - Four CO_2 hose reels (semi-automatic) CO_2 with 3/4-inch 100-foot-long hose; two are located on the west wall 52 feet apart approximately 30 feet from the center of the zone, one is located on the north wall and one is located on the south wall, approximately 105 feet from the center of the zone. Two

Table 6-75. Evaluation Parameters Summary Table, Fire Zone CB-23 (Units 1 and 2) (Cont)

water hose station with 1-1/2-inch 100-foot-long hose are located in zones CB-3 and CB-4, approximately 55 feet from the center of this zone.

b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.76 Fire Zone RB-1-a (Unit 1)

Exemption Request

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone RB-1-a does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) A fixed automatic water suppression system is provided for the entire zone.

(2) Ionization smoke detectors are provided with a common area alarm in the control room.

(3) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.76.1 Area Description

This fire zone comprises the Reactor Building at column lines 6R to 8R and K to M at elevation -17 feet. Fire zone RB-1-a is bounded by fire-rated walls to the north, south, and west and is open to the east. The floor is a reinforced concrete slab. The ceiling is a fire-rated concrete slab. Ceiling height is 34 feet 6 inches. Room ventilation is 2500 cfm.

6.76.2 Safe Shutdown Equipment

Fire zone RB-1-a contains no equipment or cables necessary for safe shutdown.

6.76.3 Fire Protection Systems

Fire zone RB-1-a contains ionization smoke detectors connected to a control room annunciator, and a fixed suppression system. A manual 1-1/2-inch hose station is located 20 feet from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.76.4 Fire Hazards Analysis

Fire zone RB-1-a has a specific Appendix R deviation which was identified utilizing the methodology and assumptions described by Section 4. This deviation is due to lack of a rated barrier between fire zone RB-1-a and the zone above. The reason for this lack of rating is due to a stairwell used for access to this fire zone. The fire zone above RB-1-a contains safe shutdown circuits of both trains which were dispositioned in the fire hazards analysis for that zone. RB-1-a does not contain any cables or equipment required for safe shutdown.

The fixed combustible loading for this fire zone is extremely light. What few cables are present are totally enclosed in conduit. The lubricating oil present in the zone is contained within the core spray pumps and is not considered a plausible combustible due to lack of a credible ignition source. The transient combustibles in this zone are also very low due to the difficulty of access to

this area. The radiological and security requirements prevent random access, and this area is not a passageway to any other zone. In addition the fixed suppression system can be credited with limiting the extent of any fire which might occur.

It is therefore concluded that due to a very low combustible loading, low maintenance activity during unit operation, a fixed suppression system, and low probability of an ignition source fire zone RB-1-a does not pose a credible fire hazard to the redundant circuits in the zone above. For these reasons, an exemption is justified for lack of a three-hour barrier between fire zones.

6.76.5 Conclusion

Based on previous analysis, exemption is requested from the requirements for a three-hour barrier between fire zones as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) A fixed automatic suppression system is provided for the entire zone.

(2) Ionization smoke detectors are provided with a common area alarm in the control room.

(3) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-76. Evaluation Parameters Summary Table, Fire Zone RB-1-a (Unit 1)

A. Zone description

1. Construction:

a. Walls

North - Interior: 31-inch thick (minimum) reinforced concrete (below grade)

South - Exterior: 48-inch thick reinforced concrete (below grade)

East - No wall

West - Exterior: 48-inch thick reinforced concrete (below grade)

b. Floor - Poured-in-place reinforced concrete slab

c. Ceiling - Poured-in-place 30-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 34 feet 6 inches

3. Room volume: Approximately 23,590 cu. ft.

4. Ventilation: 2500 cfm transfer from elevation 20 feet through the stairway (no duct); 2500 cfm exhaust air to the normal Reactor Building ventilation system

5. Congestion/Access: This zone is accessible from one stairway from the elevation above. Adequate room for firefighting exists within the zone.

Table 6-76. Evaluation Parameters Summary Table, Fire Zone RB-1-a (Unit 1) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone: None

2. Equipment in zone required for safe shutdown: None

C. Fire Hazards Analysis

1. Type of combustibles in area: Oil, grease, and cables.

2. Quantity of combustibles:

Oil - 27.8 gallons

Grease - 4 pounds

Cable - small number of cable totally encased in conduit; no trays in this zone

3. Ease of ignition and propagation: Oil flash point requires raising the oil bulk volume temperature above 450°F. Cables are non-propagating. Grease is not considered a source of fire ignition because of its high flash point.

4. Suppression damage to equipment: Damage may occur to core spray pump. Due to fire or suppression, the redundant core spray pump and other safety class equipment outside this zone are unaffected since this zone is a confined space with adequate automatic suppression.

Table 6-76. Evaluation Parameters Summary Table, Fire Zone No. RB-1-a (Unit 1) (Cont)

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling.
2. Automatic suppression systems: Wet-pipe system, utilizing automatic on/off sprinkler heads charged with water. The water supply is provided with a one-head bypass of deluge valve feature. The deluge valve is automatically operated upon actuation of the detection system and flow in the bypass.
3. Hose station/extinguisher:
   a. Distance to hose stations - One 75-foot water hose reel on the north wall of the zone, 20 feet from the center of the zone
   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.77 Fire Zone RB-1-a (Unit 2)

Exemption Request

Per the provisions of 10 CFR 50.48 (c) (6) and 10 CFR 50.12, the Carolina Power and Light Company requests exemption from the specific requirements of Appendix R Section III.G.2.

Summary

Fire Zone RB-1-a does not comply with the specific provisions of 10 CFR 50 Appendix R Section III.G.2. Carolina Power and Light Company seeks to comply with Appendix R through an exemption from the separation requirement. The basis for this exemption is as follows:

(1) A fixed automatic water suppression system is provided for the entire zone.

(2) Ionization smoke detectors are provided with a common area alarm in the control room.

(3) The fixed combustible loading is low in fire zone with no allowable storage of transient combustibles.

6.77.1 Area Description

This fire zone comprises the Reactor Building at column lines K to M and 22R to 24R at elevation -17 feet. The south and west walls are 48-inch thick reinforced concrete, the north wall is 31-inch thick reinforced concrete, the ceiling is 24-inch thick reinforced concrete, and the floor is poured-in-place reinforced concrete. Access to this area is fair. Ceiling height is 34 feet 6 inches. Room ventilation is 2500 cfm.

6.77.2 Safe Shutdown Equipment.

Fire zone RB-1-a contains no equipment or cables necessary for safe shutdown.

6.77.3 Fire Protection Systems.

Fire zone RB-1-a contains two ionization smoke detectors located on the ceiling connected to a control room annunciator, and a fixed wet-pipe suppression system utilizing water. Automatic on/off sprinkler heads are charged with water. A manual 1-1/2-inch hose station is located 20 feet away from the center of the zone. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

6.77.4 Fire Hazards Analysis

Fire Zone RB-1-a has a specific Appendix R deviation which was identified utilizing the methodology and assumptions described by Section 4. This deviation is due to lack of a rated barrier between fire zone RB-1-a and the zone above. The reason for this lack of rating is due to a stairwell used for access to this fire zone. The fire zone above RB-1-a contains safe shutdown circuits of both trains which were dispositioned in the fire hazards analysis for that zone. RB-1-a does not contain any cables or equipment required for safe shutdown.

The fixed combustible loading for this fire zone is extremely light. What few cables are present are totally encased in conduit. The lubricating oil present in the zone is contained within the core spray pumps and is not considered a plausible combustible due

to lack of a credible ignition source. The transient combustibles in this zone are also very low due to the difficulty of access to this area. The radiological and security requirements prevent random access, and this area is not a passageway to any other zone. In addition, the fixed suppression system can be credited with limiting the extent of any fire which might occur.

It is therefore concluded that due to a very low combustible loading, low maintenance activity during unit operation, a fixed suppression system, and low probability of an ignition source fire zone RB-1-a does not pose a credible fire hazard to the redundant circuits in the zone above. For these reasons, an exemption is justified for lack of a three-hour barrier between fire zones.

6.77.5 Conclusion

Based on previous analysis, exemption is requested form the requirements for a three-hour barrier between fire zones as prescribed by Section III.G.2 of Appendix R. The technical bases which justify the exemption are summarized as follows:

(1) A fixed automatic suppression system is provided for the entire zone.

(2) Ionization smoke detectors are provided with a common area alarm in the control room.

(3) The fixed combustible loading in fire zone with no allowable storage of transient combustibles.

(4) Modifications required to meet Section III.G.2 would not enhance fire protection safety above that provided by proposed modifications.

Table 6-77. Evaluation Parameters Summary Table, Fire Zone RB-1-a (Unit 2)

A. Zone description

1. Construction:

a. Walls

North - Interior: 31-inch thick (minimum) reinforced concrete (below grade)

South - Exterior: 48-inch thick reinforced concrete (below grade)

East - No wall

West - Exterior: 48-inch thick reinforced concrete (below grade)

b. Floor - Poured-in-place reinforced concrete

c. Ceiling - Poured-in-place 30-inch thick reinforced concrete slab and concrete beams

2. Ceiling height: 34 feet 6 inches

3. Room volume: Approximately 23,590 cu. ft.

4. Ventilation: 2500 cfm transfer from elevation 20 feet through the stairway (no duct); 2500 cfm exhaust air to the normal Reactor Building ventilation system

5. Congestion/Access: This zone is accessible from one stairway from the elevation above. There is adequate room for firefighting within the zone.

Table 6-77. Evaluation Parameters Summary Table, Fire Zone RB-1-a (Unit 2) (Cont)

B. Safe Shutdown Equipment

1. Safe shutdown systems in zone: None

2. Equipment in zone required for safe shutdown: None

C. Fire Hazards Analysis

1. Type of combustibles in area: Oil, grease, and cables

2. Quantity of combustibles:

Oil - 27.8 gallons

Grease - 4 pounds

Cable - small number of cables totally encased in conduit; no trays in this zone

3. Ease of ignition and propagation: Oil flash point requires raising the oil bulk volume temperature above 450°F. Cables are non-propagating. Grease is not considered a source of fire ignition because of its high flash point.

4. Suppression damage to equipment: Damage may occur to the core spray pump. Due to fire or suppression, the redundant core spray pump and other safety class equipment outside this zone are unaffected, since this zone is a confined space with adequate automatic suppression.

Table 6-77. Evaluation Parameters Summary Table, Fire Zone RB-1-a (Unit 2) (Cont)

D. Fire Protection Existing

1. Fire detection systems: Ionization detectors on the ceiling
2. Automatic suppression systems: Wet-pipe system, utilizing automatic on/off sprinkler heads charged with water. The water supply is provided with a one-head bypass of deluge valve feature. The deluge valve is automatically operated upon actuation of the detection system and flow in the bypass.
3. Hose station/extinguisher:
   a. Distance to hose stations - One 75-foot water hose reel is located on the north wall of the zone, 20 feet from the center of the zone.
   b. Twenty-pound dry chemical and/or CO_2 extinguishers are provided based on the hazards present in the zone. These extinguishers are spaced to meet NFPA 10 criteria or closer as circumstances require.

ATTACHMENT