DRAFT SAFETY EVALUATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 & 2
DOCKET NOS. 50-325 & 50-324

1.0 Introduction

By letter dated March 11, 1981, the licensee requested two exemptions from Section III.G.3 of Appendix R to 10 CFR 50 to the extent that it requires the installation of a fixed fire extinguishing system in the cable spreading rooms of both units. By memo dated May 12, 1981, we recommended denying this exemption request. In a memo dated June 17, 1981, from T. Ippolito to V. Benaroya, it was subsequently agreed to withhold action on these exemption requests to permit further evaluation. By letter dated April 15, 1982, the licensee provided additional information concerning these requests for exemption. By memo dated May 19, 1982, we again recommended denying these exemption requests. By letter dated September 8, 1982, the licensee provided additional information concerning the cable spreading room.

By letter dated June 30, 1982, the licensee requested an additional 77 exemptions from Section III.G of Appendix R to 10 CFR 50. By letter dated October 1, 1982, the licensee provided additional information.

Section III.G.2 requires that one train of cables and equipment necessary to achieve and maintain safe shutdown be maintained free of fire damage by one of the following means:

a. Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier;

b. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area; or

c. Enclosure of cables and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

If these conditions are not met, Section III.G.3 requires alternative shutdown capability independent of the fire area of concern. It also requires a fixed suppression system in the fire area of concern if it contains a large concentration of cables or other combustibles. These alternative requirements are not deemed to be equivalent; however, they provide equivalent protection for those configurations in which they are accepted.

Because it is not possible to predict the specific conditions under which fires may occur and propagate, the design basis protective features are specified in the rule rather than the design basis fire. Plant specific features may require protection different than the measures specified in Section III.G. In such a case, the licensee must demonstrate, by means of a detailed fire hazards analysis that existing protection or existing protection in conjunction with proposed modifications will provide a level of safety equivalent to the technical requirements of Section III.G of Appendix R.

In summary, Section III.G is related to fire protection features for ensuring that systems and associated circuits used to achieve and maintain safe shutdown are free of fire damage. Fire protection configura-

tions must either meet the specific requirements of Section III.G or an alternative fire protection configuration must be justified by a fire hazards analysis.

Our general criteria for accepting an alternative fire protection configuration are the following:

- The alternative assures that one train of equipment necessary to achieve hot shutdown from either the control room or emergency control stations is free of fire damage.

- The alternative assures that fire damage to at least one train of equipment necessary to achieve cold shutdown is limited such that it can be repaired within a reasonable time (minor repairs with components stored on-site).

- Modifications required to meet Section III.G would not enhance fire protection safety above that provided by either existing or proposed alternatves.

- Modifications required to meet Section III.G would be detrimental to overall facility safety.

2.0 Analytical Method

The licensee employed an analytical method to demonstrate the inherent protection afforded to existing safe shutdown systems. The intent of this method was to provide common parameters by which individual fire

areas could be judged, and to demonstrate that verbatim compliance with Section III.G of Appendix R would not enhance the fire protection for safe shutdown.

The method can be summarized as follows:

- The redundant cables and components of concern are identified.

- Their geometry and configuration within the fire area are described.

- The type of cable insulation and failure criteria are specified

- The minimum quantity of flammable liquid needed to produce sufficient heat flux and heat energy to damage the cables is calculated, considering several heat transfer modes, i.e. radiation, plume impingement, and stratification.

- The analysis determines the heat flux into the room needed to cause electrical failure of redundant cables. This heat flux is converted to a quantity of flammable liquid, usually acetone, of approximately 10 to 20 gallons, in a circular pool configuration.

We and our contractor, Brookhaven National Laboratory, have reviewed the analytical method. We have determined that the results of the methodology as applied do not demonstrate the equivalence of the protection provided for safe shutdown to the specific alternatives set forth in Section III.G of Appendix R. For example:

- The method does not consider the heat released to the room by secondary fires involving in-situ combustibles. The method uses an electrical failure criteria with the thermal energy

release to the room by a single exposure fire. When the cables of concern are at the conditions of electrical failure, other cables within the enclosure are burning and also releasing energy to the room.

- The method does not consider the increased heat release rate of a given fire when it occurs against a wall or in a corner; the method only considers the heat release of a fire as it occurs in an open area.

- The method does not consider the effects of excess pyrolyzate resulting from the degradation of plastics burning in the stratified layer.

- The method does not consider all of the alternatives set forth in Section III.G, i.e., 3-hour fire barrier, 1-hour fire barrier with suppression system, twenty-feet separation free of combustibles with automatic suppression and alternate or dedicated shutdown capability independent of the area. The method only considers separation without automatic suppression and uses a stratification model which does not include the effects of separation.

The licensee has not used the results of this analysis to compare the protection provided with that specified in Section III.G. The licensee has only stated that the accumulation of the calculated quantity of flammable liquids in the required configuration is an unrealistic condition, and will be prevented by administrative controls. We do not deem this to be a valid argument because there is no positive means of preventing the accumulation of transient materials in individual plant areas. As documented in

Inspection and Enforcement Branch Reports, recent inspections at plants such as Davis Besse (50-346/82-03, April 1, 1982), Duane Arnold (50-331/81-25, January 11, 1982), D.C. Cook (50-315/82-11, December 31, 1981), and Nine Mile Point (50-220/82-09), have demonstrated that substantial quantities of hazardous substances such as 55 gallon drums of waste oil are located in even highly restricted and controlled entry areas.

We have not relied upon the results of the licensee's analysis in our evaluation. We have evaluated each exemption request using our standard method of review, i.e., we have:

a) Reviewed the information submitted and related information existing in the docket file to determine the configuration of the redundant components, and in-situ combustibles in the fire areas of concern.

b) Evaluated the existing fire protection, proposed modifications, compensating design features and mitigating factors to determine the overall level of fire protection in the area of concern, and

c) Determined if the overall level of safety meets the criteria given previously and therefore is equivalent to that provided by Section III.G of Appendix R.

3.0 Cable Spreading Rooms (Fire Zones CB-5 and CB-6)

3.1 Discussion

The cable spreading room of Unit 1 is approximately 121 feet long 65 feet wide, and 26 feet high. The cable spreading room of Unit 2 is a mirror image. The area is defined by walls, floors, and ceilings that are rated as three-hour fire barriers. Cable penetration seals have a three-hour fire resistance rating.

A fire detection system and CO_2 hose reels are installed in each cable spreading room. Hose stations are provided at the entrances to the cable spreading room. Access for fire fighting is good.

An uncontrolled fire in the cable spreading room would threaten all redundant trains of shutdown systems in the cable spreading room and could prevent their operation from the control room.

All cables meet the requirements of IEEE-383 and are covered with a flame retardant coating. The licensee has not quantified the in-situ combustible loading and has assumed that the flame retardant coating on the cables in this area negates their potential for fuel contribution.

Within the cable spreading room cables for the most part, are run in open cable trays. Division I and division II cable trays are parallel, stacked from 7 feet above the floor to a foot or so below the ceiling. There is 18 feet of horizontal separation, with intervening combustibles, between cable trays carrying redundant system cables. Three stacks of non-safety related cable trays are the intervening combustibles. Additionally, between the cable trays and the ceiling, redundant safety cables are installed in conduit. Their separation could be as little as a few inches.

Hot and cold shutdown can be achieved independently of the control room and the cable spreading room by an alternate shutdown system.

3.2 Evaluation

The fire protection for the cable spreading rooms complies with Section III.G.3 of Appendix R to 10 CFR 50 to the extent that they have an alternate shutdown system and an automatic fire detection system. It deviates from Section III.G.3 in that it does not have a fixed fire suppression system.

In these areas, the cable trays contain IEEE-383 qualified cables covered with a flame retardant coating. Cable trays of redundant divisions are separated by approximately 18 feet; however, conduits of redundant divisions are separated by a few inches. Manual fire fighting is provided in the form of CO_2 hose reels and water hoses and the access for manual fire fighting is good, however, due to the congestion of the cable trays, manual application of fire extinguishing agents to the uppermost trays would be difficult.

The issue is whether the cable construction, fire retardant coating, existng separation distances, and access for manual fire fighting compensates for the lack of a fixed suppression system.

If an exposure fire occurs in the cable spreading room, a stratified layer of hot gas will be formed in the upper volume of the room. It is in this area that the safe shutdown cables are located. Their horizontal separation will not protect them from the hot layer temperature. This volume of hot gas will preheat the cables and their coatings. If the exposure fire is of a sufficient magnitude to ignite some of the cables, such preheating will aid the fire propagation throughout the concentration of cables.

In addition, the degradation of the cable insulation capability with the temperature associated with hot layer temperatures should also be considered. The highest temperature at which the cables can be said to be free of fire damage needs to be determined for each cable type. Such temperatures have not been established for these cables. The use of IEEE-383 qualified cables with a flame retardant coating does not quarantee that a cable spreading room fire will not cause the loss of redundant trains of safe shutdown equipment.

The quantity of plastic cable insulation and jacket material in the cable spreading room provides a significant fuel load. This fuel load is not reduced by the flame retardant coating; this coating only increases the amount of energy required to ignite the cables. The

limitations of the protection provided by fire retardant coatings are recognized by the fire protection industry. The National Fire Protection Association Handbook states that, "One popular misconception is that fire retardant treatments give a fire resistance rating. This is not true since the treated material does not resist destruction and is still subject to complete consumption by exposing fire. The treatment does, however, retard both the rate of burning and the rate at which fuel is contributed by the treated material."(1)

Tests of flame retardant coatings on cables that were conducted for the NRC at Sandia Laboratories show that the rate of fuel contribution of the burning cables is retarded to a varying degree, however, the entire quantity of cable insulation will eventually be consumed during fire exposure. The test results showed that the protection provided by fire retardant coatings varies with the type of coating. However, heat release data measured during the tests show that coated cables ultimately contribute an amount of fuel similar to that of uncoated cables.

Based on our evaluation of several tests conducted by Sandia Laboratories and others (2) (3) (4) (5) (6) (7) (8) it is our opinion, that the heat flux from a moderate size exposure fire could result in the propagation of a fire throughout the coated cable trays. The only means the licensee is proposing to control such a fire is manual action to be taken by the fire brigade. Manual fire fighting involving burning cable insulation may be ineffectve due to the large quantities of thick, black smoke and toxic gases commonly produced in burning plastics and flame retardant coatings. In tests, small plastic fires have produced sufficient smoke in five minutes to overcome ventilation systems, and reduce visibility in large rooms. This reduced visibility will significantly hamper fire brigade activities. In accordance with our defense-in-depth philosophy, a suppression system should be installed to rapidly suppress exposure fires, such as burning cable, and to rapidly cool cables of those systems not yet disabled without having to rely on accessibility for the fire brigade.

The fire protection philosphy as set forth in Section III.G.3 of Appendix R protects against the loss of plant shutdown capability by providing fire protection features for redundant trains of systems necessary to achieve and maintain shutdown conditions. Where the redundant trains pass through the same fire area, a single fire and associated fire fighting activites may cause damage to all of the redundant trains. If the fire protection features set forth in Section III.G.2 of Appendix R are not provided, alternate or dedicated shutdown capability is required. The requirements for minimum alternate or dedicated shutdown capability are set forth in Section III.L of Appendix R. However, the alternate or dedicated shutdown capability is not required to meet Seismic Category I, single failure, or other design basis accident criteria.

In light of the above, control of the plant from the control room should be maintained for as long as possible for any fire event outside the control room. In addition, control from the control room should be reestablished as soon as possible after a fire that forces the evacuation of the control room or forces control to be transferred to the alternate shutdown capability. For this reason, a fixed fire suppression system is required in the fire areas containing redundant trains of systems (such as the cable spreading rooms) for which alternate shutdown capability has been provided. The fixed suppression system is intended to preclude, or at least retard the deterioration of the plant control capability and reduce the reliance placed upon the alternate shutdown capability for safe shutdown. The purpose of the suppression system is to minimize fire damage to redundant trains of shutdown systems.

3.3 Conclusion

Based on our evaluation, we conclude that the fire protection currently provided for the cable spreading rooms is significantly less than that mandated by the technical requirements of Section III.G.3 of Appendix R to 10 CFR 50.

A fixed fire extinguishing system as required by Section III.G.3.b of Appendix R to 10 CFR 50 should be installed. The installation of this system will significantly enhance the level of fire protection safety of the plant. Therefore, the exemption should be denied.

References

(1) McKinnon, G. P. editor, Fire Protection Handbook, 14th edition National Fire Protection Association, Boston, Mass., 1976, pp. 5-67.

(2) Klamerus, L. J., "A Preliminary Report on Fire Protection Research Program Fire Retardant Coatings Tests," Sand 78-0518, Sandia Laboratories, Albuquerque, New Mexico, 1968, pp. 35-46.

(3) "Burn Mode Analysis of Horizontal Cable Tray Fires" SAND 81-0079 NUREG/CR-2431 February 1982. Summary: This test series was conducted to investigate the burning of cables in cable trays in rooms where adequate ventilation for combustion is not available. The test results show that a reduction in flames and the occurrence of deep-seated fires is more likely in a descending smoke layer. The tests also showed that reignition may occur upon readmission of fresh air.

(4) "Fire Research on Grouped Electrical Cables" SAND 79-0031 January 1979. Summary: This paper summarizes the activities of Sandia National Laboratories research through January 1979 in regard to nuclear power plant cable testing criteria. Both a small scale and full scale tests are described for use in evaluating cable fire retardancy.

(5) "Categorization of Cable Flammability - Part 1: Laboratory Evaluation of Cable Flammability Parameters" EPRI NP-1200 October 1979. Summary: This study was a laboratory scale investigation of flammability parameters such as rate of heat release sensitivity to external heat flux of 22 types of electrical cables. The results of this study were used to select cables for full scale cable tray fire tests.

(6) "Assessment of Exposure Fire Hazards to Cable Trays" EPRI-NP-1675 January 1981. Summary: This study evaluated the potential hazard to cable trays from external heat flux sources. The results show that damageability can be predicted based on the ceiling height and floor area of the room, the height of cables above the floor, the ventilation rate, and the heat release rate of the combustible.

(7) "A study of Damageability of Electrical Cables in Simulated Fire Environments" EPRI-NP-1767 March 1981. Summary: This study investigates how electrical cables may melt, expand, disintegrate, or short circuit in a heated environment, even before ignition occurs. Critical heat flux and radiant energy parameters are derived for expressing the degree of cable damage potential.

(8) Several tests conducted for the NRC fire protection research program, which as of this date final test reports have not yet been issued. These tests are:

1. "Replication Experiments for Fire Protection System" Conducted July 1981 at Underwriters Laboratories, Northbrook, IL.

2. "Evaluation of twenty-foot Separation as a Fire Protection System" May 1982, Underwriters Laboratories, Northbrook, IL.

4.0 Zones Requiring Clarification

4.1 Discussion

The licensee has requested exemptions from Section III.G.2 for the following of fire zones in Units 1 and 2:

Reactor Building (Unit 1)

- Between column lines S to T and 4R to 6R at elev. (-) 17 feet, fire zone RB-2.

- Between column lines K to M and 2R to 4R at elev. (-) 17 feet, fire zone RB-1-b.

- Between column lines K to M and 2R to 4R at elev. 20 feet, fire zone RB-1-g (N/W).

- Between column lines S to T and 2R to 3R at elev. 20 feet, fire zone RB-1-e.

- Between column lines S to T and 7R to 8R at elev. 20 feet, fire zone RB-1-f.

- Between column lines R to T and 2R to 4R at elev. 20 feet, fire zone RB-1-g (N/E).

- Between column lines P to S and 2R to 4R at elev. 50 feet, fire zone RB-1-h (N/E).

- Between column lines K to M and 2R to 4R at elev. 50 feet, fire zone RB-1-h (N/W).

- Between column lines K to M and 4R to 6R at elev. 50 feet, fire zone RB-1-h (W/C).

- Between column lines K to M and 6R to 8R at elev. 50 feet, fire zone RB-1-h (S/W).

- Between column lines M to P and 6R to 8R at elev. 50 feet, fire zone RB-10.

- Between column lines 6R and 8R and K to M at elev. (-) 17 feet, fire zone RB-1-a.

Reactor Building (Unit 2)

- Between column lines S to T and 20R to 22R at elev. (-) 17 feet, fire zone RB-2.

- Between column lines K to M and 18R to 20R at elev. (-) 17 feet, fire zone RB-1-b.

- Between column lines K to M and 18R to 20R at elev. 20 feet, fire zone RB-1-g (N/W).

- Between column lines K to M and 22R to 24R at elev. 20 feet, fire zone RB-1-g (S/W).

- Between column lines K to M and 20R to 22R at elev. 20 feet, fire zone RB-4.

- Between column lines S to T and 18R to 19R at elev. 20 feet, fire zone RB-1-c.

- Between column lines S to T and 23R to 24R at elev. 20 feet, fire zone RB-1-f.

- Between column lines R to T and 18R to 20R at elev. 20 feet, fire zone RB-1-g (N/E).

- Between column lines R to T and 22R to 24R at elev. 20 feet, fire zone RB-1-g (S/E).

- Between column lines M to R and 22R to 24R at elev. 20 feet, fire zone RB-1-g (S/C).

- Between column lines S to P and 18R to 20R at elev. 50 feet, fire zone RB-1-h (N/E).

- Between column lines K to M and 18R to 20R at elev. 50 feet, fire zone RB-1-h (N/W).

- Between column lines K to M and 20R to 22R at elev. 50 feet, fire zone RB-1-h (W/C).

- Between column lines K to M and 22R to 24R at elev. 50 feet, fire zone RB-1-h (S/W).

- Between column lines P to M and 23R to 24R at elev. 50 feet, fire zone RB-10.

- Between column lines K to M and 22R to 24R at elev. (-) 17 feet, fire zone RB-1-a.

Control Building (Units 1 and 2)

- Northeast corner, elev. 23 feet, fire zone CB-1A.

- Northeast side, elev. 23 feet, fire zone CB-1B

- Southeast corner, elev. 23 feet, fire zone CB-2A.

- Southwest side, elev. 23 feet, fire zone CB-2B.

- Northeast corner, elev. 49 feet, fire zone CB-12A.
- Northeast side, elev. 49 feet, fire zone CB-12B.
- Southwest side, elev. 49 feet, fire zone CB-13B.
- Southwest corner, elev. 49 feet, fire zone CB-13A.
- Electronics workroom, elev. 49 feet, fire zone CB-16.
- Closet, elev. 49 feet, fire zone CB-17.
- Adjacent to closet, elev. 49 feet, fire zone CB-18.
- Visitor's gallery, elev. 49 feet, fire zone CB-19.
- Northwest corner, elev. 49 feet, fire zone CB-20.
- Soutwest corner, elev. 49 feet, fire zone CB-21.
- Adjacent to visitor's gallery, elev. 49 feet, fire zone CB-22.

4.2 Evaluation

Section III.G.2 requires specified fire protection features to ensure that one train of cable and equipment necessary to achieve and maintain safe shutdown conditions will be free of fire damage, when both redundant trains are in the same fire area. Based on the information provided for these areas, either: (1) redundant trains are not located in the same fire area, or (2) redundant trains are not located in adjacent fire areas which are separated by a fire barrier of less than a 3-hour rating. The licensee has indicated verbally that additional information will be provided in January 1983 to clarify the exemptions requested for these zones.

4.3 Conclusion

The licensee is providing additional information for these areas in January 1983. We will report on these exemptions in a subsequent safety evaluation.

5.0 Zones Needing an Exemption from the Requirement for a 3-hour Barrier Between Adjacent Fire Zones

5.1 Discussion

Section III.G of Appendix R identifies acceptable methods to provide fire protection for shutdown systems, when redundant trains are located within the same fire area. A fire area is generally bounded by construction having a fire resistance of at least 3 hours or by equivalent protection such as a justified fire barrier of less fire resistance or a water curtain. The licensee has requested an exemption from the 3-hour boundary requirement for the following seven areas in Unit 1:

1. Diesel Generator Building between column lines U to V and 8D to 15 feet south of 9D at elev. 50 feet, fire zone DG-11.

2. Diesel Generator Building between column lines U to V and 14D to approximately 25 feet north of 13D at elev. 50 feet, fire zone DG-14.

3. Reactor Building between column lines S to T and 4R to 6R at elev. (-) 17 feet, fire zone RB-2.

4. Reactor Building between column lines K to M and 2R to 4R at elev. (-) 17 feet, fire zone RB-1-b.

5. Reactor Building between column lines S to T and 2R to 3R at elev. 20 feet, fire zone RB-1-e.

4. Reactor Building between column lines K to M and 2R to 4R at elev. (-) 17 feet, fire zone RB-1-b.

5. Reactor Building between column lines S to T and 2R to 3R at elev. 20 feet, fire zone RB-1-e.

6. Reactor Building between column lines S to T and 7R to 8R at elev. 20 feet, fire zone RB-1-f.

7. Reactor Buildng between column lines K to M and 6R to 8R at elev. (-) 17 feet, fire zone RB-1-a.

Five Areas in Unit 2:

1. Between column lines S to T and 20R to 22R at elev. (-) 17 feet, fire zone RB-2.

2. Between column lines K to M and 18R to 20R at elev. (-) 17 feet, fire zone RB-1-b.

3. Between column lines S to T and 18R to 19R at elev. 20 feet, fire zone RB-1-c.

4. Between column lines S to T and 23R to 24R at elev. 20 feet, fire zone RB-1-f.

5. Between column lines K to M and 22R to 24R at elev. (-) 17 feet, fire zone RB-1-A.

And nine areas in the Common Control Building:

1. Northeast corner, elev. 23 feet, fire zone CB-1A.

2. Northeast side, elev. 23 feet, fire zone CB-1B.

3. Electronics workroom, elev. 49 feet, fire zone CB-16.

4. Closet, elev. 49 feet, fire zone, CB-17.

5. Adjacent to closet, elev. 49 feet, fire zone CB-18.

6. Visitor's gallery, elev. 49 feet fire zone CB-19.

7. Northwest corner, elev. 49 feet, fire zone CB-20.

8. Southwest corner, elev. 49 feet, fire zone CB-21.

9. Adjacent to visitor's gallery, elev. 49 feet, fire zone CB-22.

Our evaluation in Section 4.0 determined that, with the exception of the two areas listed below, the requests for exemption may not be needed. The licensee will provide additional information to clarify these requests.

Each of the following two areas contains one redundant train of cables and equipment necessary for safe shutdown. The boundary that separates these areas from adjacent rooms containing safe shutdown equipment of the other train is not a 3-hour rated fire barrier.

Fire Zone DG-11 - This area is located in the northwest corner of the diesel generator building at elev. 50 feet. The room contains the Division I 4160 Volt Switchgear. The adjacent zone which contains redundant Division II equipment is Fire Zone DG-7, located directly beneath. The ceiling/floor between fire zone DG-7 and fire zone DG-11 contains a 7' x 12' non-fire rated, equipment removal hatch of steel plate. The combustible loading in fire zone DG-7 consists of one cable tray and one dry transformer. The combustible loading in fire zone DG-11 consists of several cables. Portable extinguishers, manual hose stations and a smoke detection system are provided in both areas.

Fire Zone DG-14

This area is located in the southwest corner of the diesel generator building at elev. 50 feet. The room contains the Division II 4160 volt switchgear. The adjacent zone which contains redundant Division I equipment is fire zone DG-8 located directly beneath. The floor of fire zone DG-14 contains an equipment removal hatch of steel, identical to that in fire zone DG-11. The combustible loading in fire zone DG-14 is light, and consists of several cables in conduit and three dry type transformers. The combustible loading in fire zone DG-8 consists of one cable tray.

Portable fire extinguishers, manual hose station and a smoke detection system are provided in both areas.

The licensee's technical bases to 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 both fire zones with no allowable storage of transient combustibles.

3) Modifications required to meet Section III.G would not enhance fire protection safety.

5.2 Evaluation

The non-fire rated steel hatches violate the integrity of the 3-hour rated ceiling/floor barrier. Because the licensee has not provided any justification for the fire resistance of this hatch or its fire resisting ability, we do not have reasonable assurance that it could prevent fire spread between zones containing redundant cables and equipment.

5.3 Conclusion

The non-fire rated equipment hatch does not provide a level of fire protection equivalent o the technical requirements of Section III.G. The exemptions should therefore be denied.

6.0 Fire Zones Analyzed to the Failure Criteria of 10 Gallons of Heptane

In selected areas, the licensee has analyzed the level of existing fire protection utilyzing a modified version of the analytical model described in Section 2.0. The analytical method normally starts with the failure criteria for the selected cable type and location and calculates the smallest quantity of liquid which must be spilled in the defined pool geometry and location in order to achieve the failure criteria.

The method of analysis used in the selected areas inversely applies the methodology i.e. the maximum credible quantity of liquid is arbitrarily selected (in this case 10 gallons of heptane), and its capability of achieving the failure criteria on existing cables and components is predicted. Modifications are only proposed if the existing configuration cannot withstand the 10 gallons of heptane failure criteria.

As stated in Section 1.0, it is not possible to predict the specific conditions under which fires may occur and propagate. The design basis protective features are therefore specified in the rule rather than the design basis fire. If plant specific features require protection different that the measures specified in Section III.G., the licensee must demonstrate, by means of a detailed fire hazards analysis, that existing protection or existing protection in conjunction with proposed modifications will provide a level of safety equivalent to the technical requirements of Section III.G of Appendix R.

The licensee has not made a comparison between the level of protection afforded by the existing configuration and the level of protection required by Appendix R. The licensee has instead, compared the level of safety of the existing configuration to the level of fire protection necessary to withstand a 10-gallon heptane fire. The licensee has not compared the level of protection required by the technical requirements of Section III.G to the 10-gallon failure criteria. The licensee bases the selection of 10 gallons of heptane on the premise the at this quantity of flammable liquid constitutes a likely fire hazard, and is a conservative estimate of the amount that a maintenance man might reasonably be expected to be able to carry into an area.

We do not deem this to be an adequate justification for the exemptions requested. The Section III.G fire protection features are intended to protect one train of safe shutdown equipment from a realm of possible fire exposures. The licensee's basis addresses only one type exposure, considering a limited fuel source. We therefore do not have sufficient justification to grant the exemption requested by relying solely on the licensee's analytical model. We have evaluated the additional information submitted with each exemption to identify those areas which could be evaluated using our standard method of review, and have determined that the existing protection for the following areas is equivalent to that required by Section III.G:

1) Reactor building, Unit 1, between Column lines P to T and 6R to 8R at elev. (-) 17 feet, fire zone RB-1-d.

2) Reactor building, between column lines K to M and 6R to 8R at elev. 20 feet, fire zone RB-1-g (S/W).

3) Reactor building, between column lines K to M and 4R to 6R at elev. 20 feet, fire zone RB-4.

4) Reactor building, Unit 2 between column lines P to T and 22R to 24R at elev. (-) 17 feet, fire zone RB-1-d.

These four areas are evaluated in Sections 7.0 through 10.0 of this report.

The remaining areas analyzed to the 10 gallons of heptane criteria do not demonstrate that a level of fire protection equivalent to the technical requirements of Section III.G has been provided. The licensee's request for exemption in the following areas should therefore be denied:

Unit 1

1) Diesel generator building between column lines V to 8 ft. east of V and 11D to 13D at elev. 50 feet, fire zone DG-15.

2) Diesel generator building between column lines W to 8 feet east of V and 11D to 13.5 feet south of 11D to 13D at elev. 50 feet. fire zone DG-23.

3) Reactor building between column lines S to T and 4R to 6R at elev. 5 feet, fire zone RB-1-N.

4) Reactor building between column lines P to S and 4R to 6R at elev. 20 feet, fire zone RB-6.

5) Reactor building between column lines R to T and 20R to 22R at elev. 20 feet, fire zone RB-1-G (E/C).

6) Reactor building between column lines P to M and 18R to 19R at elev. 20 feet, fire zone RB-1-G (N/C).

7. Reactor building between column lines R to T and 6R to 8R at elev. 20 feet, fire zone RB-1-g (S/E).

8. Reactor building, between column lines M to R and 6R to 8R at elev. 20 feet, fire zone RB-1-g (S/C).

9. Reactor building, between column lines P to S and 4R to 6R at elev. 36 feet, fire zone RB-1-0.

10. Reactor building between column lines P to S and 4R to 6R at elev. 50 feet, fire zone RB-1-h (E/C).

11. Reactor building between column lines P to S and 6R to 8R at elev. 50 feet, fire zone RB-1-h (S/E).

12. Reactor building, between column lines M to P and 2R to 4R at elev. 50 feet, fire zone RB-1-h (N/C).

13. Reactor building between column lines K to M and 4R to 6R at elev. 50 feet, fire zone RB-1-h (W/C).

Unit 2

1. Reactor building between column lines S to T and 20R to 22R, fire zone RB-1-n.

2. Reactor building between column lines P to S and 20R to 22R, at elev. 20 feet fire zone RB-6.

3. Reactor building between column lines S to T and 20R to 22R at elev. 20 feet, fire zone RB-1-g (E/C).

4. Reactor building between column lines M to R and 18R to 20R at elev. 20 feet, fire zone RB-1-g (N/C).

5. Reactor building between column lines P to S and 20R to 22R at elev. 36 feet, fire zone RB-1-0.

6. Reactor building, between column lines P to S and 20R to 22R at elev. 50 feet, fire zone RB-1-h (E/C).

7. Reactor building between column lines S to P and 22R to 24R at elev. 50 feet, fire zone RB-1-h (S/E).

8. Reactor building between column lines M to P and 18R to 20R at elev. 50 feet, fire zone RB-1-h (N/C).

9. Control building, control room, fire zone CB-23.

7.0 Reactor Building, Unit 1 between Column Lines P to T and 6R to 8R at elev. (-) 17 feet, fire zone RB-1-d

7.1 Discussion

This fire area is in the southeast corner of the reactor building, and is bounded by fire rated reinforced concrete walls, floor, and ceiling. The ceiling height is 34.5 feet. The redundant cables and equipment in the area are associated with the RHR, RIP, Service Water and Diesel Generator Systems.

The cables are routed in cable trays and conduits. Redundant cables of both trains are located in the same cable tray. The in-situ combustibles consist of 28 gallons of oil, 30 pounds of grease and four cable trays.

The area is provided with a smoke detection system, portable fire extinguishers, manual hose stations, and an automatic suppression system. The licensee proposes to modify the fire protection features in this area by enclosing conduits 4YF1/CB and 4YF2/CB and cable trays 3OR/CB and 3OS/CB in an appropriate fire barrier, which we assume is a one-hour rated fire barrier, or alternatively to reroute the cables.

The licensee's technical bases for 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 the fire zone with no allowable storage of transient combustibles.

(4) The conservative quantitative fire hazards analysis performed.

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

7.2 Evaluation

This area does not comply with Section III.G because redundant cables are not separated by 20 feet free of intervening combustibles, or an alternative shutdown capability independent of the area is not provided.

The requirements of Section III.G.2 are intended to provide a combination of passive (separation and/or fire barrier) and active (fire suppression/ detection system) protection to assure safe shutdown capability.

The existing fire protection for the area consists of both passive and active safety features. The cable tray and proposed one hour barrier affords an acceptable level of safety in consideration of the low in-situ fuel loading. Reinforcing this protection is a complete automatic sprinkler system that protects the area. In addition, portable fire extinguishers and hose stations are available for manual fire fighting. It is our opinion that this protection provides reasonable assurance that the shutdown related cables will be free of damage from a fire in the area.

7.3 Conclusion

Based on our evaluation, the existing level of protection for fire zone RB-1-d in conjunction with the proposed modifications provide a level of fire protection equivalent to the technical requirements of Section III.G. The exemption should, therefore, be granted.

8.0 Reactor Building Between Column Lines K to M and 6R to 8R at elev. 20 feet, fire zone RB-1-G S/W)

This fire area is in the southwest corner of the reactor building and is bounded by fire rated reinforced concrete walls, floor, and ceiling. The ceiling height is 29 feet. The redundant cables and equipment in the area are associated with the HPCI, RHR, RCIC, and RIP systems.

The cables are routed in three cable trays and conduits. Redundant cables of both trains are routed in the same tray. The licensee has not quantified the in-situ fuel load.

- - -

The area is provided with a smoke detection system, portable fire extinguishers, manual hose stations, and an automatic suppression system.

The licensee proposes to modify the fire protection features in the area by enclosing cable trays 37S/CA and 37S/DA in a one hour barrier, or alternatively, to reroute the cables. The licensee also proposes to enclose conduits 3AH1/CB. 3AH2/CB, 4MF1/DB, AAH1/BB, and AAII/BB in an appropriate fire barrier, which we assume is a one-hour rated barrier where they crossover redundant trains for a distance of eight feet horizontally.

The licensee's 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.

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

4. Intervening combustibles pose no threat to zone boundaries.

8.2 Evaluation

This area does not comply with Section III.G because redundant cables are not separated by 20 feet free of intervening combustibles, or an alternative shutdown capability independent of the area is not provided.

The requirements of Section III.G.2 are intended to provide a combination of passive (separation and/or fire barrier) and active (fire suppression/ detection systems) protection to assure safe shutdown capability.

The existing fire protection for the area consists of both passive and active safety features. The proposed one hour barriers afford an acceptable level of safety in consideration of the low in-situ fuel loading identified in the Discussion. Reinforcing this protection is a complete automatic sprinkler system that protects the area. In addition, portable fire extinguishers and hose stations are available for manual fire fighting. It is our opinion that this protection provides reasonable assurance that the shutdown related cables will be free of damage from a fire in the area.

8.3 Conclusion

Based on our evaluation, the existing level of protecton for fire zone RB-1-G (S/W) in conjunction with the proposed modifications provides a level of fire protection equivalent to the technical requirements of Section III.G. Therefore, the exemption should be granted.

9.0 Reactor Building Between Column Lines K to M and 4R to 6R at elev. 20 feet, fire zone RB-4

9.1 Discussion

This fire area is located on the west side of the reactor building and is bounded by walls, floor, and ceilings of fire rated reinforced concrete. Access to the area is only possible via concrete plugs. The ceiling height is 29 feet. There are a number of conduits routed near the ceiling that contain redundant cables associated with the main steam system and feedwater system, and for the RIP, HPCI, and RHR systems.

The separation between redundant cables is only a few inches. All cables in the zone are enclosed in conduit.

A smoke detection system is provided in the area. The licensee's 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 the fire zone with no allowable storage of transient combustibles.

3. All cables in this zone are completely enclosed in conduit.

9.2 Evaluation

This area does not comply with Section III.G because a one-hour rated fire barrier in combination with an automatic suppression system, or an alternate shutdown capability independent of the area is not provided.

Because there are no in-situ combustibles in this area, any postulated fire would involve transient combustible materials. Restricted access to this area via concrete plugs makes the probability of a significant quantity of combustible transient materials accumulating low. A fire in this area would therefore be of limited severity and duration. The installed early warning detection system would be able to promptly detect incipient fire conditions, and the 29 foot ceiling height will prevent damage to the cables until the fire brigade is able to respond and extinguish the fire.

It is our opinion that this combination of alternative protective features provides reasonable assurance that one train of equipment necessary for safe shutdown will be maintained free of fire damage.

9.3 Conclusion

Based on the above evaluation, we conclude that the level of existing protection for fire zone RB-4 provides a level of fire protection equivalent to the technical requirements of Section III.G of Appendix R and, therefore, the exemption should be granted.

10.0 Reactor Building, Unit 2 between Column Lines P to T and 22R to 24R at elev. (-)17 feet, fire zone RB-1-d

10.1 Discussion

This fire area is in the southeast corner of the Unit 2 reactor building and is bounded by fire rated reinforced concrete walls, floor and ceiling. The ceiling height in the area is approximately 35 feet. The redundant cables and equipment in the area are associated with the RCIC, Service Water, RIP, and Diesel Generator Systems. The Division A and Division B cable trays in this area are separated by a few feet in several instances.

The in-situ combustibles consist of 28 gallons of oil, 30 pounds of grease, and four cable trays. The area is provided with a smoke detection system, portable fire extinguishers, manual hose stations, and an automatic suppression system. The licensee proposes to modify the fire protection features in this area by enclosing conduits 4YF1/CB, 3NK2/CA and 4YF3/CB and cable trays 30R/CB and 30S/CB in an appropriate fire barrier which we assume is a one-hour rated fire barrier, or alternatively to reroute the cables.

The licensee's technical bases for 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. High radiation area and zone orientation limits random access of personnel to the zone.

5. Access to and mobility throughout is adequate from a fire-fighting standpoint.

10.2 Evaluation

This area does not comply with Section III.G because redundant cables are not separated by 20 feet free of intervening combustibles, or an alternative shutdown capability independent of the area is not provided.

The requirements of Section III.G.2 are intended to provide a combination of passive (separation and/or fire barrier) and active (fire suppression/detection systems) protection to assure safe shutdown capability.

The existing fire protection for the area consists of both passive and active safety features. The proposed one hour barriers affords an acceptable level of safety in consideration of the low in-situ fuel loading. Reinforcing this protection is a complete, automatic sprinkler system that protects the area. In addition, portable fire extinguishers and hose stations are available for manual fire fighting. It is our opinion that this protection provides reasonable assurance that the shutdown related cables will be free of damage from a fire in the area

10.3 Conclusion

Based on our evaluation, the existing level of protection for fire zone RB-1-d in conjunction with the proposed one hour barriers provides a level of fire protection equivalent to the technical requirements of Section III.G. Therefore, the exemption should be granted.

11.0 Service Water Building - 4 foot elev. Fire Zone SW-1B (Units 1 and 2)

11.1 Discussion

The service water building is separated from adjacent areas by fire rated reinforced concrete barriers. The ceiling height is 15 feet. 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 supply the nuclear service water header only. The three remaining Service Water Pumps can supply either the nuclear or conventional service water header. Associated cables for the service water pumps are routed in the zone in four trays. Redundant cables are separated by less than 20 feet. The in-situ fire load has not been quantified, but it is low.

Smoke detection, portable fire extinguishers manual hose stations and an automatic sprinkler system are provided in the zone. The licensee proposes the following modifications:

Unit 1

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
6M11/CB	4PT/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-1216 will be completely enclosed by an appropriate fire barrier.

Unit 2

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	69J/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.

The licensee's technical bases to justify the exemption are summarized as follows:

1. The conservative quantitative fire hazards analysis performed.

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.

11.2 Evaluation

This area does not comply with Section III.G. because redundant circuits are not separated by twenty feet free of intervening combustibles, or an alternate shutdown capability independent of the area is not provided. Automatic suppression, detection and partial fire barriers are provided. Because of the low in-situ fire load, large room volumes and the partial fire barriers, there is reasonable assurance that one train of service water pumps will be maintained free of fire damage in the time interval required for fire brigade response to extinguish a fire.

These alternative features compensate for the protective features required by Section III.G and provide an equivalent level of fire protection, and are therefore acceptable.

11.3 Conclusion

Based on the above evaluation, the existing fire protection in conjunction with the proposed modifications provides a level of fire protection equivalent to the technical requirements of Section III.G of Appendix R, and therefore, the exemption should be granted.

12.0 Service Water Building, elev. 20 feet, fire zone SW-1A

12.1 Discussion

This fire zone is separated from other zones by fire-rated reinforced concrete walls, floor, and ceiling. The ceiling height is 19 feet. This zone 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 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 combustible loading in the area consists of 140 gallons of lubricating oil for the pumps and a small number of cables totally enclosed in conduit. The lubricating oil has flash point of 480°F.

Smoke detection, portable fire extinguishers, manual hose stations, and an automatic suppression system are provided in this zone. The licensee proposes to modify the existing fire protection in the area by installing a sloping curb, at least 24 inches away from the B-train MCC to prevent spilled flammable liquids from leaking into the MCC.

12.2 Evaluation

This fire zone does not comply with Section III.G, because redundant circuits are not separated by twenty feet free of intervening combustibles or an alternate shutdown capability independent of the area is not provided.

Automatic suppression and detection are provided. The significant in-situ combustible in the fire area is the pump motor lubricating oil. The probability of ignition of the oil is low because the lubricating oil has a high flashpoint (approximately 480°F), and sufficiently hot surfaces do not exist in this fire area to cause the ignition of the lube oil.

The low probability of ignition of the lube oil in conjunction with the absence of hot surfaces provide reasonable assurance that the proposed automatic detection and suppression systems will be activated before the redundant service water components are damaged.

12.3 Conclusion

Based on our evaluation, we conclude that with the proposed modifications the level of safety provided in the service water building will be equivalent to the technical requirements of Section III.G of Appendix R and therefore, the licensee's request should be granted.

13.0 Diesel Generator Building - 2 foot elev. fire zone DG-1

13.1 Discussion

This fire zone includes the entire diesel generator building basement. The boundaries consists of fire rated reinforced concrete walls, floor and ceiling. The ceiling height is 20 feet.

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

Redundant cables in the area are separated by less than 20 feet and in some cases, they cross-over the opposite division in close proximity.

The in-situ combustible loading in the area consists of one transformer for each diesel generator, and a large number of cables in four open cable trays. Greater than 90% of the cables in the area are coated with a flame retardant coating.

Smoke detectors, portable fire extinguishers, manual hose stations and an automatic sprinkler system are provided in the area. Spray shields and pedestals are provided to prevent suppresant damage to essential electrical equipment.

The licensee's technical bases to justify the exemption are summarized as follows:

1. The conservative quantitative fire hazards analysis performed.

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.

13.2 Evaluation

This area does not comply with Section III.G because (1) redundant cables are not separated by 20 feet free of intervening combustibles, (2) redundant cables are not enclosed in a one hour barrier, or (3) an alternate shutdown capability independent of the area has not been provided.

The in-situ combustible loading in this area consists of a large quantity of cables in open cable trays. The licensee has not quantified the fuel load, and has assumed that the flame retardant coating on the cables in the area negates their potential for fuel contribution.

The limitations of the protection provided by fire retardant coatings are recognized by the fire protection industry. The National Fire Protection Association Handbook states that, "One popular misconception is that fire retardant treatments give a fire resistance rating. This is not true since the treated material does not resist destruction and is still subject to complete consumption by exposing fire. The treatment does, however, retard both the rate of burning and the rate at which fuel is contributed by the treated material."

(1) McKinnon, G. P., editor, Fire Protection Handbook, 14th edition, National Fire Protection Association, Boston, Mass., 1976, pp. 5-67.

The quantity of cable insulation and jacket material provides a significant fuel load. This fuel load is not reduced by the flame retardant coating because this coating only increases the amount of energy required

to ignite the cables. An uncontrolled fire in the diesel generator basement could threaten all redundant trains of the normal shutdown systems. There will be a time delay between the advent of a fire and the actual application of suppressing agent. During this time, damage to shutdown related cabling and equipment can occur. The physical separation requirements of Section III.G provide the necessary additional protection until the automatic fire suppression system activates or the fire brigade arrives. Since all redundant trains in the room are not separated by at least 20 feet or protected by a one hour fire rated barrier, there is no reasonable assurance that safe shutdown capability could be maintained.

13.3 Conclusion

The level of existing protection in area DG-1 does not provide a level of fire protection equivalent to Section III.G of Appendix R, therefore the exemption should be denied.

14.0 Diesel Generator Building Between Column Lines U to W and 13D to 14D at elev. 23 feet, fire zone DG-8

14.1 Discussion

This fire area is located in the southwest corner of the diesel generator building and is bounded by reinforced concrete floor, walls and ceiling. The ceiling height is 26 feet 4 inches. As previously discussed in Section 5.1, there is a non-fire rated equipment removal hatch between this fire zone and fire zone DG-14 located directly above.

This Fire zone contains Train A Electrical Distribution System equipment and cables and Train B cables for several hot shutdown systems and fire protection cabinets and circuits of both divisions.

The Train A hot 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 walls along with associated conduits; and (3) a vent fan and attached conduit on the west wall. The Train B circuits are in cable trays and conduits high in the ceiling in the northwest section of this zone. Redundant cables are separated by only a few inches.

The in-situ combustible loading consists of a small quantity of grease in the area ventilation fan assembly, and one cable tray.

Smoke detection, portable fire extinguishers and manual hose stations are provided in the area.

The licensee proposes the following modifications:

(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.

The licensee's technical bases to justify the exemption are summarized as follows:

(1) The conservative quantitative fire hazards analysis performed.

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

(3) The fixed combustible loading is moderate in the zone due to cable coatings and 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.

14.2 Evaluation

This area does not comply with Section III.G because (1) redundant cables are not separated by twenty feet free of intervening combustibles, (2) an automatic suppression system is not installed in the area, or (3) an alternate shutdown capability independent of the area is not provided.

The in-situ combustible loading in this fire area is negligible, therefore, any postulated fire would involve transient combustible materials. Such a fire would most likely be of limited severity. The installed early warning detection system in conjunction with the proposed fire barriers provides reasonable assurance that one train of components needed for safe shutdown will be maintained free of fire damage.

14.3 Conclusions

Based on the above evaluation, we conclude that the existing level of protection in area DG-8 in conjunction with the proposed modifications provides a level of fire protection equivalent to the technical requirements of Section III.G of Appendix R. Therefore, the exemption should be granted.

15.0 Diesel Generator Building Ventilation System, Fire Zone DG-16

15.1 Discussion

This fire area extends along the entire diesel generator building at elev. 50 feet. It is bounded by fire rated, reinforced concrete walls,

floor, and ceiling. The ceiling height is 17 feet. The area contains both trains of cables and equipment for the diesel generator ventilation systems. Redundant cables are separated by less than 20 feet. All cables are in conduit.

The combustible loading in this area consists of 320 gallons of lubricating oil. The area is provided with smoke detectors throughout the zone, which alarm individually at a local control panel and the control room. The four oil bath filters each have their own cross-zoned detection systems. Four infrared flame detectors and four thermal detectors are provided for each oil bath filter. 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 pre-action aqueous-film-forming-foam (AFFF) automatic suppression system provides local coverage initiated by the cross-zoned detection system previously described.

Two manual 1-1/2-inch hose reel stations are located within this zone. The hose stations are provided with AFFF. The technical bases to justify the exemption are summarized as follows:

(1) The conservative quantitative fire hazards analysis performed.

(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.

15.2 Evaluation

This area does not comply with Section III.G because (1) redundant cables are not separated by twenty feet free of intervening combustibles, (2) an automatic suppression system is not provided throughout the area, (3) an alternate shutdown capability independent of the area is not provided.

The significant combustible in the area is the lubricating oil used for the oil bath air filters. The licensee has provided automatic suppression, detection, and diking for the protection of these hazards.

Except for the oil bath air filters, the in-situ combustible loading in this fire area is negligible, therefore, any other postulated fire would involve transient combustible materials. Such a fire would most likely be of limited severity. The installed early warning detection system provides reasonable assurance that one train of components needed for safe shutdown will be maintained free of fire damage.

15.3 Conclusion

Based on our evaluation, the existing protection for area DG-16 provides a level of fire protection equivalent to the technical requirements of Section III.G, therefore the exemption should be granted.

Summary

Based on our evaluation, the following fire zones provide a level of fire protection equivalent to Section III.G and therefore should be granted:

RB-1-d (Unit 1)
RB-1-g (S/W) (Unit 1)
RB-4 (Unit 1)
RB-1-d (Unit 2)
SW-1-b
SW-1-a
DG-8
DG-16

Based on our evaluation the following fire zones do not provide a level of fire protection equivalent to Section III.G and should be denied:

CB-5
CB-6
CB-23
DG-1
DG-11
DG-14
DG-15
DG-23

Unit 1 Reactor Building

RB-1-N
RB-6
RB-1-g (E/C)
RB-1-g (W/C)
RB-1-g (S/E)
RB-1-g (S/C)
RB-1-0
RB-1-h (E/C)
RB-1-h (S/E)
RB-1-h (N/C)
RB-1-h (W/C)

Unit 2 Reactor Building

RB-1-n
RB-6
RB-1-g (E/C)
RB-1-g (N/C)
RB-1-o
RB-1-h (E/C)
RB-1-h (S/E)
RB-1-h (N/C)

The exemptions requested for the following zones require clarification by January 1983:

CB-1A
CB-1B
CB-2A
CB-2B
CB-12A
CB-12B
CB-13A
CB-13B
CB-16
CB-17
CB-18
CB-19
CB-20
CB-21
CB-22
DG-7

Unit 1

RB-2
RB-1-b
RB-1-g (N/W)
RB-1-e
RB-1-f
RB-1-g (N/E)
RB-1-h (N/E)
RB-1-h (N/W)
RB-1-h (W/C)
RB-1-h (S/W)
RB-10
RB-1-a

Unit 2

RB-2
RB-1-b
RB-1-g (N/W)
RB-1-g (S/W)
RB-4
RB-1-e
RB-1-f
RB-1-g (N/E)
RB-1-g (S/E)
RB-1-g (S/C)

RB-1-h (N/E)

RB-1-h (N/W)

RB-1-h (N/C)

RB-1-h (S/W)

RB-10

RB-1-a